

The role of ultrasound in regional anaesthesia

Regional anaesthesia is considered to be a safer alternative to general anaesthesia and as such is frequently offered either as an alternative or adjunct to general anaesthesia.

In 2002, the National Institute for Clinical Excellence published guidelines for use of ultrasound in the placement of central venous catheters. This has increased safety and efficacy and is now considered best practice. In January 2009, the National Institute for Health and Clinical Excellence published support for ultrasound-guided regional nerve block. The technique is deemed safer and more effective than anatomical landmark or nerve stimulator-guided nerve blockade. This article gives an overview of the evolution of this technique, the advantages it offers and possible pitfalls.

History of regional anaesthesia

Until 1950, anaesthetists used anatomical landmarks, the changing sensation of needle passage through tissue planes and eliciting paraesthesia in adult patient to confirm the placement of the needle (Denny and Harrop-Griffiths, 2005). After 1960, electrical nerve stimulation came into use to locate peripheral nerves. However, any procedure done under direct visualization is logically better than one performed blindly.

La Grange and colleagues used Doppler ultrasound for the first time in 1978 for supraclavicular brachial plexus blocks (Marhofer et al, 2005). Since then, there have been significant improvements such as the availability of cost-effective portable ultrasound machines, improved image quality (Horlocker and Wedel, 2007) and better facilities to store the data.

Advantages of ultrasound-guided regional anaesthesia

This technique ensures that the precise nerve location and the surrounding vascular, muscular, bony and visceral structures can be revealed. It guides accurate needle

tip placement adjacent to the nerve, allows visualization of the injected anaesthetic solution and change of position of the needle tip if the spread of local anaesthetic is not satisfactory.

Ultrasound-guided regional anaesthesia provides a higher success rate, faster onset time, better quality of sensory block and less conversion to general anaesthesia than nerve stimulator techniques (National Institute for Health and Clinical Excellence, 2009). A smaller volume of local anaesthetic is required and there is less need for postoperative analgesia. It reduces the number of needle attempts for nerve localization and the lower incidence of paraesthesia may reduce the risk of nerve injury. The chances of unintentional intravascular or intraneural injection and pneumothorax in supraclavicular blocks are less.

Ultrasound-guided regional anaesthesia offers excellent guidance in selective ganglion or nerve blocks for invasive pain therapy, e.g. lumbar sympathetic and coeliac plexus blocks, stellate ganglion block.

It is useful in paediatric patients where general anaesthesia is more common. Paraesthesia is not the end point, so visualization of underlying structures becomes more important.

Studies have been published claiming increased chances of successful epidural with ultrasound-guided procedures (Tran et al, 2009).

Pitfalls and concerns

The technique needs more training, detailed anatomical knowledge and greater manual dexterity. The costs of equipment, training and lengthened procedure time also need to be considered.

Comparison of ultrasound with nerve stimulation is difficult as it is impossible to blind the technique to the operator, so bias is inevitable. The incidence of permanent neurological damage after peripheral nerve block has been quoted as

1:5000 to 1:10 000, so studies need huge numbers of cases to show any advantage of one over the other (Denny and Harrop-Griffiths, 2005).

Although there are numerous clinical uses of ultrasound-guided techniques, the data supporting its superiority over traditional methods are few and absolute number and level of significance is not reported (Horlocker and Wedel, 2007).

There is the possibility that learners who use ultrasound-guided techniques may not be competent in performing the technique in a setting where ultrasound is not available so, at least for the present, both ultrasound-guided and more traditional techniques should continue to be taught (Horlocker and Wedel, 2007).

Conclusions

Marhofer and colleagues (2005) discussed important aspects of using ultrasound to localize nerve structures in regional anaesthesia. They agreed that although ultrasound will be the guidance technique of the future, the transition from the conventional technique of nerve stimulation will take some time to complete. There are also financial considerations. However, to ensure provision of optimal anaesthetic care, the optimal technique of applying nerve block must eventually prevail. **BJHM**

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