

SINGLE INJECTION AND CONTINUOUS CATHETER PERIDURAL SEGMENTAL BLOCK ANAESTHESIA FOR GENERAL SURGERY*

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THE anatomy and contents of the peridural space (1) (2) and satisfactory methods of administering peridural segmental block anaesthesia have been adequately described in the literature (3). During the last few years the technique has been used in 1,236 surgical cases in the operating rooms of the Vancouver General Hospital. The anaesthetic drug used exclusively was 2 per cent xylocaine (lidocaine) in aqueous solution, or with adrenalin (1:300,000 or 1:200,000) added to lengthen the action of the drug; the needles found most satisfactory were No. 18 T with straight and huber points, manufactured by Becton, Dickinson & Company. On the basis of this clinical experience it is established that peridural segmental block anaesthesia deserves greater popularity among anaesthesiologists, and that it should have increasing importance in the armamentarium of those who use regional methods.

It is accepted that the technique is somewhat more difficult to master than others, and that induction of anaesthesia requires a longer period of time, but experience should minimize both of these problems. However, it is probably contraindicated when open reduction of fractures is to be undertaken, with the exception of Smith-Peterson nailing. The slight delay in onset of anaesthesia makes it possible to move the patient from bed to bell table before blood pressure changes occur. In addition, patients undergoing cystoscopy and transurethral resection should not have peridural anaesthesia unless the urologist is willing to wait until the anaesthesia is effective.

TABLE I
COMPLICATIONS (604 cases)

Failure or incomplete	13 (2.12%)
Lumbar puncture	6 (1.0%)
Needle in vein	1 (0.17%)
Atelectasis	1 (0.17%)
Sore back	2 (0.33%)

Table I illustrates the complications encountered in 604 consecutive cases.

Peridural segmental block anaesthesia has many advantages when used for surgical procedures below the diaphragm. These include its suitability for cardiac and poor risk cases (especially if prolonged surgical procedures are necessary);

*Presented at Tenth Annual Meeting of the Western Divisions, Canadian Anaesthetists' Society, Regina, Sask., April 21-23, 1955.

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its freedom from post-anaesthetic sequelae; and its non-explosive character. It is suitable for outpatients, and single injections may be repeated without danger.

Dogliotti's "Loss of resistance" technique (4) (5) is the only satisfactory method of entering the peridural space with certainty, in the lower thoracic and lumbar regions. By this method a suitable needle is placed in the substance of the ligamentum flavum, its stylet is removed, and a 5 c.c. syringe filled with 2 per cent xylocaine solution is attached to its hub. Constant forceful pressure is then maintained on the plunger of the syringe as it is advanced slowly through the ligamentum flavum and until it passes through the periosteal layer of dura and enters the peridural space. At that moment resistance to injection of the solution will suddenly disappear, and the solution will flow rapidly into the peridural space. It is possible that the plunger of the syringe may stick in the barrel, and thus prevent transmission of the pressure change as the needle enters the peridural space. To make certain that this does not occur, a small bubble of air is allowed into the 5 c.c. testing syringe. Then increased pressure on the plunger will compress the bubble if the plunger is freely movable and the point of the needle is still in the ligamentum flavum.

First attempts at peridural puncture should be made at L 2-3 or L 3-4, allowing ample time for the technique, and the amount of anaesthetic drug injected into the peridural space should not exceed 10-15 c.c. (2% xylocaine). When sufficient skill and experience have been acquired, the peridural space may be entered at the optimum level and larger amounts of anaesthetic drug injected, up to 20 c.c.

All patients for upper abdominal surgery should have gastric suction started on the ward and should be sent to the operating room with a Levine tube in place. If doubt exists whether the patient's stomach is empty, then the patient should be kept awake during surgery or endotracheal intubation should be carried out.

An intravenous infusion should be started before or immediately after commencement of peridural anaesthesia. If the stomach is empty, pentothal 0.2 per cent added to the intravenous solution will prevent any possibility of drug reaction, and can be combined with nitrous oxide analgesia to keep the patient lightly asleep during surgery.

Frequently it is impossible to test levels of anaesthesia, or to keep the patient in an anaesthetic room until peridural block is complete. To avoid having a confused, struggling patient when surgical preparation is commenced, it is best to keep the patient either awake enough to co-operate, or asleep. In addition special care should be taken to ensure that leg restraints are properly applied, and that both arms are securely fastened. When surgical preparation and draping are complete the patient can be given light general anaesthesia.

Single injection peridural block has proven satisfactory for many surgical procedures below the diaphragm. These have included all pelvic and gynaecological operations, rectal surgery, herniorrhaphy, lumbar sympathectomy, appendectomy, circumcision (adult), nephrectomy, nephrolithotomy, plastic surgery of kidney and ureters, all suprapubic urological procedures, laminectomy, spine fusion, excision of pilonidal sinus, ligation and stripping of varicose veins, mid thigh amputation, Smith-Peterson nailing of fractured femur, meniscectomy, and

exploration of the knee joint. Complications have been relatively few, and most of them have been due to inexperience.

Table II will serve as a guide for choosing injection sites.

TABLE II
SINGLE INJECTION SITES

Procedure	Site	Type of needle
Cholecystectomy Gastrectomy Perforated ulcer	T ₁₀₋₁₁ or T ₁₁₋₁₂	Straight ↑
Kidney	T ₁₁₋₁₂	Straight ↑
Abdomen Pelvis	T ₁₁₋₁₂ or T _{12-L1}	Straight ↑
Hernia Lumbar sympathectomy	T _{12-L1}	Straight ↑
Pilonidal sinus Fractured hip leg	L ₁₋₂ or L ₂₋₃	Straight ↑
Laminectomy	Not at disc	Straight
Rectum Prostate Circumcision	L ₃₋₄ or L ₄₋₅	Huber ↓

↑ Means that flow of solution is directed cephalad

↓ Means that flow of solution is directed caudad

Continuous catheter peridural segmental block may well prove to be the most satisfactory method of regional anaesthesia yet devised. An experienced anaesthesiologist can place a catheter with certainty in the peridural space at any desired level. Anaesthesia may be maintained during long surgical procedures, and post-operative pain control may be supplied in selected cases (6). This method has proved excellent for the following surgical procedures: gastrectomy, cholecystectomy and exploration of common duct, bilateral herniorrhaphy, ligation of inferior vena cava, bowel resection, and embolectomy. It may, however, be used in any surgical procedure in which the diagnosis is in doubt or which may require longer than 1½ hours.

Table III indicates the injection sites, and the catheter direction.

As yet, plastic tubing suitable for catheters is supplied only in rolls 100 feet long, which must be cut into 36" lengths. When cut, the catheters are fitted with stylets made from No. 5 or No. 6 tonsil wire. The stylets should be about 40" long, and must have the ends filed smooth so that they will not damage

TABLE III
CATHETER INJECTION SITES

Procedure	Site	Type of needle
Gastrectomy Gall bladder	T ₁₀₋₁₁ or T ₁₁₋₁₂	Straight ↑
Bowel resection Ligate inf. vena cava Abdomen Pelvis	T ₁₁₋₁₂ or L _{1-L2}	Straight ↑ or Huber ↑
Bilateral hernia legs	L _{1-L2}	Huber ↑
Embolectomy	L _{1-L2} or L ₃₋₄	Huber ↑

the catheters. The prepared catheters should be wrapped separately, each with a catheter adapter, and autoclaved at 250° for five minutes.

Following placement of a needle in the peridural space, at the selected level the stylet is withdrawn until it is about ½" inside the catheter at one end (Figure 1). The needle is fixed and the catheter is gently inserted into the lumen of the needle, with its curve towards the direction it is to go in the peridural space. As the end of the catheter reaches the needle point—and the space—a characteristic resistance is always encountered, until the end of the catheter has

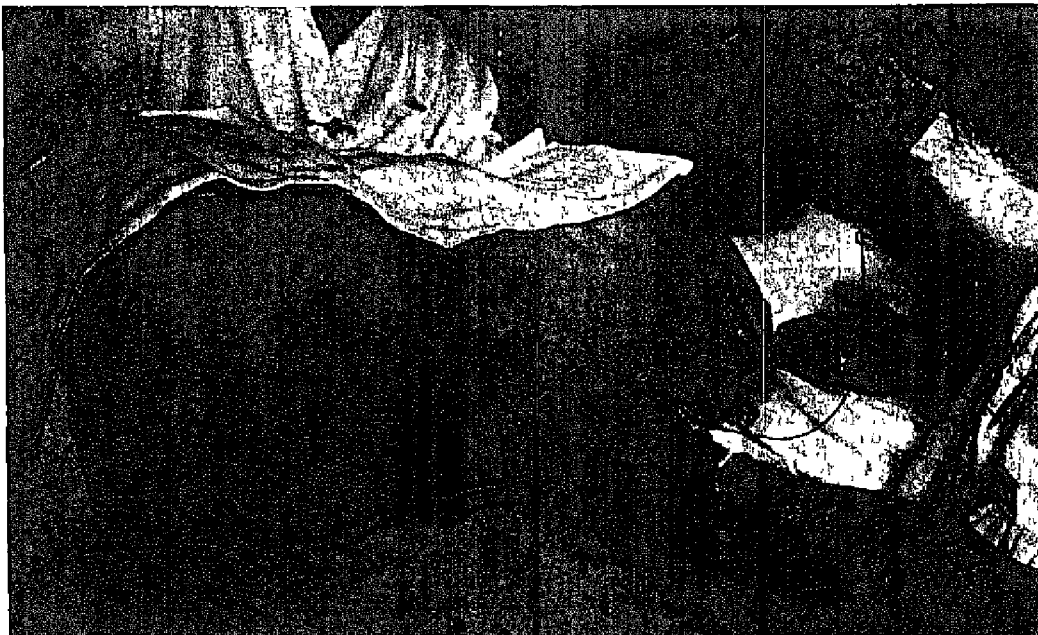


FIG 1 Catheter about to be inserted into needle



FIG 2 Catheter in peridural space stylet partly withdrawn

passed into the peridural space. When the resistance ceases then the stylet should be withdrawn from the catheter as the catheter is advanced through the point of the needle (Figure 2). The catheter need only be advanced far enough into the peridural space to make certain that it will not be pulled out of the

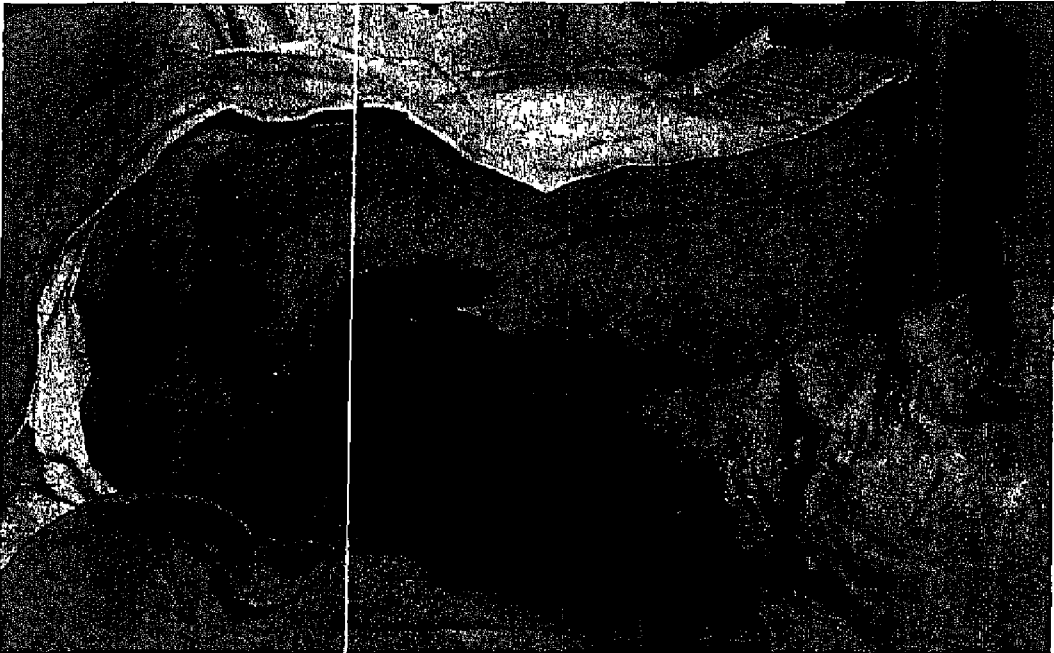


FIG 3 Catheter in position for taping

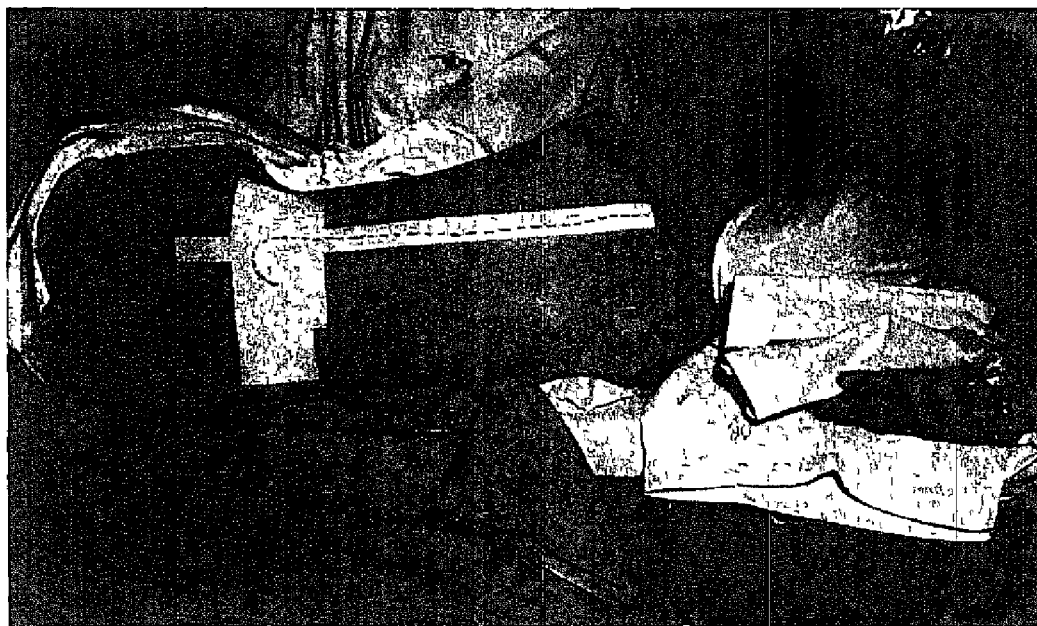


FIG 4 Catheter taped to patient's back

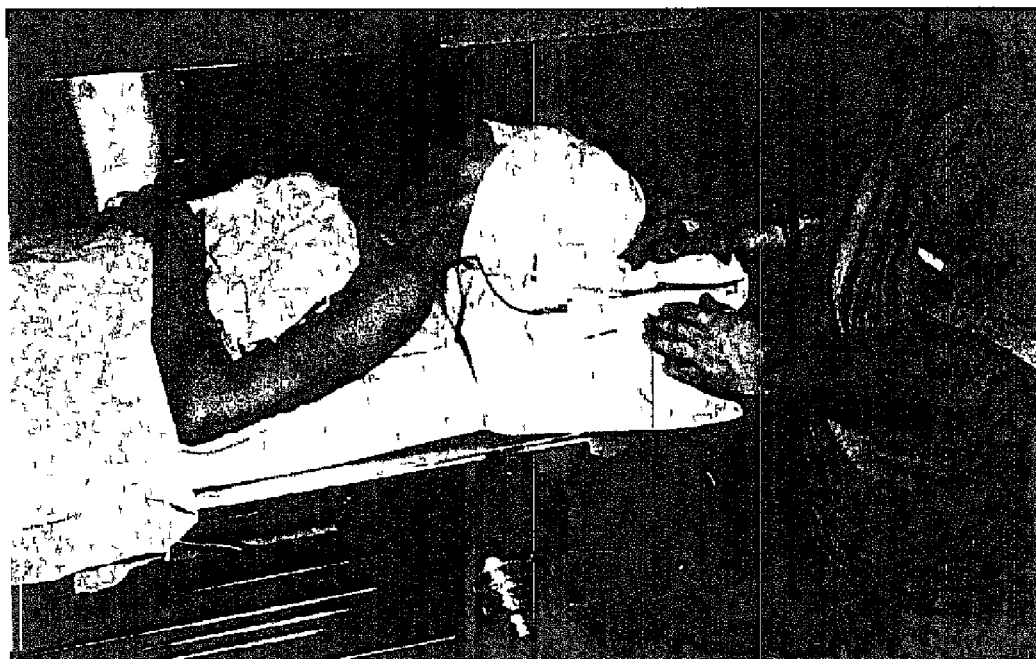


FIG 5 Patient in supine position Catheter and loaded syringe shown

space, as the needle is threaded backwards along the catheter. The catheter can then be taped to the patient's back, after the catheter adapter has been attached, and a test dose (2-3 c.c. 2 per cent xylocaine) can be given to rule out spinal. The patient is repositioned on the operating table, and if no anaesthesia is present within five minutes, a full dose of 15-20 c.c. of 2 per cent xylocaine is injected

into the catheter. This may be repeated at hourly intervals. Catheters should be removed before the patient leaves the operating room.

Vasopressor drugs are not administered in either single injection or continuous catheter peridural anaesthesia unless the systolic blood pressure falls below 80 mm. Hg., in normo-tensive patients, or unless the patient's condition requires careful regulation of the blood pressure. For this reason it is extremely important that blood pressures be taken at frequent intervals, especially immediately after peridural injections have been made. Age, site of injection of the anaesthetic drug, and amount injected will all tend to influence the blood pressure. Table IV for

TABLE IV
SINGLE INJECTION PERIDURALS

Age	No vasopressor	Vasopressor
10-19	16	—
20-29	29	3
30-39	29	15
40-49	24	15
50-59	11	21
60-69	16	19
70-79	8	33
80-89	3	12
90 +	—	1

single injection peridurals indicates that on the basis of age alone vasopressor drugs are unlikely to be required in patients under 30 years of age, and that a percentage of patients in all age groups will not need them. If hypotension does occur in healthy patients, owing to peridural segmental block, a minimum blood pressure of 80 mm. Hg. systolic is considered safe, and will produce a relatively bloodless operative field, with minimal blood loss.

Additional assistance in providing a bloodless field for surgery of the spine (laminectomy, spine fusion, and pilonidal sinus excision) may be provided by using 2 per cent xylocaine with adrenalin added (1:300,000 or 1:200,000) as the adrenalin produces a local vasoconstriction at the site of action.

Methedrine (Methamphetamine) and neosynephrine are the drugs of choice for maintenance of blood pressure. Methedrine is administered 5 mgm. intravenously and 15 mgm. intramuscularly to maintain blood pressure in poor risk cases, and frequently will raise the blood pressure to safe levels should serious hypotension occur. If more active control is necessary, 4 mgm. of neosynephrine may be added to 500 c.c. of intravenous solution, and the mixture used to maintain the blood pressure at satisfactory levels, by varying the speed of the intravenous drip. When blood pressure is difficult to maintain during surgery, it must be watched constantly until anaesthesia has worn off.

SUMMARY

Single injection and continuous catheter peridural segmental anaesthesia are satisfactory for most surgical procedures below the diaphragm. The continuous

catheter technique is limited in its use because of difficulty in preparing catheters, but should be more widely employed. Advantages, disadvantages, complications, and sites of injection are discussed.

RÉSUMÉ

Durant ces quelques dernières années, on a utilisé, dans les salles d'opération de l'Hôpital Général de Vancouver, le blocage anesthésique péridural segmentaire dans 1236 cas de chirurgie. En se basant sur cette expérience clinique, il est permis d'affirmer que l'anesthésie péridurale segmentaire mérite une plus grande popularité chez les anesthésistes.

Il est probable que cette technique est contre-indiquée dans les réductions ouvertes des fractures. En plus, on ne doit pas l'employer pour les cystoscopies ou les résections transurétérales à moins que l'urologue est prêt à attendre le temps nécessaire à l'anesthésique pour être effectif.

Les complications présentées dans 604 cas sont analysées (Tableau I). La technique "par perte de résistance" de Doggliotti est la seule méthode satisfaisante d'entrée dans l'espace péridural. L'endroit d'élection pour injection unique de la solution anesthésique varie selon le niveau opératoire (Tableau II).

Quand on utilise un cathétère inséré dans l'espace péridural, l'anesthésie peut être maintenue pour de longues périodes de temps. Cette technique est décrite en détail et les points d'élection pour l'injection par cathétère dans diverses opérations sont donnés dans le tableau III.

On ne donne aucun vasoconstricteur chez les patients à tonus vasculaire normal à moins que la pression sanguine systolique tombe en bas de 80 mm Hg. En fait, la plupart des patients de moins de 30 ans ne requièrent aucun vasoconstricteur.

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