

## Original Research Article

# Comparative study of ultrasound guided supra-scapular nerve block versus intra-articular steroid injection in frozen shoulder

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### ABSTRACT

**Background:** Frozen shoulder is one of the most common musculoskeletal problems seen in orthopaedics. Many treatment modes are available however, it is difficult to treat and data on the comparative efficacy of various interventions are limited. Intra-articular corticosteroid injection (IASI) is a commonly used to treat frozen shoulder pain. Supra-scapular nerve block (SSNB) is also effective method to treat pain in chronic diseases that affect the shoulder. The present study was done to compare efficacy of ultrasound guided SSNB and IASI in management of painful frozen shoulder.

**Methods:** 60 patients with painful frozen shoulder were divided in two groups, Group A received ultra-sound guided SSNB with 6 ml 0.5% Bupivacaine; Group B received IASI using 40 mg Triamcinolone. Outcome measures were shoulder ranges mainly lateral rotation and abduction, shoulder pain and disability index and visual analogue scale (VAS). Patients were followed-up on 2<sup>nd</sup> day, at 1<sup>st</sup>, 3<sup>rd</sup> and 6<sup>th</sup> week.

**Results:** All baseline parameters improved significantly in both groups; however, on comparison Group A showed significant improvement in passive lateral rotation on 2<sup>nd</sup> day and 1<sup>st</sup> week follow up (P =0.038 and 0.040 respectively). VAS score showed significance at all follow-up in Group A, whereas, in Group B significance was seen after 1 week. On inter group comparison Group A shows significance on 2<sup>nd</sup> day (P =0.050), 1<sup>st</sup> week (P =0.042) and 3<sup>rd</sup> week (P =0.036).

**Conclusions:** Both SSNB and IASI have efficacy in management of frozen shoulder. But supra-scapular nerve block is better than intra-articular injection and should be considered prior to steroid as it has early onset pain relief, early improvement in ranges, potentially lesser contraindications and side effects.

**Keywords:** Supra-scapular nerve block, Adhesive capsulitis, Periarthritis shoulder, Shoulder pain

### INTRODUCTION

Frozen shoulder is an insidious painful condition with gradual restriction of all planes of movement in the shoulder. The current consensus definition of the American Academy of Orthopaedic Surgeons is a condition of uncertain aetiology characterized by significant restriction of both active and passive shoulder motion that occurs in the absence of a known intrinsic shoulder disorder.<sup>1</sup> Several terms are used to define this condition like adhesive capsulitis, periarthritis shoulder,

etc. It is the main cause of shoulder pain and dysfunction in middle aged and elderly populations.<sup>2</sup> It most commonly affects women aged between 40 and 60 years. Frozen shoulder has been shown to have an incidence of 3% to 5% in the general population and up to 20% in those with diabetes. This disorder is one of the most common musculoskeletal problems seen in orthopaedics.<sup>3</sup>

Many treatments have been reported in the literature including rest, non-steroidal anti-inflammatory drugs (NSAIDs), active and passive mobilization, intra-articular

corticosteroids, hydro dilatation, manipulation under anesthesia, arthroscopic capsular release, intra-articular hyaluronate injection and supra-scapular nerve block etc. However, it is difficult to treat and there are limited data on the comparative efficacy of various interventions.

Intra-articular corticosteroid injections are a commonly used modality to treat frozen shoulder pain. Supra-scapular nerve block (SSNB) also is a safe and effective method to treat pain in chronic diseases that affect the shoulder, like irrecoverable injury of rotator cuff, rheumatoid arthritis, calcific tendinitis, stroke sequels and cancer pain.

In this study our primary aim is to compare efficacy of ultrasound guided supra-scapular nerve block and intra-articular shoulder joint steroid injection in management of painful frozen shoulder.

## METHODS

This study is prospective randomised control trial. After getting ethical clearance from institutional medical ethics committee, a total of 60 participants were included in the study.

### Inclusion criteria

Patients of both male and female having diffuse shoulder joint pain of more than 4 weeks duration and diagnosed as frozen shoulder clinically, who are willing to undergo procedure and are ready to come for follow-ups as required and patients who are willing to stop analgesic medication 1 week prior to procedure were included in the study.

### Exclusion criteria

Patients of age less than 18 years, shoulder pain less than 4 weeks, localised shoulder pain due to bicipital tendinitis, acromio-clavicular osteoarthritis, rotator cuff tear etc. shoulder pain due to acute trauma, fractures, post- surgery and bony deformity, bleeding disorder, active infection or any other contraindication for injection and patients sensitive to Bupivacaine were excluded from the study.

After baseline demographic evaluation all 60 participants fulfilling above criteria were randomly assigned to Group A and Group B using lottery method. Group A patients received ultrasonography guided supra-scapular nerve block using 6 ml of 0.5% Bupivacaine HCL (n=30). Group B patients received intra-articular shoulder joint steroid injection using 40 mg Triamcinolone acetone (n=30).

Pre and post intervention assessment was done using shoulder ranges mainly lateral rotation (with arm by the side of patient) and abduction, both active and passive ranges were taken into consideration, shoulder pain and

disability index (SPADI) and visual analogue scale (VAS). Post procedure patients were followed-up on 2<sup>nd</sup> day, at 1<sup>st</sup> week, at 3<sup>rd</sup> week and at 6<sup>th</sup> week.

Data analysis is done with the help of SPSS Software 15. Intra group assessment was done by median and inter-quartile ratio with one-way RM ANOVA test. Inter group analysis was done by Mann-Whitney test as per results of normality test. Qualitative data is presented with the help of frequency and percentage table, association among study group is assessed with the help of Chi-square test.

### Ultra-sonography guided supra-scapular nerve block procedure

Group A received ultrasound guided supra-scapular nerve block using 6 ml 0.5% Bupivacaine hydrochloride injection. The patient was placed in a sitting position with the affected hand resting by the side of body on his lap. The spine of scapula was visualised by placing ultrasound transducer (Medison sonoace 5-12 MHz, 38 mm broadband linear array) and sterile jelly over spine of scapula. Transducer was then gradually moved laterally along the spine to locate supraspinatous fossa as given in Figure 1.



**Figure 1: Ultrasound image of supraspinatous fossa with supra scapular notch and transverse scapular ligament.**

Within the fossa supra-scapular artery can be visualised using Doppler, it acts as landmark for supra-scapular nerve which lies in close proximity to artery (as identifying supra-scapular nerve with low resolution can be difficult). With higher resolution supra-scapular nerve can be seen as a round hyper-echoic structure beneath the transverse scapular ligament in the scapular notch. After localising nerve, part prepared and excess jelly was wiped and cleaned with surgical spirit. SCNB was given using 6 ml of 0.5% Bupivacaine HCL by 21-gauge 38 mm needle under ultra-sound guidance as given in Figure 2.



**Figure 2: Supra-scapular nerve block using ultrasound guidance.**

***Intra-articular shoulder joint steroid injection procedure***

Group-B patients received intra-articular shoulder steroid injection. Part was completely exposed. Patient was placed in sitting position with the affected shoulder towards the operator. The patient's arm was internally rotated across the waist, by placing the forearm on his lap close to his abdomen. The posterior approach for entry was used. Part was prepared using povidone iodine and surgical spirit. The 22-gauge 38 mm needle was inserted two fingerbreadths inferior and medial to the posterolateral corner of the acromion and directed antero-medially towards the coracoid process. 40mg of 1ml injection Triamcinolone acetonide was injected intra-articular in shoulder joint as shown in Figure 3.



**Figure 3: Intra-articular shoulder joint injection.**

Both the patient groups were advised local Ice fomentation at the injection site and regular therapeutic

exercises for frozen shoulder. No Pain killers were prescribed post injection in both groups of patients.

**RESULTS**

The baseline demographic data as in Table 1 do not show any significant difference between two groups. The association of diabetes mellitus as a co-morbid condition was seen in 12 patients of Group A and 10 patients of Group B. However, this association was not statistically significant (P =0.592). The mean disease duration was 2.52±1.05 months in Group A and 3.20±1.58 months in Group B (P =0.128).

**Table 1: Demographic details of study population.**

Study Parameters	Group A	Group B	P Value
<b>Age</b>	51.67±12.23	58.97±12.67	0.027
<b>Sex</b>	Male 22 (73.3%)	21 (70%)	0.774
	Female 8 (26.7%)	9 (30%)	
<b>Side</b>	Left 12	12	1.000
	Right 18	18	
<b>Diabetes mellitus</b>	Yes 12	10	0.592
	No 18	20	
<b>Duration (months)</b>	2.52±1.05	3.20±1.58	0.128

Active and passive ranges of both lateral rotation and abduction ranges were taken in consideration during this study.

The pre-operative “median range and (inter-quartile ratio)” of active and passive lateral rotation for Group A were 30° (15) and 45° (20) respectively whereas for Group B ranges were 32.50° (15) and 40° (15) respectively. There was no statistical significance in both groups with P value 0.828 in active range and 0.371 in passive range.

During the subsequent follow-up the active range improved from 30° (15) to 50° (10) by 6<sup>th</sup> week in Group A and from 32.50° (15) to 52° (15) in Group B. The intra group result shows statistical significance in both group; however inter group result do not show statistical significance at any follow up as shown in Figure 4.

Passive lateral rotation improved from 45° (20) to 57.50° (10) by 6<sup>th</sup> week in Group A and from 40° (15) to 55° (10) in Group B. The intra group result shows statistical significance in both groups, inter group result showed statistical significance on 2<sup>nd</sup> day and 1<sup>st</sup> week follow up with P-value 0.038 and 0.040 respectively as shown in Figure 5.

The pre-operative “median range and (inter-quartile ratio)” of active and passive abduction for Group A were 82.50° (40) and 105° (50) respectively whereas for Group B ranges were 87.50° (40) and 95° (30) respectively.

There was no statistical significance in both groups with P value 1.000 in active range and 0.489 in passive range.

During the subsequent follow-up the active range improved from 82.5° (40) to 130° (50) by 6<sup>th</sup> week in Group A and from 87.50° (40) to 130° (65) in Group B. the intra group result shows statistical significance in both group; however inter group result do not show statistical significance at any follow up as shown in Figure 6.

Passive abduction improved from 105° (50) to 140° (50) by 6<sup>th</sup> week in Group A and from 95° (30) to 135° (45) in Group B. The intra group result shows statistical significance in both groups; however inter group result does not show any statistical significance as shown in Figure 7.

The pre-operative median range and (inter- quartile ratio) of VAS score is 7 (2) in Group A and 7 (2) in Group B. (P=0.624). During the subsequent follow up, the median range improved significantly in both groups, significance was seen at all follow-up in supra-scapular nerve block group, whereas, in intra-articular shoulder injection significance was seen after 1 week. Inter group comparison shows significance on 2<sup>nd</sup> day (P =0.050), 1<sup>st</sup> week (P =0.042) and 3<sup>rd</sup> week (P =0.036) as shown in Figure 8.

The pre-operative median range and (inter- quartile ratio) SPADI score is 76.92 (18.46) in Group A and 73.46 (9.23) in Group B. (P =0.652). During the subsequent follow up, the median range improved significantly in both groups; however inter group comparison shows not significance as shown in Figure 9.

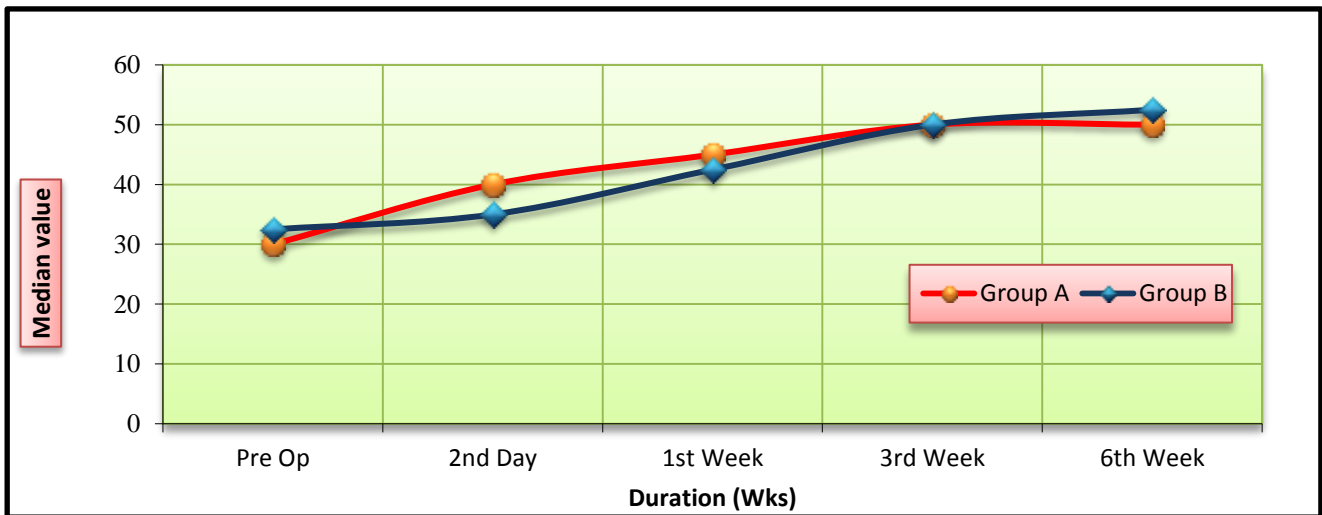


Figure 4: Comparison among study group for active lateral rotation at various time intervals in Group A and Group B.

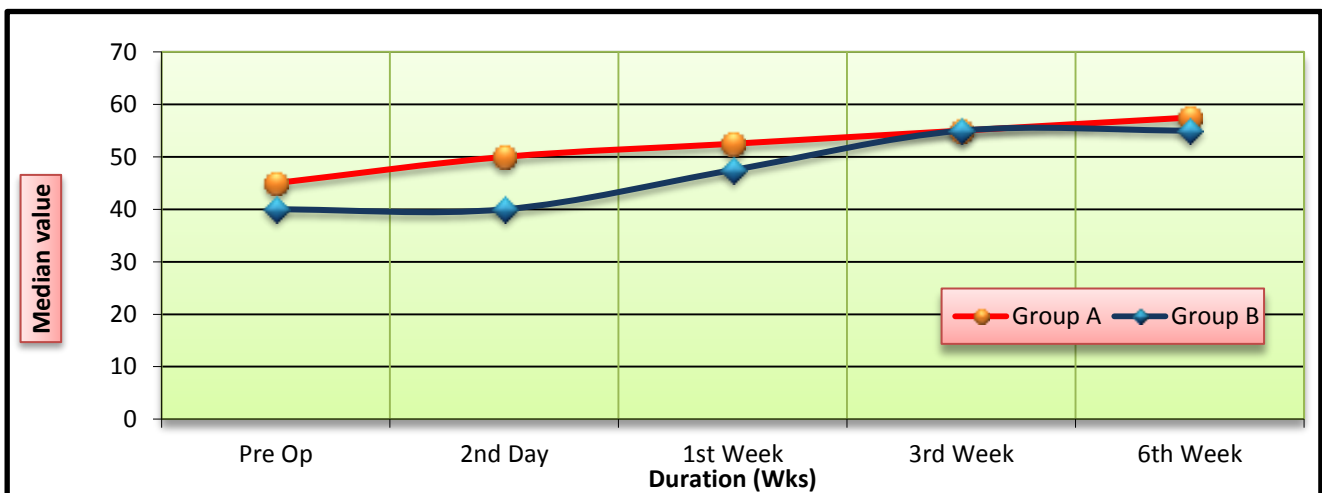


Figure 5: Comparison among study group for passive lateral rotation at various time intervals in Group A and Group B.

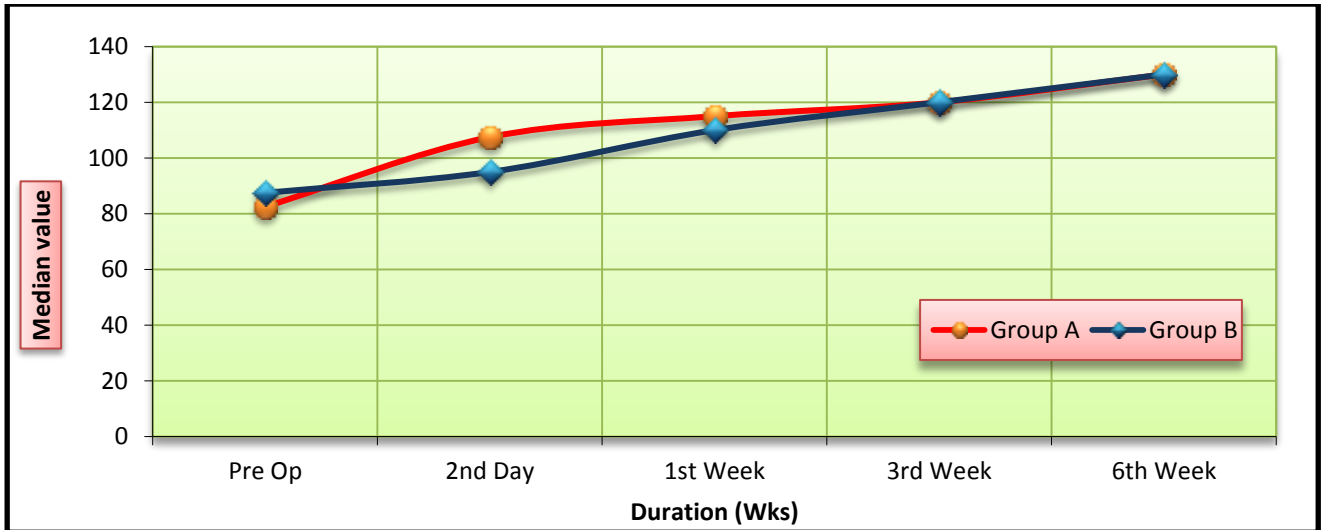


Figure 6: Comparison among study group for active abduction at various time intervals in Group A and Group B.

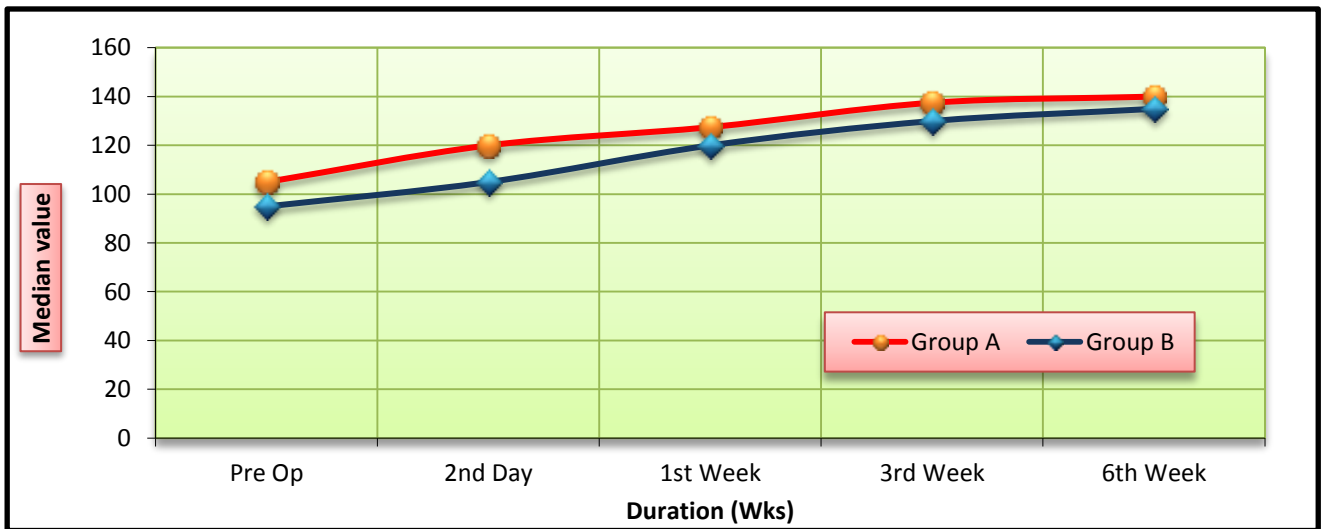


Figure 7: Comparison among study group for passive abduction at various time intervals in Group A and Group B.

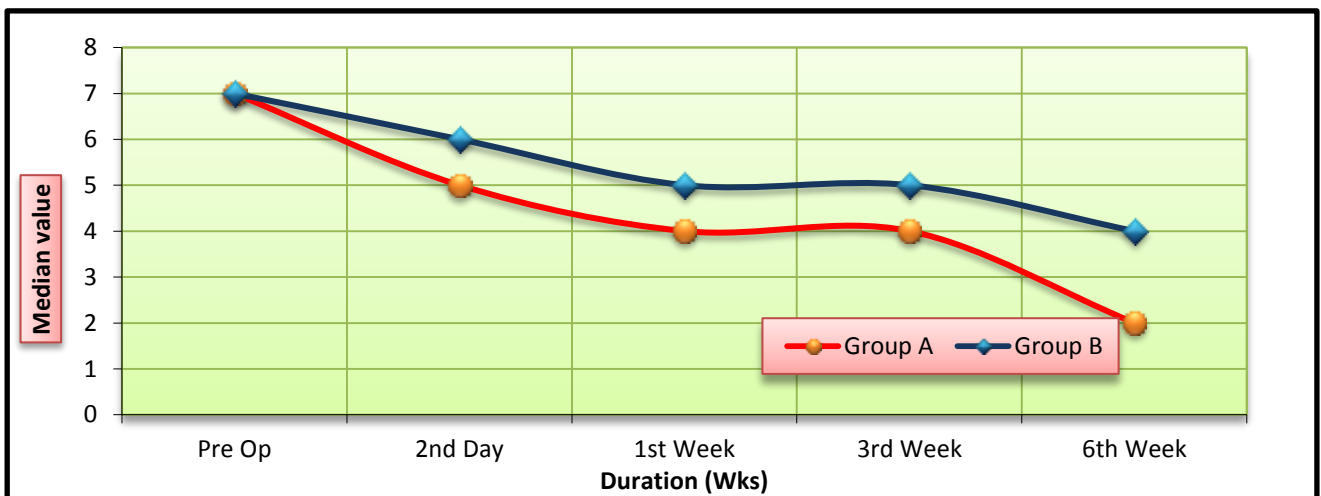
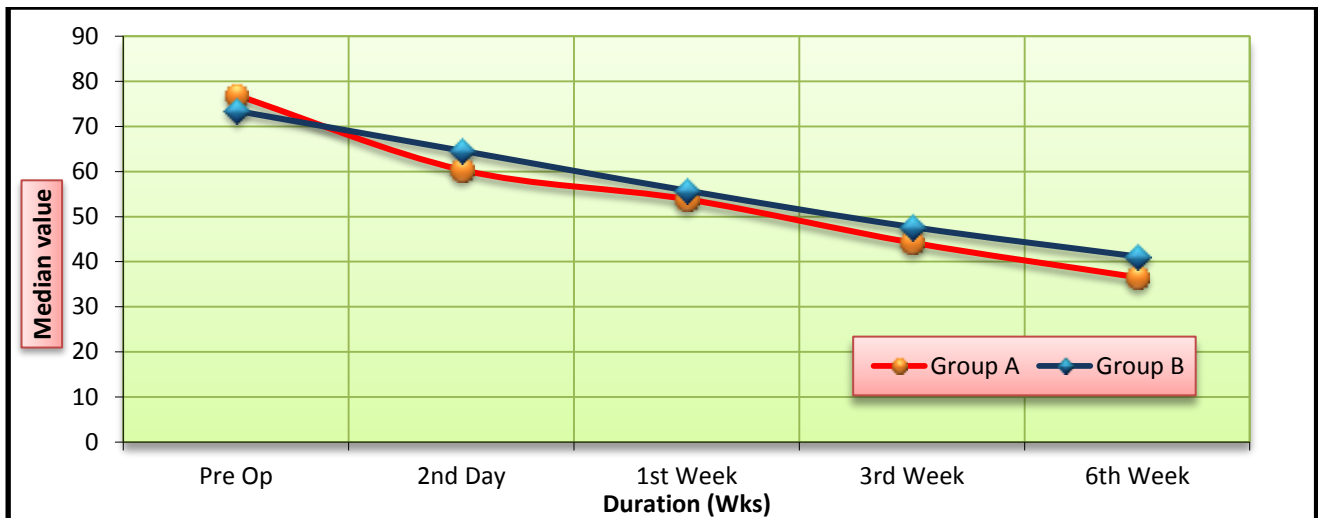


Figure 8: Comparison among study group for visual analogue scale at various time intervals in Group A and Group B.



**Figure 9: Comparison among study group on SPADI at various time intervals in Group A and Group B.**

## DISCUSSION

All 60 participants completed study; there was no drop-out or loss of follow-up of any patient. The demographic data does not show statistical significance suggesting a successful randomisation. The total number of right side shoulder affected was 36 and left side was 24. The average duration of disease was between 1 to 5 months, with pain and restriction of range of motion. Most of the patients were in stage 2 of the disease state as described by Hannafin et al.<sup>4</sup>

22 patients out of 60 patients (36.7%) had associated diabetes. This data was similar to the study conducted by Charles et al.<sup>5</sup> The risk ratio for diabetes in the frozen shoulder group was 5.9 for males and 5.0 for females.

The active and passive lateral rotation range improved in both groups with an average improvement of 15<sup>0</sup> to 20<sup>0</sup>, and that most of the patients were able to achieve full range. However it was notable that the passive range showed significant improvement on 2<sup>nd</sup> day and 1<sup>st</sup> week in Group A as compared to Group B. The active and passive abduction range improved in both groups with an average improvement of 50<sup>0</sup> to 60<sup>0</sup>. Our results were similar to that of study done by David et al and Taskaynatan et al.<sup>6,7</sup>

VAS score improved significantly in both groups. But Group A showed significance at all follow-up whereas, Group B showed significance after 1 week. Also on comparing both groups, Group A showed significance on 2<sup>nd</sup> day, 1<sup>st</sup> week, and 3<sup>rd</sup> week. This suggests that the supra-scapular nerve block was more effective in controlling pain at initial phase as compared to intra articular steroid.

SPADI score improved in both groups with significant intra group result, but Inter group result showed no statistical significance. This suggested that both

interventions were equally effective in terms of pain and disability score of SPADI.

Our results for VAS and SPADI score were comparable with study done by Iqbal et al and Shanahan et al showing efficacy of supra-scapular nerve block in shoulder pain management.<sup>8,9</sup> Carrette et al and Siraj, et al had similar results for intra-articular steroid.<sup>10,11</sup>

In our study it was clearly seen that there is definite efficacy of both, supra-scapular nerve block and intra-articular shoulder steroid injection, in treatment of frozen shoulder. However, our study results shows that supra-scapular nerve block is effective than intra-articular shoulder joint steroid injection as shown by significant difference in passive lateral rotation (p-value, 2<sup>nd</sup> day =0.038 and 1<sup>st</sup> week =0.040), visual analogue scale at 1<sup>st</sup> week (P =0.042) and 3<sup>rd</sup> week (P =0.036). Also, within the group changes in VAS showed statistical significance at 2<sup>nd</sup> day in group A and after 1 week in group B, suggesting early onset of pain relief in group A. However, by the end of our study, the effectiveness in both groups was more or less similar.

In view of complications, there was no report of any complication, however patient receiving intra-articular injection complain of pain post injection. In case of supra-scapular nerve block the postulated complications are systemic toxicity and peripheral nerve injury. There was no incidence of this complication as drug was given under ultra-sound guidance and after negative aspiration (to avoid intra-arterial injection in supra-scapular artery which lies in close proximity to nerve).

## CONCLUSION

Despite considerable research and interest in the condition, frozen shoulder remains a controversial and debatable disease. Currently, no standard medical, surgical, or therapy regimen is universally accepted as the

most efficacious treatment for restoring motion in patients with frozen shoulder. Goals of treatment are to decrease pain, increase range of movement (ROM) and improve function.

In this study we found the efficacy of both supra-scapular nerve block and intra-articular shoulder joint injection in treatment of frozen shoulder. However, supra-scapular nerve block is better than intra-articular steroid considering the facts of early onset pain relief, early improvement in ranges, least complications, contraindications or side effects and ease of administration under ultra-sound guidance as an outpatient procedure. At the same time, intra-articular injection requires aseptic set-up (preferably operation theatre) and has significant contraindication and side effects.

Therefore, we conclude that, both supra-scapular nerve block and intra-articular shoulder steroid injection have efficacy in management of frozen shoulder. But supra-scapular nerve block is better than intra-articular injection and should be considered prior to steroid as it has potentially lesser contraindications and side effects.

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*Ethical approval: The study was approved by the institutional ethics committee*

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