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Spinal anesthesia

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FIGURE 45–4  Lumbar epidural anesthesia; midline approach.

THE SPINAL CORD

The spinal canal contains the spinal cord with its coverings (the meninges), fatty tissue, and a venous plexus (Figure 45–5). The meninges are composed of three layers: the pia mater, the arachnoid mater, and the dura mater; all are contiguous with their cranial counterparts (Figure 45–6). The pia mater is adherent to the spinal cord, whereas the arachnoid mater is usually adherent to the thicker and denser dura mater. Cerebrospinal fluid (CSF) is contained between the pia and arachnoid mater in the subarachnoid space. The spinal subdural space is generally a poorly demarcated, potential space that exists between the dura and arachnoid membranes. The epidural space is a better defined potential space within the spinal canal that is bounded by the dura and the ligamentum flavum (Figures 45–1 and 45–5).
Local anesthesia definition

• Drugs that cause reversible loss of sensory perception specially of pain in a restricted area of the body, when applied topically or local injection. • LA if applied to a mixed nerve—sensory and motor impulses are interrupted—resulting in muscular paralysis and loss of autonomic control.
• **Spinal anaesthesia (subarachnoid anaesthesia)**: is the injection of small amounts of local anaesthetics into the (CSF) at the level below (L2) **Why??**, where the spinal cord ends, anaesthesia of the lower body part below the umbilicus is achieved.
• the goal is to inject the chosen medication(s) into the cerebrospinal fluid-filled subarachnoid space. To achieve this, the spinal needle will pass through skin, subcutaneous tissue, supraspinous ligament, interspinous ligament, ligamentum flavum, dura mater, and subarachnoid membrane.

• Note: The correct space is identified by return of cerebrospinal fluid through the spinal needle
Subarachnoid block can be used as the sole source of anesthesia. Alternatively, spinal and epidural anesthesia can be used jointly (Needle-through-needle Technique)

, taking advantage of the qualities of both techniques: the rapid, dense sensorimotor blockade of a spinal anesthetic and the opportunity to redose the patient with an epidural catheter anesthetic. [2]

Spinal anesthesia produces intense sensory and motor blockade as well as sympathetic blockade. As opposed to epidural anesthesia, in which medications are instilled outside the dura mater, the goal of spinal anesthesia is to instill the desired medications into the cerebrospinal fluid (CSF). The sensorimotor block produced requires smaller doses of local anesthetics (hence, local anesthetic toxicity is rarely a concern) and is often more dense in character
Advantages of spinal anesthesia (SPA)

1. **Cost.** The costs associated with SPA are minimal.
2. **Patient satisfaction.** The majority of patients are very happy with this technique.
3. **Respiratory disease like atelectasia and pneumonia rarely**
   SPA produces few adverse effects on the respiratory system as long as unduly high blocks are avoided.
4. **Patent airway**
5. **Diabetic patients.** There is little risk of unrecognised hypoglycaemia in an awake patient.

6. **Muscle relaxation.** SPA provides excellent muscle relaxation for lower abdominal and lower limb surgery. Better than epidural anesthesia.

7. **Bleeding.** Blood loss during operation is less than when the same operation is done under general anaesthesia.
8. Visceral tone. The bowel is contracted by SPA and sphincters relaxed although peristalsis continues. Normal gut function rapidly returns following surgery.

(lockade of sympathetic outflow (T5-L1) to the GI tract leads to predominance of parasympathetic (vagus and sacral parasympathetic outflow), leading to active peristalsis and relaxed sphincters, and a small, contracted gut, which enhances surgical access)

9. Coagulation. Post-operative deep vein thromboses and pulmonary emboli are less common following spinal anaesthesia.
Indications

1. Operations below the umbilicus: hernia repairs, gynaecological and urological operations

2. Any operation on the perineum or genitalia
Contra-indications

1. Patient refusal

2. Uncooperative patients: like young children and psychiatric or mentally handicapped patients

3. Clotting disorders: as bleeding from ruptured peridural vein is common, patients with low platlet count or those on anticoagulant drugs (heparin + warfarin) are at high risk of hematoma formation (haematoma leading to spinal cord compression.)
4. Hypovolemia: since SPA has marked hypotensive effect, hypovolemic patients must be adequately rehydrated and resuscitated.

5. Septicemia or skin infection: leading to CSF infection and meningitis.

(Skin infection at injection site may introduce pathogenic bacteria into the epidural space and subarachnoid space, leading to serious complications such as meningitis or epidural abscess.)

6. Anatomical deformities (relative contraindication) as it will probably only serve to make the dural puncture more difficult.

7- Raised intracranial pressure (patient with raised ICP may lead to brainstem herniation)
8. **Neurological disease.** Any worsening of the disease postoperatively may be blamed erroneously on the spinal anaesthetic.

9. **Inadequate resuscitative drugs and equipment.** No regional anaesthetic technique should be attempted if drugs and equipment for resuscitation are not immediately to hand.
Local anesthetics for SPA

- Local anesthetic agents are either hyper-, hypo- or isobaric.

- Hyperbaric agents tend to spread below the level of injection and they are easier to predict, that's why they are preferred over iso- and hypobaric agents.
Local anesthetic

- **Bupivacaine** (Marcaine) : 0.5%
  hyperbaric bupivacaine is the best
- Lasts longer than most spinal anesthetics from 2 hours
• **Lidocaine** (Xylocaine): 5% hyperbaric lidocaine is the best lasting 45-90 mins

• 2% lidocaine can be used but as a much shorter duration of action

• 0.2 ml of **adrenaline** 1:1000 + lidocaine will prolong the duration of action
Complications of spinal Anaesthesia

- **Hypotension**: due to vasodilatation and a functional decrease in the effective circulating volume.

  ✓ By giving fluids and oxygen mask.
  ✓ Raising the legs: simple and effective.
  ✓ Increase the speed of IV infusion: until the blood pressure is restored.
  ✓ If the pulse low give **atropine** IV because atropin increase heart rate.
  ✓ Vasoconstrictor (**ephedrine**)
• **Headache**: within 12-24 h and may last for 1 week
  - it is postural and it is often occipital associated with a stiff neck, nausea, vomiting, Dizziness and photophobia.
  - Ask to lying flat in bed and give simple analgesics.
  - **Note**: the cause of headache >>>>During a spinal tap, a needle is placed within the fluid-filled space that surrounds your spinal cord. This creates a passage for the spinal fluid to leak out, which changes the fluid pressure around your brain and spinal cord. If enough of the fluid leaks out, you may get a spinal headache
• **Urinary retention**: the sacral autonomic fibers are among the last to recover. >>

• **Permanent neurological complications** (rare): meningitis, arachnoiditis, peridural abscess

• **Permanent paralysis**: in elderly patient other cause: direct injury of the spinal cord.