

Epidurals and their care on a surgical ward

An epidural is a small catheter that is placed blindly into the epidural space. Local anaesthetics and other analgesics injected through the catheter act locally on the nerve roots and also directly on the spinal cord. In acute hospitals, epidurals are often the domain of the anaesthetist but it is important that all specialties know how to appropriately advise patients and recognize complications. This article gives a general overview of epidurals and their care on a surgical ward for the non-anaesthetist.

Why is epidural analgesia used?

Approximately 320 000 epidurals are inserted each year in the UK. They are used for both intraoperative and postoperative analgesia, and for a huge range of surgical operations: thoracic, intra-abdominal and lower limb procedures. For many years there has been extensive debate as to whether epidurals are any better than other forms of analgesia, such as morphine patient-controlled analgesia (Table 1). Whether they reduce mortality following major surgery is still debated.

Technique of epidural insertion

The patient should have been appropriately consented, contraindications considered (Table 2) and the procedure should have been explained. On arrival in the anaesthetic room monitoring is applied and a large bore intravenous cannula is inserted. The epidural is usually inserted with the patient awake (to minimize the risk of neurological damage) in a lying or sitting position. A full aseptic technique is used including gown, mask, gloves and appropriate skin preparation.

Epidural insertion is a blind technique, aimed at identifying the low pressure epidural space. Epidurals are inserted at the spinal height or level corresponding to the midpoint of the dermatome requiring

analgesia. For example, to block surgical procedures centred around the umbilical area for a laparotomy, supplied by the T10 dermatome the epidural is inserted between T10 and T11.

After local anaesthetic infiltration a blunted large bore needle (Tuohy needle) is inserted into the back in the midline until it is gripped by the interspinous ligaments. A low resistance syringe filled with saline is attached to the end of the Tuohy needle. The Tuohy needle is slowly advanced through the interspinous ligaments and ligamentum flavum (Figure 1).

At all times, pressure is kept on the plunger of the low resistance syringe. When the needle tip is in the ligaments, injection is not possible. The epidural space is identified by a sudden loss of resistance to injection of saline as the needle tip exits the ligamentum flavum, i.e. you can inject. Immediately, advancement of the Tuohy needle should stop as the tip

is in the epidural space. Depending on body habitus, this can be anywhere between 3 and 10 cm from the skin surface in adults. The catheter is then threaded through the needle, the needle removed and the catheter is secured to the patient's back. Usually 3–6 cm of catheter is left in the epidural space. A filter is then attached to the end of the epidural catheter to reduce bacterial contamination (Figure 2). The solution injected down an epidural catheter normally spreads a few spinal segments up and down the epidural space.

Management of the epidural on the surgical ward

When a patient returns to a surgical ward with an epidural catheter in situ, the epidural catheter will be firmly secured to the patient's back. The anaesthetist may have left a small window in the dressing so that the epidural catheter can be seen and the position checked, as shown by

Table 1. Commonly quoted benefits of epidural analgesia

Provides better analgesia than parenteral analgesics
Reduces postoperative pneumonia
Reduces hypercoagulable response leading to reduced risk of deep vein thrombosis
Reduces need for blood transfusion
Reduces neurohumoral stress response to surgery
Improves gut function

Table 2. Contraindications to epidural analgesia

Absolute contraindications	Patient refusal
	Coagulopathy: insertion of the epidural needle or removal of the catheter may cause an epidural haematoma
	Local infection at the site of injection: the epidural needle can introduce pathogens into the epidural space
	Raised intracranial pressure: accidental dural puncture can cause brainstem herniation
Relative contraindications	Local anaesthetic allergy
	Systemic infection: risk of seeding infection into the epidural space
	Fixed cardiac output states, e.g. aortic stenosis, hypertrophic obstructive cardiomyopathy: patients can not increase their cardiac output in response to the epidural-induced peripheral vasodilatation resulting in circulatory collapse
	Hypovolaemia: vasodilatation will result in circulatory collapse
	Anatomical abnormalities of the vertebral column, e.g. previous surgery: may make placement of the epidural catheter technically impossible
Pre-existing neurological disorders: new symptoms may be ascribed to the epidural	

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the blue centimetre markings. The filter is then attached to yellow-coloured tubing leading to the bag of local anaesthetic, usually 0.1% bupivacaine with 2 µg/ml of fentanyl. There are a variety of pumps available to ensure the patient receives a set amount of local anaesthetic per hour, usually 6–14 ml.

A patient with an epidural should only go to a ward where the staff can monitor the effects of the epidural, in order to identify problems (Table 3).

Patients should be regularly reviewed by the acute pain team. Only an anaesthetist or appropriately trained acute pain nurse should direct care in relation to epidurals. At all times an acute pain team or anaesthetist should be available to deal with any problems that may arise.

Complications of epidural analgesia

Complications can be the result of problems associated either with the procedure

of epidural catheter insertion or the drugs that are injected into the epidural space.

Commonly occurring side effects and complications

Breakthrough pain may be caused when a low block which occurs when the level of analgesia does not cover the surgical incision. This is relatively easy to solve: a bolus of local anaesthetic (e.g. 3–8 ml) can be given through the epidural and the rate of infusion increased. Pain may also be the result of a ‘patchy’ or ‘unilateral block’. This may be solved by withdrawing the epidural catheter until only 3 cm is left in the epidural space and giving a bolus of local anaesthetic. Pain from missed sacral segments can be very hard to treat. The epidural may have been disconnected or pulled out during patient transfer. If an epidural is disconnected between the patient and filter it should not be reconnected because of the risk of epidural infection. Paracetamol and a non-steroidal anti-inflammatory drug, if not contraindicated, can be given. Systemic opioids should not be prescribed at the same time as epidural opioids because of the risk of respiratory depression.

Hypotension is an expected side effect of epidural analgesia as a result of the blockade of the sympathetic vasoconstrictor fibres by the local anaesthetic in the epidural space. Often, so long as it is not severe or causing organ hypoperfusion it can be treated with intravenous fluid boluses but occasionally the patient may need an infusion of vasopressors, e.g. noradrenaline.

Patients with an epidural in situ should generally be catheterized to prevent painless overdistension of the bladder.

Pruritis, nausea and vomiting occur as a result of the opioids in the epidural infusion. Nausea and vomiting can be treated

Figure 1. Anatomy of the epidural space.

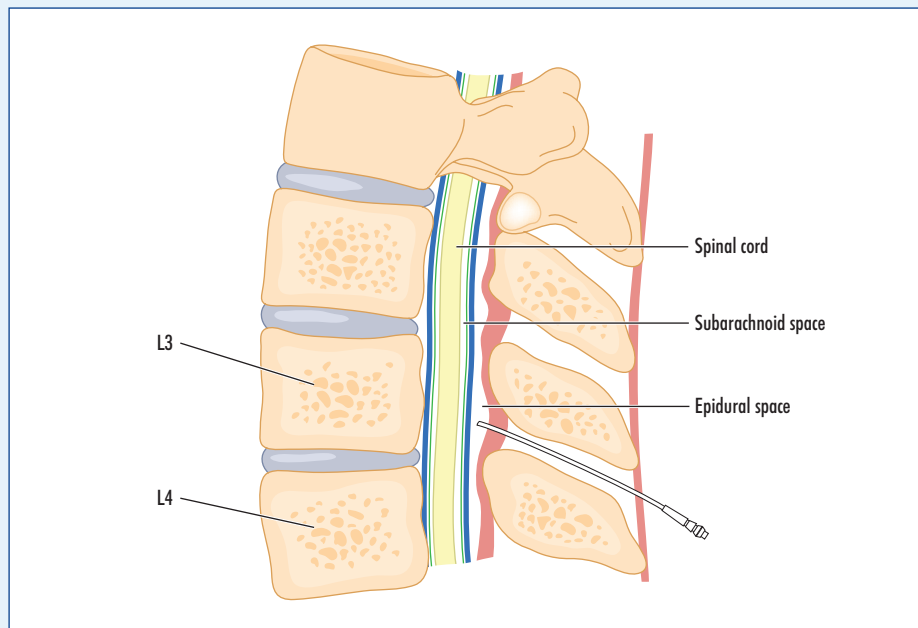


Figure 2. An epidural needle, catheter, filter, syringe and connections.

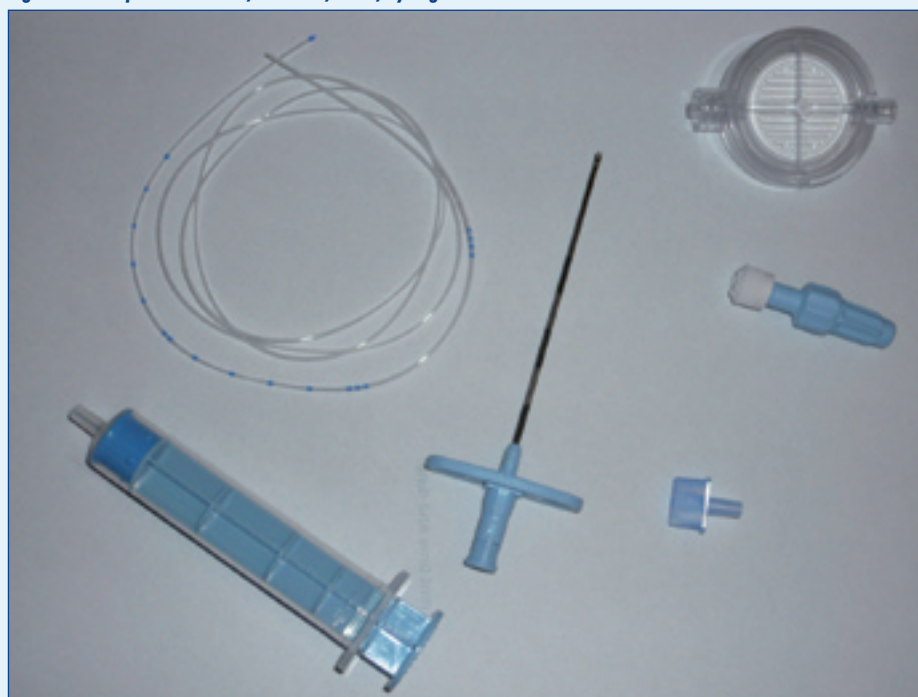


Table 3. Essential observations in a patient with an epidural

Heart rate and blood pressure
Respiratory rate and oxygen saturations
Temperature
Sedation score
Pain score
Sensory level: height of the sensory block to cold

with anti-emetics. After discussion with the anaesthetic team pruritis can be treated with small doses of naloxone. In both circumstances, if symptoms are severe, the epidural infusion can be changed to plain bupivacaine without fentanyl.

Mild motor block is an expected side effect of lumbar epidurals, but it is rarer in patients with a thoracic epidural. Mild motor block more commonly occurs if the epidural has been running for a long time or if higher concentrations of local anaesthetic have been used, e.g. 0.25% or 0.5% bupivacaine. Profound motor block is not an expected side effect of epidural analgesia and requires urgent investigation after discussion with the anaesthetic team.

Rarely occurring serious complications

Extensive blockade (above T4) can be recognized by respiratory distress caused by weakness of the intercostal muscles, profound hypotension and bradycardia caused by sympathetic blockade, arm weakness resulting from involvement of C5 to T1 nerve roots and profound leg weakness. It is either caused by a correctly placed epidural catheter with the local anaesthetic infusion running at too high a rate or if the epidural catheter has migrated through the dura into the CSF surrounding the spinal cord.

In both circumstances the epidural should immediately be turned off and an anaesthetist urgently called to support the patient until the high block recedes.

Dural puncture headache

The technique of epidural insertion described above was developed in order to minimize the risk of puncturing the dura with the large bore Tuohy needle. If this happens then CSF leaks out of the intrathecal space at a rate greater than its production. The CSF pressure falls and the brain sinks, stretching the meninges. This stretching is thought to cause a severe headache.

The headache characteristically occurs 24–48 hours after epidural insertion. It tends to occur in the fronto-occipital regions and radiates to the neck and is characteristically worse on standing. Nausea, vomiting, diplopia and cranial nerve palsies can also occur.

Wrong route errors

When epidurals are in use on a ward it is absolutely vital that local anaesthetics are stored separately from intravenous fluids. Deaths have been reported in young fit patients as a result of inadvertent administration of intravenous bupivacaine.

Nerve or spinal cord injury

Nerve injury can occur as a result of direct physical injury caused by the Tuohy needle or catheter. It can also be caused by the pressure effects of an expanding epidural haematoma or an epidural abscess. Any new neurological symptoms or signs should be urgently investigated. Often there are avoidable delays in diagnosis as clinicians wrongly assume profoundly weak legs are an expected side effect.

Stopping an epidural

The acute pain team will direct ward staff as to when they think it is appropriate to stop the local anaesthetic infusion and then remove the epidural catheter. When the epidural infusion is stopped the patient should continue with regular paracetamol and a non-steroidal anti-inflammatory drug, if appropriate, and also be prescribed a weak opioid as rescue analgesia.

An epidural catheter should not be removed if the patient is coagulopathic, because of the risk of epidural haematoma. If a patient is on low molecular weight heparin as prophylaxis against venous thromboembolism, the removal of the catheter needs to be carefully timed. It should be removed at least 12 hours after

the last dose of low molecular weight heparin and at least 2 hours before the next dose. Many hospitals have standardized epidural removal at 9am–3pm and low molecular weight heparin prophylaxis at 6pm. Epidurals are never kept in for more than 4 days because of the risk of infection.

Conclusions

Epidural analgesia is a widely used form of analgesia on surgical wards. It confers many benefits to patients and is associated with a high level of patient satisfaction. However, the use of epidural analgesia is associated with complications, some of which may lead to permanent injury or even death. It is vital that all doctors are aware of these complications to expedite investigation and treatment. **BJHM**

Figure 1 is reproduced from *Anaesthesia UK Image Library* with permission.

Conflict of interest: none.

Further reading

- Allman K, Wilson H (2006) *Oxford Handbook of Anaesthesia*. 2nd edn. Oxford University Press, Oxford
- Cook TM, Counsell D, Wildsmith JA (2009) Major complications of central neuroaxial block: report on the Third National Audit Project of the Royal College of Anaesthetists. *Br J Anaesth* **102**: 179–90
- National Patient Safety Agency (2007) *Patient safety alert 21: Safer practice with epidural injections and infusions*. Central Alerting System Ref: NPSA/2007/21. www.nrls.npsa.nhs.uk/EasySiteWeb/getresource.axd?AssetID=60063&type=full&servicetype=Attachment (accessed 21 January 2010)
- Yentis S, Hirsch N, Smith G (2005) *Anaesthesia and Intensive Care A–Z*. 3rd edn. Elsevier, Oxford

KEY POINTS

- Epidural analgesia is widely used during and after surgery.
- The technique of epidural catheter insertion has been developed to minimize complications.
- Epidural analgesia can only be provided by appropriately trained staff.
- All clinicians should be aware of the common side effects of epidural analgesia and also the rarer, more serious complications.
- Inappropriately weak legs should be identified as abnormal and urgently discussed and investigated.
- Coagulation abnormalities should be normalized before epidural catheter removal