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Review Article

Should continuous rather than single-injection interscalene block be routinely offered for major shoulder surgery? A meta-analysis of the analgesic and side-effects profiles

L. Vorobeichik[1], R. Brull[1,2], R. Bowry[1,3], J. G. Laffey[1,4,5,6] and F. W. Abdallah[1,4,5,7,*]

[1]Department of Anesthesia, University of Toronto, Toronto, Ontario, Canada, [2]Department of Anesthesia, Women's College Hospital, Toronto, Ontario, Canada, [3]Department of Anesthesia, North York General Hospital, Toronto, Ontario, Canada, [4]Department of Anesthesia, St Michael's Hospital, Toronto, Ontario, Canada, [5]The Li Ka Shing Knowledge Institute, Toronto, Ontario, Canada, [6]Department of Anesthesia, School of Medicine, National University of Ireland Galway, Galway, Ireland and [7]Department of Anesthesiology and Pain Medicine, Ottawa Hospital Research Institute, University of Ottawa, Ottawa, Ontario, Canada

*Corresponding author. Department of Anesthesia, University of Toronto, Toronto, Ontario, Canada. E-mail: FAbdallah@toh.ca.

Abstract

Background: Major shoulder surgery is associated with moderate-to-severe pain, but consensus on the optimal analgesic approach is lacking. Continuous catheter-based interscalene block (CISB) prolongs the analgesic benefits of its single-injection counterpart (SISB), but concerns over CISB complications and difficulties in interpreting comparative evidence examining major and minor shoulder procedures simultaneously, despite their differences in postoperative pain, have limited CISB popularity. This meta-analysis evaluates the CISB analgesic role and complications compared with SISB for major shoulder surgery.

Methods: We retrieved randomised controlled trials (RCTs) comparing the effects of CISB to SISB on analgesic outcomes and side-effects after major shoulder surgery. Postoperative opioid consumption at 24 h was designated as the primary outcome. Secondary outcomes included 24–48 h opioid consumption, postoperative rest and dynamic pain scores up to 72 h, time-to-first analgesic, recovery room and hospital stay durations, patient satisfaction, postoperative nausea and vomiting, respiratory function, and block-related complications.

Results: Data from 15 RCTs were pooled using random-effects modelling. Compared with SISB, CISB reduced 24- and 48-h oral morphine consumption by a weighted mean difference [95% confidence interval] of 50.9 mg [−81.6, −20.2], (P=0.001) and 44.7 mg [−80.9, −8.7], (P<0.0001), respectively. Additionally, CISB provided superior rest and dynamic pain control beyond 48 h, prolonged time-to-first analgesic, enhanced satisfaction, and reduced postoperative nausea and vomiting without complications. CISB caused an 11.0–11.7% decrease in respiratory indices. Result heterogeneity was successfully explained.

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Conclusions: High-level evidence indicates that CISB provides superior analgesia up to 48 h after major shoulder surgery, without increasing side-effects, compared with SISB. The importance of CISB-related changes in respiratory indices is questionable.

Keywords: analgesia; postoperative pain; shoulder

Editor's key points

- The authors compared the benefits and complications of continuous catheter-based interscalene block (CISB) for major shoulder surgery with those of single-injection interscalene block.
- CISB appeared to reduce the cumulative postoperative opioid consumption and reduced rest, and dynamic, pain scores up to 48 h.
- The authors conclude that CISB provides superior analgesia, compared with single-injection interscalene block, for up to 48 h after major shoulder surgery, without increasing side-effects.

Single-injection interscalene block (SISB) of the brachial plexus is a popular and easy to perform technique that provides effective pain control up to 8 h[1] after minor shoulder surgeries.[2–4] For major shoulder surgeries, after which the duration of moderate-to-severe acute pain extends into the first 48 h, continuous catheter-based interscalene block (CISB) may provide prolonged postoperative analgesia.[2,5–7] However, consensus over the ideal interscalene block modality for major shoulder surgery is lacking for several reasons. First, clear evidence for the superiority of CISB is missing. Clinical trials comparing CISB with SISB have included both major and minor procedures, despite different degrees in postoperative pain, making meaningful interpretation of the evidence difficult. Second, CISB requires additional time and technical skill for insertion, and more resources for procurement and management.[8] Of concern, potentially serious complications have been associated with the use of CISB, including catheter malposition (1.5%),[9,10] dislodgement (1.5%),[9,11,12] infection (3%),[13] myotoxicity (0.05%),[14] phrenic nerve block (100%),[15,16] and even a potential risk of compression leading to persistent hemi-diaphragmatic palsy.[12,17] Consequently, concerns regarding the safety of CISB has limited its clinical use.[18] In fact, there have been calls dissuading anaesthetists who contemplate setting up a CISB service in their centres.[8]

Given these issues, the objective of this systematic review and meta-analysis is to evaluate the analgesic benefits and side effects profile of CISB for major shoulder surgery. We hypothesise that CISB provides superior postoperative analgesia by reducing the cumulative analgesic consumption at 24 h postoperatively.

Methods

The authors followed the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement guidelines[19] in the preparation of this manuscript. Randomised and quasi-randomised controlled trials (RCT) examining the effect of CISB on analgesia after major shoulder surgery were evaluated using a predesigned protocol.

Literature search

Two of the authors (L.V. and F.W.A.) independently sought and retrieved relevant studies from electronic databases including the US National Library of Medicine database, Medline; Medline In-Process; EMBASE; Excerpta Medica; Cochrane Central Register of Controlled Trials; Cochrane Database of Systematic Reviews; Scopus; Web of Science Core Collection; and other non-indexed databases of citations (AMED, CINAHL, BIOSIS). Medical subject headings (MeSH), controlled terms, and text words relating to interscalene block such as interscalene, nerve block, and brachial plexus were combined using the Boolean operator AND with search terms relating to shoulder surgery, including grouped or individually named anatomical terms such as rotator cuff, biceps; procedural terms such as surgical procedures, arthroscopy, arthroplasty, reconstruction, fixation, repair, stabilisation, decompression, revision, excision, plication, tenodesis, acromioplasty, Bankart; and surgical instruments such as bone nails, anchors, prosthesis, plates, screws, and wires. The bibliographies of retrieved RCTs were hand-searched for additional relevant studies. Only RCTs of adults (age ≥18 years) published in full-manuscript form between 1970[20] and April 2017 were considered. No language restrictions were imposed. Relevant meeting abstracts of the American Society of Regional Anesthesia (ASRA, 2005–2016), ASA (2000–2016), and the European Society of Regional Anesthesia (ESRA, 2006–2016) were sought and reviewed. The web-based registries of clinical trials (www.clinicaltrials.gov and www.clinicaltrialsregister.eu) were also reviewed for ongoing relevant trials.

Eligibility criteria

We included RCTs with parallel group design examining the effects of CISB compared with SISB on postoperative analgesic outcomes in patients undergoing major shoulder surgery. We considered procedures as rotator cuff repair, Bankart repair, biceps tenodesis, anterior shoulder stabilisation,[21,22] and arthroplasty as major shoulder procedures; while simple arthroscopy (+/− debridement), subacromial decompression (+/− acromioplasty), capsular plication, and excision lateral clavicle were considered as minor procedures.[23] Based on a preliminary literature search, we determined that trials limited to major shoulder surgery are rare,[24,25] and most published trials did not make a distinction between minor and major shoulder surgeries.[26–33] We therefore decided to include RCTs where the majority (more than half), if not all, of the patients examined underwent major shoulder surgery. Trials examining populations having minor shoulder surgeries and those with patients having major shoulder constituted the minority, were excluded. Blocks administered for surgical anaesthesia or postoperative analgesia were considered. RCTs comparing different bolus or infusion regimens of CISB,[34–36] or CISB with other analgesic strategies (e.g. local infiltration,[37]