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Case Report

Exploring opioid-free pain management in complex oncologic surgery: A case of total scapulectomy

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ABSTRACT

Opioids are widely used perioperatively for pain control. However, growing concerns about opioid-related adverse effects, such as respiratory depression, dependence, and delirium, have driven interest in opioid-free analgesia. These adverse effects can prolong hospital stays and complicate recovery. We present the case of a 53-year-old male with risk factors for opioid-induced morbidity (BMI >50 and obstructive sleep apnoea [OSA]) who successfully underwent opioid-free analgesia for a left total scapulectomy in the setting of scapular Grade 3 chondrosarcoma.

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1. Introduction

The use of opioids in perioperative settings has been a longstanding standard for managing pain; however, this practice is not without significant adverse effects, which can negatively impact patient recovery and extend hospital stays. These concerns have led to increased interest in opioid-free analgesia, especially for high-risk patients. Regional anesthesia has emerged as a valuable tool in this regard, offering effective pain control while minimizing the reliance on opioids. The case highlights the implementation of a multimodal regional anesthetic approach in a high-risk patient undergoing total scapulectomy. By employing a combination of suprascapular nerve block, superior trunk brachial plexus block, and unilateral erector spinae plane block, the patient's postoperative course was managed effectively without significant opioid use. This case

highlights the potential for regional anesthesia to improve outcomes in complex surgeries involving high-risk patients.

2. Case Presentation

A 53-year-old male with Grade 3 chondrosarcoma of the left scapula presented for total scapulectomy and soft tissue reconstruction with suspensionplasty of the left humerus. His medical history was notable for extreme obesity with a BMI of 53, obstructive sleep apnoea (OSA), type II diabetes mellitus, iron-deficiency anaemia, and hypertension. He had previously undergone a right-sided partial nephrectomy in 1986. Preoperative laboratory evaluations revealed hemoglobin of 11.4 g/dL, haematocrit of 35.8%, and platelet count of $220 \times 10^9/L$, with all other metabolic panel values within normal limits.

Given the patient's obesity and OSA, the anesthesia team opted for a regional anesthetic strategy to minimize the use of opioids and reduce the risk of opioid-induced

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respiratory depression. The use of an interscalene block was deliberately avoided due to its association with transient phrenic nerve palsy, which could exacerbate respiratory compromise in this high-risk patient. Instead, the anesthetic plan included a left suprascapular nerve block, superior trunk brachial plexus block, and unilateral left-sided erector spinae plane block. All blocks were performed under ultrasound guidance using a mixture of 0.5% bupivacaine, 25 µg of dexmedetomidine, and 4 mg of Decadron. Block-specific volumes included 10 mL for the superior trunk, 5 mL for the suprascapular nerve, and 30 mL for the erector spinae plane.

Preoperatively, the patient's blood pressure was elevated at 156/93 mmHg, consistent with his history of hypertension. Other vital signs were heart rate 74 bpm, temperature 97.6°F, and respiratory rate 14 breaths per minute. He received premedication with 2 mg of midazolam, 1 g of acetaminophen, and 600 mg of gabapentin.

General anesthesia was induced with lidocaine 100 mg, propofol 150 mg, ketamine 50 mg, and succinylcholine 200 mg. Intubation was achieved using video laryngoscopy with an 8.0 oral endotracheal tube. Maintenance anesthesia consisted of desflurane, a dexmedetomidine infusion at 0.4 µg/kg/hr, and a ketamine infusion at 0.3 mg/kg/hr based on an ideal body weight of 80 kg. The surgery proceeded uneventfully, and the patient was extubated without complications (Figure 1).

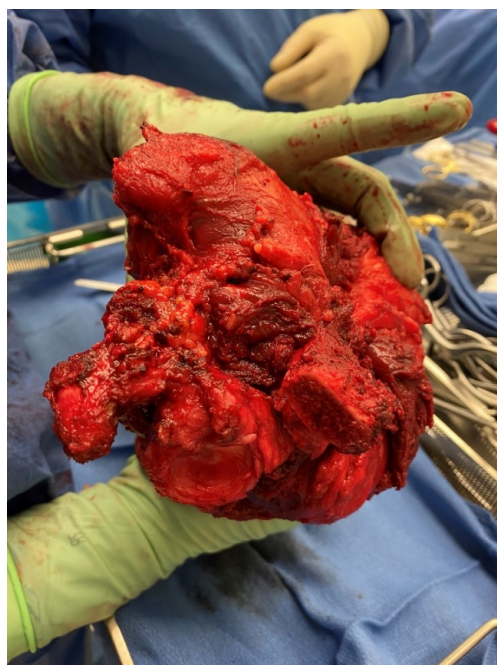


Figure 1: Total scapula resection for chondrosarcoma

Postoperatively, the patient was transferred to the PACU, where he required no opioids for pain management and

reported adequate analgesia. On postoperative day (POD) 0, analgesia was maintained with hydromorphone 0.5 mg IV, acetaminophen 1 g, and gabapentin 300 mg. On POD 1, the regimen included hydromorphone 1 mg IV, oxycodone 30 mg, acetaminophen 4 g, and gabapentin 300 mg. By POD 2, the patient's pain was effectively controlled with oxycodone 10 mg and acetaminophen 2 g. He was discharged on POD 2 with a 7-day prescription for acetaminophen 1 g every 6 hours as needed and oxycodone 5 mg every 4 hours as needed. His postoperative recovery was uneventful.

3. Discussion

Chondrosarcomas account for approximately 20%-27% of primary malignant bone tumors and are the second most common type following osteosarcoma.¹ The main locations of origin are the pelvis, proximal femur, proximal humerus, distal femur, and ribs; however, chondrosarcomas may originate in any anatomical location in which cartilage is present.^{2,3} Chondrosarcoma originating in the scapula is exceedingly rare but well-documented in the literature.³ Tumors of the scapula may become large before diagnosis and often present with pain and/or a palpable mass.⁴ Tumor grading of chondrosarcomas is a significant prognostic factor.⁵ Radiation therapy and chemotherapy have limited efficacy in management of conventional chondrosarcomas.^{6,7} As such, the majority of patients are dependent on surgical treatment by tumor resection for management of chondrosarcoma.⁸

Regional anesthesia is frequently incorporated in shoulder surgery including total scapulectomy.^{4,9–11} The sensory innervation of the scapula is complex, involving branches of the brachial plexus including the suprascapular nerve innervating the posterior scapula as well as the subscapular nerve which innervates the anterior scapula. Additional contributions to the sensory innervation of the scapula include the axillary nerve, the lateral pectoral nerve, the musculocutaneous nerve, and posterior branches of thoracic intercostal nerves.^{12–14}

The interscalene block of the brachial plexus is one of the most frequently employed regional anesthesia techniques for shoulder surgeries.^{15,16} It is particularly effective in blocking the majority of the brachial plexus, with the exception of the ulnar nerve (C8-T1).¹⁶ However, the proximity of the brachial plexus to the phrenic nerve at the C5-C6 levels introduces a significant risk of phrenic nerve palsy.¹⁶ Studies have shown that when large volumes of local anesthetic (20 mL or more) are used, the incidence of transient phrenic nerve palsy can reach up to 100%.⁹ While this condition is often asymptomatic and self-limiting, it can pose serious risks for patients with obesity, obstructive sleep apnoea (OSA), or pre-existing pulmonary disease, who may experience symptoms such as dyspnea.¹⁷

In symptomatic cases, diagnostic findings may include hypoxia on pulse oximetry, reduced forced vital capacity

(FVC) and forced expiratory volume in 1 second (FEV1) on pulmonary function tests, or impaired diaphragmatic movement on ultrasonography.⁹ Management of mild cases involves positioning the patient upright and administering supplemental oxygen via nasal cannula or facemask. Severe cases may require non-invasive ventilation, such as BiPAP or CPAP, or even invasive mechanical ventilation.

Given the potential for respiratory compromise, especially in patients with obesity or OSA, alternative regional anesthesia techniques should be considered to provide effective analgesia without compromising respiratory function. In this case, the decision to avoid an interscalene block was based on the patient's history of OSA and morbid obesity, which placed him at increased risk of respiratory complications. Instead, a combination of alternative nerve blocks including the suprascapular nerve block, superior trunk brachial plexus block, and erector spinae plane block was successfully utilized to achieve effective perioperative pain control.

The blockade of the superior trunk of the brachial plexus is a novel regional anesthesia technique that has shown significant promise in providing effective analgesia while minimizing the risk of diaphragmatic impairment compared to the interscalene block (Figure 2).¹⁸ The superior trunk, formed by the convergence of the C5 and C6 nerve roots, is blocked at a site where the phrenic nerve has already diverged from the brachial plexus. This anatomical distinction makes the superior trunk block a safer alternative, especially for patients at risk of respiratory complications. A recent randomized controlled trial demonstrated that the superior trunk block offers analgesia and anesthesia comparable to the interscalene block while significantly reducing the incidence of phrenic nerve palsy and hemidiaphragm paresis.¹⁸

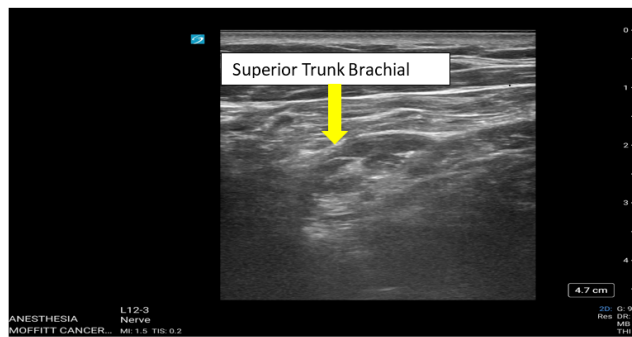


Figure 2: Superior trunk block showing the brachial plexus and terminal nerve roots

The erector spinae plane (ESP) block, first described by Forero et al. in 2016, represents another innovative advancement in regional anesthesia.^{19,20} This technique involves the deposition of local anesthetic between the erector spinae muscle and the transverse process of the vertebra. Once deposited, the anesthetic spreads

cranio-caudally across 3-4 vertebral levels, infiltrating the paravertebral and epidural spaces (Figure 3).¹⁹ This diffusion enables the ESP block to provide both somatic and visceral analgesia, covering multiple dermatomes, including those relevant to the scapulectomy incision.¹⁹

Additionally, the suprascapular nerve block is a reliable option frequently employed in shoulder and scapula surgeries. The suprascapular nerve innervates the glenohumeral and acromioclavicular joints, making its blockade particularly effective for analgesia in the shoulder region. The nerve can be targeted either at the suprascapular fossa or at the base of the neck distal to its divergence from the brachial plexus. While this approach reduces the likelihood of phrenic nerve involvement, care must still be taken to avoid unintentional spread of the local anesthetic to adjacent structures, particularly when using large volumes.⁹

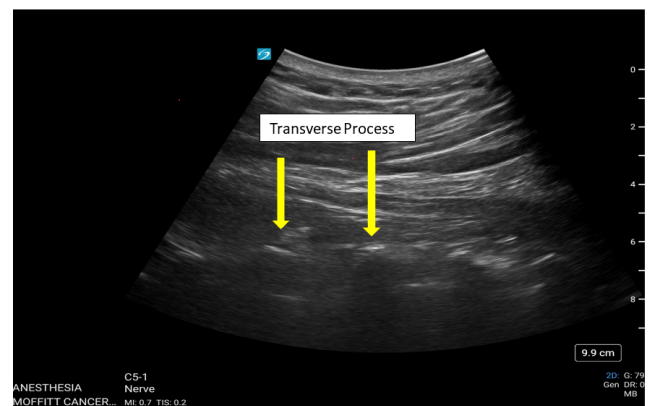


Figure 3: Erector spinae block showing the transverse process and overlying musculature

By incorporating regional anesthesia, opioid use in the postoperative period was minimized. While opioids are a mainstay for managing postoperative pain, their use is associated with adverse effects, particularly opioid-induced respiratory depression (OIRD).^{21–23} The risks of OIRD, such as hypoxia and hypercapnia, are especially significant in patients with comorbidities like obesity and OSA.^{21,22} Furthermore, opioid-related complications can increase perioperative costs and length of hospital stay.²¹

Opioid-free anesthesia aims to eliminate or significantly minimize opioid use intraoperatively and postoperatively.²⁴ Although opioids remain effective analgesics, their risks including addiction and perioperative morbidity necessitate cautious use.²³ In this case, the patient's obesity and OSA stressed the need for an alternative strategy. Effective postoperative analgesia was achieved using ultrasound-guided regional techniques, avoiding opioids intraoperatively and in the PACU. This approach minimized respiratory compromise and serves as an example of the utility of multimodal analgesia for high-risk patients.

4. Conclusions

Opioid-free anesthesia is a paradigm shift aimed at minimizing the risks associated with opioid use, particularly in high-risk populations. This case demonstrates the successful implementation of multimodal regional anesthesia techniques to achieve effective postoperative pain control while avoiding respiratory compromise in a morbidly obese patient with OSA undergoing total scapulectomy for chondrosarcoma. Anesthesiologists should be cognizant of utilizing such techniques to optimize patient outcomes in similar scenarios.

5. Sources of Funding

None.

6. Conflict of Interest

None.

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