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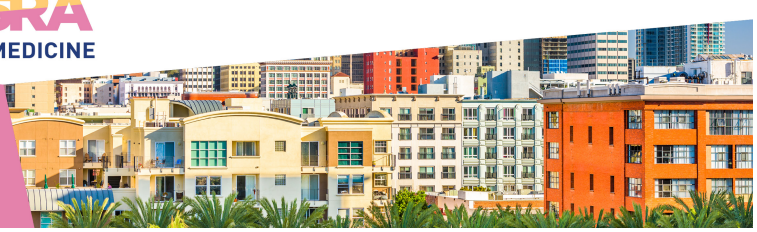

Abstract: 5088

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Procedure-Specific Acute Pain Trajectories After Shoulder Surgery

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Introduction

Shoulder surgery is common and associated with significant and prolonged postoperative pain. Over 45,000 shoulder replacements and over 270,000 rotator cuff repairs are performed annually in the US (1). Pain scores after shoulder surgery often reach severe levels when relying on conventional oral analgesics only, and opioid requirements can be high (2). Characterizing the extent and timing of postoperative pain would help more precisely time invasive pain management.

We aimed to construct average pain trajectories in different analgesic interventions for the first 48 hours after surgery. Understanding the average pain trajectory under different standard analgesic regimens may inform not only which analgesic regimen is generally most effective, but also the optimal timing of these interventions. To this end, we aimed to illustrate how different reported analgesic strategies play out over time after shoulder surgery by systematically reviewing previously published studies and synthesized pain score data to construct average pain trajectories for three predominant analgesic strategies.

Materials and Methods

We performed a systematic review of randomized controlled trials (RCTs) and cohort studies published between January 1987 and April 2018 assessing pain scores after shoulder surgery according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines using PUBMED (3). This systematic review was registered in the International Prospective Register of Systematic Reviews (PROSPERO; NHS; ID: CRD42018096724). As this study is devoid of patient identifiable information, it was exempt from IRB review requirements according to the Mass General Brigham policy.

Pain score means and standard deviations were extracted from each study at each time point. For studies that reported median pain scores with interquartile ranges, approximate mean values and standard deviations (SD) were calculated (4). To create a pain trajectory over time, pain scores from different studies were combined and weighted according to study sample size, and an average pain score at each time point was calculated using the metamean function in R package meta. All statistical analysis was performed in R software version 3.4.1 (R Foundation for Statistical Computing, Vienna, Austria). All reported p-values were two-tailed and unadjusted. In order to compare pain scores between groups at each time point, we used z-test (5). To account for multiple comparisons across 12

timepoints examined, we considered a p value <0.00417 as statistically significant (Bonferroni correction). All reported P-values are unadjusted.

Results/Case Report

Seventy-four studies, including 4,676 patients, were included. Three main treatment groups (continuous nerve block; CNB, single shot nerve block; SSNB, and conventional analgesia; CA) were identified. Pain scores in the presence of CNB (mean (SD): 1.04 (0.19)), SSNB (2.39 (0.18)), and CA (4.52 (0.27)) were significantly different (p<0.0001) at 12 hours postoperatively after all shoulder surgeries (Figure 1A). Patients with continuous nerve blocks reported very low pain scores on average at both 24 hours (1.84 (0.21)) and 48 hours (1.51 (0.19)) (p<0.0001).

The analysis was further subdivided into minimally invasive shoulder surgery (e.g., arthroscopic procedures) and major shoulder surgery (e.g., arthroplasty, open procedures). Immediately after minimally invasive shoulder surgery (n=3463), mean pain scores were significantly different between the CA (5.27 (0.60)), CNB (1.41 (0.58)), and SSNB groups (1.53 (0.15), p<0.0001) (Figure 1B). Mean pain is not statistically different at 24 hours when accounting for repeat measures. At 48 hours, mean pain scores has decreased in all three groups and is significantly different between the CNB (1.91 (0.24)), SSNB (2.59 (0.18)) and control (3.26 (0.24), p=0.0006) groups (Figure 1C).

Mean pain immediately after major shoulder surgery (n=1213) was significantly different between the CA (4.35 (0.38)), SSNB (1.30 (0.36)), and CNB groups (1.98 (0.15), p<0.0001) (Figure 1C). At 12 hours after surgery, mean pain remains significantly different between the CA (4.47 (1.13)), CNB (1.04 (0.19)), and SSNB groups (2.20 (0.24), p<0.0001). No significant differences are observed between groups at 24 hours. There was insufficient data to analyze pain trajectories beyond 24 hours after major shoulder surgery (Figure 1B).

To more directly compare the analgesia provided by these two different regional anesthesia approaches, we directly compared the subset of patients who received CNB vs SSNB, including both minimally invasive and major shoulder surgery, across multiple timepoints. Immediate postoperative pain after shoulder surgery was not significantly different between the CNB (1.55 (0.47)) and SSNB (1.49 (0.14), p=0.8847) groups at hour zero. The CNB group had significantly lower mean pain scores at 12 hours (CNB: 1.04 (0.19); SSNB: 2.39 (0.18), p<0.0001), 24 hours (CNB: 1.84 (0.21); SSNB: 3.05 (0.10), p<0.0001), and 48 hours (CNB: 1.51 (0.19); SSNB: 2.62 (0.16), p<0.0001).

Discussion

This is the first study that focused on systematically evaluating pain trajectories after shoulder surgeries. In this systematic summative review we observed the average pain trajectories after shoulder surgery and found that pain was significantly different at most time point in the 48 hours after surgery between conventional therapy, SSNB, and CNB. A direct comparison between SSNB and CNB suggested that mean pain scores in the presence of CNBs are significantly lower at 12, 24, and 48 hours postoperatively. However, the average pain scores remained within the mild range in both of these groups, potentially suggesting that the clinical significance between CNB and SSNB may be less marked particularly for timepoints where the difference between mean NRS scores is less than 1. If CNB is unavailable at an institution or contraindicated due to patient factors, SSNB may still provide improved analgesia over non-regional pain management techniques in the early postoperative period.

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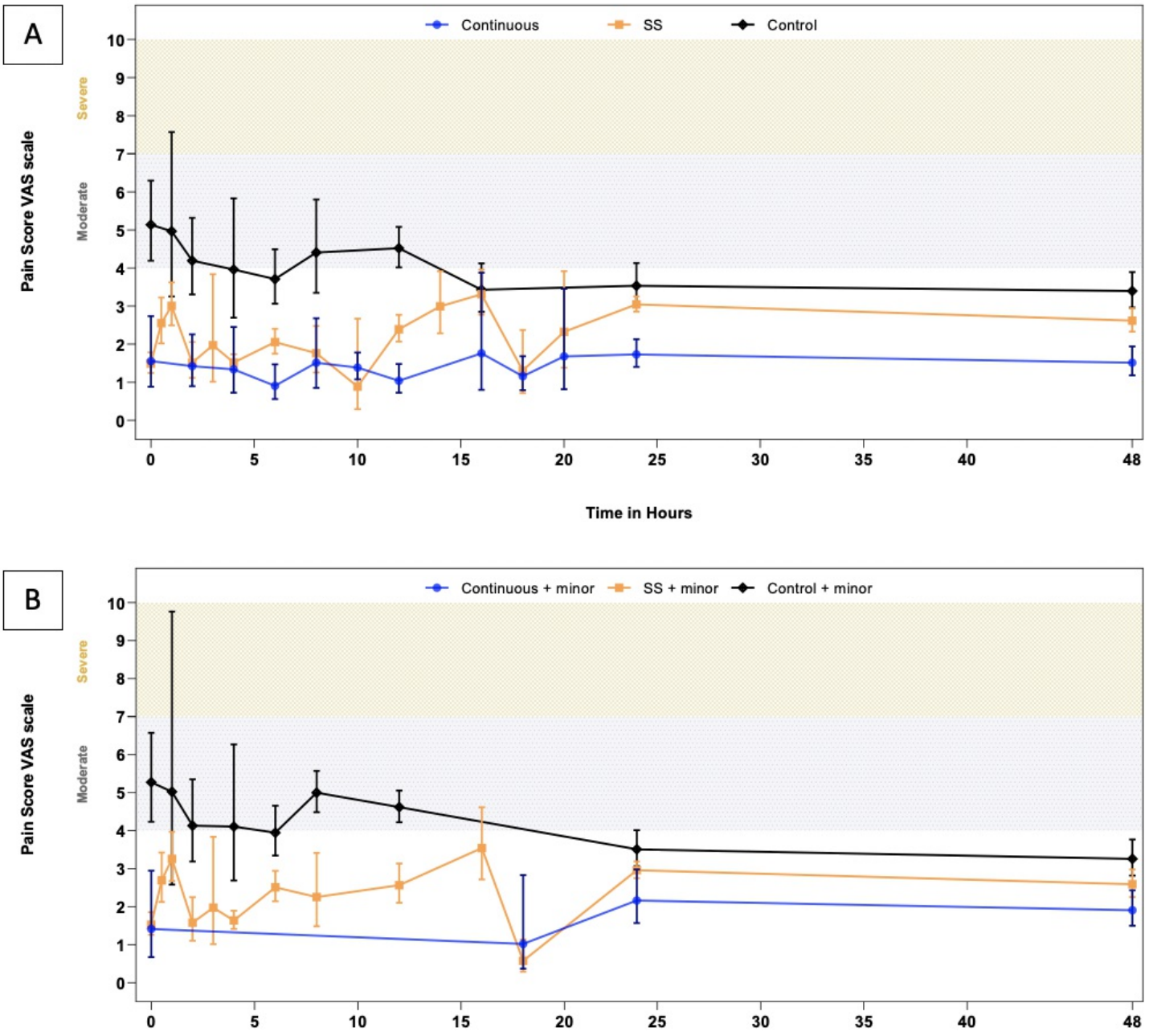
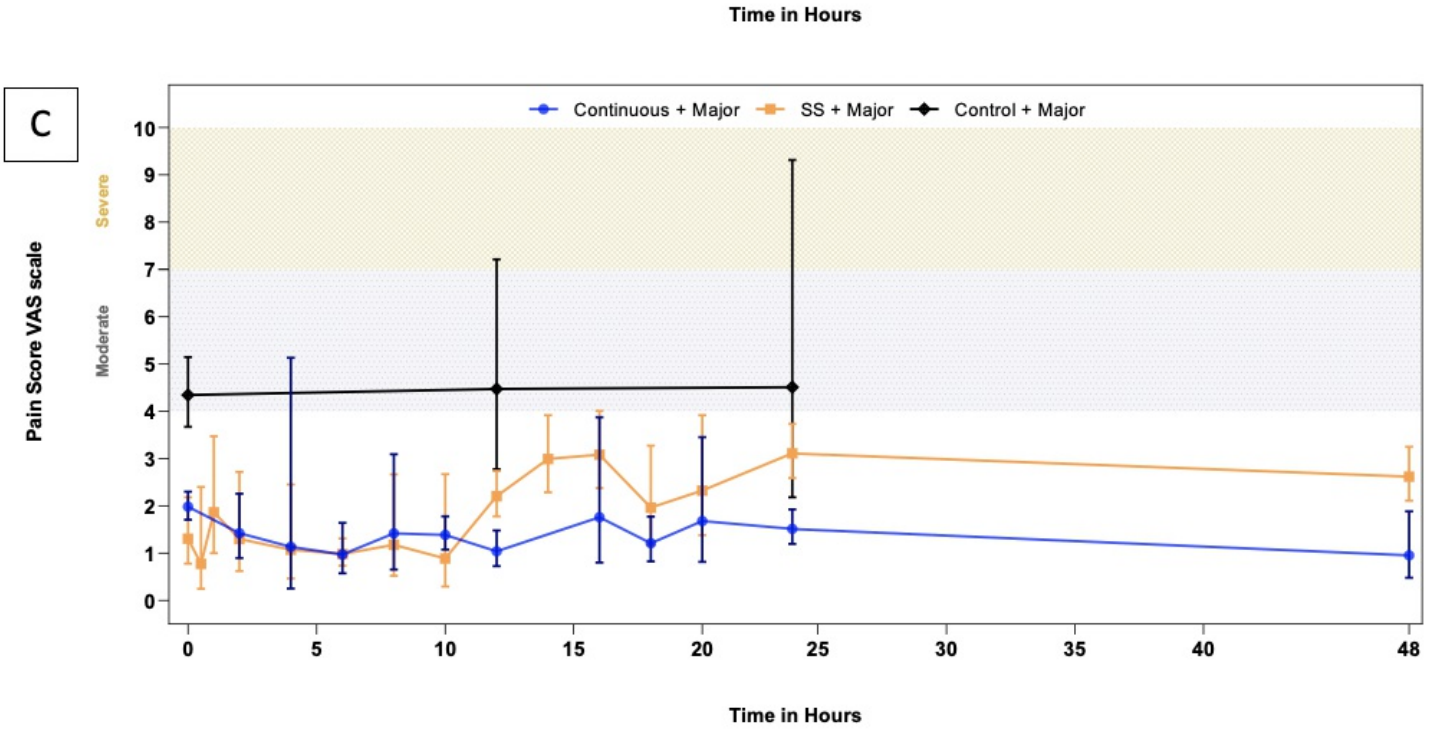
Disclosures

No

Tables / Images




Time in Hours
C
Continuous + Major
SS + Major
Control + Major
Severe
Moderate
Pain Score VAS scale
10
9
8
7
6
5
4
3
2
1
0
0
5
10
15
20
25
30
35
40
48
Time in Hours