Where is the optimum placement of an interscalene brachial plexus nerve block?

Regional anaesthesia has developed significantly with the advance of ultrasound, allowing real time visualization of the needle tip and local anaesthetic spread.

Interscalene brachial plexus nerve blocks are frequently performed for shoulder surgery, either as the sole anaesthetic or as an analgesic adjuvant for patients undergoing general anaesthesia.

The brachial plexus consists of a group of nerves surrounded by many layers of connective tissue. The outermost layer (the paraneurium) surrounds the entire plexus, the epineurium surrounds the individual nerve roots, the perineurium surrounds the fascicular bundles and the endoneurium surrounds the individual axons of neurons.

The optimum location for injection of the local anaesthetic is debated, as it needs to be close enough to the functional nerve tissue to ensure an effective block while minimizing risks of nerve injury.

It is commonly believed that hazardous needle contact and injections in the fascicles, i.e. within the perineurium or endoneurium, pose a high risk of nerve damage as a result of trauma, direct chemical toxicity or pressure-related ischaemia. Injections immediately outside the paraneurium fascia and therefore outside of the actual brachial plexus (peri-plexus technique) are thought to be safe, but injections within the paraneurium fascia (intra-plexus technique) are subject to much debate.

Intra-plexus injections are safe

Supporters of intra-plexus techniques argue that the closer the injection is to the functional nervous tissue the more likely it is that the injectate will reach the tissue and exert its effect. A study of interscalene blocks found that intra-plexus techniques produced a 16% (2.6 hours) increase in duration of sensory block compared with peri-plexus techniques (Spence et al, 2011). A study of popliteal sciatic nerve blocks shown that intra-plexus techniques were less likely to fail than peri-plexus techniques (0% *vs* 27%) and had a faster onset time (mean onset time 11 minutes *vs* 19 minutes) and a greater duration of sensory block (mean duration 397 minutes *vs* 310 minutes) (Choquet et al, 2014).

A widely held view is that intra-plexus techniques have a greater risk of causing intra-epineurial injections (Szerb et al, 2015), which are thought to be harmful. However, Bigeleisen (2006) studied 72 cases of deliberate intra-epineurial injections and did not find a single postoperative neurological complication at 6 months.

Intra-plexus injections should not be used

Palhais et al (2016) found that para-plexus injections performed 4 mm away from the nerve roots were just as reliable and effective as intra-plexus injections with regards to quality and duration of analgesia. The para-plexus group also benefitted from a reduced incidence of phrenic nerve block as seen on ultrasound and spirometry.

Detractors also question the safety of intra-plexus injections. The ability of clinicians to visualize the epineurium and nerve fascicles and to reliably avoid breaching those vital structures is operator dependent and can be fallible even in expert hands. Doubts also exist about whether the 1–2 mm resolution of current ultrasound machines can reliably identify fascicles (many of which are <1 mm in diameter) and whether nerve expansion is a reliable indicator of imminent nerve injury. The reliability of a fully awake patient alerting the operator to hazardous needle contact has also been questioned. There have been numerous cases of nerve injuries following regional anaesthesia in fully awake patients who did not complain of any pain or odd sensations during the administration of their blocks (Neal and Wedel, 2010).

Conclusions

Para-plexus injections appear as reliable and effective as intra-plexus injections, especially when used as an adjunct to general anaesthesia. The benefits of intra-plexus injection seem modest, and likely to be advantageous in only selected cases. The very limited data on the postoperative clinical effects of intra-epineurial injections cannot guarantee their safety, so the authors feel that anaesthetists should stay as far away from neural tissue as possible. **BJHM**

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