

Ultrasound-guided catheterisation of the epidural space

1 Guidance

1.1 Evidence on ultrasound-guided catheterisation of the epidural space is limited in amount, but suggests that it is safe and may be helpful in achieving correct placement. The procedure may be used provided that normal arrangements are in place for clinical governance, consent and audit. Normal consent should include informing patients about the possibility of rare but serious complications of catheterisation of the epidural space.

2 The procedure

2.1 Indications

2.1.1 Catheterisation of the epidural space, commonly known as an epidural, is often used to provide pain control during labour or during and after surgery on the abdomen, pelvis or legs.

2.1.2 In the conventional procedure, the point of injection is determined by feeling for specific bony landmarks on the spine and pelvis. A small volume of local anaesthetic is injected into the skin and interspinous ligament. A needle is advanced slowly through the interspinous ligament until resistance is no longer felt to the attempted injection of air or saline, indicating that the tip of the needle is in the epidural space (the loss-of-resistance technique). A catheter is then threaded through the needle into the epidural space, the needle is removed and the catheter is secured.

2.2 Outline of the procedure

2.2.1 Ultrasound guidance may be used in two different ways to facilitate catheterisation of the epidural space. One method is to use real-time ultrasound imaging to observe passage of the needle towards and into the epidural space. The second method (prepuncture ultrasound) is to use ultrasound as a guide to the conventional technique. In this method an initial ultrasound scan of the patient's lumbar spine is performed to locate the midline and the middle of an interspinous space; the position of each is marked on the skin. The depth of the epidural space is also determined from the ultrasound scan. Catheterisation is then done in the conventional way, but with the skin markings as an additional guide. In both methods, 'loss of resistance' during passage of the needle remains an added safeguard against dural puncture. As with the conventional procedure, ultrasound-guided catheterisation of the epidural space is performed under sterile conditions.

Sections 2.3 and 2.4 describe efficacy and safety outcomes which were available in the published literature and which the Committee considered as part of the evidence about this procedure. For more details, refer to the Sources of evidence.

2.3 Efficacy

2.3.1 The published literature describes the use of this procedure in children and neonates, pregnant women and patients with scoliosis.

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This guidance represents the view of the Institute, which was arrived at after careful consideration of the available evidence. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. This guidance does not, however, override the individual responsibility of healthcare professionals to make appropriate decisions in the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Interventional procedures guidance is for healthcare professionals and people using the NHS in England, Wales, Scotland and Northern Ireland.

This guidance is endorsed by NHS QIS for implementation by NHSScotland.

- 2.3.2 In two randomised controlled trials (RCTs) of 300 and 72 pregnant women comparing prepuncture ultrasound with no ultrasound (control), mean numbers of puncture attempts in the prepuncture ultrasound groups were 1.3 and 1.5 compared with 2.2 and 2.6, respectively, in the control groups ($p < 0.013$ and $p < 0.001$). In an RCT of 30 pregnant women comparing real-time ultrasound, prepuncture ultrasound and no ultrasound, only one puncture attempt was required in 100% (10/10) of procedures using real-time ultrasound, 70% (7/10) of procedures using prepuncture ultrasound and 40% (4/10) of procedures not using ultrasound ($p = 0.036$). Patient satisfaction in the RCT of 300 women was significantly higher in the prepuncture ultrasound group than in the control group (no ultrasound) (1.3 vs 1.8, measured on a 6-point verbal scale where 1 is very good and 6 is insufficient, $p < 0.001$).
- 2.3.3 In an RCT of 64 children comparing real-time ultrasound with prepuncture ultrasound, epidural catheter placement was successful in all children. The epidural procedure took 162 seconds to perform in the real-time ultrasound group compared with 234 seconds in the prepuncture ultrasound group ($p < 0.01$). In the prepuncture ultrasound group, supplementary analgesia was required by 6% (2/34) of children and postoperative intravenous morphine by 6% (2/34) of children. Neither was required for children in the real-time ultrasound group.
- 2.3.4 In a case series of 180 children, the epidural space was located on the first puncture attempt in 99.4% (179/180) of procedures using prepuncture ultrasound.
- 2.3.5 The Specialist Advisers stated that the key efficacy outcomes include patient comfort during catheter insertion, success rate for entering the epidural space on the first attempt, success in patients in whom the conventional technique has failed, identification of the interspinous space by ultrasound and correlation of depth measured by ultrasound with depth on needle insertion.

2.4 Safety

- 2.4.1 In the RCT of 300 pregnant women, dural puncture was reported in 0.7% (1/150) of patients in the prepuncture ultrasound group compared with 1.3% (2/150) in the control group (no

ultrasound). Aspiration of blood was reported in 2.0% (3/150) of patients in the prepuncture ultrasound group and 7.3% (11/150) of patients in the control group (p not significant). 'Severe' headache was reported in 2.7% (4/150) of patients in the prepuncture ultrasound group and 10.0% (15/150) of patients in the control group ($p < 0.011$). There were no significant differences in the rates of reported backache, sensory problems and continence problems.

- 2.4.2 In the RCT of 64 children, aspiration of blood was reported in 3% (1/34) of procedures that used prepuncture ultrasound and in 0% (0/30) of procedures using real-time ultrasound (p value not stated). There were no dural punctures in either group. A case series of 180 children reported no incidents of dural puncture or aspiration of blood using prepuncture ultrasound.
- 2.4.3 One Specialist Adviser identified an increased risk of accidental dural puncture as a potential adverse outcome if the 'loss-of-resistance' technique is not adhered to.

3 Further information

- 3.1 The Institute has produced technology appraisals guidance on the use of ultrasound locating devices for placing central venous catheters (www.nice.org.uk/TA049).

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Information for patients

NICE has produced information describing its guidance on this procedure for patients and their carers ('Understanding NICE guidance'). It explains the nature of the procedure and the decision made, and has been written with patient consent in mind. This information is available from www.nice.org.uk/IPG249publicinfo

Sources of evidence

The evidence considered by the Interventional Procedures Advisory Committee is described in the following document.

'Interventional procedure overview of ultrasound-guided catheterisation of the epidural space', June 2007.

Available from: www.nice.org.uk/ip403overview

Ordering information

Copies of this guidance can be obtained from the NHS Response Line by telephoning 0870 1555 455 and quoting reference number N1449. 'Understanding NICE guidance' can be obtained by quoting reference number N1450.

The distribution list for this guidance is available at www.nice.org.uk/IPG249distributionlist

Interventional procedures guidance makes recommendations on the safety and efficacy of a procedure. The guidance does not cover whether or not the NHS should fund a procedure. Decisions about funding are taken by local NHS bodies (primary care trusts and hospital trusts) after considering the clinical effectiveness of the procedure and whether it represents value for money for the NHS.

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