CURRENT COMMENT AND CASE REPORTS

STUART C. CULLEN, M.D., *Editor*

There has been an encouraging response to this section, and several interesting communications have been received and are included in this issue. We are especially pleased to have three letters. We hope that more of you will find the time to send in comments on material that appears in the *Journal*.

NONREBREATHING VALVE

Dr. George Lewis, Jr., of Los Angeles has modified the Leigh valve and his comments concerning it follow.

The Lewis-Leigh valve (fig. 1) is a clear plastic nonrebreathing valve which permits assisted and controlled respirations with one hand of the anesthesiologist. The basic design of the valve is that of the conventional Leigh nonrebreathing valve which incorporates intrinsically a chimney piece which stems from the seat of the exhalation valve. The

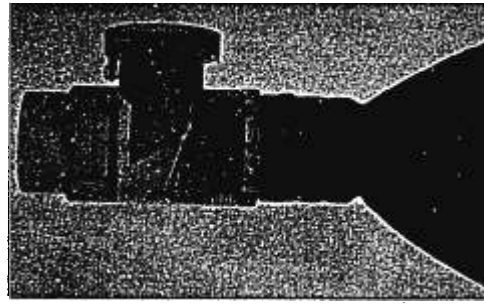


FIG. 1. Lewis-Leigh nonrebreathing valve.

chimney piece serves the dual function of (1) helping to prevent the escape of gases during positive pressure inhalation and (2) acting as the avenue for the escape of exhaled gases.

METHOD OF FUNCTION

Figure 2A shows the direction of flow of gases and the position of the leaflets of the valve during positive pressure inhalation. When hand pressure is applied to a partially filled breathing bag at the beginning of inhalation, the inspiratory valve leaflet swings in an arc from its resting position and occludes the opening of the chimney piece. Gases then go from the breathing bag to the patient without escaping into the atmosphere.

Figure 2B shows the direction of flow of gases and the change in position of the valve leaflets during exhalation. When the pressure on the breathing bag is *suddenly* released at the height of inhalation, the inspiratory valve leaflet swings off the chimney piece and back to its resting position. The exhaled gases then traverse the chimney piece and go free into the atmosphere through the exhalation valve. It follows, with the inhalation valve now in the closed resting position, exhaled gases cannot go back into the breathing bag.

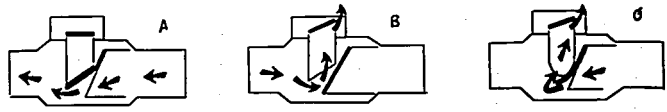


FIG. 2. (A) Positive pressure inhalation. (B) Exhalation. (C) Pop-off.

Figure 2C shows the pop-off mechanism. By turning the chimney piece one-fourth of a turn from its operating position, the inhalation valve leaflet does not make occlusive contact with the opening of the chimney piece and excess gas will be released into the atmosphere.

FACTORS IN OPERATION

1. The total flow of gases delivered from the anesthetic machine should closely approximate the respiratory minute volume of the anesthetized patient. The proper way of using the valve is never to allow the breathing bag to become overdistended with gas.

2. If excess gas is delivered from the gas machine, the breathing bag will become overdistended and the inspiratory valve leaflet will persistently occlude the chimney piece. This situation is corrected by utilizing the pop-off mechanism and reducing the total flow of gases from the gas machine to a point where the breathing bag is partially full but not distended. The chimney piece is then returned to its operating position.

3. The Lewis-Leigh nonrebreathing valve functions whether it be placed upright, upside down, or on end.

4. The visibility of the valvular mechanism allows the operator to see the method of action of the valves.

5. In surgical operations where it is desirable to place the valve remote from the anesthesiologist, there is available a pop-off which is incorporated in the connector which connects the delivery tube to the tail of the breathing bag.

INDIRECT LARYNGOSCOPE

Dr. Robert Miller of San Antonio (Texas, that is) has added to his collection of laryngoscope modifications an "indirect" laryngoscope. He feels that it is useful in those cases in which the chin recedes, the mandibular joint is ankylosed, or inflammatory changes or tumors distort the larynx and adjacent structures.

The instrument consists of a hollow tube 20 centimeters in length, 11 millimeters in diameter (fig. 1). Five centimeters from the tip there is a 135 degree angulation at the base of which is a stainless steel mirror that reflects the image of the cords. The image of the cords is inverted. A lens can be fitted to the end of the laryngoscope to correct the position of the cords, but this adds to the cost of the instrument and is unnecessary.

This idea is not new, as Bozzini, in Germany in 1807, designed a similar instrument which had no light except for direct sunlight. He used two mirrors, one for light and the other for the image. Due to poor illumination this instrument was discarded.

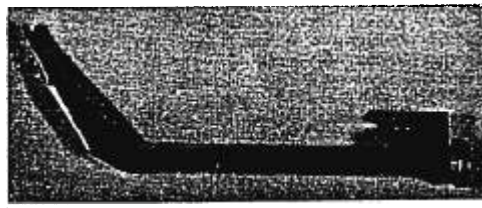


FIG. 1.

In 1954 an experimental instrument was shown at the meeting of the American Society of Anesthesiologists held in Seattle. This instrument was larger and had two lights, one to light the mirror and the other to light the cords. It was found that two lights were unnecessary, and the present smaller scope was found to be more practical. An open curved laryngoscope of a similar design has been described by Siker.

After using the indirect laryngoscope for one year, it has been found useful in difficult cases but does not replace a direct vision laryngoscope. A stylet should be used to insert the tracheal tube through the mouth. Orotracheal intubation is easier with the indirect laryngoscope than nasal intubation.

SYRINGE ADAPTER FOR CUFFS

Dr. Glen J. Potter of Los Angeles has designed a syringe adapter to fit all sizes of endotracheal cuff catheters (fig. 1). The basis of it is an 18 gauge needle with the hub turned down on a lathe to receive a specially tapered cone made of drilled bronze weld rod. The needle tip is blunted and rounded, but some of the bevel may be retained. A metal extension is attached to the hub to prevent rolling and falling of the syringe with its adapter. The three metal parts are united with solder.

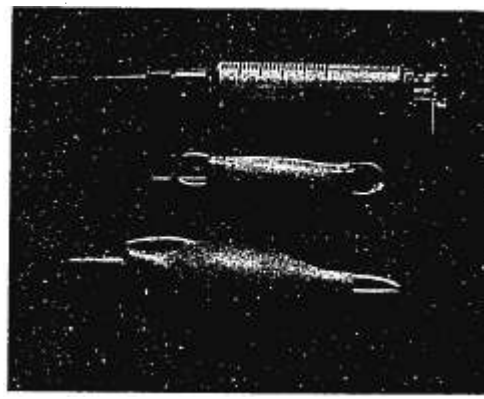


FIG. 1.

TRICK IN PLACING CAUDAL NEEDLE

Dr. Benjamin Schneiderman of Beverly Hills, California, uses the following additional test for proper placement of a needle in the caudal canal.

After the needle is inserted into what is thought to be the caudal canal, the hub of the needle is held by the thumb and index finger of one hand, while gentle pressure is applied with the palmar surface of the thumb of the other hand on the shank of the needle just proximal to the point where it enters the skin. The pressure is then maintained while the hub is gently moved to-and-fro laterally several times in about one-half inch excursions. A clicking or scratching sensation perceived through the palmar surface of the thumb indicates that the top of the needle is contacting the anterior surface of the posterior wall of the caudal canal and is therefore properly placed.

PRACTICAL GROUNDING METHODS

Dr. Wallace M. Shaw, Mid-Island Hospital, Bethpage, New York, has some practical ideas regarding conductive footwear. He presents one method for permanent installation and some other methods for temporary use. The first method mentioned is the permanent one.

A stainless steel disk with two long tabs is cut from 26 or 28 gauge stainless steel (fig. 1). The regular rubber or leather heel of any shoe is removed and discarded. Two holes are then drilled from the inside of the shoe through the remaining portion of the heel, using a suitable size drill. These holes are spaced 1¾ inches apart, this being the diameter of the disk. The tabs on the stainless steel disk are bent down at right angles, inserted through the holes, and bent over underneath. A conductive rubber heel is then applied over these bent strips of stainless steel so that it contacts them. This heel should be attached with nonferrous nails, or the nail heads should be set below the level of the rubber. If a cement is used it should be applied around the edges and not between the steel strips and the conductive heel because it may act as an insulator. The heel is then ground down to fit the rest of the shoe. Such an installation can be performed very easily by a local shoemaker, particularly if arrangements can be made with one in the neighborhood of the hospital to take care of this work. These heels allow the use of any shoes to which personnel may have become accustomed. They can even be mounted on sponge rubber shoes and still provide adequate grounding. In use they should be tested for conductivity just as any footwear used in operating rooms. A pair of these shoes has been worn for over one year with no loss of conductivity and with completely satisfactory grounding.

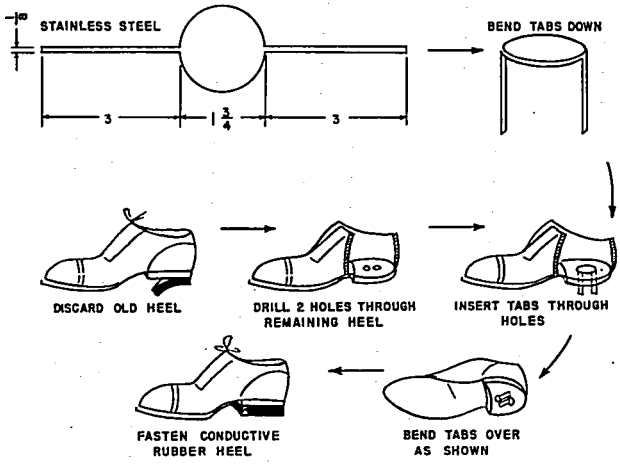


FIG. 1.

The other methods of grounding personnel were devised for temporary use by people who only occasionally enter operating rooms and who, for some reason or other, are not wearing properly conductive footwear. They consist of strips of conductive

rubber sheeting ½ to ¾ inch wide and 20 inches long. These can be cut or torn from a larger sheet. In one method a slit about 1 inch long is made in one end of the strip (fig. 2). The opposite end is threaded through the slit to make a loop, and this loop is placed around the ankle of the wearer. It should contact the skin, or if placed over a stocking, a few drops of water beneath the rubber will afford adequate contact through the moist hosiery. The trailing end is brought down along the outer side of the foot, under the heel of the shoe, and a large-headed thumb tack is pressed through the conductive rubber strap into the undersurface of the heel. Steel-headed tacks can be used on conductive linoleum floors but not on ceramic or concrete floors because of the risk of percussion sparks. In this latter case, brass-headed tacks can be used or a piece of adhesive tape can be applied, as shown, to allow part of the grounding strap to contact the floor.

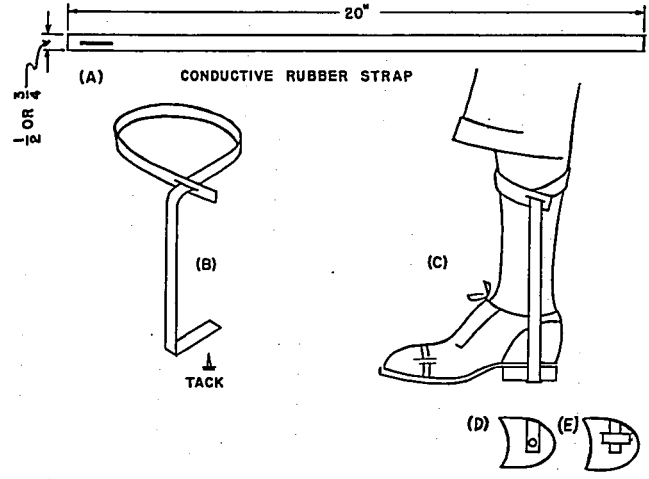


FIG. 2.

In the next method, the conductive rubber strap is pushed down inside the heel of the shoe (fig. 3 A). The foot is put into the shoe and the two loose ends of the strap are brought down on both sides of the shoe, crossed beneath the heel and tacked or taped in place. This strap can be left in place day after day without adjustment.

The last method requires no tack or tape (fig. 3 B). The heel of the shoe is placed over the conductive strap and the ends are brought up and into the shoe. The foot is then put into the shoe so as to rest on the two strap ends. This is the simplest and least permanent grounding device of all.

Any of these strap devices will provide an effective conductive jumper for a shoe whose resistance is too high. Two such jumpers should be used for each person. These grounding devices are very inexpensive, costing 2 cents each for materials. They are simple to make on the spot, can be prepared by unskilled personnel, and can be stored in large quantity. The cost is so slight that the devices may be discarded after use. They may also be reused after a brief washing.

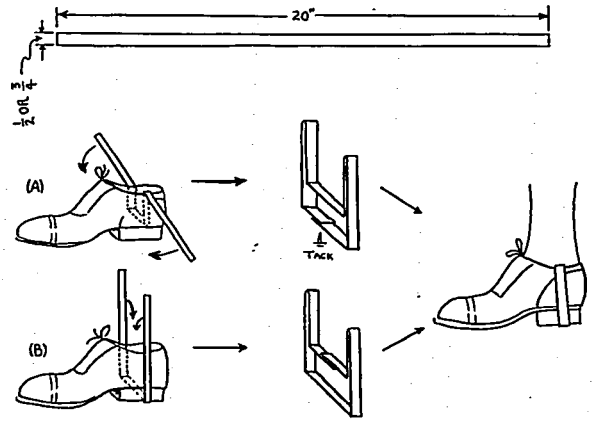


FIG. 3.

All of these devices contain a built-in resistance in the form of the conductive rubber of over 25,000 ohms. This prevents serious shock hazard to personnel and still provides adequate grounding.

VENTILATION DURING ANESTHESIA FOR BRONCHOSCOPY

Doctors Hugh S. Mathewson, J. Donald McIntyre, and Don R. Meriwether of Kansas City have a solution to the problem of ventilation during general anesthesia combined with muscle relaxants for bronchoscopy.

FIG. 1.

A standard large-bore slip joint is welded into the base of the bronchoscope, adjacent to but not encroaching on the visual path of the bronchoscopist (fig. 1). The slip joint can be connected to a closed circle-absorption system (fig. 2).

Manual inflation of the lungs can be accomplished intermittently by having the bronchoscopist place his thumb over the end of the bronchoscope.

By virtue of having respiratory control, the anesthetist may administer enough succinylcholine to produce the desired degree of relaxation, even though the patient be rendered apneic.

In their experience the attachment of the breathing tubes to the bronchoscope has not proved encumbering to the bronchoscopist. Actually, the ease of manipulation provided by complete relaxation seems to more than compensate for the presence of the device. They have found it advisable to interpose a Woodhull adapter between the slip joint and the chimney Y, for additional mobility.

FIG. 2.

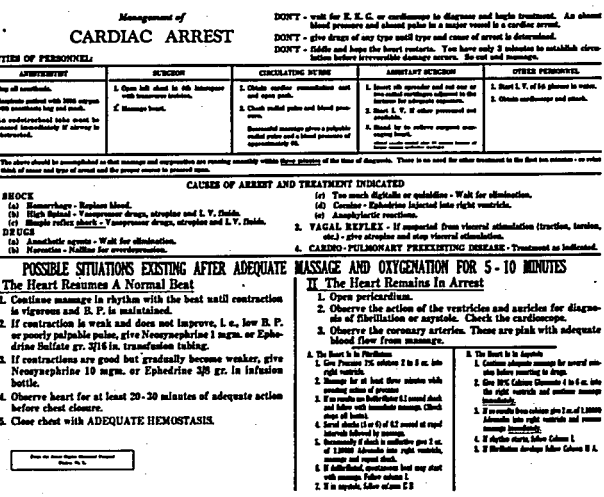
Occasionally, where there is a large disparity between the size of the bronchoscope and the size of the trachea, it has been necessary to increase the rate of flow of oxygen to 15 to 20 liters per minute. However, it has been possible in all instances to provide positive pressure up to 15 millimeters of mercury on forced inflation.

The design of the apparatus might be further improved by the addition of an air-tight eyepiece, which would enable artificial ventilation to be performed at all times. However, the eyepiece would have to be removed for suction or biopsy, during which times the system would be open.

They have used this device in 100 bronchoscopies and feel that it represents a technical improvement over pre-existing methods.

CARDIAC ARREST POSTER

The surgical and anesthesia staffs of the Arnot-Ogden Memorial Hospital, Elmira, New York, developed a poster outlining a "standard" procedure for the treatment of cardiac arrest (fig. 1). This poster has been placed on the back wall of each operating, delivery, emergency, and recovery room. The printing is of such a size that the poster



Management of

CARDIAC ARREST

DON'T - wait for E. K. G. or cardiogram to diagnose and begin treatment. An absent blood pressure and absent pulse in a major vessel is a cardiac arrest.

DON'T - give drugs of any type until type and cause of arrest is determined.

DON'T - fiddle and hope the heart restarts. You have only 3 minutes to establish circulation before irreversible damage occurs. Be out and massage.

DUTIES OF PERSONNEL:

ANESTHETIST	SURGEON	CIRCULATING NURSE	ASSISTANT SURGEON	OTHER PERSONNEL
1. Stop all anesthesia. 2. Ventilate patient with 100% oxygen with anesthetic bag and mask. 3. An endotracheal tube must be passed immediately if airway is obstructed.	1. Open left chest in 4th interspace with transverse incision. 2. Massage heart.	1. Obtain cardiac resuscitation cart and open pack. 2. Check radial pulse and blood pressure. Successful massage gives a palpable radial pulse and a blood pressure of approximately 60.	1. Insert rib spreader and cut rest of intercostal cartilages adjacent to the incision for adequate exposure. 2. Start I. V. if other personnel not available. 3. Stand by to relieve surgeon massaging heart.	1. Start I. V. of 5% glucose in water. 2. Obtain cardiotonique and attach.

The above should be accomplished so that massage and oxygenation are running smoothly within three minutes of the time of diagnosis. There is no need for other treatment in the first ten minutes - so relax and think of cause and type of arrest and the proper course to proceed upon.

CAUSES OF ARREST AND TREATMENT INDICATED

1. SHOCK
   (a) Hemorrhage - Replace blood.
   (b) High Spinal - Vasopressor drugs, atropine and I. V. fluids.
   (c) Simple reflex shock - Vasopressor drugs, atropine and I. V. fluids.
2. DRUGS
   (a) Anesthetic agents - Wait for elimination.
   (b) Narcotics - Nalline for overdepression.
   (c) Too much digitalis or quinidine - Wait for elimination.
   (d) Curare - Ephedrine injected into right ventricle.
   (e) Anaphylactic reactions.
3. VAGAL REFLEX - If suspected from visceral stimulation (traction, torsion, etc.) - give atropine and stop visceral stimulation.
4. CARDIO-PULMONARY PREEXISTING DISEASE - Treatment as indicated.

POSSIBLE SITUATIONS EXISTING AFTER ADEQUATE MASSAGE AND OXYGENATION FOR 5 - 10 MINUTES

I. The Heart Resumes A Normal Beat

1. Continue massage in rhythm with the beat until contraction is vigorous and B. P. is maintained.
2. If contraction is weak and does not improve, i. e., low B. P. or poorly palpable pulse, give Neosynephrine 1 mgm. or Ephedrine Sulfate gr. 3/16 in. transfusion tubing.
3. If contractions are good but gradually become weaker, give Neosynephrine 10 mgm. or Ephedrine 3/8 gr. in infusion bottle.
4. Observe heart for at least 20-30 minutes of adequate action before chest closure.
5. Close chest with ADEQUATE HEMOSTASIS.

II. The Heart Remains In Arrest

1. Open pericardium.
2. Observe the action of the ventricles and auricles for diagnosis of fibrillation or asystole. Check the cardioscope.
3. Observe the coronary arteries. These are pink with adequate blood flow from massage.

A. The Heart Is In Fibrillation

1. Give Procaine 2% solution 2 to 5 c.c. into right ventricle.
2. Massage for at least three minutes with pounding action of pressure.
3. If no results use Defibrillator 0.1 second shock and follow with immediate massage. Check shape of beats.
4. Serial shocks (5 or 6) of 0.2 second at rapid intervals followed by massage.
5. Occasionally if shock is ineffective give 2 cc. of 1:10000 Adrenalin into right ventricle, massage and repeat shock.
6. If defibrillated, spontaneous beat may start with massage. Follow column 1.
7. If in asystole, follow column II B

B. The Heart Is In Asystole

1. Continue adequate massage for several minutes before resorting to drugs.
2. Give 10% Calcium Gluconate 4 to 6 c.c. into the right ventricle and continue massage immediately.
3. If no results from calcium give 1 c.c. of 1:10000 Adrenalin into right ventricle and resume massage immediately.
4. If rhythm starts, follow Column I.
5. If fibrillation develops follow Column II A.

FIG. 1. Cardiac arrest poster.

can be read at a distance of 18 feet and can be seen easily from the operating room table. The size of the poster is 28 by 22 inches. This poster depicts:

1. The duties of each person in the operating room.
2. The specific initial treatment, for example, thoracotomy, cardiac massage, and pulmonary ventilation.
3. Subsequent treatment.
4. The "don'ts" of treatment.

The main objective of this poster is to prevent waste of time in the diagnosis and initial therapy of cardiac arrest, to prevent confusion, to delegate responsibility, and to prevent good intentioned but misguided therapy.

Patients under preoperative sedation do not appear to be too aware of their surroundings; their vision is altered by the preoperative belladonna drug, and the location of the chart on the back wall makes it difficult for the patient to see. In any event, no patient to date has appeared to notice the chart or has commented on it.

The authors, Doctors William K. Nowill and Ross E. Hobler, believe that this chart has a definite teaching function. They do not expect their surgical teams to follow its direction implicitly or do they believe that the information on the chart is the ultimate in the treatment of cardiac arrest or that everyone will agree to the details of treatment as outlined on the chart.

ADDITIVE FOR TRANSFUSED BLOOD

Dr. Christine Furman of Minneapolis, in cooperation with Dr. Phillip Eder, has perfected a formula to be given in conjunction with blood transfusions in anesthetized patients. They have administered these drugs over 10,000 times without recognizable

ill effects. The formula is:

200 cc. of distilled water
5 grams of sodium bicarbonate
½ gram of ascorbic acid
2 mg. of vitamin K

The mixture is given following each 1500 cc. of transfused blood. After the fluid has been running long enough to clear the tubing and needle, 10 cc. of 10 per cent calcium gluconate is added.

The dose of sodium bicarbonate is calculated to exactly counteract the acidity associated with the storage of blood and the addition of anti-coagulants. The sodium bicarbonate must be clean but is self-sterilizing and does not tolerate heat. Ascorbic acid helps to maintain the integrity of the capillaries, and calcium gluconate restores the ionized calcium depleted by the anti-coagulants. Although vitamin K is of minor importance in the formula, it may help prevent bleeding.

THE REMAINING MATERIAL IN THE SECTION IS PRESENTED ESSENTIALLY AS SUBMITTED

CONTINUOUS PERIDURAL BLOCK

John Bonica of Tacoma, Washington, presents in the following material an approach to continuous peridural block.

In using the continuous or fractional technique for peridural block as originally described (1, 2, 3), which entails inserting the needle in the midline, difficulty is often encountered in advancing the plastic tubing or ureteral catheter beyond the point of the needle. This is due to the fact that in the lumbar region the needle is almost perpendicular to the long axis of the narrow peridural space and the tubing must make a 90 degree turn in order to proceed cephalad or caudad. Although the use of the Huber point diminishes this problem it does not eliminate it entirely. Moreover, it is necessary to use a 16 gauge Tuohy needle, which is not only larger but presents the disadvantage of a long, sharp bevel. With the 18 gauge short beveled, thinwalled needle specially made for continuous peridural block, the difficulty of advancing the needle is greater since its bevel is not conducive to cause the tubing to make a 90 degree turn. The force used to overcome this obstacle often produces paresthesia and is inherent with the danger of piercing the dura.

In order to obviate these difficulties several years ago we began to use a modified paramedian technique of inserting the needle (4). By using the approach to be described the needle can be made to enter the peridural space at an angle in excess of 135 degrees, thus facilitating the advance of the plastic tubing. This technique was suggested by the writings of Dogliotti (5), Taylor (6), and Macintosh (7) and by anatomic studies.

The only special equipment necessary is a special 18 gauge needle with a very short bevel and a thin wall, which permits the passage of a 1 mm. bore vinyl plastic tubing made for this purpose. The tubing has markings made with brilliant green at 5 cm. intervals to indicate distances from its point and is fitted also with a fine stylet made from no. 5 tonsil wire.

The procedure is executed with the patient in the lateral position, usually lying on the side which requires the more intense anesthesia. The table is tilted so that the spinal canal is at a slightly head-down inclination in order to decrease intrathecal pressure, thus allowing the dura to fall away from the walls of the spinal canal where the point of the needle enters the peridural space. Since the injected solution disperses in both directions from the site of the injection, it is best to choose as the site of inserting the needle the interspace which is one or two vertebral segments below the midpoint of the desired zone of anesthesia.

The method of entering and identifying the peridural space is the one first described by Forestier (8) and subsequently popularized by Dogliotti (5) and known as the "lack-of-resistance" test. This technique as performed in the midline is depicted in figure 1.

For the paramedian approach an intracutaneous wheal is made 1.5 cm. lateral to the caudal end of the spinous process of the vertebrae below the chosen interspace. If the lumbosacral interspace is to be used, the wheal is made 1.5 cm. from the midline at the level of the posterior superior spine. The subcutaneous tissue, muscle and periosteum of the lamina are infiltrated with dilute solution of the local anesthetic by using a sharp, long-beveled 20 gauge needle. The point of the needle is directed so that it will contact the medial extremity of the lamina. This maneuver serves to produce analgesia and to explore the region prior to inserting the larger needle.

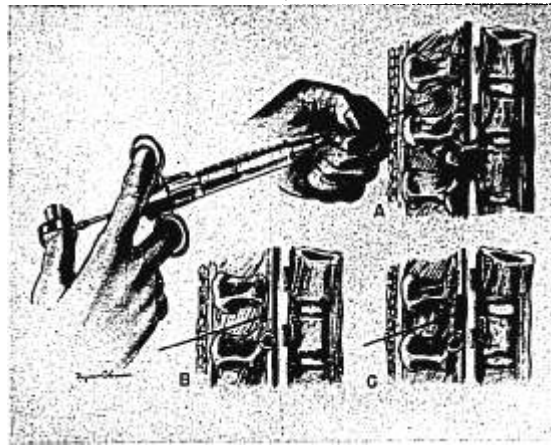


FIG. 1. Sagittal section in the region of the lumbar portion of the spinal column to depict the technique of peridural block. (a) Advance of needle with the left hand while constant, unremitting pressure is being exerted on the plunger of the syringe with the right hand. Some resistance is offered by the interspinous ligament to the injection of the saline. (b) The point of the needle in the ligamentum flavum which offers great resistance. (c) Entrance of point of the needle into the peridural space is discerned by sudden lack of resistance to the injection of the saline. The force of the injected solution pushes the dura arachnoid away from the point of the needle.

The next step is to introduce a sharp, long-beveled 18 gauge needle through the anesthetized skin and subcutaneous tissue to produce an opening for the blunt peridural needle. Holding the skin with the fingers of the left hand prevents displacement of the tract made by the sharper needle. The special peridural needle is then introduced through this opening and its point directed medially and cephalad so that its axis makes an angle of approximately 15 degrees with the midsagittal plant and 135 degrees with the long axis of the spinal canal. The needle is advanced through the paraspinal muscles until contact is made with the ipsilateral lamina of the vertebra. If the needle is properly directed it should contact the medial extremity of the lamina at its junction with the spinous process as depicted in figure 2.

As soon as contact is made, the needle is maneuvered so that its bevel faces the superior surface of the lamina and is felt engaging the ligamentum flavum. The stylet is then removed and a Luer-lok control syringe filled with saline is carefully adapted to the hub of the needle and an attempt is made to inject the saline. If the bevel of the needle is within the tough, compact ligamentum flavum, considerable resistance is encountered in injecting the solution, whereas if the bevel is still in the loose paraspinal muscle the resistance will be only minimal. While the thumb of the right hand exerts steady pressure on the plunger of the syringe, the shaft of the needle is grasped between the thumb and forefinger of the left hand and very slowly advanced. The left hand should rest on the back of the patient so as to steady the needle and better regulate the pressure that is exerted against it. In this manner the needle is very slowly and gently pushed through the ligamentum flavum until it enters the peridural space. As soon as the bevel of the needle enters the peridural space, there is a sudden lack of resistance, and the liquid can be injected very easily. As the saline solution is discharged, the force of the injection pushes the dura anteriorly, away from the needle point and from the posterior wall of the canal.

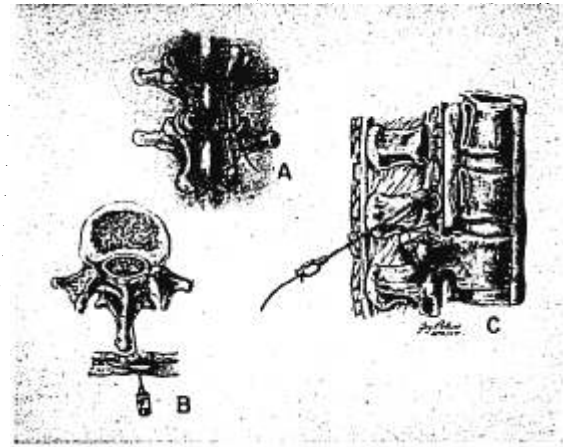


FIG. 2. Technique of continuous peridural block in the lumbar region by the paramedian route, (a) posterior view and (b) superior view showing the relationship of the site of the puncture, the direction of the needle, and the spinous processes. (c) Sagittal view to demonstrate the same relationships and the position of the tubing in the peridural space. The laminae and pedicles of the upper two vertebra have been removed.

When it is ascertained by aspiration test that the point of the needle is not in the subarachnoid space, but is in the peridural space, the tubing with stylet in place is inserted through the needle. Before introducing the tubing, the stylet should be withdrawn 2 cm. from the end which is to be inserted, and the plastic tube dipped in warm saline to make it more pliable. When the end of the tubing contacts the dura the hub of the needle is depressed toward the patient to increase further the angle the needle makes with the peridural space. Because of this greater angle very little pressure is needed to cause the tubing to pass beyond the point of the needle cephalad in the peridural space.

The tubing is advanced 4 or 5 cm. within the peridural space. If the site of the needle puncture was selected correctly, this would place the tip of the catheter at a

vertebral level which corresponded approximately to the midpoint of the zone of cutaneous anesthesia. For example, to produce anesthesia for renal surgery (T7-L5) the needle is inserted through the second lumbar interspace and the catheter advanced to place its tip at the level of the twelfth thoracic vertebra, as illustrated by figure 3.

As soon as the tubing is properly placed the needle is withdrawn, a Tuohy-Borst catheter adaptor is attached, and aspiration is attempted with a dry syringe to distinguish between a subarachnoid and extradural location of the catheter tip. If no blood or fluid can be aspirated, a syringe containing 3 cc. of solution is attached and the solution is injected as the test dose. If blood can be aspirated, or if it is difficult to inject the anesthetic solution, the catheter should be withdrawn at 1 cm. increments until a more favorable location can be obtained. Once this is accomplished, tape is applied to fasten the catheter to the patient's skin, and the catheter is connected to a reservoir bottle, after

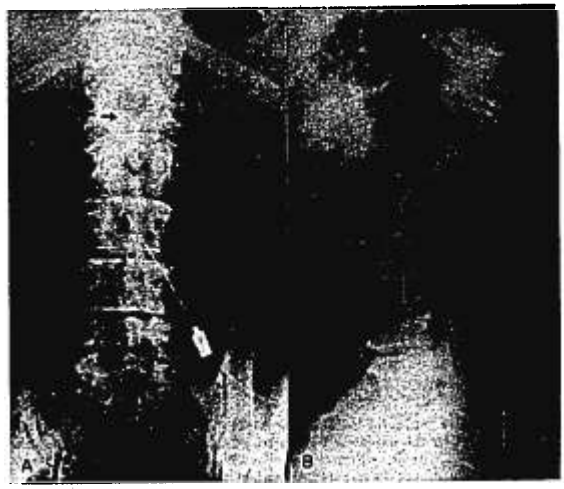


FIG. 3. Photographs of roentgenograms showing the technique of continuous peridural block in the lumbar region. (a) Posterior anterior view with the peridural needle and plastic tubing in place. (b) Lateral view showing the plastic tubing within the spinal canal with its tip at the level of the caudad portion of the twelfth thoracic vertebra.

which the full therapeutic dose is injected. The amount of solution varies according to the purpose of the block. In general, 1 ml. of 2 per cent Xylocaine® produces block of approximately one segment.

The position of the patient immediately after block is completed varies, depending on the indication. If it is desirable to produce unilateral block, the patient is left on the side to be blocked for a period of five to ten minutes in order to take advantage of the gravitation factor. Such is the case in patients who undergo inguinal or femoral herniorrhaphies, nephrectomies, operations involving one of the extremities, or diagnostic-therapeutic blocks. On the other hand, if a bilateral block is required, the patient is placed immediately in the supine position in order to avoid predominancy of the solution to one side.

In the middle thoracic region, where the obliquity of the spinous processes is extreme and there are usually bony spurs on the surface of the adjacent spinous processes making

introduction of the needle through the interspinous space difficult, the paramedian approach is used. The technique is very similar to the one described above and is depicted in figure 4.

The paramedian technique herein described has been used in 1,073 cases. The occurrence of paresthesia during the advance of the tubing was much less frequent than when the midline approach was used. In no case did the tubing pierce the dura and enter the subarachnoid space.

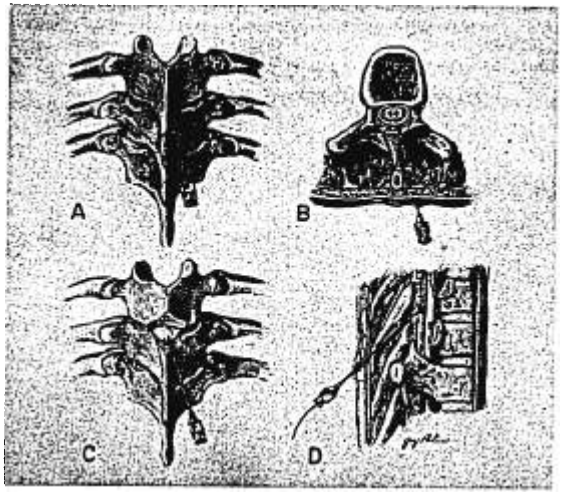


FIG. 4. Technique of peridural block in the midthoracic region by the paramedian route. (a) Posterior view showing the needle in contact with the lamina and (c) its advance through the ligamentum flavum. (b) A schematic cross section depicting the relationship of the needle to the soft tissue, the spinous process, lamina, and the ligaments. The point of the needle has entered the peridural space with the bevel facing cephalad. (d) A sagittal section with the laminae and pedicles removed to show the relationship of the needle to the surrounding structures and of the tube in the peridural space.

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