Dexamethasone Versus Ketamine in the Interscalene Block in Patients Undergoing Arthroscopic Shoulder Surgery: A Randomized Double-Blinded Study

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Objective: Arthroscopic shoulder surgery (ASS) is often followed by severe pain. Interscalene brachial plexus block (ISB) was used to relieve such pain. The aim of the study was to compare the effect of adding either dexamethasone or ketamine to ISB on time to the first request for analgesia.

Methods: Sixty patients scheduled for ASS were enrolled in this study. Before induction of general anaesthesia, patients were randomly allocated to two groups; in Group D, patients received ISB with bupivacaine 0.3%, 5 mL lidocaine 2% plus 8 mg dexamethasone. Whereas in Group K, patients received ISB with bupivacaine 0.3%, 5 mL lidocaine 2% plus 50 mg ketamine. Time to the first administration of supplemental analgesic postoperative was our primary concern. Secondary outcomes included pain score, patient satisfaction, and side effects of either block or drugs. Student’s t-test was utilized for comparison between the two groups. Chi-square test was used to test the association between categorical variables.

Results: Time to the first request of analgesia was statistically significantly longer in Group D when compared to Group K. The onset of sensory and motor blocks, number of patients requiring rescue analgesia and patient satisfaction showed no difference between the two groups. Pain score in Group K, compared to Group D, was statistically significant less early postoperatively.

Conclusions: We conclude that addition of dexamethasone to local anesthetic in ISB for patients undergoing ASS resulted in longer time elapsed to the first request of analgesia when compared with ketamine. Pain score in the early postoperative period was statistically improved in ketamine group, but this might be of no clinical significance, when compared with dexamethasone.

Keywords: arthroscopic shoulder surgery, interscalene, dexamethasone, ketamine

Introduction

Arthroscopic shoulder surgery (ASS) is often followed by severe pain. Many modalities have been postulated to relieve such pain. These modalities include interscalene brachial plexus block (ISB), suprascapular nerve block and intra-articular local anesthetic injection. The use of an ISB in addition to general anaesthesia permits control of respiration safely, and maintenance of surgical analgesia easily. Also, this technique resulted in higher patient satisfaction with lower narcotic requirements either during or shortly after the surgery. Single-injection ISB is effective but time-limited to combat pain after shoulder surgery. Various adjuvants, like dexamethasone, have been used to prolong the time of pain relief in ASS performed under ISB. Intravenous intraoperative low-dose ketamine has been used to decrease acute postoperative pain.
following ASS. The primary concern of this study was a comparison of the first request of analgesia after ISB containing either dexamethasone or ketamine as an additive in patients undergoing ASS between. The secondary goals were pain score, patient satisfaction, and side effects.

**Methods**

After informed consent and institutional research board approval, 60 patients, ASA (American Society of Anesthesiologists physical status classification) I or II, subjected to ASS were randomized to two groups. In the first group, patients received ISB with bupivacaine 0.3% plus 8 mg dexamethasone (Group D). Whereas in other group patients received ISB with bupivacaine 0.3% plus 50 mg ketamine (Group K). The total volume of the block was 25 mL including 15 mL bupivacaine 0.5%, 5 mL lidocaine 2% plus 5 mL normal saline containing either ketamine or dexamethasone. The study was started in a university hospital from July 2016 and ended in January 2017. Criteria for exclusion from the study include epilepsy, diabetes, obstructive pulmonary disease, muscular disease, bleeding diathesis, and a history of allergy to the drugs used in this study. A computer-generated method was used for randomization. The block solutions looked identical and were prepared by a pharmacist who is blinded to the other personnel involved in the block as well as to the patients. Assessment of postoperative parameters was done by personnel blinded to the drugs used in this study. A computer-generated method was used for randomization. The block solutions looked identical and were prepared by a pharmacist who is blinded to the other personnel involved in the block as well as to the patients. Assessment of postoperative parameters was done by personnel blinded to the study. All cases were blocked by same anesthetist. The all surgeries were done by same surgeon team. The ISB was given before induction of general anesthesia (GA) guided by SonoSite portable ultrasound unit (SonoSite, Bothell, WA, USA).

After identification of the sternocleidomastoid muscle and interscalene groove at the approximate level of C6, a linear transducer is placed 90° to the course of the interscalene muscles. The brachial plexus at this level appeared as three to five hypoechoic circles. The carotid artery and internal jugular vein may be seen lying anterior to the anterior scalene muscle. After careful aspiration for nonappearance of blood, local anesthetic (hypoechoic) spread occurred adjacent to the plexus. The block was assessed to be well established before induction of anesthesia.

After a period of preoxygenation with 100% oxygen, GA was induced with propofol and cisatracurium. Then, anesthesia was maintained with sevo-flurane, nitrous/oxygen. Intraoperative monitoring included electrocardiogram (ECG), heart rate, pulse oximetry, non-invasive blood pressure, and end-tidal carbon dioxide concentration. A pinprick test was mean to test the sensory block (whereas normal sensation = 0; loss of sensation of pin prick = 1 and loss of sensation to touch = 2). Shoulder movement was the way to test motor block (normal movement = 0; paresis = 1 and lack of movement = 3). Time passed from giving local anesthetic till loss of sensation of pin-prick performed every minute (sensory score = 1) was the onset of sensory block, whereas time passed from giving local anesthetic till absent movement (motor score = 2) was the onset of motor block. All surgeries were performed by the one surgeon. Postoperative pain was assessed using a visual analog scale (VAS) (no pain = 0 cm and the worst pain imaginable = 10 cm) at 2, 4, 6, 8, 12, and 24 hours, postoperatively. Patients were discharged from the postanesthetic care unit when Aldrete’s score was not less than 9. Time to the first administration of supplemental analgesic postoperative was our primary concern. If pain more than 3, rescue analgesic was intravenous tramadol 1 mg/kg. Secondary outcomes included pain score, patient satisfaction as percentage (0% = not satisfied, 100% = fully satisfied), side effects of either block (arm numbness, arm weakness, phrenic nerve palsy, Horner syndrome, and dyspnea) or drugs (hallucination, nausea, and vomiting).

Based on pilot study and using the t-test and setting α to 0.05, we needed minimally 25 cases in each group to detect 15% difference in time to the first request of analgesia (primary goal) with 80% power. We increased the sample to 30 cases to compensate for possible dropouts. Statistical Package of Social Science (SPSS) program for Windows (Standard version 22.0; IBM Corp., Armonk, NY, USA) was used for analysis of collected data. The normality of data was primarily tested with the one-sample Kolmogorov–Smirnov test. Chi-square test was used to test the association between categorical variables. When expected cell count less than 5, Fischer’s test was used. Continuous variables were presented as mean ± standard deviation (SD). Number and percent were used to describe qualitative data. Student’s t-test was utilized for comparison between the two groups. When p value was less than or equal to 5%, the results were considered significant. The smaller the p value, the more significant are the results.

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Results
Seventy patients, submitted for arthroscopic shoulder surgeries, were assessed for eligibility; out of the 70 patients, 60 patients completed this study. Ten patients were excluded because of obstructive pulmonary disease, diabetes, epilepsy, and patient’s refusal (Fig. 1).

Patients showed no statistically significant difference with respect to patients’ age, sex, weight, duration of surgery, and type of surgery (Table 1). Time to the first request of analgesia was statistically significantly longer in Group D when compared to Group K (Fig. 2). The onset of sensory and motor blocks, number of patients requiring rescue analgesia, and patient satisfaction showed no difference between the two groups (Table 2).

Table 1. Patients’ characteristics data, duration, and type of surgery

<table>
<thead>
<tr>
<th></th>
<th>Group D (n = 30)</th>
<th>Group K (n = 30)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>43.47 ± 4.21</td>
<td>44.43 ± 3.97</td>
<td>0.364</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (%)</td>
<td>24 (80.0)</td>
<td>24 (80.0)</td>
<td>1.000</td>
</tr>
<tr>
<td>Female (%)</td>
<td>6 (20.0)</td>
<td>6 (20.0)</td>
<td></td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>85.43 ± 10.58</td>
<td>87.83 ± 12.49</td>
<td>0.426</td>
</tr>
<tr>
<td>Duration of surgery (min)</td>
<td>91.37 ± 10.10</td>
<td>88.47 ± 7.29</td>
<td>0.207</td>
</tr>
<tr>
<td>Type of surgery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotator cuff repair (%)</td>
<td>27 (90.0)</td>
<td>27 (90.0)</td>
<td>1.000</td>
</tr>
<tr>
<td>Arthroplasty (%)</td>
<td>1 (3.3)</td>
<td>2 (6.7)</td>
<td></td>
</tr>
<tr>
<td>Adhesiolysis (%)</td>
<td>2 (6.7)</td>
<td>1 (3.3)</td>
<td></td>
</tr>
</tbody>
</table>

Group D = dexamethazone group; Group K = ketamine group.
Data are mean ± standard deviation (SD) or number (%).
Pain score in Group K, compared to Group D, was statistically significant less at 4, 6, and 8 hours, postoperatively (Fig. 3).

**Discussion**

Shoulder arthroscopic surgeries have been associated with the frequent occurrence of severe pain after surgery. Improper management of such pain might result in delayed recovery and rehabilitation. Use of regional analgesia in addition to GA decreases requirements of anesthetics during surgery and provides a better quality of pain control after surgery.

Interscalene nerve block has been used frequently to control pain after shoulder surgery. Although single-injection block is effective, it has the disad-
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vantage of limited duration. GA along with ISB have
been utilized for shoulder surgery, with better maintenance of surgical analgesia, higher patient satisfaction with a decreased need for analgesics during or after surgery. In a double-blinded study, Cummings et al. found that dexamethasone prolongs analgesia from single-injection ISB. In this study, the results were the same regardless the used local anesthetic, ropivacaine or bupivacaine.

Prolongation of regional anesthesia with dexamethasone attributed to increasing the efficiency of potassium channels on nociceptive C-fibers, vasoconstriction, and reduction of local anesthetic absorption. Potassium channels have an inhibitory effect on C-fibers transmitting pain.

In this study, the onset of sensory and motor blocks was faster in dexamethasone group than in ketamine group but the difference was not statistically significant.

Ketamine, in a dose of 50 mg, has been added to local anesthetic aiming to prolong the axillary brachial plexus block or epidural anesthesia as a result of the direct action on the nerve root fibers. Also, Clerc et al. found that addition of 75 mg ketamine to bupivacaine 0.5% in inguinal field block after hernia repair resulted in minimal improvement in the analgesic effect of bupivacaine. Lee et al. have noticed no prolongation of sensory and motor effects of ketamine when added to ropivacaine 0.5% in ISB. They explained that by two assumptions. First, low concentration of ketamine in their study (0.1%) which is not enough to exert its local anesthetic action. Secondly, the local antinocice-
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Conclusion

We conclude that addition of dexamethasone to local anesthetic to ISB for patients undergoing ASS resulted in longer time elapsed to the first request of analgesia when compared with ketamine. Pain score in the early postoperative period was statistically improved in ketamine group, but this might be of no clinical significance, when compared with dexamethasone.

References

5. Jadon A, Dixit S, Kedia SK, Chakraborty S, Agrawal A, Sinha N. Interscalene brachial plexus block for shoulder arthroscopic surgery: prospective randomized controlled study of effects of 0.5% ropivacaine and 0.5% ropivacaine with dexamethasone. Indian J Anaesth 2015;59:171–176. doi:10.4103/0019-5049.153039
8. Casati A, Fanelli G, Albertini A, et al. Interscalene brachial plexus anesthesia with either 0.5% ropivacaine or 0.5%...