CHAPTER 8: CONTINUOUS NERVE BLOCKS

Introduction

Single-shot peripheral nerve blocks provide quality anesthesia for a variety of different procedures. In most cases postoperative pain is moderate and manageable with either IV PCA (patient controlled analgesia) or oral analgesics. However, there are surgical procedures known to be followed by intense pain in the postoperative period. Pain does not only affect patients physically and emotionally, but also affects their recovery time, rehabilitation and overall satisfaction.

In those cases in which postoperative pain is expected to be more than moderate and to last longer than the duration of a single shot block, the anesthesiologist needs other means to produce and prolong the analgesia. Ideally, analgesia could be provided by slow-released analgesic products injected along with local anesthetics during single shot techniques. Local anesthetics and other substances like morphine have been added to liposome systems to deliver controlled and steady doses of analgesia. However, to date only duromorph, a liposomal system delivering morphine, is the only one available. It has been approved by the FDA for epidural analgesia. In this context continuous peripheral nerve blocks with perineural catheters become an excellent option for postoperative analgesia providing the versatility in duration and effect that single shot techniques lack.

F. Paul Ansbro published in 1946 what is widely considered the first account of a continuous peripheral nerve block technique. He described a technique in the supraclavicular area in which he used a needle passed through a cork for stabilization. Once the needle was inserted to an adequate level, as judged by parasthesia, the cork was advanced to the level of the skin and taped. A tubing connected to a syringe provided the opportunity for what Ansbro called "fractional injections". More recently in the 1970s, Selander introduced continuous techniques in the axillary region using an IV cannula left in place.

Benefits of continuous perineural catheters

Many authors have demonstrated the benefits of continuous techniques, mainly **prolonged analgesia** without the undesirable side effects associated with opioid use (i.e., nausea, vomiting, constipation, dependency), **better patient satisfaction** and **better ability to participate in rehabilitation**. Liu and Salinas published in 2003 an excellent review on continuous perineural blocks. After an extensive review of the available literature they concluded that there was enough evidence to support the claim of superior analgesia of continuous perineural blocks as compared to IV PCA "for open shoulder procedures and total knee replacement". It is likely that patients undergoing many other surgical procedures could also benefit from the ability to extend the analgesia provided by perineural catheters.

Continuous techniques

Continuous blocks are usually performed in a similar way than single-shot techniques with the addition of a catheter that provides the means to continuously deliver the analgesic solution. Single-shot blocks ("primary block") are generally associated with a high success rate. Catheters techniques ("secondary block") do not generally achieve the same degree of success. Catheters need to be closely placed in the proximity of target nerve(s) in order to decrease the "secondary block failure", a failure to achieve the same degree of success than single shot techniques. In general catheters should not be advanced more than 3-4 cm because the risks for catheter-related complications (e.g., knotting, vascular puncture, nerve injury, etc) potentially increase.

Stimulating versus non-stimulating catheters

There are proponents of both techniques. The non-stimulating catheters are commonly inserted through an insulated, Tuohy type needle. The catheter can be a single orifice catheter in which the hole is usually at the tip, or most commonly a multi orifice catheter with a dead end (no hole at the tip) and three side holes, the distal one at about 0.5 cm from the tip. The proximal hole is separated from the distal one by a distance of about 1 cm. After the needle is positioned the catheter is advanced to the desired location. The technique is generally easy, but the success of the secondary block (through the catheter) depends on a proper perineural placement of the catheter.

The stimulating catheter uses for insertion a similar Tuohy type needle, but the catheter itself has a wire connected to its tip, allowing for stimulation through it in a similar fashion than through a needle. The ability to stimulate a nerve as the catheter is advanced provides a measure of catheter tip-nerve proximity. If the elicited twitch disappears the catheter is carefully withdrawn into the housing of the needle to avoid cutting or otherwise damaging the catheter. The position of needle is then slightly modified by rotation or by moving it in and out a few millimeters and a new attempt is made. The needle and catheter together as a unit can be slightly rotated in its main axis before reinserting the catheter. This technique can be more time consuming and more difficult, but it may contribute to decrease secondary failure. The introduction of ultrasound into regional anesthesia practice with its ability to visualize the needle, the catheter as well as the spread of the local anesthetic solution, has called into question the need for stimulating catheters.

Catheter related problems

The most common problems with catheters include inability to achieve adequate analgesia and a number of technical problems like accidental dislodgement and peri-catheter leaks. Catheters tend to have a "mind of their own". They can advance away from nerves and into undesirable places. Capdevila et al in 2005 in a multicenter study that included 1,416 patients identified 17.9 % of "technical problems due to catheters and devices".

Many techniques are used to increase the resistance to accidental dislodgement. Perhaps the most successful is the subcutaneous tunnelization of the catheter. It does not only increase the resistance to removal but also provides the opportunity to direct the catheter away from the surgical site.

Severe nerve damage and infection are rare complications of continuous techniques.

References

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