MEDICAL EDUCATION PROF-858

CRITICAL PROCEDURE;
TECHNIQUE OF PROVIDING EPIDURAL ANALGESIA

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ABSTRACT... Epidural analgesia provides excellent relief of pain in areas innervated by spinal cord segments, below the upper thoracic Level. The area easiest to reach with least risk of injuring spinal cord is lower lumbar area. To administer an epidural analgesic, place the patient in lateral or sitting position with lumbar spine fully flexed. Raise a wheal with local anaesthetic at L4 – 5 inter-spinous level, between dorsal spine, and advance an 18-gauge needle through the skin, sub-cutaneous layer, supra spinous ligament, interspinous ligament, and finally ligamentum flavum. A loss of resistance signals that the needle has entered epidural space. Dural puncture is most common clinically significant complication. Placement of an analgesic agent in the epidural space provides superb analgesia for most patients. Many patients in ICU, particularly those who have undergone surgery or who have sustained major trauma are candidates for this therapy. Cancer pain and pain associated with labor and delivery have been well controlled by it. In post operative and trauma patients, epidural analgesia is associated with improved pulmonary function and an overall reduction in complications like pulmonary infections and cardiovascular problems. Other advantages of epidural analgesia include early mobilization, less incidence of deep vein thrombosis and earlier post operative tracheal extubation. I will begin with brief discussion of spinal anatomy and description of indications and contra indications of epidural analgesia. Then technique most commonly employed to provide epidural analgesia and confirmation of epidural placement of needle or catheter will be discussed. Finally possible complications and their management will be reviewed.

ANATOMIC CONSIDERATIONS

Epidural analgesia is achieved by placing an analgesic medication in the epidural space, through either a needle or an indwelling catheter placed via a needle. The lower lumbar area is the easiest level of the vertebral column to approach and administration of epidural analgesia at this level avoids spinal cord.

The spinal and epidural space surrounds the dura and extends from foramen magnum to coccyx. This space contains fat, a plexus of blood vessel and spinal nerves ensheathed by dura.

In adults, the spinal cord, which is surrounded by cerebrospinal fluid, within dural sac, forms the cauda equina at about second lumbar vertebra. Hogon[1] suggests from frozen cryomicrotome cadaver sections that the epidural space is more segmented and less

uniform than previously believed from indirect anatomic analysis. One anatomic clarification has been made through epiduroscopy and epidurography confirms prior clinical observation that occasionally unilateral anesthesia may follow apparently adequate epidural technique[2-4]. Via epiduroscopy, Blomberg[5] identified the universal appearance of dorsomedian connective tissue band in the midline of epidural space.

INDICATIONS & CONTRA INDICATIONS

At the most basic level, centroneuraxis block is indicated whenever the surgical procedure can be accomplished with a sensory level of anaesthesia that does not produce adverse patient out come. The level of sensory analysis is of prime importance. Low levels i.e, a T - 10 or lower sensory level carries different physiologic impact than does a block performed to produce (> T 5) anaesthesia[6].

INDICATIONS/CONTRAINDICATIONS

Table-I. (Epidural analgesia When to consider and when to avoid)	
Indications: II Relief of pain in areas innervated by spinal cord (segments below upper thoracic area)	
CONTRAINDICATIONS	
II	Patient refusal.
II	Allergy to medication being delivered.
II	Coagulopathy
II	Inadequate training of staff or monitoring capabilities.
II	Patients inability to maintain stillness during needle puncture.
✯ Progressive neurologic disease. ✯ Injury or prior surgery involving lumbar spine.	
✯	These are considered relative contra indications.

Pain relieved by epidural analgesia includes pain caused by pathologic condition, surgery; or injury. The respiratory control centers in the medulla are close to cervical and upper thoracic segments of cord. There is always a very high risk of death and serious respiratory complication with epidural analgesia for head and neck and upper limb.

EQUIPMENT

A specialized needle, such as 18-gauge tube is used to enter epidural space at chosen level. The needle has blunt bevel, curved tip & through it a 20-gauge catheter can be passed. It is provided with tight fitting removable obturator.

Catheter is normally made of Teflon. There is 1-cm marking on catheter extending back from catheters tip, so that a measured length of it can be inserted. It comes with a connector and microfilter.

TECHNIQUE

The most common technique employed will be described. Other methods are also used. The choice depends on characteristic of each patient & physicians preference. Seour and co-workers[7] have demonstrated slightly faster block on set corset times in patient's dependent body regions when the lateral decubitus position was used.

Patient is placed in either a lateral or sitting position with spine fully flexed. For patient in ICU, the lateral position is most convenient and best tolerated.

The L4-5 interspinous level is defined by referring to an imaginary line connecting the superior margins of the iliac crests. Sterile technique is observed as the skin over the spine is cleaned and draped. With the operator standing at the patients back, a skin wheal of local anaesthetic drug is raised between dorsal spines. Small amount of local anaesthetic may be injected into deeper sub-cutaneous and ligamentous tissue.

The epidural needle with obturator in place and bevel facing lateral to the patient, is advanced through the skin, subcutaneous layer, supra spinous ligament, inter spinous ligament and finally the ligamentum flavum. The needle is in epidural space when it emerges from the

ligamentum flavum.

The point of entry into epidural space can be determined by one of several methods. The most common one is loss of resistance. After the needle has been placed into interspinous ligament, the obturator is removed and glass syringe containing 5-10 ml of sterile saline is attached; with the operators dominant hand pressure is applied to, and maintained on the plunger. The non-dominant hand rests on the patient's back and slowly advances the needle towards the spinal cord.

When the tip of the needle enters the epidural space, there is sudden loss of resistance; as the plunger advances, it pushes a small volume of saline into the space. The theory behind this maneuver has been attributed to sub atmospheric pressure in epidural space. The sub-atmospheric pressure has been related to the expansion of the epidural space as the needle pushes the dura away from ligamentum flavum[8]. The needle is held firmly with the non-dominant hand while the syringe is detached. A small flow of fluid from the needle often results; however, this flow should stop very quickly. If the flow continues dural puncture is suspected and needle is immediately withdrawn.

After the bevel of the needle has been turned cephalad or caudad, the catheter is introduced. When the catheter tip meets the needle bevel extra pressure may be necessary to direct catheter beyond the needles edges. Approximately 2 to 4 cm of catheter is advanced into the epidural space. The needle is then withdrawn over the catheter, which is held in place by adhesive tape.

The catheter can be taped to the skin along the patient spine and brought up to the shoulder where the connector and filter can be attached to it. If necessary catheter can be left in place for 7-10 days.

CONFIRMING EPIDURAL PLACEMENT

The correct position of the catheter can be confirmed by injection of a "test dose" of local anaesthetic agent mixed with epinephrine. A suitable combination consists of 1.5-% lidocaine with 1: 200,000 epinephrine.

After aspiration of the catheter to prove absence of blood or CSF, 3ml of local anaesthetic solution is injected. There should be no effect if catheter is properly placed. If it is in sub-dural space, the local anaesthetic will enter CSF and there will be development of spinal block (with anesthesia and paresis within 2-3 min).

If the tip lies in the blood vessel, the effect of injected epinephrine will be apparent by changes in blood pressure and heart rate. Especially keep in mind possibility of intra vascular placement when tachycardia develops within 1 min of injection of a test does of local anaesthetic.

COMPLICATIONS

Dural puncture and Headache

This is the most common significant complication. This occurs in 1% to 3% of attempts, when the large relatively blunt ended needle is advanced beyond epidural space and into such-arachnoid space. This is shown by the passage of CSF from the needle or a positive response to a test dose of local anaesthetic medication.

The adverse effects of unintentionally administering epidural dose of local anaesthetic into sub arachnoid are less dramatic; rather the issue is how to treat cardiopulmonary effects. Arterial BP and heart rate are to be supported. Tracheal intubation and mechanical ventilation are needed. The necessity for sedation during the period is minimal. These patients generally do not recall these events[9].

When needle is with-drawn from sub - arachnoid space, a gap is left in the dura through which further flow of CSF into epidural space occurs. The pressure surrounding spinal cord is reduced, and this produces tension on cerebral blood vessels crossing the sub- arachnoid space. Headache which result is classically occipital and frontal, it is severe. It is greatly relieved when patient lies down and aggravates on sitting. Complication is worse in younger and obstetric patients. Oral, intravenous fluid and bed rest are advised to relive pain, but results are unreliable. Caffeine is recommended but it is not

uniformly successful.

If headache is severe and incapacitating of more than 24 hrs, the epidural blood patch is used. With this procedure rapid relief is obtained. 10 –15 ml of patients own blood is introduced into epidural space at the level of the previous dural puncture. An 18 gauge **tuohy needle** is placed in epidural space while the second operator using a sterile technique obtains blood sample. The patient is kept in supine position for 30minutes, by which time, if diagnosis is correct the headache is usually relieved Administration of blood patch carries risk of infection in the epidural space.

NERVE INJURY

Epidural anaesthesia has not been linked with neurologic injury more frequently than other anaesthetics, regional or general[10]. Spinal cord can be damaged from dural puncture above the second lumbar level. Injury to nerve roots can occur at any level either from needle or from Catheter as it is advanced into epidural space.

Possible injury is suggested by onset of continuing parastheias. Permanent injury can result from direct trauma to cord or nerve roots. If there is continuous parasthesia, needle and catheter should be withdrawn.

BACKACHE

Mostly mild to moderate. It lasts for few days only, many cases of backache associated with epidural analgesia are not related to catheter placement or medication used, but rather to prolong profound relaxation during anesthesia.

INTRA-VASCULAR INJECTION

The toxic effects of local anaesthetics primarily affect the CNS and CVS. CNS is affected at lower blood levels. For example, four to seven times the dose of local anaesthetic necessary to produce convulsion in dogs is required to produce cardiovascular collapse[11].

Initially, potential for local anaesthetic – induced toxicity to both CNS and CVS, was thought to parallel anaesthetic potency[12,13]. Ropivacaine is being evaluated to whether the CNS – to – Cardiotoxicity ratio is more like that of lidocaine than that of long acting amides, as it appears in animal work[14]. Early in local anaesthetic – induced seizures, hypoxemia, hypercarbia and acidosis develop rapidly and therefore symptomatic treatment of toxicity must involve treatment of these factors. Oxygen should be given by bag and mask, and tracheal intubation is not mandated unless ventilation is ineffective[15]. Diazepam is effective is controlling local anaesthetic induced seizures, although 2 – 3 min are required for them to be controlled once diazepam is administered[16,17].

CATHETER RELATED COMPLICATIONS

Catheter may become knotted, incidence can be lessened if a limited amount of catheter (2 to 4 cm) is advanced into epidural space. Intactness of catheter can be verified by inspection of colour marker on the tip of catheter.

EPIDURAL MASS

A mass occurring in epidural space following placement of catheter can be abscess or haematoma. Symptoms include severe back pain, paresis and loss of sensation. Urgent decompression of both lesions in needed because of possibility of spinal cord compression.

INFECTION

Epidural catheter infection is quite rare. Should it occur, however, the catheter needs to be removed and appropriate anti-biotic therapy started.

CLINICAL "PEARLS"

In order to be successful one must perform the technique often enough to be technically facle. If catheters can be avoided (e.g by selecting appropriate local anaesthetic) a potential source of difficulties with the technique can be made. It is important to allow the block enough " Soak time" prior to surgical procedures. One must recognize that there in plateau effect in dosing epidural anaesthetic. That is once some quantity has been injected, additional local anaesthetic dose not significantly increase the block height but rather make to block more dense (i, e improve quality)[18] To be

successful with this technique are one must be prepared to treat complications associated with technique at all times, that is air way equipment and drugs, especially oxygen and resuscitation, must be immediately available.

REFERENCES

1. Hogan QH: **Lumbar epidural anatomy; a new look by Cryomicrotome section.** Anesthesiology 75: 767, 1991.

2. Santos DJ, Bridenbaugh PO, Heins S, Pai U: **Unilateral epidural analgesia for labor.** Roe Anesth 10:41, 1985.

3. Nunn G. Mackinnon RPG: **Two unilateral epidural blocks, letter.** Anaesthesia 41 :439 1986

4. Gallart L, Blanco D, Samso E, Vidal F. **Clinical and radiological evidence of the epidural plica mediana dorsalis.** Anesth Analg 71:698,1990.

5. Blomheeg R : **The dorsomedian connective tissue band in the lumbar epidural space of humans: an anatomic study using epiduroscopy is autopsy cases.** Anaesth Analg 65: 747, 1986.

6. Greene NM: **Perspectives of spinal Anaesthesia.** Reg Anaesth 7:55, 1982.

7. Seour LT, Lips FJ, Cousins MJ: **Effect of Lateral posture an epidural blockade for surgery.** Anaesth Intensive Care 11:957, 1983.

8. Zarsur E: **Genesis of "true" negative pressure in the lumber epidural space a new hypothesis.** Anaesthesia 39:1101, 1984.

9. Evans TI: **Total spinal anaesthesia.** Anaesth Intensive Care 2 : 158, 1974.

10. Kane RE: **Neurologic deficits following epidural or spinal anaesthesia.** Anesth Analg 60: 150, 1981.

11. Liu PL, Feldman HS, Giasi et al: **Comparative CNS toxicity of lidocaine, etidocaine, bupivacaine and tetracaine in awake dogs following rapid with intravenous administration.** Anaesth Analg 62:375,1983.

12. Munson ES Tucker, WK, Ausinsch B, Malagadi MH: **Etidocaine bupivacaine and lidocaine Seizures threshold in monkeys.** Anaesthesiology, 42:471, 1975.

13. Black A, Covino B: **Effects of local anaesthetic agents on Cardiac Contraction and Contractility.** Reg Anaesth 6:55, 1981.

14. Akerman B, Sandberg R, Covino B G: **Local anaesthetic efficacy of LEA 103: an experimental Xylidide agent.** Anaesthesiology 65: A217, 1986.

15. Moore DC, Bridenbaugh LD: **Oxygen: the antidote for systemic toxic reactions from local anaesthetic drugs.** JAMA 174:842, 1960.

16. Munson ES Wagman IH: **Diazepam treatment of local anaesthetic induced seizures** Anaethesiology 37:523 1972.

17. Moore DC Balfour RI, Fitzgibbons D: **Convulsive arterial plasma levels of bupivacaine and response to diazepam therapy.** Anaesthesiology 50: 454, 1979.

18. Cousins MJ Blomage PR : **Epidural neural blockage.** P 255. In cousins MJ, Bridenbaugh PO (eds). Neural blockade in Clinical Anaesthesia and Management of Pain JB Lippincott, Philadelphia, 1988.

Nobody is born genius;
one has to work hard for it.

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