Evidence-based lumbar puncture: best practice to prevent headache

Nicola Cooper

Lumbar puncture is routinely used to access cerebrospinal fluid. Headache is the most common complication, and can be debilitating. The risk of headache is related to age, sex, needle size and shape, and lumbar puncture procedure. Doctors continue to use 20 G bevelled needles followed by bed rest, although overwhelming evidence supports use of 22 G atraumatic needles with no bed rest.

Lumbar puncture is a common procedure used to obtain samples of cerebrospinal fluid (CSF) in order to measure its pressure, to enable the administration of drugs and to provide spinal anaesthesia (local anaesthetic injected into the CSF). British doctors continue to use bevelled needles for lumbar puncture followed by 4 hours' bed rest (Broadley and Fuller, 1997a,b), despite overwhelming evidence that this is not the best practice. This article summarizes the evidence around the procedure and outlines strategies to reduce post-lumbar puncture headache.

POST-LUMBAR PUNCTURE HEADACHE

Headache is the most common complication following lumbar puncture, occurring in over 30% of patients where a 20G bevelled needle is used for the procedure (Kuntz et al, 1992). Young people and women are susceptible to headache after dural puncture, with obstetric patients being affected the most; this is therefore an area of interest among anaesthetists giving spinal anaesthesia.

Post-lumbar puncture headaches can be incapacitating and can prolong hospital stay. Rare neurological complications can occur, such as cranial nerve palsies and subdural haematoma.

Possible cause

Although the cause of post-lumbar puncture headache is not entirely clear, it is thought that a hole is left in the dura after the lumbar puncture needle has been withdrawn. This hypothesis is supported by several studies (see below) that have investigated strategies to reduce the size of the hole and then compared the incidence of headache. The hole allows CSF to leak further out of the subarachnoid space, lowering the volume of CSF cushioning the brain. When the patient sits up, traction of the membranes produces a headache.

Characteristics and diagnosis

The classical post-lumbar puncture headache:

- Is posture-related
- Is throbbing in nature
- Is of varying severity
- Presents usually 24–48 hours after lumbar puncture (Vilming and Kloster, 1998)
- Is worse on sitting or standing, but relieved by lying down.

Post-lumbar puncture headache may render the patient immobile. The diagnosis can be confirmed by abdominal compression (Reynolds, 1993). With the patient sitting and symptomatic, the waist is slowly squeezed from behind. Compression of the inferior vena cava causes the epidural veins to become engorged and this displaces CSF into the head, quickly relieving the headache.

LUMBAR PUNCTURE PRACTICE

Various studies have shown that the risk of developing post-lumbar puncture headache is not only related to age and sex, but also to needle size, shape, bevel orientation and reinsertion of the stylet before withdrawal (Braune and Huffman, 1992; Muller et al, 1994; Carson and Serpell, 1996; Kleyweg et al, 1998; Strupp et al, 1998; Yentis, 1998).

By comparing atraumatic (blunt-tipped) and bevelled needles of varying sizes, Carson and Serpell (1996) have demonstrated adequate CSF flow when using a 22G atraumatic needle (*Figure 1*). When using such needles the incidence of headache is reduced to only 5%

Dr Nicola Cooper is Specialist Registrar in General Internal Medicine and Care of the Elderly, Huddersfield Royal Infirmary, Huddersfield HD3 3EA

(Braune and Huffman, 1992; Muller et al, 1994). It is thought that rather than cutting the elastic fibres in the dura, atraumatic needles temporarily separate them and allow them to close on withdrawal, thus minimizing persisting CSF leak. Replacing the stylet before withdrawing the needle is thought to push back any strands of tissue and also help reduce the size of the hole. Studies have shown that this manoeuvre alone significantly reduces the incidence of post-lumbar puncture headache (Strupp et al, 1998; Yentis, 1998).

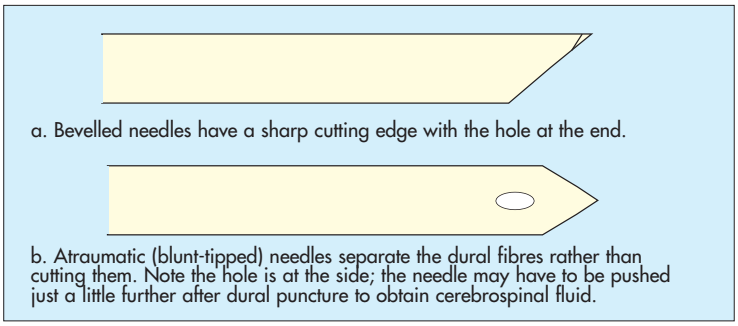

Figure 1. Difference between bevelled and atraumatic needles.

HEADACHE MANAGEMENT

Randomized controlled trials have not found any difference in the incidence of headache when comparing bed rest and immediate mobilization post-lumbar puncture (Vilming et al, 1988; Spriggs et al, 1992). If headache does occur, conservative management usually works. Analgesia, bed rest and increased fluids ameliorate the headache, which usually disappears within a few days.

In severe cases, intermittent extradural injections of physiological saline have been tried with success. However, because the hole persists, the most effective treatment is an autologous extradural blood patch (Hardman and Gajraj, 1996). This is where 10–20 ml of the patient's blood is injected into the extradural space. Ninety per cent of headaches are relieved after the first injection, and 95–98% after two. Such a procedure should be performed by an experienced consultant anaesthetist.

EVIDENCE-BASED LUMBAR PUNCTURE PRACTICE

- There is now enough evidence to justify the use of 22G atraumatic needles for lumbar punctures, although they are more expensive than bevelled needles
- Enforced bed rest following lumbar puncture should be obsolete
- Clinicians should be aware of how to treat the potentially incapacitating headache that can follow, including rare complications. HM

Conflict of interest: none.

Braune HJ, Huffman G (1992) A prospective double-blind clinical trial comparing the sharp Quincke needle (22G) with an 'atraumatic' needle (22G) in the induction of post-lumbar puncture headache. *Acta Neurol Scand* **86:** 50–4

Broadley SA, Fuller GN (1997a) Audit of LP practice in UK neurology centres. *J Neurol Neurosurg Psychiatry* **63:** 266

Broadley SA, Fuller GN (1997b) Lumbar puncture needn't be a headache [editorial]. *Br Med J* **316:** 1324–5

Carson D, Serpell M (1996) Choosing the best needle for diagnostic lumbar puncture. *Neurology* **47:** 33–7

Hardman JG, Gajraj NM (1996) Epidural blood patch. *Br J Hosp Med* **56:** 268–9

Kleyweg RP, Hertzberger LI, Carbaat PA (1998) Significant reduction in post-lumbar puncture headache using an atraumatic needle. A double-blind, controlled clinical trial. *Cephalalgia* **18**(9): 6355–7

Kuntz KM, Kokmen E, Stevens JC, Miller P, Offord KP, Ho MM (1992) Post-lumbar puncture headaches: experience in 501 consecutive procedures. *Neurology* **42:** 1884–7

Muller B, Adelt K, Reichmann H, Toyka K (1994) Atraumatic needle reduces the incidence of post-lumbar puncture syndrome. *J Neurol* **241:** 376–80

Reynolds F (1993) Dural puncture and headache — avoid the first but treat the second. *Br Med J* **306:** 874–6

Spriggs DA, Burn DJ, French J, Cartilidge NEF, Bates D (1992) Is bed rest useful after diagnostic lumbar puncture? *Postgrad Med J* **68:** 581–3

Strupp M, Brandt T, Muller A (1998) Incidence of post-lumbar puncture syndrome reduced by reinserting the stylet: a randomised prospective study of 600 patients. *J Neurol* **245**: 589–92

Vilming ST, Kloster R (1998) The time course of post-lumbar puncture headache. *Cephalalgia* **18**(2): 97–100

Vilming ST, Schrader H, Monstad I (1988) Post-lumbar puncture headache: the significance of body posture. A controlled study of 300 patients. *Cephalalgia* **8:** 75–8

Yentis S (1998) Lumbar puncture and headache. Replacing the stylet before withdrawing the needle may help to prevent headache [letter]. *Br Med J* **316:** 1018

KEY POINTS

- Using smaller, 22 G atraumatic needles significantly reduces the incidence of headache after lumbar puncture.
- Atraumatic needles are just as easy to use as the traditional bevelled needles.
- Replacing the stylet before needle withdrawal also reduces the incidence of post-lumbar puncture headache.
- There is no evidence that bed rest following lumbar puncture makes any difference to the incidence of headache.
- Despite this overwhelming evidence, lumbar puncture with bevelled needles followed by 4 hours bed rest is currently the most common practice.