The technical skills associated with lumbar puncture are simply to find the correct intervertebral space and pass a needle into it, through the dura mater and into the subarachnoid space. However, accurate identification of intervertebral spaces is often difficult, and passing the needle into the subarachnoid space is occasionally impossible, even for the confident, able and experienced anaesthetist.

Identifying the correct intervertebral space
The intercristal line (Tuffier’s line) is a theoretical line that joins the tops of the two iliac crests and passes through the fourth lumbar vertebra (L4). Using this should allow the anaesthetist to identify the L3/4 interspace and, by palpation and extension, any other interspace. Studies suggest that doctors’ ability to identify L3/4 clinically is at best poor. The importance of identifying the correct interspace for lumbar puncture relates to the level at which the spinal cord terminates. The passage of a spinal needle into the subarachnoid space below the termination of the spinal cord is thought to offer no risk to nerves. Inserting a spinal needle above the termination of the cord may damage the end of the cord; the conus medullaris. The cord is said to terminate at the level of L1 in adults. However, it ends below this level in a substantial proportion of patients and, as a result, it is reasonable to recommend that lumbar puncture or spinal anaesthesia should not normally be attempted above the L3/4 interspace.

Positioning the patient
Both the sitting position and the lateral position have their advocates. Supporters of the sitting position argue that the spine is less likely to be rotated or laterally flexed if the patient is sitting and leaning forward. Those who favour the lateral position argue that it is more comfortable for patient and anaesthetist. The anaesthetist should be able to perform a lumbar puncture with the patient in either position. Most lumbar punctures are performed with a midline approach. However, many favour a paramedian approach, and it is worth becoming familiar with this technique because difficult midline lumbar punctures can become easy if a paramedian approach is used.

Needle choice
Length — most spinal needles are 70–90 mm long. This length is suitable for most adult patients. Longer needles may be used if the patient is unusually large or if the anaesthetist plans to pass the spinal through a Tuohy needle as part of a combined spinal-epidural technique.

Tip design — traditionally, spinal needles had a Quincke tip (Figure 1), a cutting open bevel similar to that of a hypodermic needle. The introduction of needles with a conical or elliptical tip (often termed pencil-point needles, though this term should only be used to refer to conical tips) led to the realization that they were associated with a lower incidence of post-dural puncture headache (PDPH), resulting from leakage of CSF through the hole created in the dura. It is thought that this is because the Quincke tip tends to cut the longitudinal fibres of the dura, whereas pencil-point needles divide the fibres. Another advantage of pencil-point needles is the greater resistance they offer to passage through tissues, giving the anaesthetist a better ‘feel’ during insertion of the needle.

<table>
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<th>Common tip designs for spinal needles</th>
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<tr>
<td>Quincke</td>
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<td>Whitacre</td>
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**Width (gauge)** – the larger the diameter of the needle, the higher the incidence of PDPH. However, the narrower the needle, the more flexible it is. The consequence of flexibility is greater difficulty in passing it through tough tissue, though the use of an introducer can facilitate the passage of small-diameter needles. Most anaesthetists use spinal needles that are 25 G or smaller.

**Needle selection** – the smaller the needle the better. A pencil-point should be used if possible. However, some elderly backs are not amenable to the passage of a 27 G pencil-point needle. Greater rigidity (i.e. a larger diameter) may be needed to pass a needle through a calcified interspinous ligament. Many anaesthetists faced with this situation resort to a 22 G Quincke tip spinal needle because it can be passed through the toughest of interspinous ligaments and the incidence of PDPH is low in the elderly.

**Correct positioning**
The needle should be passed slowly towards the dura. There is a familiar feel to the passage of the spinal needle through the ligamentum flavum. The appearance of CSF at the hub of the needle is the only absolute confirmation of correct placement. If the purpose of the lumbar puncture is a diagnostic tap, wait until enough CSF has dripped from the needle. The larger the diameter, the shorter the time this will take (busy neurologists often favour 18 G spinal needles for this reason). If the purpose is to perform a spinal anaesthetic, connect a syringe containing the local anaesthetic and perform the injection. It is popular to aspirate both before and after injection (and sometimes during), to confirm the correct position of the tip of the spinal needle throughout the injection.

Placing a needle into the CSF of a slim adult is easy. Consistently placing a spinal needle in the correct place when faced with obese, pregnant, elderly or uncooperative patients takes skill, experience and patience. ◆

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