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Comparative study of supra clavicular and interscalene block for proximal humerus fractures

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Abstract

Introduction: Supraclavicular brachial plexus block could be an alternative and provide comparable effective anaesthesia and postoperative analgesia for shoulder surgery. Interscalene brachial plexus blockade is the standard nerve block for analgesia after arthroscopic and open shoulder surgery.
Material and Methods: This is a Prospective, observational and descriptive study conducted in the Department of Anaesthesia at Nimra Institute of Medical Sciences (NIMS) over a period of 1 year. These patients were divided into two groups by simple random method; the patients were divided into group IRD (interscalene block using 30 ml of ropivacaine 0.5% + 50 µg of dexmedetomidine) and another group (supraclavicular block using 30 ml of ropivacaine 0.5% + 50 µg of dexmedetomidine). The procedure was conducted using nerve stimulator technique.
Results: The mean time of the onset of sensory block in supraclavicular group was 3.50±0.83, in interscalene was 3.1±0.62 and onset of motor block (min) was 3.60±0.62 in supraclavicular group, in interscalene was 3.21±0.54. The duration of sensory block was 495.53±49.41 min and 759.42±84.15 min in supraclavicular group and interscalene block respectively. Moreover, duration motor block (min) in supraclavicular group was 438.52±47.32, in interscalene was 659.23±38.74.
Conclusions: The onset of sensory and motor block was significantly faster in interscalene techniques then supraclavicular. Prolonged duration of sensory and motor block followed by interscalene and supraclavicular approaches, respectively.

Keywords: Supra clavicular, interscalene block, upper limb surgeries

Introduction

Supraclavicular block provides anesthesia of entire upper limb in most consistent and time efficient manner [1]. It is indicated for surgeries of upper extremity distal to the shoulder and for postoperative pain control. It is best for areas below the mid-humerus level [2]. The major advantage of supraclavicular block is that the nerves are very tightly packed in that area. This gives a very fast deep block, giving it a nickname “the spinal anesthesia of the arm”. The major disadvantage of supraclavicular block is the proximity to the pleura which causes concern for pneumothorax [3].
In interscalene block, the roots of the brachial plexus lying between the anterior and middle scalene

muscles are most easily blocked [4]. The interscalene approach results in anesthesia of shoulder, lateral two-third of clavicle and proximal humerus [5]. The use of classical interscalene block alone is associated with diaphragmatic paresis and respiratory complications [6]. To overcome the drawbacks of classical interscalene approach, alternative low interscalene approach is used. In low approach, on interscalene groove, the site selected is two-third of distance caudally from C6 vertebral level but above supraclavicular fossa [7].

It has been suggested that supraclavicular brachial plexus block could be an alternative and provide comparable effective anaesthesia and postoperative analgesia for shoulder surgery, with a reduced incidence of adverse events, including hemidiaphragmatic paresis. The increased distance between the supraclavicular injection site and the phrenic nerve compared with the interscalene approach results in a reduced incidence of hemidiaphragmatic paresis [8].

The shoulder joint is mainly innervated by the suprascapular and axillary nerves originating from the brachial plexus. Many clinicians assume that the supraclavicular approach might result in insufficient spread to block these two major components compared with the interscalene approach. This might be one of the main reasons the supraclavicular approach is often ignored or dismissed as an option for brachial plexus blockade [9].

The primary aim of the study was to study the onset and duration of sensory and motor blockade using different techniques of brachial plexus block in patients posted for upper limb surgeries.

Material and Method

This is a Prospective, observational and descriptive study conducted in the Department of Anaesthesia at Nimra Institute of Medical Sciences (NIMS) over a period of 1 year.

Inclusion criteria: Patients of either sex with more than 18 years presenting with displaced proximal humerus fractures according to NEER two, three-and four-part fracture, with associated dislocation of the shoulder, undergoing revision surgery for failure of other implants, Failure of conservative treatment.

Exclusion criteria: Age less than 18 years, Pathologic fractures from primary or metastatic tumors, Open fractures and Poly trauma, Four-part fracture in elderly, with neurovascular deficits.

These patients were divided into two groups by simple random method; the patients were divided into group IRD (interscalene block using 30 ml of ropivacaine 0.5% + 50 µg of dexmedetomidine), and another group (supraclavicular block using 30 ml of ropivacaine 0.5% + 50 µg of dexmedetomidine). The procedure was conducted using nerve stimulator technique.

In the supraclavicular approach, 2.5 cm lateral to insertion of sternocleidomastoid muscle, brachial plexus was identified. The nerve stimulator was connected to stimulator needle and set to deliver a 0.8-1.0 mA current at 1 Hz frequency and 0.1 ms pulse duration. The needle is inserted in anteroposterior direction perpendicular to skin and advanced slowly from upper trunk to middle trunk and lower trunk until apt muscle twitch is obtained on fingers.

In case of low interscalene approach, with similar settings on nerve stimulator, interscalene groove was identified and stimulator needle was inserted 3-4 cm (approximately 2 finger breadths) above the clavicle and needle advanced until apt twitch on fingers is obtained. At this point, prepared drug is administered with intermittent aspiration.

The time of the onset of sensory block was defined as the time between the administration of the drug and establishment of score 3 on Hollmen scale 3. Duration of analgesia was defined by duration from injection of local anesthetic drug to the first requirement of rescue analgesics and the effect is noted by pinprick method using Hollmen scale. Pinprick felt as sharp pointed but weaker compared with same area on other limbs, i.e., Grade 2.

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Hollmen scale 3

1 = Normal sensation of pinprick.
2 = Pinprick felt as sharp pointed but weaker compared with same area in other limbs.
3 = Pinprick recognized as touch with blunt object.
4 = No perception of pinprick.

The time of the onset of motor block was defined as the time between the administration of the drug and establishment of score 3 on Hollmen scale 3. Using Hollmen scale 3, the duration of motor response was checked hourly and documented. Motor weakness was checked by hand grip and movement at wrist, elbow and shoulder joint.

Hollmen scale 3

1 = Normal muscle function.
2 = Slight weakness in function.
3 = Very weak muscular action.
4 = Complete loss of muscle action.

Patient's satisfaction was either satisfactory or unsatisfactory depending on patient's intraoperative account of any painful stimulus in the operative site.

Statistical analysis: Data analysis was performed by using software SPSS 22.0. Descriptive statistics such as mean, SD, frequency and percentage was used. P-value of less than 0.05 was considered to be statistically significant.

Results

Among these 29 (58%) were males and 21 (42%) were females in table 1.

Table 1: Gender distribution of patients

Gender	No. of Patients	Percentage
Males	29	58
Females	21	42
Total	50	100

Table 2: Age wise distribution of patients

Age in years	No of patients	Percentage
20-40	6	12
40-60	19	38
>60	25	50
Total	50	100

Table 3: Injury related parameters

Parameters	Number of patients	Percentage
Mode of injury		
RTA	31	62
Fall due to slip	29	38
Limb involved		
Right Side	28	56

Left Side	22	44
	Co-morbidity	
None	19	38
Hypertension	12	24
Diabetes Mellitus	09	18
C.A.D	10	20

In the present study, the most common mechanism of injury was found to be road traffic accidents with a total of 31 (62%) patients and rest 29 (38%) were injured due to accidental fall on the ground. In the present study, the right side proximal humeral fracture occurred in 28 (56%) patients and left side proximal humeral fracture occurred in 22 (44%) patients respectively. Majority of the patients around 19 (38%) doesn't have any co-morbidities, a total of 31 patients had different comorbidities which includes; 9 (18%) had diabetes mellitus, 12 (24%) had hypertension and 10 (20%) had coronary artery disease.

Table 4: Onset and duration of sensory and motor block

	Supraclavicular block	**Interscalene block**	**p-value**
Onset time of sensory block (min)	3.50±0.83	3.1±0.62	>0.05
Onset time of motor block (min)	3.60±0.62	3.21±0.54	>0.05
Duration of sensory block (min)	495.53±49.41	759.42±84.15	<0.001
Duration of motor block (min)	438.52±47.32	659.23±38.74	<0.001

The mean time of the onset of sensory block in supraclavicular group was 3.50±0.83, in interscalene was 3.1±0.62 and onset of motor block (min) was 3.60±0.62 in supraclavicular group, in interscalene was 3.21±0.54. The duration of sensory block was 495.53±49.41 min and 759.42±84.15 min in supraclavicular group and interscalene block respectively. Moreover, duration motor block (min) in supraclavicular group was 438.52±47.32, in interscalene was 659.23±38.74 in table 4.

Table 5: Patient Satisfaction Score between

Patient Satisfaction Score	**Supraclavicular block**	**Interscalene block**
2	0 %	20%
3	50%	50%
4	50%	30%

Discussion

In the present study, we compared supraclavicular block and interscalene block approaches to perform brachial plexus block. We used a high-frequency (7 to 12 MHz) linear array transducer ultrasound probe, for better visualisation of the brachial plexus anatomy and neurostimulation confirmation for performance of blocks in all the groups. Our block performance times were comparable to previous studies using similar techniques [10, 11].

In our study, distribution of patients according to age and gender was similar in the two groups and statistically no significant difference was seen between the groups ($P > 0.05$). The result was in concordance with previously published studies. Chandrappa *et al*. conducted a study on the supraclavicular block and interscalene block stated that there is no statistical significance difference between age group and gender [12].

In the present study, the mean time of the onset of sensory block in supraclavicular group was 3.50±0.83, in interscalene was 3.1±0.62 and onset of motor block (min) was 3.60±0.62 in supraclavicular group, in interscalene was 3.21±0.54. The duration of sensory block was 495.53±49.41 min and 759.42±84.15 min in supraclavicular group and interscalene block respectively. However, the final spread of sensory and motor blockade was comparable between two groups. Our onset times in supraclavicular and interscalene

groups were similar to the previous study by Gürkan *et al*., while shorter than that reported by Fredrickson *et al*., and Koscielniak-Nielsen *et al*., which could be explained by the different techniques and the different local anaesthetic agents used in these studies [13-15].

Our success rate in supraclavicular and infraclavicular groups was comparable to previous reports using US-guided nerve blocks [16]. Though the interscalene block has been found to be highly effective for shoulder surgery, a high incidence of inadequate anaesthesia of the forearm and hand has been reported [17]. The high surgical effectiveness of interscalene blockade for arm and forearm surgery in our study may be due to the use of a different approach or choice of local anaesthetic type and volume. Plante *et al*., also reported greater success rates of anaesthesia in all distal nerve areas by placement of interscalene blocks below the level of C6 nerve roots. Injection below the C6 nerve root allows the diffusion within the deep cervical fascia, offering a wide and homogeneous spread of the local anaesthetic to the entire plexus. Conversely, injection near the C5 nerve root could lead to unintentional subepineural injection that limits the diffusion around the upper primary trunk [18].

After the completion of surgery, we observed the patient for their satisfaction using patient satisfaction score in all two groups. Clinically, the inference drawn from this analysis indicates that supraclavicular and interscalene blocks had better patient satisfaction as graded according to patient satisfaction score in table 5. In a study conducted by Idehen and Imarengiaye, patient satisfaction score was recorded. In this study, all patients were satisfied intraoperatively irrespective of the type of approach [19].

Conclusion

Thus, the supraclavicular approach might be a clinically comparable (regarding analgesic efficacy) but safer option (regarding the incidence of specific adverse effects) than the interscalene approach for proximal humerus fractures.

References

1. Sumrein BO, Huttunen TT, Launonen AP, Berg HE, Felländer-Tsai L, Mattila VM. Proximal humeral fractures in Sweden-a registry-based study. Osteoporos Int. 2017;28(3):901-907.
2. Park C, Jang S, Lee A, Kim HY, Lee YB, Kim TY, *et al*., Incidence and mortality after proximal humerus fractures over 50 years of age in South Korea: national claim data from 2008 to 2012. J Bone Metab. 2015;22(1):17-21.
3. Holloway KL, Bucki-Smith G, Morse AG, Brennan-Olsen SL, Kotowicz MA, Moloney DJ, *et al*., Humeral Fractures in South-Eastern Australia: Epidemiology and Risk Factors. Calcif Tissue Int. 2015;97(5):453-465.
4. Gaebler C, McQueen MM, Court-Brown CM. Minimally displaced proximal humeral fractures: epidemiology and outcome in 507 cases. Acta Orthop Scand. 2003;74(5):580-585.
5. Waliullah S, Kumar A. Difference between radiological and functional outcome with deltoid-splitting approach versus delto pectoral approach for the management of proximal humeral fractures with philosplate. J Ortho paed All Sci. 2013;1(1):14-17.
6. Roux A, Decroocq L, El Batti S, Bonnevialle N, Moineau G, Trojani C, *et al*., Epidemiology of proximal humerus fractures managed in a trauma center Orthop Traumatol. Surg. Res. 2012;98(6):715-719.
7. Karl JW, Olson PR, Rosen Wasser MP. The Epidemiology of Upper Extremity Fractures in the United States, 2009. J Orthop Trauma. 2015;29(8):e242-244.
8. Erasmo R, Guerra G, Guerra L. Fractures and fractured is locations of the proximal humerus: A retrospective analysis of 82 cases treated with the Philos locking plate. Injury. 2014;45(6):S43-S48.
9. Menendez ME, Ring D. Does the timing of surgery for proximal humeral fracture affect inpatient outcomes? J Shoulder Elbow Surg. 2014;23(9):1257-1262.
10. Doshi C, Sharma GM, Naik LG, Badgire KS, Qureshi F. Treatment of proximal humerus fractures

using PHILOS plate. Journal of clinical and diagnostic research: JCDR. 2017;11(7): RC10-RC13.
11. Jordan RW, Modi CS. A review of management options for proximal humeral fractures. Open Orthop J.2014; 8:148-156.
12. Chandrappa HN, Deepak BS, Mohapatra S. Combination of supraclavicular and low interscalene block with bupivacaine 0.5% and lignocaine 5% (heavy) for shoulder and upper limb surgery. J Anaesth Clin Pharmacol 2010;26:181-4.
13. Gürkan Y, Hosten T, Tekin M, Acar S, Solak M, Toker K. Comparison of ultrasound-guided supraclavicular and infraclavicular approaches for brachial plexus blockade. Agri 2012; 24:159-164
14. Fredrickson MJ, Patel A, Young S, Chinchanwala S. Speed of onset of 'corner pocket supraclavicular' and infraclavicular ultrasound guided brachial plexus block: a randomised observer blinded comparison. Anaesthesia 2009; 64:738-744.
15. Koscielniak-Nielsen ZJ, Frederiksen BS, Ramussen H, Hesslbjerg L. A comparison of ultrasound-guided supraclavicular and infraclavicular blocks for upper extremity surgery. Acta Anaesthesiol Scand 2009; 53:620-626.
16. Manek V, Venkatachalam K, Reddy V. Proximal humeral internal locking osteosynthesis for surgical fixation for displaced two part to four part fractures: A prospective study. Int. J Orthopaed. 2018;4(2):640-648.
17. Arumugam S, Arumugam V, Raviraman V. Surgical management of proximal humerus fracture treated with locking compression plate. Int. J Res Orthop 2017; 3: 1165-9.
18. Burkhart KJ, Dietz SO, Bastian L, Thelen U, Hoffmann R, Müller LP. The treatment of proximal humeral fracture in adults. Dtsch Arztebl Int. 2013; 110 (35–36):591-597.
19. Idehen HO, Imarengiaye CA. The effect of combining axillary brachial plexus block with interscalene or supraclavicular block for upper limb surgeries using neurostimulation technique. J West Afr. Coll. Surg. 2016;6:78-94.