We describe a case of spinal cord injury caused by direct trauma from a local anaesthetic infiltration needle. During local anaesthetic infiltration before placement of an epidural catheter, the patient suddenly rolled over onto her back, causing the infiltrating needle to advance all the way to its hub. She immediately showed signs of spinal cord injury, confirmed by MRI scan. However, her neurological status gradually improved, and on discharge she was able to walk, with a sensory deficit localized to her left foot.

Keywords: anaesthetic techniques, epidural; complications, spinal cord trauma

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In recent years, the anaesthetic literature has contained much discussion about the safety of performing epidural anaesthesia in unconscious patients. Bromage and Wildsmith argue against the performance of central neural blockade in anaesthetized patients. In Germany, after a report of two cases of traumatic cord injury arising during thoracic epidurals performed under general anaesthesia, national guidelines were published stating that prior general anaesthesia is an absolute contraindication to thoracic epidural blockade and a relative contraindication to all other central neural blocks. Nonetheless, there is no general consensus on the subject. Fischer maintains that not only is the practice of anaesthetizing patients before regional blockade widespread in the UK and elsewhere, but also that there are insufficient data to show that the risks of regional anaesthesia are increased in unconscious patients.

It is often unwise to have absolute rules in medical practice, as cases should be judged according to their specific circumstances. This is illustrated by the case reported here, in which a spinal cord injury that occurred during insertion of an epidural catheter might have been avoided if the procedure had been performed after induction of anaesthesia.

Case history

A 31-yr-old woman (height 157 cm, weight 50 kg) presented with a history of intermittent small bowel obstruction. She had had a tubal ectopic pregnancy 1 yr previously. On laparotomy, she was found to have tuberculous salpingitis. This responded initially to conventional anti-tuberculous chemotherapy. Before this admission, she had developed subacute distal ileal obstruction secondary to adhesions caused by the salpingitis. Ultrasound and a CT scan confirmed this, and she was prepared for urgent laparotomy under combined general anaesthesia and epidural analgesia.

She was extremely nervous, and did not speak English. According to her religion, she could only speak via her husband or brother to an interpreter, who then spoke to the anaesthetist (N.B.S.). Premedication was avoided so as not to interfere with communication during insertion of the epidural. The instructions were repeated to her through her husband, and in particular she was asked to remain as still as possible. Midazolam 3 mg was then administered i.v. This caused her to become somewhat disinhibited, but the anaesthetist was loath to administer a further dose and risk oversedation. At the pre-operative visit, the patient and her husband were adamant that the anaesthetist should do whatever was necessary to ensure that she had no pain after the operation. Thus, it was decided to continue with the procedure. She was placed in the left lateral position and the skin in the low thoracic and upper lumbar region was prepared and draped. She was not ‘stabilized’ or restrained by a member of staff.

At the T11/12 interspace, 3 ml of 2% lignocaine was injected via a 21 G needle (Microlance 3, Becton Dickinson, Oxford, UK; length 4 cm) for local anaesthesia. During subcutaneous infiltration the patient suddenly flung her arms out, and then rolled towards the anaesthetist onto her back.
causing the infiltrating needle to be advanced to its hub and trapping the hands of the anaesthetist. The patient felt a shock-like sensation, running from the site of insertion of the needle down both legs, but worse on the left. After the needle was withdrawn, she complained of a transient sharp pain all over the body and then heaviness, numbness, and paraesthesia in the left leg down to the foot. On examination she could not bend her left knee. Initially, it was thought that a small amount of the local anaesthetic might have been injected intrathecally. However, the clinical findings did not progress over the next 10–15 min. After discussion with the gynaecologist and general surgeon, surgery was postponed and an urgent MRI scan was arranged. This revealed a focal signal void in the dorsal epidural space opposite T11/12, consistent with a small volume of air having been injected into the epidural space. It also showed an area of spinal cord oedema at the same level, consistent with a needle-stick injury.

The following day there was no change in the clinical picture. Micturition and defaecation were normal but she complained of dizziness and backache on mobilization. Forty-eight hours later, she developed septicemia and disseminated intravascular coagulation (DIC) requiring admission to the intensive care unit (ICU). Her condition responded to fluid resuscitation, dopamine, i.v. antibiotics, clotting factors and platelets. After a further 48 h, she underwent laparotomy under general anaesthesia. Findings at laparotomy were polycystic ovarian disease, tubo-ovarian abscess, and multiple adhesions in the pelvis with adherent loops of small bowel. Bilateral salpingo-oophorectomy and division of adhesions were performed. After surgery, the sepsis and DIC persisted for a further 4 days and she remained in the ICU during this period. She then made a rapid and full recovery from the operation.

Neurological recovery was slow but progressive and was assessed regularly by a consultant neurologist. From his initial assessment he was confident of complete eventual recovery. A second MRI, performed 14 days after the needle-stick injury, demonstrated disappearance of low-signal material in the epidural space dorsal to the conus region of the spinal cord, compatible with resorption of air from the epidural space. There was a focal area of high signal in the conus suggestive of cord oedema or myelomalacia.

Eighteen days after the needle-stick injury, her balance and ability to walk had recovered almost fully. The heaviness of the left leg had improved, as had the paraesthesia, which had become localized to the sole of the left foot. Temperature and touch sensation were normal. She still had some pain in the lumbar region but not at the site of injection. Anal and bladder sphincter function remained normal throughout. Clinical examination revealed a slight weakness in the left leg but, after a further 7 days, she was able to take a few steps on her tiptoes. Heel–shin coordination was normal on both sides. Reflexes were equal on both sides, but the left plantar response was extensor. Temperature sensation was intact. Light touch sensation was reduced in the sole and the lateral border of the left foot. Pinprick sensation was blunted from L3 caudad.

She was discharged home soon afterwards, but repeated attempts to contact her since then have failed.

**Discussion**

Regional anaesthesia has many benefits. When used alone or combined with general anaesthesia for major surgery, it has been shown to reduce post-operative mortality and the incidence of several other complications, such as deep vein thromboses, pulmonary embolism, stroke, myocardial infarction, wound infection and pneumonia.5

However, the benefits of regional anaesthesia must be balanced with the risks, the most serious of which are neurological injury. Fortunately, several large studies of the complications of regional anaesthesia have confirmed that neurological injuries are rare, and are usually injuries to a single spinal nerve. In the 1950s6 and 1960s,7 large prospective studies of the complications of spinal anaesthesia were performed. Each of these two studies involved more than 10 000 cases, and neither found any cases of arachnoiditis, cauda equina syndrome or transverse myelitis. However, the later study did identify 38 patients with peripheral nerve symptoms—transient in 30 cases and permanent in eight. Similarly, the former study identified 17 patients in whom traumatic lumbar puncture was associated with transient peripheral neurological symptoms.

The results from recent studies are similar.8–10 Scott and Hibbard reviewed 500 000 obstetric patients who received extradural anaesthesia.9 Of these, there was one case of permanent neuropathy, a case of quadriplegia due to thrombosis of a cervical haemangioma, and a case of paraplegia, probably due to anterior spinal artery syndrome. In a prospective study of more than 100 000 spinal and epidural anaesthetics, there was one case of paraplegia after combined spinal–epidural anaesthesia, presumed to be due to spinal ischaemia, and five cases of cauda equina syndrome.10 In a study of 18 000 consecutive central blocks in Sweden, there were three cases of paraplegia caused by spinal haematomas in patients with coagulopathy.8 Other serious but rare complications include cardiac arrest and seizures.10

Although none of these large studies identified any cases of direct traumatic spinal cord injury caused by a spinal or epidural needle, in recent years there have been several case reports of such injuries. Cases have been reported of lower limb paresis due to spinal cord injury caused by a spinal needle11 12 and of serious spinal cord injuries sustained during attempted epidural anaesthesia, confirmed by MRI, at operation or at post-mortem.13–15 In one case,13 the epidural catheter and possibly the epidural needle entered the cord. As far as we are aware, ours is the first reported
case of spinal cord injury caused by a hypodermic needle used for local anaesthetic infiltration.

The authors of these reports tend to support the views of Bromage and Wildsmith that regional blockade is best performed in conscious patients. The main argument is that unconscious subjects are unable to report paraesthesia, a sign warning of the proximity of a needle or catheter to the cord. This sign was present in all the reports of spinal cord injury in awake patients.11–13

While we believe that regional anaesthesia is safest when performed in awake patients, in this particular case the spinal cord damage might have been avoided if the epidural had been performed after the patient was anaesthetized. If this had been done, one option would have been to insert the epidural catheter in the lumbar epidural space, below the level of the cord. However, the disadvantages of increased loss of motor function and delayed mobilization were felt to outweigh the benefit of a potential reduction in risk of spinal cord injury.

Unfortunately, there were many factors making it difficult for our patient to cooperate. She did not receive a sedative premedication and arrived in the postanaesthesia care unit in an anxious state. There were communication difficulties, and it is likely that she found the hospital and theatre intimidating and frightening. As she and her husband had demanded a pain-free recovery, the option of abandoning the epidural anaesthetic at this stage was not considered appropriate. Had she been restrained, the neurological injury might have been avoided, but this practice is not considered acceptable in the UK.

Several of the reported cases of direct cord injury occurred in patients in whom the epidural space was difficult to locate, and so occurred during the course of failed spinal or epidural anaesthesia.12 14 15 The patient in our report was slim, with easily identifiable landmarks and an epidural space that was likely to be easy to locate. It is thus unlikely that difficulties would have arisen if the procedure had been performed while she was unconscious.

In our patient, the 4-cm infiltrating needle was able to penetrate the skin, ligaments and epidural and subarachnoid spaces into the cord. In the majority of patients the distance from the skin to the epidural space is between 4 and 6 cm. However, in thin patients this distance can be <3 cm.16 In the lumbar region there is a 1 in 6 chance of encountering the epidural space between 2 and 4 cm,17 and one can expect to encounter the subarachnoid membrane after a further 4–7 mm.18 In slim patients, it may thus be wiser to infiltrate local anaesthetic agents through shorter needles to reduce the risk of inadvertent dural puncture and spinal cord injury.

As always, the importance of clear communication and careful explanation of all invasive procedures to patients and their relatives cannot be over-stressed, as better understanding usually leads to improved cooperation. In the UK, while the culturally entrenched expectation persists that all unpleasant procedures should be performed under general anaesthesia, there will always be patients who, after being informed of the benefits of regional anaesthesia, prefer to have this performed whilst asleep. If rigid guidelines are introduced, preventing epidural blockade in the unconscious, then these patients may not receive the benefits of regional anaesthesia and analgesia, for the sake of an unproven reduction in the risk of spinal cord injury (a risk that, though potentially catastrophic, is very small). Thus, while national guidelines such as those introduced in Germany are laudable, they should be thought out carefully and there should be room for flexibility, so that each case can be judged on its own merits.

References

2 Wildsmith JA. Regional anaesthesia—before or after general anaesthesia? Anaesthesia 1999; 54: 86
4 Fischer HB. Regional anaesthesia—before or after general anaesthesia? Anaesthesia 1998; 53: 727–9
12 Greaves JD. Serious spinal cord injury due to haematotomylia caused by spinal anaesthesia in a patient treated with low-dose heparin. Anaesthesia 1997; 52: 150–4
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15 Mayall MF, Calder I. Spinal cord injury following an attempted thoracic epidural. Anaesthesia 1999; 54: 990–4
17 Sutton DN, Linter SP. Depth of extradural space and dural puncture. Anaesthesia 1991; 46: 97–8