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# Comparison of the Effectiveness of Dexmedetomidine Sedation and General Anesthesia Following Interscalene Block in Proximal Humerus Fracture Surgery

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## ABSTRACT

**Objective:** This study aimed to evaluate the effects of dexmedetomidine sedation and general anesthesia combined with ultrasound-guided interscalene brachial plexus block (ISB) on perioperative patient satisfaction, surgeon comfort, pain management, and length of hospital stay in the surgical management of proximal humeral fractures.

**Materials and Methods:** Patients who underwent surgical treatment for proximal humerus fractures between January 2021 and June 2024 were retrospectively evaluated. All procedures were performed following ISB, either in combination with dexmedetomidine sedation or general anesthesia. A total of 72 patients were included in the final analysis (Group I: ISB with dexmedetomidine sedation, n=35; Group II: ISB with general anesthesia, n=37). Baseline demographic and clinical characteristics were comparable between the groups. Perioperative outcomes, including the patient satisfaction score (PSS) and surgeon comfort score (SCS), were assessed using 10-point numerical rating scales. Additional outcomes included postoperative pain scores, opioid consumption, motor function recovery, complications, and length of hospital stay.

**Results:** The PSS was significantly higher in Group I, whereas the SCS was significantly higher in Group II (both $p<0.001$). Intraoperative hypotension and postoperative nausea and vomiting occurred more frequently in Group II than in Group I, with statistically significant differences between the groups ($p<0.05$). In contrast, no significant intergroup differences were observed in perioperative numerical rating scale scores, total systemic analgesic consumption, time to recovery of motor strength, or length of hospital stay ($p>0.05$).

**Conclusion:** ISB combined with sedation provided greater patient satisfaction and fewer perioperative complications, whereas general anesthesia improved surgeon comfort. These findings suggest that ISB with sedation is a preferable approach for patients undergoing shoulder surgery.

**Keywords:** Dexmedetomidine sedation, general anesthesia, interscalene brachial plexus block, patient satisfaction, proximal humerus fracture, surgeon comfort.

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## INTRODUCTION

Among skeletal injuries, proximal humerus fractures account for nearly 10% of all fractures and constitute a significant proportion of upper-extremity trauma, with an incidence that increases with age.[1,2] Proximal humerus fractures cause significant pain and functional impairment in affected patients.[3,4] The use of regional anesthesia (RA), most notably interscalene brachial plexus block (ISB), has gained prominence as a primary method for postoperative pain management in shoulder surgery.[3] This approach improves patient satisfaction in the postoperative period while reducing opioid consumption and associated complication rates.[3,5,6] Because shoulder surgery can cause severe perioperative pain and certain complications, an optimal anesthetic method should be selected. Multimodal analgesia is used in perioperative pain management and includes central and peripheral nerve blocks in addition to various pharmacologic agents. Nevertheless, because opioid use is often associated with a range of adverse outcomes, including nausea, vomiting, delirium, constipation, and respiratory depression, regional anesthesia methods have become increasingly preferred.[7,8] In addition to effective analgesia, patient and surgeon comfort are also important in anesthesia management. In recent years, RA techniques, especially ISB, have been preferred to provide effective shoulder analgesia while allowing the patient to remain conscious during surgery.[9,10] Although the COVID-19 pandemic accelerated the adoption of regional anesthesia techniques, the preference for regional approaches in shoulder surgery has persisted beyond the pandemic period because of their advantages in reducing perioperative complications, minimizing airway manipulation, and improving recovery profiles.[11,12]

RA techniques in shoulder surgery have predominantly been used in combination with general anesthesia (GA) to enhance perioperative analgesia and patient satisfaction. However, data on the outcomes of proximal humerus fracture surgery performed exclusively under RA, without GA, remain scarce. To the best of our knowledge, no previous study has specifically evaluated the perioperative outcomes of proximal humerus fracture fixation performed solely under ISB, as applied in the present study.[13,14]

Thus, this study was designed to evaluate the effects of two anesthetic strategies—dexmedetomidine sedation with ultrasound-guided ISB and general anesthesia with ultrasound-guided ISB—on perioperative patient satisfaction, surgeon comfort, pain management, and length of hospital stay in patients undergoing proximal humerus fracture fixation.

### KEY MESSAGES

- Dexmedetomidine sedation following ISB significantly increased patient satisfaction, whereas the combination of general anesthesia with ISB improved surgeon comfort.
- Sedation was associated with lower rates of postoperative nausea and vomiting and hypotension, whereas pain scores, opioid consumption, and length of stay were comparable between the groups.
- The findings support regional-first anesthesia strategies, particularly during extraordinary periods such as the COVID-19 pandemic.

## MATERIALS AND METHODS

### Study Setting and Design

This study was conducted at a state hospital affiliated with the Ministry of Health. The medical records of patients who underwent surgical treatment for proximal humerus fractures between January 2021 and June 2024 were reviewed. The study was designed to compare perioperative outcomes between two anesthetic strategies: ultrasound-guided interscalene brachial plexus block (ISB) combined with dexmedetomidine sedation and ISB combined with general anesthesia.

### Ethics Approval

Ethical approval was obtained from the Bilecik Seyh Edebali University Clinical Research Ethics Committee (Approval Number: 317242, Date: 10.03.2025). All research procedures complied with institutional ethical standards and the principles of the Declaration of Helsinki.

### Patients and Data Collection

The diagnostic criteria included patients who underwent surgery for proximal humerus fractures between January 2021 and June 2024. Patients aged 18 to 90 years who underwent ISB for the surgical management of proximal humerus fractures were considered eligible for inclusion. The exclusion criteria were defined as follows:

1. Any history of prior surgical procedures involving the same shoulder.
2. Fractures resulting from pathological bone disease.
3. Patients who could not undergo ISB because of local anesthetic allergy, coagulopathy, anticoagulant therapy, infection at the block site, a history of neurologic deficit in the upper extremity scheduled for surgery, or inability to communicate.
4. Patients with insufficient data.

Patients were enrolled consecutively. Allocation to the anesthetic groups was not randomized but was based on

institutional practice and patient preference. During the COVID-19 period, regional anesthesia with sedation was recommended when feasible; however, general anesthesia was performed if preferred by the patient after appropriate preoperative counseling. Perioperative data for all patients were routinely recorded during clinical care using structured evaluation forms by an independent assessor who was not involved in anesthesia management or surgical procedures. These data included pain intensity, patient satisfaction, surgeon comfort, analgesic use, and length of hospital stay. For the purposes of this study, all recorded data were retrospectively retrieved from hospital records and analyzed. Patients included in the study were divided into two groups: Group I consisted of patients who underwent sedation with dexmedetomidine after ISB, and Group II consisted of patients who underwent general anesthesia after ISB.

### Block and Surgical Procedure

All patients were monitored with standard electrocardiography, noninvasive blood pressure measurement, and pulse oximetry upon arrival in the recovery room. Ultrasound-guided ISB was performed by an experienced anesthesiologist (A.G.) using a high-frequency linear probe under strict aseptic conditions, with the patient in a semi-lateral position. After the brachial plexus was identified between the anterior and middle scalene muscles, a 21-gauge needle was advanced in-plane, and 20 mL of local anesthetic solution (10 mL of 0.5% bupivacaine + 10 mL of 2% lidocaine) was administered with intermittent aspiration (Fig. 1). Sensory and motor block adequacy was confirmed, and the patients were transferred to the operating room approximately 30 minutes later.

In the sedation group, sedation depth was clinically monitored using the Ramsay Sedation Scale at regular intraoperative intervals, and dexmedetomidine infusion (0.2–0.7 µg/kg/h) was titrated to maintain the target sedation level (score 3). However, detailed time-based sedation records were not available because of the retrospective design. In the general anesthesia group, anesthetic induction was achieved with propofol, fentanyl, and rocuronium, followed by intubation. Anesthesia was maintained with age-adjusted 1 MAC sevoflurane, and ventilation parameters were adjusted to maintain end-tidal $CO_2$ between 35 and 40 mmHg. Short-acting IV opioids were permitted intraoperatively if hemodynamic changes exceeded 20% from baseline.

The operations were performed at a single center by a single surgeon (M.G.) with 5 years of experience in trauma surgery. All patients were placed in the beach-chair position, and standard sterile preparation was performed. A deltopectoral approach was used to access the proximal humerus. Hematoma and soft-tissue interposition were cleared, and traction sutures were placed when necessary to mobilize displaced tuberosities. Anatomic reduction was achieved under fluoroscopic guidance, with restoration of the medial calcar. Provisional K-wire fixation was followed by application of a precontoured locking proximal humerus plate lateral to the bicipital groove. Final fluoroscopic images confirmed implant positioning and screw length before layered closure.

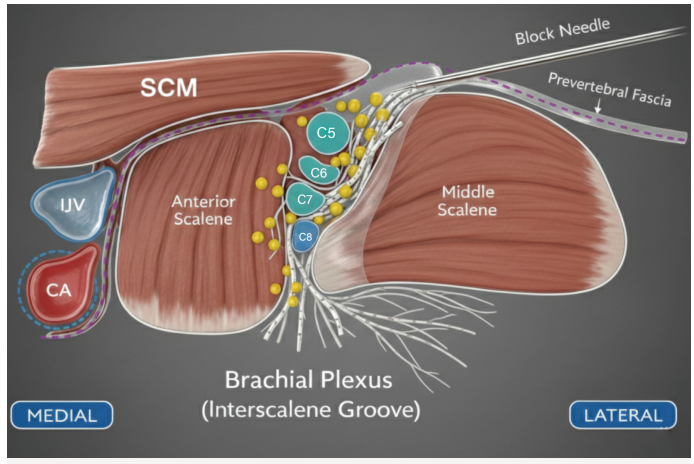


**Figure 1.** Ultrasound anatomy for interscalene brachial plexus block.

SCM: Sternocleidomastoid muscle; IJV: Internal jugular vein; CA: Common carotid artery; C5: Fifth cervical nerve; C6: Sixth cervical nerve; C7: Seventh cervical nerve; C8: Eighth cervical nerve.

### Postoperative Follow-up Procedure

The primary outcomes were the patient satisfaction score and surgeon comfort score. The secondary outcomes were pain at 1, 6, 12, 18, and 24 hours postoperatively, assessed using the numeric rating scale (NRS); first-hour and total systemic analgesic consumption; motor function assessment; length of hospitalization; and perioperative or postoperative complications.

Patient satisfaction and surgeon comfort were assessed using 10-point numerical rating scales. Surgeon comfort was recorded on a scale of 1 to 10 (1=very uncomfortable, 10=very comfortable). Patient satisfaction was recorded 24 hours postoperatively on a scale of 1 to 10 (1=poor, 10=excellent).

Patients received postoperative analgesia according to the standard protocol. Intravenous acetaminophen 1 g was administered at 6-hour intervals and withheld if the NRS score was ≤2. When the NRS score was ≥4, intravenous tramadol 50 mg was administered as rescue analgesia; if pain persisted after 30 minutes, an additional 50 mg was administered (maximum: 100 mg). If analgesia remained inadequate,

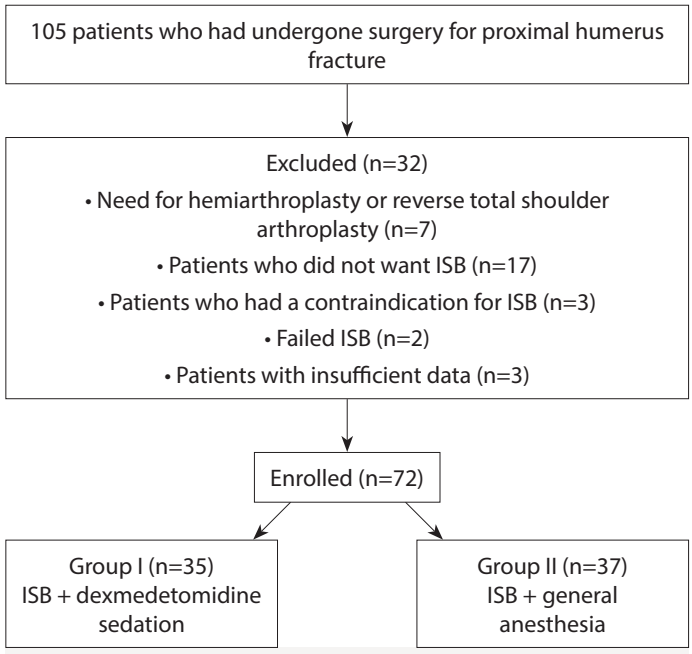


**Figure 2.** Presentation of the patients included in the study according to the inclusion and exclusion criteria.

ISB: Interscalene block.

intravenous morphine 3 mg was administered as second-line rescue analgesia. Time to first rescue analgesia and total analgesic requirement were recorded. Motor function was assessed using a modified Bromage scale adapted for the upper extremity.

Intraoperative hypotension was defined as a decrease in mean arterial pressure of >20% from baseline or to below 65 mmHg. PONV was defined as nausea, retching, or vomiting within 24 hours postoperatively. Ondansetron was administered as required according to the institutional protocol. In Group I, two patients required conversion to general anesthesia because of inadequate analgesia and were excluded from the final analysis.

### Statistical Analysis

The normality of quantitative variables was assessed using the one-sample Shapiro-Wilk test. Categorical variables were presented as frequencies and percentages, normally distributed continuous variables as means with standard deviations, and non-normally distributed variables as medians with minimum–maximum ranges. Between-group comparisons of categorical variables were performed using the chi-square test. For continuous variables, Student's t-test was used when normality assumptions were met, whereas the Mann–Whitney U test was used for non-normally distributed data.

Because no established minimal clinically important difference (MCID) values exist for patient satisfaction or surgeon comfort scores, which are single-item, nonvalidated satisfaction measures, an anchor-based MCID calculation was not feasible. Therefore, a distribution-based approach was adopted, and the MCID was defined as 0.5 standard deviation of the pooled scores, a commonly accepted statistical method for estimating clinically meaningful differences in such outcomes. In addition, a Patient Acceptable Symptom State (PASS) analysis was performed to support clinical interpretability, with scores ≥8 on the 10-point scale considered indicative of high patient satisfaction and surgeon comfort. No additional multivariable adjustment was performed because of the retrospective design and relatively limited sample size; however, baseline demographic and clinical characteristics were comparable between the groups.

All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS), Version 20.0 (SPSS Inc., Chicago, IL, USA). A p-value of <0.05 was considered statistically significant.

## RESULTS

Among the 105 patients initially assessed for eligibility, 33 were excluded based on the predefined exclusion criteria. Consequently, 72 patients constituted the final study population. Of these, 35 patients were assigned to Group I and 37 to Group II (Fig. 2). The mean age of the patients was 57.7 years (range, 22–79 years). The sex distribution was comparable, comprising 35 female and 37 male patients. The distribution of fracture patterns according to the Arbeitsgemeinschaft für Osteosynthesefragen (AO) classification was comparable between the two groups, with no statistically significant difference observed, indicating a balanced fracture severity profile across the groups. The duration of surgery was also comparable between the two groups, with no statistically significant difference observed. No significant intergroup differences were observed in baseline demographic variables. The descriptive demographic and clinical characteristics of the study cohort are presented in Table 1.

### Functional Results

The median patient satisfaction score was 9 (6–10) in Group I and 8 (6–10) in Group II. The patient satisfaction score was significantly higher in Group I (p<0.001) (Table 2).

The median surgeon comfort score was 8 (5–10) in Group I and 9 (5–10) in Group II. The surgeon comfort score was significantly lower in Group I (p<0.001) (Table 2). The surgeon comfort score was assessed by a single experienced surgeon, which may have introduced a degree of subjectivity into the evaluation.

**Table 1.** Baseline demographic and clinical characteristics of the study population

| Variables | Group I (n=35) | Group II (n=37) | p |
|---|---|---|---|
| Age, years | 59 (24–79) | 56.5 (22–79) | 0.14[a] |
| Sex, male/female, n (%) | 17–18 (48.5–51.5) | 20–17 (54–46) | 0.12[b] |
| Fracture type, n (%) | | | 0.12[b] |
| AO 11A1 | 5 | 6 | |
| AO 11A2 | 8 | 8 | |
| AO 11A3 | 8 | 7 | |
| AO 11B1 | 7 | 8 | |
| AO 11B2 | 3 | 3 | |
| AO 11B3 | 3 | 3 | |
| AO 11C1 | 2 | 1 | |
| AO 11C2 | 1 | 1 | |
| AO 11C3 | 0 | 0 | |
| Operation duration, min | 52.5 (45–60) | 51.5 (43–60) | 0.47[b] |
| BMI, kg/m$^2$ | 27.18 (19.48–31.25) | 26.68 (21.99–31.64) | 0.16[a] |
| ASA class, I/II/III, n (%) | 4–21–10 (11–60–29) | 5–22–10 (13.5–59.5–27) | 0.32[b] |
| No comorbid diseases, n (%) | 14 (40) | 23 (62) | 0.18[b] |
| Hypertension, n (%) | 27 (77) | 24 (64) | 0.44[b] |
| Diabetes mellitus, n (%) | 27 (77) | 27 (72) | 0.79[b] |
| Thyroid disease, n (%) | 2 (6) | 3 (8) | 0.83[b] |
| Smoking, n (%) | 12 (34) | 13 (35) | 0.95 |

Data are presented as median (minimum–maximum) unless otherwise indicated. a: Mann–Whitney U test; b: Chi-Square Test. AO: Arbeitsgemeinschaft für Osteosynthesefragen; ASA: American Society of Anesthesiologists; BMI: body mass index.

The incidence of postoperative nausea, vomiting, and intraoperative hypotension was significantly higher in Group II than in Group I (p=0.01, p=0.01, and p=0.02, respectively) (Table 2).

No statistically significant differences were observed between the groups in terms of postoperative NRS scores, time to first opioid use, total opioid dose, or length of hospital stay (p>0.05) (Table 2, 3).

A total of 72 patients underwent ISB (ISB+D: n=35; ISB+GA: n=37). No life-threatening complications were observed in either group. Hoarseness developed in two patients in Group I and completely resolved during inpatient follow-up.

The mean difference in patient satisfaction scores between the groups was 1.01 points. Based on a pooled standard deviation of 1.08, the calculated MCID was 0.54. Because the observed difference exceeded the MCID threshold, the difference was considered clinically meaningful. Similarly, the mean difference in surgeon comfort scores was 1.32 points, with a pooled standard deviation of 1.06, yielding an MCID of 0.53. The observed intergroup difference also exceeded the MCID threshold. PASS analysis demonstrated that patient satisfaction scores in Group I consistently exceeded the predefined PASS threshold (≥8), whereas surgeon comfort scores more frequently reached PASS in the general anesthesia group (Table 4).

## DISCUSSION

In this study, patient satisfaction among patients undergoing proximal humerus fracture surgery was higher in the dexmedetomidine sedation group after ISB, whereas the surgeon comfort score was higher in the general anesthesia group after ISB. The incidence of intraoperative hypotension and postoperative nausea and vomiting was higher in the general anesthesia group than in the dexmedetomidine group. Neither group was superior with respect to postoperative pain scores, total opioid dose, time to first analgesic requirement, or length of hospital stay.

Various techniques, such as arthroscopy, open surgery, and joint replacement, are commonly used to treat shoulder pathologies. The choice of anesthesia for shoulder surgery is important for

**Table 2.** Comparison of perioperative patient outcomes between the groups

| Variables | Group I (n=35) | Group II (n=37) | p |
|---|---|---|---|
| PSS | 9 (6–10) | 8 (6–10) | <0.001[a*] |
| SCS | 8 (5–10) | 9 (5–10) | <0.001[a*] |
| Intraoperative hypotension, yes/no, n (%) | 5/30 (14–86) | 10–27 (27–73) | 0.02[b*] |
| Intraoperative hypertension, yes/no, n (%) | 8/27 (27–73) | 9–28 (25–75) | 0.26[b] |
| Surgical duration, min | 110 (90–140) | 110 (90–140) | 0.82[a] |
| Time to first opioid use, h | 11.5 (9–16) | 10.5 (9–16) | 0.26[a] |
| Total postoperative opioid consumption, mg tramadol hydrochloride | 50 (0–100) | 50 (0–100) | 0.21[a] |
| Duration of motor block, h | 8 (5–9) | 6.5 (5–10) | 0.38[a] |
| Postoperative nausea, n (%) | 10 (28) | 18 (48.6) | 0.01[b*] |
| Postoperative vomiting, n (%) | 2 (5.7) | 11 (28) | 0.01[b*] |
| Length of hospital stay, days | 2 (1–4) | 2 (1–5) | 0.11[b] |

Data are presented as median (minimum–maximum) unless otherwise indicated. a: Mann–Whitney U test; b: Chi-Square Test; *: Statistically significant. PSS: patient satisfaction score; SCS: Surgeon comfort score.

ensuring patient comfort, optimizing surgical conditions, and minimizing postoperative pain.[15] Multimodal analgesia aims to optimize postoperative pain management by targeting different receptors in pain pathways with systemic analgesics, such as opioids, and techniques such as nerve blocks.[7,16] Opioid-sparing or opioid-free anesthesia, which aims to avoid opioid-related side effects, is mainly achieved using peripheral or central nerve block techniques. Several blocks, such as ISB, supraclavicular block, suprascapular block, and intra-articular injections, are used for perioperative pain control in shoulder surgery. In particular, ISB has been reported to provide long-lasting and effective postoperative pain control and to reduce opioid-related side effects by decreasing opioid consumption.[7,17] Although ISB is most commonly used in combination with general anesthesia to provide postoperative analgesia for shoulder surgery, it can also be used alone for shoulder surgery. Compared with general anesthesia, ISB has been reported to increase patient comfort and satisfaction.[18,19] Studies on the use of ISB alone or in combination with general anesthesia have reported conflicting results.[20,21] ISB is often combined with general anesthesia to take advantage of the benefits of both techniques. However, the potential side effects of both techniques may also increase.[20,22]

**Table 3.** Intergroup comparison of perioperative pain scores at rest and during movement

| Variables | Group I (n=35) | Group II (n=37) | p |
|---|---|---|---|
| rNRS in the recovery room | 1 (0–2) | 1 (0–2) | 0.17 |
| mNRS in the recovery room | 1 (0–3) | 1 (0–2) | 0.08 |
| rNRS at postoperative 2 h | 1 (0–2) | 1 (0–2) | 0.09 |
| mNRS at postoperative 2 h | 2 (0–3) | 2 (0–3) | 0.26 |
| rNRS at postoperative 6 h | 1 (0–3) | 2 (0–4) | 0.19 |
| mNRS at postoperative 6 h | 3 (0–5) | 3 (1–7) | 0.13 |
| rNRS at postoperative 12 h | 2 (0–5) | 2 (0–4) | 0.13 |
| mNRS at postoperative 12 h | 3 (0–7) | 3 (1–7) | 0.29 |
| rNRS at postoperative 18 h | 2 (1–4) | 2 (1–3) | 0.13 |
| mNRS at postoperative 18 h | 3 (2–6) | 3 (2–6) | 0.30 |
| rNRS at postoperative 24 h | 1 (0–3) | 1 (0–3) | 0.26 |
| mNRS at postoperative 24 h | 3 (1–4) | 3 (1–4) | 0.10 |

Data are presented as median (minimum–maximum) unless otherwise indicated. Mann–Whitney U test. mNRS: Numerical rating scale score during movement; rNRS: Numerical rating scale score at rest.

One of the most important steps in modern hospital quality management is assessing and improving perioperative patient satisfaction.[22] Patient satisfaction is influenced by many factors, such as postoperative complications, nausea, vomiting, itching, early mobilization, and early return to daily physical activities, in addition to perioperative pain.[20–22] Many studies have shown that assessing patient satisfaction and maintaining it at the highest possible level are integral components of optimal anesthesia management.[20,22] Garip et al.[23] reported that dexmedetomidine sedation increased patient satisfaction and decreased postoperative complications, such as hoarseness and sore throat, compared with general anesthesia in dental surgery. Similarly, the current study showed that dexmedetomidine sedation after ISB in proximal humerus fracture surgery increased patient satisfaction and decreased postoperative complications compared with general anesthesia. This may be because general anesthesia is more invasive, may increase complications such as nausea, vomiting, chills, and sore throat, and may be associated

**Table 4.** Clinical relevance of patient satisfaction and surgeon comfort scores based on MCID and PASS analyses

| Variables | Group I (n=35) | Group II (n=37) | Pooled SD | MCID (0.5 SD) | Exceeds MCID | PASS threshold |
|---|---|---|---|---|---|---|
| PSS | 9 (6–10) | 8 (6–10) | 1.08 | 0.54 | Yes | Yes (Group I) |
| SCS | 8 (5–10) | 9 (5–10) | 1.06 | 0.53 | Yes | Yes (Group II) |

Data are presented as median (minimum–maximum) unless otherwise indicated. The minimal clinically important difference was calculated using a distribution-based method (0.5×pooled SD). The Patient Acceptable Symptom State was defined as a score ≥8 on a 10-point scale. MCID: Minimal clinically important difference; PASS: Patient Acceptable Symptom State; PSS: Patient satisfaction score; SCS: Surgeon comfort score; SD: Standard deviation.

with patient anxiety regarding general anesthesia procedures.[23] In addition, the current study found that the surgeon comfort score was higher with ISB+general anesthesia than with ISB+dexmedetomidine sedation. This may be because complete muscle relaxation under general anesthesia facilitates surgical manipulation and intervention in the surgical field.

Postoperative nausea and vomiting (PONV) not only impair patient comfort but can also affect patient recovery and early discharge.[24,25] Opioid anesthesia is known to be more strongly associated with PONV than nonopioid anesthesia.[26] In addition, inhaled anesthetics have also been shown to be strongly associated with PONV.[27] Therefore, reducing the use of inhaled anesthetics and opioids may reduce PONV. In the current study, patients in the dexmedetomidine group experienced less PONV. These results may be related to the use of sevoflurane to maintain general anesthesia, opioid use, and procedures such as intubation attempts.[24,25] In addition, intraoperative hypotension was less common in patients in the dexmedetomidine group in this study. This may be due to the various techniques used in general anesthesia, including intravenous and inhaled anesthetics, and their effects on hemodynamic reflex mechanisms.

With advances in ultrasound technology, interest in peripheral nerve blocks has increased in recent years. Ultrasound allows the practitioner to visualize the needle in real time, enabling more successful blocks with lower doses of local anesthetic and reducing the risk of vascular, nerve, or soft-tissue damage.[7] Although some studies suggest that ISB does not increase the risk of peripheral nerve injury, it should be noted that it can cause permanent or temporary nerve damage.[28] ISB can cause phrenic nerve block, which may lead to Horner syndrome and severe respiratory failure.[29] Several studies have investigated how to minimize pulmonary dysfunction associated with ISB, but the risk has not been completely eliminated.[7] In the present study, no clinically significant respiratory complications were observed. However, two patients in the dexmedetomidine group developed transient hoarseness after ISB, which resolved completely during ward follow-up.

Many studies have investigated the choice of local anesthetic and the administered volume. Fredrickson et al.[30] reported that 20 mL of 0.375% ropivacaine provided analgesia similar to that of 30 mL of 0.5% ropivacaine in shoulder surgery but increased patient satisfaction. Riazi et al.[31] reported that the use of a 5-mL volume of local anesthetic in ultrasound-guided ISB resulted in similar postoperative analgesia and fewer respiratory and other complications compared with 20 mL. However, Gautier et al.[32] demonstrated that although successful blocks could be achieved with 5 mL of 0.75% ropivacaine in ultrasound-guided ISB, the failure rate was high (25%). Different local anesthetic mixtures can be used to regulate the onset and duration of the block.[33] In the present study, successful ISB was performed with a mixture of 10 mL of 0.5% bupivacaine and 10 mL of 2% lidocaine. Studies have reported ISB success rates of 84%–96% using the nerve stimulator technique for shoulder surgery.[20,34] Another study reported a 97.5% success rate for ultrasound-guided ISB, similar to that in our study.[20]

In recent years, increasing emphasis has been placed on distinguishing statistical significance from clinical relevance in perioperative outcome research. While minimal clinically important difference (MCID) thresholds have been well established for validated, multi-item patient-reported outcome measures, such as the American Shoulder and Elbow Surgeons (ASES) and Constant scores, no consensus exists regarding MCID values for single-item, satisfaction-based measures, including patient satisfaction and surgeon comfort scores.[35,36] These outcomes are frequently reported in anesthesia and perioperative medicine studies; however, they are typically interpreted using absolute score differences rather than clinically meaningful thresholds, limiting their interpretability across studies.[37,38] To address this methodological limitation, we applied a distribution-based MCID estimation using 0.5 standard deviation of the pooled scores, a widely accepted and recommended approach when anchor-based MCID calculation is not feasible.[39] This method has been extensively used in clinical research to approximate meaningful change in single-item or non-validated outcome measures and allows for a standardized interpretation of between-group differences beyond statistical significance alone. In the present study, the observed intergroup differences in both patient satisfaction and surgeon comfort scores exceeded the calculated MCID thresholds, supporting the clinical

relevance of our findings. In addition, we complemented the distribution-based MCID analysis with a Patient Acceptable Symptom State (PASS) approach to further enhance clinical interpretability. PASS represents a patient-centered concept reflecting a threshold beyond which patients consider their condition satisfactory, and it has been increasingly used in orthopedic and perioperative research as an anchor for meaningful outcomes.[40] By defining PASS as a score ≥8 on the 10-point scale, we were able to contextualize satisfaction outcomes in terms of clinically acceptable states rather than numerical differences alone. The concordance between MCID exceedance and PASS achievement in our cohort strengthens the robustness of our conclusions and provides a more comprehensive assessment of patient- and surgeon-centered outcomes. Taken together, this combined approach offers a pragmatic and methodologically sound framework for interpreting satisfaction-based outcomes in shoulder surgery anesthesia studies.

This study has several limitations. Detailed intraoperative sedation depth recordings were not systematically documented because of the retrospective design. Subgroup analyses based on fracture severity were not performed. The surgeon comfort score was assessed using a non-validated single-item scale by a single surgeon, which may have introduced subjective bias. Although no clinically significant respiratory complications were observed, respiratory outcomes, including hemidiaphragmatic paralysis, were not objectively evaluated, representing an important limitation given the known phrenic nerve involvement associated with interscalene block.

Despite these limitations, this study has several strengths. All interscalene blocks were administered by the same anesthesiologist, and all surgeries were performed by a single surgeon using standardized techniques, minimizing variability. To our knowledge, this is the first study to estimate MCID values for patient satisfaction and surgeon comfort scores in proximal humerus fracture surgery. Additionally, perioperative assessments were performed by an independent nurse, reducing observational bias.

## CONCLUSION

In conclusion, dexmedetomidine sedation following interscalene block was associated with higher patient satisfaction and fewer perioperative complications, whereas general anesthesia was associated with improved surgeon comfort. However, given the retrospective design and inherent limitations of the study, these findings should be interpreted with caution. Future prospective, randomized studies with standardized outcome measures are needed to confirm these results and better define the optimal anesthetic approach for proximal humerus fracture surgery.

**Ethics Committee Approval:** Ethics committee approval was obtained from Bilecik Seyh Edebali University Clinical Research Ethics Committee (Approval Number: 317242, Date: 10.03.2025).

**Informed Consent:** An informed consent was obtained from all patients involved in the study. Written informed consent has been obtained from the patients to publish this paper.

**Conflict of Interest:** The authors have no conflicts of interest to declare.

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**Author Contributions:** Concept – AG; Design – MG; Supervision – AG; Resource – AG, MG; Materials – AG, MG; Data Collection and/or Processing – AG, MG; Analysis and/or Interpretation – AG; Literature Review – AG, MG; Writing – MG; Critical Review – AG.

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