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Interscalene block for elective musculoskeletal shoulder surgery in patients with obstructive sleep apnea – Is it safe?

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ABSTRACT

Objectives: Obstructive sleep apnea (OSA) patients increasingly require shoulder surgery. Their management can be complex for anesthetists and surgeons. Interscalene nerve blocks are used routinely in shoulder surgery, providing adequate analgesia. This study aimed to investigate whether using an interscalene block in patients with OSA is associated with increased postoperative complications and morbidity when undergoing elective musculoskeletal shoulder surgery.

Methods: Patients undergoing elective musculoskeletal shoulder operations with OSA were recruited for the study. They received an interscalene brachial plexus nerve block, with or without general anesthesia. Continuous positive airway pressure (CPAP) was used routinely in the perioperative period. Patients were followed up at 24 h and 30 days postoperatively. Patients were reviewed for complications, recovery time, and length of hospital stay.

Results: Thirty-one patients were included in the study: 20 arthroscopic and 11 open shoulder procedures. No patients suffered any perioperative morbidity or mortality in the first 24 h or 30-day follow-up periods. There were no complications nor high dependency unit admissions.

Conclusion: This study indicates that OSA patients may safely undergo musculoskeletal shoulder surgery with an interscalene nerve block without an increase in perioperative morbidity and mortality. The use of an interscalene nerve block is important as it reduces or eliminates the use of opioids. Furthermore, CPAP use assists in preventing common complications related to the OSA cohort, facilitating day-case surgery.

Keywords: Brachial plexus block, Continuous positive airway pressure, Nerve block, Obstructive sleep apnea, Orthopedics

INTRODUCTION

Obstructive sleep apnea (OSA) is a disorder characterized by repetitive upper airway collapse during sleep and is associated with daytime sleepiness. The number of people suffering from OSA globally is approximately 1 billion,[1] while in some older age groups, the prevalence of OSA is even higher.[2] The prevalence of OSA is expected to rise with the rising obesity rate and it has been associated with several comorbidities like hypertension, type 2 diabetes mellitus (T2DM), and cardiovascular disease.[3] It has been linked to various physiological abnormalities such as

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intermittent hypoxia, sympathetic hyperactivity, abnormal coagulation, endothelial dysfunction, inflammation, and insulin resistance.[4,5]

Patients with OSA undergoing elective surgery have higher rates of postoperative complications, including in-hospital mortality, pulmonary embolism, and wound hematomas.[6,7] The problem, particularly for patients suffering from OSA undergoing surgery, is thought to result from anesthetic agents and analgesics. These agents, particularly opiates, have the potential to exacerbate apnea, as they relax the upper respiratory tract muscles and can cause airway collapse, which may explain the higher incidence of postoperative respiratory complications in this group.[8]

OSA is of concern in the elective shoulder surgery setting, as it can make shoulder surgery challenging due to ventilatory difficulties. In addition, the beach chair position is often adopted for shoulder surgery, a position known to cause cerebral hypotension, which may reduce brain oxygenation, causing undetectable intraoperative neurological insults.[9]

Regional interscalene blocks (ISB) provide excellent pain relief perioperatively for shoulder surgery and are the current standard analgesia of choice with or without additional general anesthesia. Interscalene brachial plexus nerve blocks often freeze the phrenic nerve, consequently paralyzing the ipsilateral hemidiaphragm in most patients.[10] This is tolerated well by most people, but can be problematic for patients with a susceptibility to hypoxemia as in OSA, putting this cohort of patients at increased risk perioperatively. This risk must be carefully balanced against the benefits of using an ISB: Significant reduction in post-operative pain, early rehabilitation, and a reduced requirement for opiates, which may be particularly important in OSA patients.

Continuous positive airway pressure (CPAP) is a recognized treatment for patients with OSA. It has been shown to increase oxygen saturation, reduce the number of night arousals and apnea attacks, restore memory, and improve daytime sleepiness.[8] However, evidence for its effectiveness within the perioperative elective shoulder surgery setting is unclear.

Our study aimed to assess the outcome of OSA patients undergoing elective shoulder surgery and the safety of ISB with little or no opioids in these patients. In particular, we investigated whether these patients have an increased risk of post-operative complications, including mortality, the impact on the ability to perform surgery as day-case procedures, and the need for higher levels of care postoperatively.

MATERIALS AND METHODS

A patient cohort with an established diagnosis of OSA, made by a respiratory physician, was followed up prospectively. All patients were scheduled for elective musculoskeletal shoulder procedures under the senior author.

Standard pre-operative anesthetic discussions were held with patients to consider surgery under regional ISB only, or to receive a general anesthetic with ISB, both with little or no opioids. Opioid was only selectively given to any patient with an intra-operative pain response, like tachycardia. The ISB was performed using an ultrasound machine and electronic stimulation guidance by an experienced anesthetic consultant.

Arthroscopic musculoskeletal shoulder procedures were performed in a lateral position, and open procedures were performed in a beach chair position through the anterior deltopectoral or lateral deltoid splitting approaches.

All patients received CPAP treatment immediately post-surgery, in the anesthetic recovery area. Patients were discharged when three consecutive oxygen saturation readings were maintained over 2 h and no medical concerns remained. The patients were followed up at 24 h (by telephone if a day-case surgery was performed or on the ward if an inpatient) and 30 days postoperatively in the outpatient clinic. The variables collected were patients' sex, age, body mass index (BMI), comorbidities, surgery being performed, open or arthroscopic surgery, lateral or beach chair position, and length of hospital stay. The primary outcome measure assessed was identifying intraoperative and immediate post-operative complications at 24 h and 30 days.

In addition, any specific episodes of respiratory obstruction, hypoxia, dyspnea, or inability to cough were asked about within the first 30 days postoperatively. Other outcomes recorded included the requirement for a high-dependency unit (HDU) bed, increased time spent in recovery, overall hospital length of stay, and 30-day mortality and morbidity. The authors quantitatively reviewed the data collected.

RESULTS

There were 31 patients (25 men and six women). The mean age was 52 years (standard deviation 8). Twenty-five patients (81%) had a BMI between 35 and 40 and 6 patients (19%) had BMI between 40 and 45. Sixteen patients (52%) had T2DM and hypertension, while ten patients (32%) had hypertension alone.

Five patients (16%) agreed to have surgery under light sedation and ISB only, while the remaining 26 (84%) received a general anesthetic in addition to the ISB and with little or no opioids postoperatively. Twenty-three patients (74%) were planned to have their procedures performed as day-case surgeries, while eight patients (26%) required a planned inpatient stay (due to the operation performed, comorbidities, or no support available at home) [Table 1]. Two patients required opioids intraoperatively due to intra-

operative pain response, namely tachycardia. The anesthetist noted the amount given was a quarter of the dose usually administered in the departmental regime.

During the study, 20 (64%) arthroscopic procedures were carried out in the lateral decubitus position and 11 (36%) open procedures in the beach chair position. Sixteen patients had a rotator cuff repair (nine arthroscopic and seven open). Eight patients had arthroscopic subacromial decompression ± acromioclavicular joint excision. A further two patients underwent arthroscopic capsular release, and one had an arthroscopic procedure for calcific tendonitis. Four patients underwent open total shoulder arthroplasty [Table 2].

No patient had any significant intra-operative or post-operative morbidity or mortality in the first 24 h or within the first 30 days following surgery. No adverse events were noted in patients who had surgery in either the lateral or the beach chair position. There were no respiratory compromises following ISB in the OSA patients. No patient reported any adverse episodes of respiratory obstruction, hypoxia, dyspnea, or problems related to coughing sufficiently. The two opioid patients had no change in their postoperative behavior compared to the rest of the cohort. Our study did not demonstrate an increase in the expected inpatient stay or increase in the time in recovery and no patient required a HDU bed. No patients that were scheduled for day-case surgery had to change to an overnight stay. All ISBs had worn off by 24 h. This was assessed through the telephone for day-case patients by questioning the patient and their ability to perform certain movements. Only arthroplasty patients (n = 4) required opioids as inpatients postoperatively. No patients were discharged home with opiates. All outcomes and data were included, and no patients were lost to follow-up.

Table 1: Patients demographics and results.

Variable	Number (%) total=31
Sex	
Male	25 (80.6)
Female	6 (19.4)
Age (Mean+SD)	52±8
BMI	
35–40	25 (80.6)
>40	6 (19.4)
Comorbidities	
Hypertension+T2DM	16 (51.6)
Hypertension only	10 (32.3)
Anesthesia	
General anesthetic+ISB	26 (83.9)
ISB alone	5 (16.1)
Length of stay	
Day case	23 (74.2)
Inpatient <2 days	6 (19.4)
Inpatient <7 days	2 (6.5)
Patient position	
Lateral	20 (64.5)
Beach chair	11 (35.5)

SD: Standard deviation, BMI: Body mass index (kg/m^2), T2DM: Type 2 diabetes mellitus, ISB: Interscalene block

Table 2: Summary of the surgeries performed.

Surgical procedure	Number (%) Total=31
Arthroscopic	Total=20 (64.5)
Rotator cuff repair	9 (29.0)
Subacromial decompression±ACJ excision	8 (25.8)
Capsular release	2 (6.5)
Calcific tendonitis	1 (3.2)
Open	Total=11 (35.5)
Rotator cuff repair	7 (22.6)
Total shoulder replacement	4 (12.9)

*ACJ: Acromioclavicular joint

DISCUSSION

Regional anesthesia, particularly the ISB, has become the most common method of perioperative pain relief in arthroscopic shoulder surgery. Its use in patients with OSA has not been reported in the literature to date. This study supports the use of ISB in patients with OSA.

This study shows that patients with OSA undergoing musculoskeletal shoulder surgery can safely have ISBs, with no respiratory complications occurring, while additionally reducing the need for opiates, assisting in the post-operative rehabilitation of these patients. Opioid use is particularly important to minimize in this cohort of patients due to its potential to exacerbate apnea by relaxing the upper respiratory tract muscles.[8]

Further studies have shown the use of regional anesthesia in patients with OSA to reduce post-operative complications and mortality. They can be beneficial in minimizing the incidence of cerebral hypoxia caused by the beach chair position.[9,11]

Patients with OSA typically have a high BMI, which, when coupled with the anesthetic challenge to maintain satisfactory ventilation perioperatively, can often require closer observation in an HDU or intensive care setting. We believe that using the ISB, light sedation, and reduced opioid use minimizes respiratory depression and compromise. We advocate using CPAP in these patients early in the post-operative recovery as a useful ventilatory tool to reduce the number of post-operative complications, enhance recovery, and expedite discharge. Several studies have found using CPAP to be beneficial in optimizing the perioperative care of patients with OSA by improving oxygenation and reducing the risk of cardiovascular events, primarily cardiac arrest, and shock.[12,13]

Although outcome evidence for patients with OSA in shoulder surgery is sparse, our findings help provide one of the first cohorts of patients who have safely undergone musculoskeletal shoulder surgery using ISB in the current literature. Griffin *et al.* compared the outcomes of patients with and without OSA undergoing shoulder arthroplasty and found that OSA did not increase perioperative morbidity and mortality.[14] Thompson *et al.* found that patients with probable undiagnosed OSA do not correlate with increased perioperative risks in shoulder and elbow arthroplasty.[15] Liu *et al.* investigated the risk of post-operative hypoxemia in ambulatory surgical patients with OSA and found that episodes of hypoxemia were not associated with increased adverse outcomes.[16]

We are aware that the study has limitations. A higher sample size would offer greater strength to our conclusions. However, given the paucity of the literature, it still provides a valuable data set. This is a single surgeon and anesthetist series and, therefore, can demonstrate consistency with the study, but a more robust randomized control trial is necessary to assess the key points in more detail to ascertain the benefits fully and their comparisons. We are aware that the follow-up period could be longer and complications could arise down the line. However, we would expect most study outcomes to have been evident during this follow-up period. We are aware that complications may have been reported to other hospitals and unavailable to us. However, we are confident this would have been captured at the 30-day outpatient follow-up if any had occurred.

CONCLUSION

This study helps to demonstrate that patients with OSA can safely have musculoskeletal shoulder surgery with an ISB without any increase in their perioperative morbidity and mortality. Twenty-three of our patients were successfully discharged as day-case operations. We would advocate patients with OSA can have musculoskeletal shoulder surgery safely as a day case and in a beach chair position. However, their management in the perioperative setting should be carefully considered and discussed with the anesthetist. We support using an ISB, which reduces or eliminates the use of opioids and the potential for respiratory compromise in this group. In this group of patients, we also believe that using CPAP postoperatively contributed to and facilitated many of the procedures to be performed safely as a day case, avoiding the need for admission or HDU care.

ETHICAL APPROVAL

The study was registered with the local research and audit department. This was an observational study. The local research ethics committee confirmed that no ethical approval was required.

AUTHORS' CONTRIBUTIONS

All authors contributed to the study's conception and design. Patients were recruited, and data were collected by PM and RP. Material preparation, data collection, and analysis were performed by MS, PR, and RP. The first draft of the manuscript was written by MS, and all authors commented on the previous versions of the manuscript. All authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY FOR MANUSCRIPT PREPARATION

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patients consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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CONFLICTS OF INTEREST

There are no conflicting relationships or activities.

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