
CAUDAL EPIDURAL ANAESTHESIA

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Introduction

Caudal anaesthesia has been used for many years and is the easiest and safest approach to the epidural space. When correctly performed there is little danger of either the spinal cord or dura being damaged.

It is used to provide peri and post operative analgesia in adults and children. It may be the sole anaesthetic for some procedures, or it may be combined with general anaesthesia.

Indications

Anaesthesia and analgesia below the umbilicus.

Paediatric patients do not generally tolerate surgery under regional anaesthesia alone. However in the very young a caudal block may be adequate to carry out urgent procedures such as reduction of incarcerated hernias, allowing return of normal bowel function prior to surgical repair. Anaesthesia

can be provided for superficial operations such as skin grafting, perineal procedures, and lower limb surgery. A general anaesthetic will often be required in addition. Pain relief will extend into the post operative period. The duration of the block can be prolonged by the addition of an opiate (pethidine 0.5mg/kg) to the local anaesthetic. The possibility of delayed respiratory depression from epidural opiates needs taken into account, and patients should be monitored in an intensive care or high dependency unit for 24 hours following their administration.

Obstetric analgesia for the 2nd stage or instrumental deliveries. Care should be taken as the foetal head lies close to the site of injection and there is real risk of injecting local anaesthetic into the foetus.

Chronic pain problems such as leg pain after prolapsed intervertebral disc, or post shingles pain below the umbilicus.

Contraindications

Infection near the site of the needle insertion.

Coagulopathy or anti coagulation.

Pilonidal cyst

Congenital abnormalities of the lower spine or meninges, because of the unclear or impalpable anatomy.

Anatomy

The caudal epidural space is the lowest portion of the epidural system and is entered through the sacral hiatus. The sacrum is a triangular bone that consists of the five fused sacral vertebrae (S1- S5). It articulates with the fifth lumbar vertebra and the coccyx.

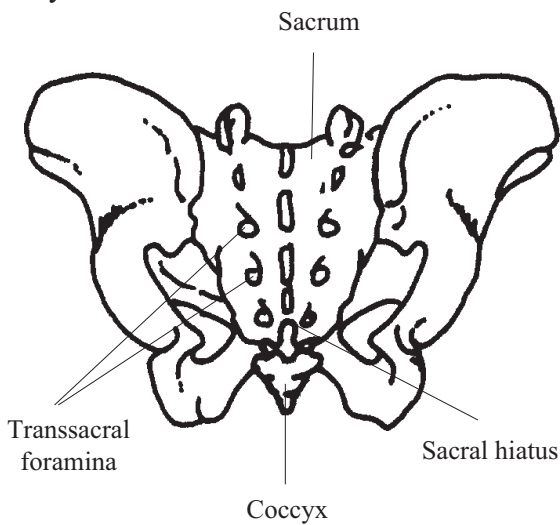


Fig. 1. Anatomy of the sacrum and coccyx

The sacral hiatus is a defect in the lower part of the posterior wall of the sacrum formed by the failure of the laminae of S5 and/or S4 to meet and fuse in the midline. There is a considerable variation in the anatomy of the tissues near the sacral hiatus, in particular, the bony sacrum. The sacral canal is a continuation of the lumbar spinal canal which terminates at the sacral hiatus. The volume of the sacral canal can vary greatly between adults.

The sacral canal contains:

1. The terminal part of the **dural sac**, ending between S1 and S3.
2. The five sacral nerves and coccygeal nerves making up the **cauda equina**. The sacral epidural veins generally end at S4, but may extend throughout the canal. They are at risk from catheter or needle puncture.
3. The **filum terminale** - the final part of the spinal cord which does not contain nerves. This exits through the sacral hiatus and is attached to the back of the coccyx.

4. **Epidural fat**, the character of which changes from a loose texture in children to a more fibrous close-meshed texture in adults. It is this difference that gives rise to the predictability of caudal local anaesthetic spread in children and its unpredictability in adults.

Choice of drug and dosage.

Choose the drug with the longest duration of action and the fewest side effects. Drugs that are commonly used include Lignocaine 1% and Bupivacaine 0.25%, although higher concentrations may be needed for muscle relaxation. Drugs used for epidural injections should come from single use ampoules and be preservative free.

Various regimes have been produced to calculate the appropriate dose of local anaesthetic, the doses vary widely:

1. Armitage recommends bupivacaine 0.5ml/kg for a lumbosacral block, 1ml/kg for a thoracolumbar block, and 1.25ml/kg for a mid thoracic block. He recommended the use of 0.25% bupivacaine for the block up to a maximum of 20ml. For larger volumes he recommended adding one part of 0.9% NaCl to three parts local anaesthetic to produce a 0.19% mixture.
2. Scott calculates the dose from the child's age or weight. If the child is of average weight for its height both figures will be the same. If the child is overweight use the figure based on age to avoid the possibility of overdose.

Weight in Kg.	Age (in years)	Dose(ml) 0.25% bupivacaine for a block to T12	Dose(ml) 0.25% bupivacaine for a block to T7
12.5	2	4	6
15	3	5	7.5
16	4	5.5	8
17.5	5	6	9
20	6	7	10.5
22.5	7	8	12
25	8	9	13.5
27.5	9	10	15
30	10	11	16.5

Scott's lower doses are more likely to produce analgesia to the expected height, whereas Armitage will get anaesthesia. Dosages for adults are 20-30 ml for a block of the lower abdomen and 15-20ml for a block of the lower limb and perineum.

Care is needed to avoid the use of toxic doses of drugs for high blocks. The recommended maximum dose of Bupivacaine is 2mg/kg or Lignocaine 4mg/kg. These dosages are the maximum for a correctly injected dose. If the drug is mistakenly injected intravenously very small dosages may cause serious toxicity.

Technique

The patient is prepared as for general anaesthesia,

1. He/she should be fasted
2. All appropriate equipment for resuscitation must be available. Equipment for intubation, airway suction and drugs to stop fitting ie thiopentone 2-5mg/kg or Diazepam 0.2-0.4mg/kg.
3. An intravenous cannula should always be inserted in an upper limb, in case of accidental intravenous injection, or profound sympathetic blockade from a high epidural block.
4. The procedure must be carried out with a **strict aseptic technique**. The skin should be thoroughly prepared and sterile gloves worn. **Any infection in the caudal space is extremely serious.**
5. There are three main approaches: the prone, the semi-prone, and the lateral. The choice depends on the preference of the anaesthetist and the degree of sedation of the patient.

The prone position is often easiest in the adult, as fat tends to move away from the mid-line and landmarks are easier to find. However, there could be difficulty if urgent access to the airway is required. The caudal space is made more prominent by asking the patient to internally rotate their ankles (fig. 2).

The semi-prone position is preferred for the anaesthetised or heavily sedated patient as the airway is easier to control in this position, while still allowing reasonably easy access to the sacral hiatus.

The lateral position is often used in children, as the

landmarks are easier to find than in adults. Care should be taken to avoid over flexing the hips (as for lumbar epidurals) as this can make the landmarks more difficult to palpate.

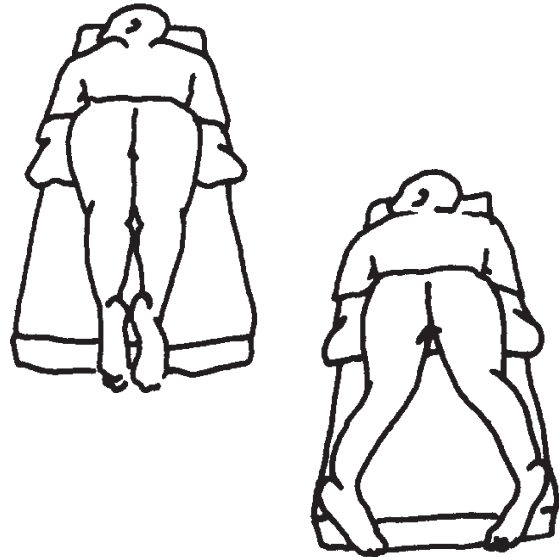
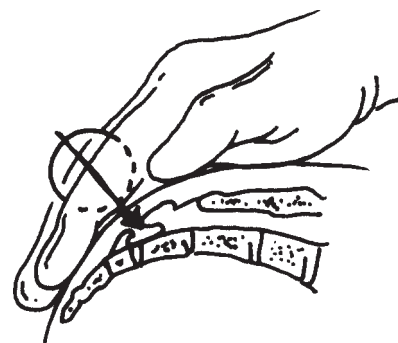


Fig. 2. Position (a) causes contraction of the gluteal muscles. Position (b) allows relaxation of gluteal muscles.

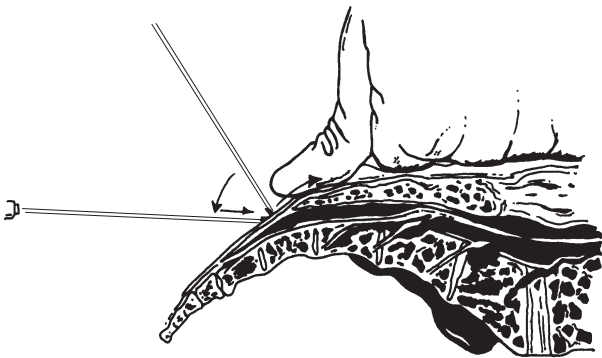
6. The landmarks are palpated. The sacral hiatus and the posterior superior iliac spines form an equilateral triangle pointing inferiorly. The sacral hiatus can be located by first palpating the coccyx, and then sliding the palpating finger in a cephalad direction (towards the head) until a depression in the skin is felt. (In an adult the distance from the tip of the coccyx to the sacral hiatus is approximately the same as the distance from the tip of their index finger to their proximal interphalangeal joint)!



As there can be a considerable degree of anatomical variation in this region confirmation of bony landmarks is the key to success. The needle can

penetrate a number of different structures mimicking the feel of entering the sacral hiatus. It is important to establish the midline of the sacrum as considerable variability occurs in the prominence of the cornua, causing problems unless care is taken.

- Once the sacral hiatus is identified the area above is carefully cleaned with antiseptic solution, and a 22 gauge short bevelled cannula or needle is directed at about 45° to skin and inserted till a “click” is felt as the sacro-coccygeal ligament is pierced. The needle is then carefully directed in a cephalad direction at an angle approaching the long axis of the spinal canal.



Care should be taken not to insert the needle too far as the dura lies at or below the S2 level in the child.

- The needle should be aspirated looking for either CSF or blood. A negative aspiration test **does not exclude** intravascular or intrathecal placement. Care should always be taken to look for signs of acute toxicity during the injection. The injection should never be more than 10 ml/30 seconds.

Further tests to confirm the correct position include gently moving the tip of the needle from side to side. The needle will feel firmly held. Introduction of a small amount of air will **not** produce subcutaneous emphysema, and will be heard as a “woosh” sound if a stethoscope is placed further up the lumbar spine. Light blood staining is not uncommon and indicates entry into the sacral canal. There should be no local pain during injection. Tingling or a feeling of fullness that extends from the sacrum to the soles of the feet is common during injection.

- A small amount of local anaesthetic should be injected as a test dose (2–4mls). It should

not produce either a lump in the subcutaneous tissues, or a feeling of resistance to the injection, nor any systemic effects such as arrhythmias, peri-oral tingling, numbness or hypotension. If the test dose does **not** produce any side effects then the rest of the drug is injected, the needle removed and the patient positioned for surgery.

In the post-operative period, motor function must be checked and the patient should not be allowed to try and walk until complete return of motor function is assured. The patient should not be discharged from hospital until he/she has passed urine, as urinary retention is a recognised complication.

Complications

Intravascular or intraosseous injection. This may lead to grand mal seizures and/or cardio-respiratory arrest.

Dural puncture. Extreme care must be taken to avoid this as a total spinal block will occur if the dose for a caudal block is injected into the subarachnoid space. If this occurs then the patient will become rapidly apnoeic and profoundly hypotensive. Management includes control of the airway and breathing, and treatment of the blood pressure with intravenous fluids and vasopressors such as ephedrine.

Perforation of the rectum. While simple needle puncture is not important, contamination of the needle is extremely dangerous if it is then inserted into the epidural space

Sepsis. This should be a very rare occurrence if strict aseptic procedures are followed.

Urinary retention. This is not uncommon and temporary catheterisation may be required.

Subcutaneous injection. This should be obvious as the drug is injected.

Haematoma

Absent or patchy block.

Conclusion

Caudal block is an easy and safe technique which can be used provide anaesthesia and postoperative analgesia for a wide range of surgical procedures.

When performed carefully complications are rare.