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Peripheral regional anaesthesia and outcome: lessons learned from the last 10 years

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Editor's key points

- The authors reviewed the extensive literature regarding outcome following peripheral regional anaesthetic techniques.
- Improvements in postoperative pain and surgical pathway efficiency were noted. Complications were rare.
- Long-term effects were not apparent, although further work is needed in this area.

Background. Our aim was to review the recent evidence for the efficacy of peripheral regional anaesthesia.

Methods. Following a systematic literature search and selection of publications based on prospectively agreed upon criteria, we produced a narrative review of the most commonly performed peripheral regional anaesthetic blocks for surgery on the upper limb, the lower limb, and the trunk. We considered short-term and longer-term benefits and complications among the outcomes of interest.

Results. Where good quality evidence exists, the great majority of the blocks reviewed were associated with one or any combination of reduced postoperative pain, reduced opioid consumption, or increased patient satisfaction. For selected surgical procedures, the use of blocks avoided general anaesthesia and was associated with increased efficiency of the surgical pathway. The exceptions were supraclavicular block, where there was insufficient evidence, and transversus abdominis plane block, where the evidence for efficacy was conflicting. The evidence for the impact of the blocks on longer-term outcomes was, in general, inadequate to inform clinical decision making. Permanent complications are rare.

Conclusions. The majority of peripheral regional anaesthetic techniques have been shown to produce benefits for patients and hospital efficiency. Further interventional trials are required to clarify such benefits for supraclavicular block and transversus abdominis plane block and to ascertain any longer-term benefits for almost all of the blocks reviewed. Permanent complications of peripheral regional anaesthetic blocks are rare but accurate estimates of their incidence are yet to be determined.

Keywords: nerve block; outcome studies; postoperative complications; postoperative pain

Peripheral regional anaesthesia is an integral component of modern perioperative care. The worldwide popularity of peripheral regional anaesthesia has increased over the last decade mainly because of innovative and more reliable needle location methods, principally based on ultrasonography. Such highly sophisticated technology enables an effective blockade of almost any peripheral nerve to be achieved, resulting in expanded opportunities for regional anaesthetic blocks. Peripheral regional anaesthesia can be performed with minimal technological requirements using basic techniques (e.g. fascia iliaca compartment blocks).

The improved capability of anaesthetists to achieve a high success rate with peripheral regional anaesthetic techniques has coincided with an increasing number of multimorbid surgical patients, who are generally perceived to benefit most from peripheral nerve blocks. On the one hand, such patients may benefit from avoiding general anaesthesia,[1] while neuraxial techniques are recognized to be associated with albeit rare serious complications,[2] especially in patients on anticoagulant or antiplatelet therapy.

A large number of publications describe various aspects of peripheral regional anaesthesia techniques in daily clinical practice. There has been a lot of debate within the literature concerning the relative merits of nerve location techniques, but our focus will be on the outcome of the block per se rather than how the block was achieved. Even so, the heterogeneity of the literature in this field significantly contributes to the difficulty of practitioners attempting to define the clinical value of peripheral nerve blocks and precludes the use of formal statistical comparison of combined study data. Thus a clear narrative overview of the available scientific data may be the best approach to help in making a well-balanced

risk–benefit analysis for the use of different peripheral regional anaesthesia techniques.

Thus the present review article was designed to present a weighted summary of the available outcome data in the field of peripheral regional anaesthesia. Outcome was defined primarily as effectiveness, which summarizes clinical endpoints such as pain reduction, reduced demand for systemic analgesic drugs, reduced need for general anaesthesia, and patient satisfaction. Secondary outcomes were functional recovery from the surgical procedure and complications. For each block we also included a section entitled 'Nice to know', which includes interesting findings for specific blocks that could not easily be fitted into one of the other categories and reflects again the great variety of endpoints included in studies of peripheral nerve blocks.

Methods

Source of information

Human studies in the field of upper extremity, lower extremity, and trunk block techniques with a publication date between October 4, 2003, and October 3, 2013, were extracted from PubMed, with reference lists of retrieved articles searched for additional trials or reports. For upper extremity blocks, interscalene, supraclavicular, infraclavicular, and axillary brachial plexus techniques were included. For lower extremity blocks, femoral, saphenous and adductor canal, sciatic, and psoas compartment techniques were considered. For blocks of the trunk, cervical, intercostal, transverse abdominal plane, rectus sheath, and ilioinguinal/iliohypogastric nerve block techniques were considered. Studies were excluded if children (<18 yr) were the subjects.

The following search terms were used: interscalene nerve block, interscalene nerve blockade, interscalene plexus block, interscalene plexus blockade, interscalene brachial plexus block, interscalene brachial plexus blockade, supraclavicular nerve block, supraclavicular nerve blockade, supraclavicular plexus block, supraclavicular plexus blockade, supraclavicular brachial plexus block, supraclavicular brachial plexus blockade, infraclavicular nerve block, infraclavicular nerve blockade, infraclavicular plexus block, infraclavicular plexus blockade, infraclavicular brachial plexus block, infraclavicular brachial plexus blockade, axillary nerve block, axillary nerve blockade, axillary plexus block, axillary plexus blockade, axillary brachial plexus block, axillary brachial plexus blockade, sciatic block, sciatic blockade, sciatic nerve block, sciatic nerve blockade, femoral block, femoral blockade, femoral nerve block, femoral nerve blockade, saphenous block, saphenous blockade, saphenous nerve block, saphenous nerve blockade, adductor canal block, adductor canal blockade, psoas compartment block, psoas compartment blockade, cervical plexus block, cervical plexus blockade intercostal block, intercostal blockade, intercostal nerve block, intercostal nerve blockade, ilioinguinal block, ilioinguinal blockade, ilioinguinal nerve block, ilioinguinal nerve blockade, iliohypogastric block, iliohypogastric blockade, iliohypogastric nerve block, iliohypogastric nerve blockade, transversus abdominis plane block, transversus abdominis plane blockade, rectus sheath block, and rectus sheath blockade. The reference lists of the included articles were examined to ensure that no relevant literature was missed.

Data selection

Decisions for listing articles were made according to the recommendations for narrative reviews by McAlister.[3] We ranked randomized controlled trials (RCT) highest, followed by other trials and reports when no superior, broad evidence base could be discerned. Technical reports, anatomical descriptions, dose-finding studies, studies comparing peripheral nerve blocks, studies comparing various approaches, studies comparing different local anaesthetics or different local anaesthetic concentrations or additive perineural drugs were excluded. We included articles in any language.

All articles were reviewed for the following outcomes: effectiveness (pain reduction, reduced demand for systemic analgesic drugs, reduced need for general anaesthesia, and patient satisfaction), functional recovery, and complications (e.g. nerve injury). Other relevant findings (e.g. length of hospital stay) were also recorded and summarized under the subheading 'Nice to know'.

Results

Figure 1 summarizes the results of the study selection process.

Upper extremity blocks

Interscalene approach

Twenty-eight (17 RCTs with a total of 910 patients) of 344 articles on outcome data regarding interscalene plexus blocks with a total of 26 288 patients where identified as suitable for this review.

Effectiveness. When compared with placebo in patients undergoing 'major shoulder surgery', interscalene block significantly reduced the consumption of rescue medication after surgery,[4 5] improved patient satisfaction,[6] and even produced pain relief during movement for up to 3 days after a single-shot injection of local anaesthetic.[7] Patient satisfaction in 1319 patients was reported to be 99%, while 97.8% of these patients would choose the same procedure again.[8] In addition, interscalene block was found to be associated with less need for intraoperative opioids.[6]

In patients undergoing 'moderately painful shoulder surgery', less pain [median (range) nominal rating scale (NRS) 0 (0–5) *vs* 3 (0–6), respectively, on postoperative day 1; $P<0.001$], reduced opioid consumption (67% of subjects receiving ropivacaine required no supplemental opioid compared with 13% of subjects in the placebo group; $P=0.012$), less sleep disturbance, and a higher patient satisfaction compared with placebo was described.[9]

Functional recovery. For shoulder surgery, interscalene block compared with systemic analgesia was associated with a reduced Constant score[10] (a multimodal scoring system