Original Research Article

Dexmedetomidine as an adjuvant drug for ultrasound guided interscalene block for shoulder arthroscopic surgeries: prospective observational study

Sangeeta Khanna[1], Biraj Gogoi[2], Vipin Sharma[3], Krishna Prasad[4*]

[1]Department of Anaesthesiology, MH-KIRKEE, Pune, Maharashtra, India
[2]Department of Orthopaedics, MH-KIRKEE, Pune, Maharashtra,India
[3]Department of Anaesthesiology, MH-KIRKEE, Pune, Maharashtra, India
[4]Department of Anaesthesiology, MH-KIRKEE, Pune, Maharashtra, India

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Abstract

Introduction: Arthroscopic shoulder surgeries can be done under general anaesthesia, regional anaesthesia or a combination of both. In patients undergoing shoulder arthroscopy, pain can persist for more than 48 hours in the postoperative period despite multimodal analgesia, thus making pain control challenging for anesthesiologists.

Materials and Methods: Institutional ethics committee approval was sought before commencing this prospective observational study. Patients of American Society of Anaesthesiologists physical status (ASA PS) I or II, aged 19-76 years of either gender scheduled for elective arthroscopic shoulder surgeries (Surgery done in lateral position) under interscalene block using 50 mcg of Dexmedetomidine as adjuvants along with 15 mL of 2% lignocaine and 15 mL of 0.5% bupivacaine were included in the study. Patients who refused to participate, those with neurological deficits, known allergy to local anaesthetics and history of seizures were excluded. Informed consent was obtained from all participants. Consultant anaesthesiologists administered the USG guided interscalene blocks with 15 mL of 2% lignocaine and 15 mL of 0.5% bupivacaine and Dexmedetomidine as adjuvant. Ultrasound guided interscalene block using linear probe and 26G needle without using nerve stimulator.**Results:** Fifty five male and eight female patients participated in the study. Fifty patients belonged to ASA PS I and 13 patients belonged to ASA PS II. Age, weight and the duration of surgery were comparable between all the patients. Dexmedetomidine as an adjuvant to lignocaine and bupivacaine prolongs ultrasound guided interscalene blockade is more efficaciently in hastening the onset, prolonging sensorimotor blockade and delaying the time for request of rescue analgesia.**Conclusion:** Dexmedetomidine as an adjuvant to lignocaine and bupivacaine prolongs ultrasound guided interscalene blockade is more efficaciently in hastening the onset, prolonging sensorimotor blockade and delaying the time for request of rescue analgesia. Dexmedetomidine also provides Intraoperative sedation, which is very helpful for conducting the surgery.

Keywords: Arthroscopic, Dexmedetomidine, lignocaine, interscalene blockade

Introduction

Arthroscopic shoulder surgeries can be done under general anaesthesia, regional anaesthesia or a combination of both. In patients undergoing shoulder arthroscopy, pain can persist for more than 48 hours in the postoperative period despite multimodal analgesia, thus making pain control challenging for anesthesiologists.

Effective postoperative pain management is important for initiating rehabilitation, thus decreasing hospital stay and improving patient satisfaction. Various analgesic regimens like intravenous, oral and transdermal patches have been tried to control postoperative pain but with certain limitations.

**Correspondence*
Dr. Krishna Prasad
Department of Anaesthesiology, MH-KIRKEE, Pune Maharashtra, India.
E-Mail: drkaypee99@yahoo.com

Interscalene brachial plexus block is one of the most widely practiced regional anaesthetic technique for shoulder surgeries and it provides better analgesia, greater satisfaction and fewer side effects. When combined with general anaesthesia, it reduces intraoperative anaesthetic and analgesic requirements and provides postoperative analgesia.The addition of various adjuvants like opioids, α-2 agonists, ketamine, neostigmine, magnesium sulphate, adenosine, and steroids to local anesthetics hasten the onset and prolong the duration of analgesia..Adjuvants to local anaesthetics improve the quality of analgesia, prolong duration of blockade and reduce the dose of local anaesthetics[1-4]. In this study we observed and compared the efficacy of adjuvant dexmedetomidine with lignocaine and bupivacaine.

Primary Objective: Dexmedetomidine prolongs the duration of block and improves patient satisfaction and opioid sparing analgesia.

Secondary objective: onset of motor and sensory block, complications (mentioned in data)

Materials and methods

Study: Observational Study

Sample Size: 63 patients

Institutional ethics committee approval was sought before commencing this prospective observational study.

Patients of American Society of Anaesthesiologists physical status (ASA PS) I or II, aged 19-76 years of either gender scheduled for elective arthroscopic shoulder surgeries (Surgery done in lateral position) under interscalene block using 50 mcg of Dexmedetomidine as adjuvants along with 15 mL of 2% lignocaine and 15 mL of 0.5% bupivacaine were included in the study. Patients who refused to participate, those with neurological deficits, known allergy to local anaesthetics and history of seizures were excluded.

Informed consent was obtained from all participants. Consultant anaesthesiologists administered the USG guided interscalene blocks with 15 mL of 2% lignocaine and 15 mL of 0.5% bupivacaine and dexmedetomidine as adjuvant. Ultrasound guided interscalene block using linear probe and 26G needle without using nerve stimulator.Observed parameters include onset of sensory and motor block, duration of sensory and motor block, sedation score and time for rescue analgesia, Heart rate, BP, Respiratory rate, complications, failed block or conversion into general anaesthesia, Duration of block Postoperative pain relief Postoperative regression of block. The time interval between administration of local anaesthetic solution to loss of prick sensation in C5, 6, 7 dermatomes was taken as onset time; it was assessed every 3 min till complete loss of sensation for 30 min. Three point scale was used to assess the sensory blockade (Grade 0: Sharp prick felt, Grade 1: Analgesia, dull sensation felt, Grade 2: Anaesthesia, no sensation felt). Onset of motor blockade was defined as the duration from injection of local anaesthetic solution to loss of movements in the arm, assessed every 3 min for 30 min using modified Bromage scale (Grade 0: Normal motor function, Grade 1: Ability to move only fingers, Grade 2: Complete motor block with inability to move below the wrist and finger). Time interval between complete loss of sensation on toothpick prick to reappearance of sensations was considered as duration of sensory blockade. Interval between complete motor blockade to reappearance of movements was regarded as duration of motor blockade. Sensory blockade of less than grade 2, for 30 min following administration of study drug was considered as unsuccessful blockade and those patients were excluded from analysis. Interval between administration of block to request for any pain relieving medications by the patient was considered as time for rescue analgesia. Five point sedation score described by Culebras et al. was used for assessing sedation[.5] Once the parameters were noted, general anaesthesia was administered as per the standard protocol. Any additional dose of analgesic administered were documented. Post-operative follow-up was done every 30 min to measure the outcomes mentioned earlier[11-15].

Statistical analysis: SPSS13.0 software was used for statistical analysis, the data were expressed as mean ± standard deviation and analyzed using single factor analysis of variance. The comparison between groups was analyzed using a t-test. $P < 0.05$ was considered statistically significant.

Results

Fifty five male and eight female patients participated in the study. Fifty patients belonged to ASA PS I and 13 patients belonged to ASA PS II. Age, weight and the duration of surgery were comparable between all the patients. Dexmedetomidine as an adjuvant to lignocaine and bupivacaine prolongs ultrasound guided interscalene blockade is more efficaciently in hastening the onset, prolonging sensorimotor blockade and delaying the time for request of rescue analgesia.

Table 1: Demographic profile

S.No	Parameter	Number	Percentage
1	Male	55	87.30
2	Female	8	12.69
3	Age 19-30 years	40	63.49
4	31-40 years	7	11.11
5	41-50 years	8	12.69
6	51-60 years	2	3.17
7	61-70 years	4	6.34
8	71-80 years	2	3.17

Table 2: ASA Grade

S.No	ASA Grade	Number	Percentage
1	I	50	79.36
2	II	13	20.63

Table 3: Diagnosis

S.No	ASA Grade	Number
1	ADHESIVE CAPSULITIS(LT) SHOULDER	1
2	AUB ACROMIAL BURSITIS SYNDROME	1
3	AUB ACROMIAL BURSITIS SYNDROME	1
4	DISLOCATION REVERSE SHOULDER ARTHROPLASTY	1
5	PARTIAL TEAR(LT0 SHOULDER	1
6	RECURRENT SHOULDER DISLOCATION (LT)	47
7	ROTTATOR CUFF TEAR(LT)	1
8	ROTTATOR CUFF TEAR(RT)	3
9	SCAP TEAR(RT) SHOULDER	1
10	SHOULDER DISLOCATION(LT)	1
11	SLAP TEAR(LT) SHOULDER	1
12	SLAP TEAR(RT) SHOULDER	1
13	SUPRASPINATUS TEAR(RT) SHOULDER	2

Table 4: Surgery

S.No	Surgery	Number
1	Arthroscopic Bankart Repair	13
2	Arthroscopic Sub Acromial Decompression	1
3	Bankart Repair	2
4	Diagnostic Arthroscopy And Proceed	42
5	Reverse Shoulder Arthroplasty	1
6	Rottator Cuff Repair	3
7	Shoulder Arthroplasty	1

Table 5: Onset of blockade (Mean ± SD)

S.No	Parameter	Value	P Value
1	Onset of sensory	3±3.07	0.001
2	Motor block	5±5.46	0.002

Table 6: Pre OP Spo2, BP, Heart Rate

S.No	**Parameter**	**Value**	**P Value**
1	Spo2	100%	0.001
2	BP	127/77 ± 3/5	0.001
3	Heart Rate	65 ± 5	0.001

Table 7: Comorbidities

S.No	**Parameter**	**Value**
1	Age Hypertension	1
2	Deranged LFT	1

3	Diabetes	3
4	Hypertension	6
5	Over weight	4

Table 8: Intra OP BP

S.No	Intra OP BP	Value
1	15 min	112/78 +6/8
2	30 min	128/88 ± 5/6
3	45 min	112/78 ± 6/7
4	60 min	102/64 ± 5/6
5	75 min	100/66 ± 6/7
6	90 min	98/68 ± 6/8
7	105 min	102/64 ± 7/9
8	120 min	100/64 ± 4/5
9	135 min	106/70 ± 3/6
10	150 min	106/68 ± 4/5
11	165 min	104/64 ± 5/6
12	180 min	108/68 ± 6/5
13	210 min	128/78 ± 5/4

Table 9: Intra-OP Heart Rate

S.No	Intra-OP Heart Rate	Value
1	15 min	60
2	30 min	58
3	45 min	56
4	60 min	64
5	75 min	60
6	90 min	64
7	105 min	65
8	120 min	58
9	135 min	64
10	150 min	62
11	165 min	59
12	180 min	60
13	210 min	59

Table 10: Post OP BP

S.No	Intra-OP Heart Rate	Value
1	**Intra-OP Heart Rate immediately**	110/60
2	4 Hour	112/64
3	8 Hour	120/78
4	12 Hour	122/82
5	16 Hour	128/78
6	20 Hour	124/80
7	24 Hour	130/80

Table 11: Post OP Heart Rate

S.No	Intra-OP BP	Value
1	Intra-OP HR	62
2	4 Hour	66
3	8 Hour	68
4	12 Hour	65
5	16 Hour	68
6	20 Hour	70
7	24 Hour	66

Table 12: Pain Score (VAS) and duration of analgesia

S.No	Parameter	Value
1	sensory recovery postop (PAIN SCORE>4)	850 ± 5 (min)

Table 13: Patient satisfaction score

S.No	Parameter	Value
1	**Patient satisfaction score**	7 ± 1.2

Table 14: Rescue analgesia requirement

S.No	Parameter	Value
1	Rescue analgesia requirement	4

Table 15: Convertion into general anaesthesia

S.No	Convertion into general anaesthesia	Value
1	Yes IGEL	3

Table 16: Complications due to procedure (NIL)

S.No	Complications	Value
1	HORNERS SYNDROME	2
2	PARTIAL BLOCK EFFECT	3
3	PARTIAL PHRENIC PALSY	1

Discussion

The benefits of regional anaesthesia, wherever feasible, is very well recognized. Ropivacaine is an amide local anaesthetic, less potent than bupivacaine. Being 10 times less lipid soluble compared to bupivacaine renders it less cardiotoxic[6]. Regional anaesthesia with local anaesthetics alone has limitations such as systemic toxicity, regression of block amidst surgery and requirement of additional sedation leading to side effects. Hence the concept of adding adjuvants to local anaesthetics came into practice. Additives provide quicker onset, prolonged dense blockade with reduction in the requirement of systemic analgesics and improves patient satisfaction. Several studies are available till date to find out efficacy of various adjuvants[2].

Dexmedetomidine is an alpha-2 adrenoreceptor agonist used as an adjuvant in neuraxial and peripheral nerve blocks. Mechanism of action is hypothesised to be multifactorial with both peripheral and central actions. Dexmedetomidine was approved by FDA in 1999 as a short acting sedative in intensive care setting.[4] It has gained popularity in recent years due to its sympatholytic, sedative, analgesic as well as amnestic properties. Various studies have proven that dexmedetomidine, as an adjuvant to local anaesthetics in peripheral nerve blocks prolongs the duration of sensorimotor blockade[7-9]. Being a glucocorticoid, dexamethasone is known to reduce tissue damage and inflammation by reducing the production and maintenance of inflammatory mediators and hence pain perception. It activates glucocorticoid receptor and inhibit phospholipase A2. Extended analgesic effect of dexamethasone is attributed to increased activity of inhibitory potassium channels in nociceptive C-fibres[10].

Conclusion

Dexmedetomidine as an adjuvant to lignocaine and bupivacaine prolongs ultrasound guided interscalene blockade is more efficaciently in hastening the onset, prolonging sensorimotor blockade and delaying the time for request of rescue analgesia.Dexmedetomidine helps in early onset of block. Dexmedetomidine helps in prolonged duration of block which helps in reduced post-op analgesia and less requirements of opioids for post-op analgesia. Patient satisfaction is good, no complications like nerve injury observed in our study. Arthroscopy can be done under block without general anaesthesia and helps in early recovery, less hospital stay and early discharge from hospital. Few complications like horners syndrome, phrenic nerve involvement which happened can be managed easily. Dexmedetomidine provides Intraoperative sedation, which is very helpful for conducting surgery.

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