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Original Article

Physical Medicine and Rehabilitation Section

Ultrasound Guided Suprascapular Nerve Block versus Intra-articular Steroid Injection in the Treatment of Periarthritis Shoulder: A Randomised Clinical Trial

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ABSTRACT

Introduction: Suprascapular Nerve Block (SSNB) and Intra-articular (IA) steroid injection are used for management of Periarthritis (PA) of shoulder with variable results.

Aim: To compare the efficacy of SSNB and IA steroid injection for management of PA shoulder.

Materials and Methods: In this randomised clinical trial, 100 patients of PA shoulder from Physical Medicine and Rehabilitation (PMR) Outpatient Department (OPD) were enrolled over the period of 18 months and were divided in two equal groups using computerised block randomisation. Group A patients received IA methylprednisolone while Group B patients were subjected to Ultrasound (USG) guided SSNB. Assessment was done at baseline and at 1, 4 and 12 weeks after the intervention, using Numerical Pain Rating Scale (NPRS), active and passive Range Of Motion (ROM) of shoulder and Shoulder Pain And Disability Index (SPADI). Statistical significance was determined by Chi-square for qualitative variables and by unpaired t-test or paired t-test for quantitative variables. The $p<0.05$ was taken as a level of statistical significance.

Results: Both groups had significant improvement ($p<0.0005$) in pain, ROM and functional index at all follow-ups. Comparison between the groups revealed a better outcome in Group A, in terms of NPRS, SPADI score, internal and external rotations at 1, 4 and 12 weeks ($p<0.0005$). Both the groups were comparable in terms of abduction, flexion and extension at first week ($p<0.0005$) with Group A showing better improvement at subsequent follow-up.

Conclusion: Both SSNB and IA steroid injection can be used for treatment of PA shoulder but IA steroid injections gave better results as compared to SSNB. SSNB may be used as an adjunct to exercise therapy and as an alternative to IA steroid injection if required.

Keywords: Bupivacaine, Intra-articular methylprednisolone, Shoulder pain and disability index

INTRODUCTION

Peripheral nerve blocks such as femoral nerve block [1], genicular nerve block [2] are well-documented treatment options for management of various painful conditions in their area of supply. Suprascapular nerve is a mixed nerve which originates from upper trunk of brachial plexus having C5 and C6 nerve roots [3]. It provides two motor branches for supraspinatus and infraspinatus muscles and sensory branches to acromioclavicular joint, glenohumeral joint, coracoclavicular ligament, coracohumeral ligaments and subacromial bursa [4]. It provides sensation to superior and posterior part of capsule of shoulder joint. A 70% of shoulder articular sensation is provided by suprascapular nerve and remaining by axillary nerve [5]. The sensory branches to shoulder joint emerge from suprascapular nerve after passing through suprascapular notch below superior transverse scapular ligament [4]. Hence, SSNB is ideal for treatment of various painful conditions in and around the shoulder joint. It is safe and efficacious and has been used in conditions like non specific shoulder pain,[6] chronic shoulder pain [7], rotator cuff tendinitis [8], rheumatoid arthritis [9], hemiplegic shoulder pain [10], postarthroscopic shoulder surgery pain [11], and PA shoulder [12-14].

The PA shoulder is defined by the American Shoulder and Elbow Society as “a condition characterised by functional restriction of both active and passive shoulder motion for which radiographs of the glenohumeral joint are essentially unremarkable except for the possible presence of osteopenia or calcific tendonitis” [15]. It occurs in approximately 2-5% of the general population [16], and is slightly more common in women than men [17]. It is most frequently seen in 5th and 6th decade of life [18]. It is usually an idiopathic condition but may be associated with diabetes mellitus, inflammatory arthritis, trauma, prolonged immobilisation, thyroid disease, cerebrovascular accident, myocardial infarction, or autoimmune diseases. Number of treatment modalities has been reported including rest, Non steroidal Anti-Inflammatory Drugs (NSAIDs), active and passive mobilisation, physical modalities, IA corticosteroids, hyaluronate and Platelet Rich Plasma (PRP) injections, hydro dilatation, manipulation under anaesthesia, arthroscopic capsular release and regional nerve blocks. Of these, IA steroid is one of the most commonly employed treatment modality. Its effectiveness in PA shoulder has been reported in the literature [19-23]. However, some cases fail to respond to IA steroid. Moreover, IA steroid per se may be contraindicated in some patients. Owing to its self-limiting nature [24,25], physical therapy and active use of the joint augments recovery in PA shoulder [26]. However, pain is a major hindrance to early initiation of physical therapy and active use of the joint. In this regard, SSNB may be an alternative to IA steroid injection. SSNB offers pain relief allowing the patient to carry out exercise therapy and gradual routine activities and thereby promote early recovery [26,27]. However, there is inconclusive evidence of efficacy of SSNB in PA shoulder. Therefore, this study was conducted to compare the effectiveness of SSNB versus IA corticosteroid injection in the treatment of PA shoulder.

MATERIALS AND METHODS

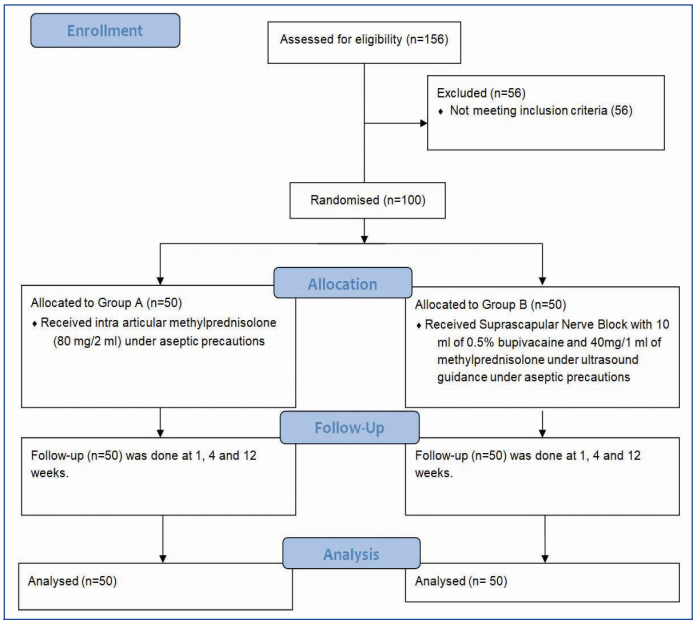
This randomised clinical trial was conducted in Department of Physical Medicine and Rehabilitation of a tertiary care hospital during September 2014 to January 2016. Approval of Institutional Ethics Committee (IEC/VMMC/SJH/2014/386) was taken. Written informed consent was taken from participants and they were assured of confidentiality of the data and their right to participate in the study.

With the prevalence rate taken as 3% [16], with α=0.05, margin of error as 5% and power equal to 80%, calculated sample size per group was 45. Assuming 10% dropouts, total sample size taken was 100.

Inclusion and exclusion criteria: Hundred patients above 18 years of age with shoulder pain and stiffness in one or both shoulders for at least four weeks and clinically diagnosed with PA shoulder were enrolled from the OPD. Patients with history of substantial shoulder trauma, surgery, dislocation, or fractures in the shoulder area, history of any IA injection in the involved shoulder during the preceding six months, chronic diseases like rheumatoid arthritis, gout, clotting disorders, uncontrolled diabetes mellitus and those with history of allergy to local anaesthetics were excluded from the study.

Study Procedure

The enrolled patients were distributed over two groups (Group A and B) using computerised block randomisation. This was a single blinded study as patients were explained about both the procedures but were not aware of the group they were allotted [Table/Fig-1].



[Table/Fig-1]: CONSORT 2010 flow diagram.

Under all aseptic precautions, Group A patients received IA injection of 80 mg/2 mL of methylprednisolone (depot preparation) into the glenohumeral joint using 21 gauze 1.5 inch needle with posterior approach while Group B patients received 40 mg/1 mL of methylprednisolone (depot preparation) along with 10 mL of 0.5% bupivacaine injection (after sensitivity testing) near suprascapular nerve after identifying suprascapular notch under ultrasound guidance using 20 gauze spinal needle as described by Harmon D and Hearty C [28]. All patients in both groups underwent daily 30 minutes exercise program including active and passive ROM exercises of shoulder, posterior capsular stretching exercises and Codmann-Pendulum exercises. Patients were taught exercises and they were supervised for initial five sessions and after that they were advised to practice at home for 30 minutes daily throughout the period of study. Patients were advised to take tablet Paracetamol 500 mg if there is increase in pain to a maximum of 2 gram per day.

The outcome of treatment modalities was assessed in terms of reduction of pain, improvement in limitation of ROM and functional improvement. Each patient was assessed before intervention and at 1, 4 and 12 weeks after intervention using 0-10 NPRS [29], Active and passive ROM of shoulder using hand held goniometer and SPADI [30]. Either patients or attendants had administered the questionnaire.

STATISTICAL ANALYSIS

Data was collected and entered in MS Excel. Normalcy of distribution was tested using Kolmogorov Smirnov test. For comparing the statistical significance of qualitative variables between the two groups, Chi-square test was used. For quantitative variables statistical significance was determined by unpaired t-test for intergroup comparison and paired t-test for intragroup comparison. The p<0.05 was taken as a level of statistical significance. The data was analysed by Statistical Package for the Social Sciences (SPSS) statistical software version 17.0.

RESULTS

A total of 100 subjects, 50 in each group were enrolled in the study. Mean age of patients in group A was 50.02±8.81 years and that of group B was 50.52±8.63 years with majority of them being females in both groups. Mean duration of the condition was 4.4±2.45 months and 4.2±2.03 months in Group A and B, respectively. Therefore, there was uniform distribution of patients in both the groups [Table/Fig-2].

Characteristics		Group A	Group B	p-value
Age (years)		50.02±8.81	50.52±8.63	0.775*
Gender	Male	23	21	0.690**
	Female	27	29	
Laterality	Left	20	24	0.420**
	Right	30	26	
Duration (months)		4.4±2.45	4.2±2.03	0.658*

[Table/Fig-2]: Comparison of demographic and clinical characteristics between the two groups.
*Statistical test used was unpaired t-test; **Statistical test used was Chi-square test

At the time of enrollment into the study, the mean score on NPRS in group-A was 7.64±1.2 and in Group-B was 7.72±1.29 without any statistical difference (p=0.7). Significant reduction of pain was observed in both the groups at all three follow-ups following intervention (p<0.0005). While comparing the two groups, group-A patients showed significantly better improvement in pain throughout the study period [Table/Fig-3].

	Group A		Group B		
Duration	Mean±SD	p-value* (compared from baseline)	Mean±SD	p-value* (compared from baseline)	p-value** (comparison between two groups)
0 week	7.64±1.2		7.72±1.29		0.7
1 week	4.78±1.93	<0.0005	5.84±1.8	<0.0005	0.005
4 weeks	3.6±1.55	<0.0005	5.34±1.73	<0.0005	<0.0005
12 weeks	2.9±1.59	<0.0005	4.84±1.61	<0.0005	<0.0005

[Table/Fig-3]: Comparison of mean range Numerical Pain Rating Scale (NPRS) between the two groups.
*Statistical test used was paired t-test; **Statistical test used was unpaired t-test

Objective measurement of ROM of the involved joints in the two groups was comparable at initial assessment. Statistically significant improvement in active as well as passive ROM was recorded following intervention in both the groups. This improvement was observed over all directions of motion. At one week following intervention the improvement in passive and active abduction, flexion and extension were comparable in the two groups. However, in case of rotational movements group-A patients showed better improvement at one week. In rest of the follow-ups both the groups showed significant improvement as compared to baseline. Intergroup comparison at four weeks and 12 weeks follow-ups showed better improvement in group-A in both active and passive movements in all directions [Table/Fig-4,5].

In terms of functional index as assessed by SPADI score the two groups were comparable at the initiation of the study [Table/Fig-6]. Initial mean SPADI score of 56.25±11.48 in Group A gradually improved over the study period to reach 19.69±15.13 at 12 weeks following IA methylprednisolone injection. Similarly, in Group B patients, the same improved from 58.42±12.8 to 43.23±13.5 following SSNB. These improvements in both the groups were statistically significant in each follow-up assessment. When the

Variables	Duration	Group A		Group B		p-value** (comparison between two groups)
		Mean±SD	p-value* (compared from baseline)	Mean±SD	p-value* (compared from baseline)	
Abduction (active)	0 week	102.4±26.84		108±27.18		0.303
	1 week	122.2±29.98	<0.0005	115.8±28.15	0.0005	0.274
	4 weeks	139.2±25.22	<0.0005	123.8±27.78	<0.0005	0.003
	12 weeks	153.4±19.55	<0.0005	129.6±24.57	<0.0005	<0.0005
Flexion (active)	0 week	109.2±23.28		118.2±25.45		0.068
	1 week	130±24.83	<0.0005	127.6±25.6	<0.0005	0.635
	4 weeks	143.8±23.02	<0.0005	134.6±22.33	<0.0005	0.045
	12 weeks	156.4±17.23	<0.0005	1141±21.31	<0.0005	<0.0005
Extension (active)	0 week	40±12.12		41±12.65		0.685
	1 week	52.8±12.78	<0.0005	48.8±12.56	<0.0005	0.118
	4 weeks	61±9.94	<0.0005	54.2±10.12	<0.0005	0.001
	12 weeks	65.4±8.38	<0.0005	57±9.53	<0.0005	<0.0005
Internal rotation (active)	0 week	29.4±2.19		25.2±10.15		0.064
	1 week	46.8±13.47	<0.0005	34±12.78	<0.0005	<0.0005
	4 weeks	58±14	<0.0005	41.6±13.15	<0.0005	<0.0005
	12 weeks	65.8±12.3	<0.0005	45.2±13.28	<0.0005	<0.0005
External rotation (active)	0 week	30.8±11.04		30.2±11.69		0.792
	1 week	46.6±15.46	<0.0005	38.2±13.8	<0.0005	0.005
	4 weeks	58.6±14.98	<0.0005	43±13.44	<0.0005	<0.0005
	12 weeks	68.2±14.38	<0.0005	46.2±12.76	<0.0005	<0.0005

[Table/Fig-4]: Comparison of mean range active ROM (degrees) between the two groups.
*Statistical test used was paired t-test; **Statistical test used was unpaired t-test

Variables	Duration	Group A		Group B		p-value** (comparison between two groups)
		Mean±SD	p-value* (compared from baseline)	Mean±SD	p-value* (compared from baseline)	
Abduction (passive)	0 week	112.2±26.31		112.8±25.95		0.76
	1 week	125.4±28.98	<0.0005	119.2±26.33	<0.0005	0.265
	4 weeks	141.8±24.96	<0.0005	125.2±24.85	<0.0005	0.001
	12 weeks	155.2±20.33	<0.0005	129.8±24.57	<0.0005	<0.0005
Flexion (passive)	0 week	117±23.5		123.4±23.79		0.179
	1 week	134±24	0.0005	130.6±25.59	<0.0005	0.495
	4 weeks	147.4±22.57	<0.0005	137.6±21.81	<0.0005	0.029
	12 weeks	159±16.81	<0.0005	141.6±20.74	<0.0005	<0.0005
Extension (passive)	0 week	43.6±12.41		43.2±12.03		0.87
	1 week	54.6±12.49	<0.0005	50±11.78	<0.0005	0.061
	4 weeks	63.4±10.42	<0.0005	54.4±10.33	<0.0005	<0.0005
	12 weeks	67.4±8.99	<0.0005	57.8±8.87	<0.0005	<0.0005
Internal rotation (passive)	0 week	32.4±12.05		28.6±9.69		0.085
	1 week	49±14.32	<0.0005	35.4±12.32	<0.0005	<0.0005
	4 weeks	60.8±14.12	<0.0005	41.6±13.15	<0.0005	<0.0005
	12 weeks	68.6±12.46	<0.0005	45.8±12.79	<0.0005	<0.0005
External rotation (passive)	0 week	33.4±11.54		32.6±12.26		0.738
	1 week	49.4±15.83	<0.0005	39±13.44	<0.0005	0.0006
	4 weeks	62±14.57	<0.0005	43.4±13.18	<0.0005	<0.0005
	12 weeks	70.2±14.07	<0.0005	46.6±12.06	<0.0005	<0.0005

[Table/Fig-5]: Comparison of mean range passive ROM (degrees) between the two groups.
*Statistical test used was paired t-test; **Statistical test used was unpaired t-test

Duration	Group A		Group B		p-value** (comparison between two groups)
	Mean±SD	p-value* (compared from baseline)	Mean±SD	p-value* (compared from baseline)	
0 week	56.25±11.48		58.42±12.8		0.374
1 week	43.35±12.53	<0.0005	51.67±13.9	<0.0005	0.002
4 weeks	26.91±10.39	<0.0005	47.02±13.1	<0.0005	<0.0005
12 weeks	19.69±15.13	<0.0005	43.23±13.5	<0.0005	<0.0005

[Table/Fig-6]: Comparison of mean range SPADI scores between the two groups.
*Statistical test used was paired t-test; **Statistical test used was unpaired t-test

data was compared between the two groups, significant difference was observed between the groups with better result in group-A in each follow-up.

DISCUSSION

In the present study, the mean age of the study population was around 50 years. Similar finding has been documented by various authors previously [17,18].

Pain, one of the primary components of the symptomatology of PA shoulder has been reported to be reduced following SSNB [7,12-14]. Similar findings were documented in the present study. In the present study, significant pain reduction was observed till three months following SSNB as compared to the findings of Dahan TH et al., wherein 64% pain reduction was reported at one month [14]. However, in comparison to IA steroid injection, the latter was found to yield better improvement in terms of pain reduction. This finding of the present study was in contrast to the findings of Sheikh SI et al., Jones DS et al., and Sonune SP et al., where better improvement was recorded following SSNB [31-33]. On the other hand, Taskaynatan MA et al., reported similar efficacy of SSNB and steroid injection in terms of pain reduction in patients with non specific shoulder pain [6]. In a recent study, Verma D et al., recorded comparable efficacy of the two treatment regiments in the treatment of PA shoulder [34].

The improvement in ROM showed by the study population in the present study following SSNB was similar to previous studies [7,12,13]. Comparative results of IA steroid injection with SSNB suggest better outcome in range of movement after IA steroid injection. This finding was contradictory to that reported by Sheikh SI et al., and Jones DS et al., [31,32]. Taskaynatan MA et al., and Verma D et al., reported comparative outcome of both the treatment modalities in improving flexion, abduction and external rotation of shoulder [6,34]. Similarly, Sonune SP et al., observed comparable efficacy of SSNB and IA steroid injection in improving active and passive lateral rotation and abduction at three and six weeks. However, they noted better improvement in passive lateral rotation at 2nd day and one week following SSNB [33].

Following SSNB improvement in pain and ROM was found to be translated to improvement in functional status of the study population as measured in SPADI. Comparable efficacy has been reported by Shanahan EM et al., and Iqbal M et al., [7,35]. Shanahan EM et al., reported improvement in SPADI at 1, 4 and 12 weeks as compared to baseline score with a trend of increasing SPADI at 4th week onward [7]. Iqbal M et al., found significant reduction of SPADI at four weeks following SSNB [35]. In the present study, the same was found to be reduced significantly at four weeks which continued to reduce till 12 weeks. While comparing this finding with that following IA steroid injection similar trend was observed as in case of pain and ROM. However, comparable efficacy of SSNB and IA steroid injection in the treatment of PA shoulder in terms of SPADI has been reported by Sonune SP et al., and Verma D et al., [33,34].

Thus, the findings of the present study suggest that SSNB is an effective treatment modality for PA shoulder. However, in contrast to the findings of few previous studies [31,32], IA steroid injection showed better outcome. This finding was probably due to the fact that IA steroid injection reduces synovitis and fibrosis, thereby providing enhanced healing and overall better functional and clinical recovery whereas SSNB offers pain relief without directly affecting the local pathology in the shoulder joint. Also, authors noted few differences between earlier studies and the present one. First, number of patients enrolled in the present study was larger than those enrolled in earlier studies. Second, authors have assessed functional parameters using SPADI scores, whereas the earlier studies have not studied these parameters. These differences in the study design and pre and post intervention assessment methods can further explain the observed disparity in the findings.

A recent study however, documented the benefit of addition of SSNB with exercises and electrotherapy in the management of PA shoulder [27]. Ozkan K et al., recorded the beneficial effects in terms of pain relief and improved ROM of SSNB in PA shoulder patients not responding to IA steroids and suggested that SSNB increases tolerability to intense exercise program [13]. It is also suggested that, further studies with larger sample size need to be conducted with longer follow-up in order to conclusively comment on the comparative efficacy of SSNB over IA steroid injection and to establish it as a primary treatment option.

Limitation(s)

This study had its own limitations of short follow-up period of three months only.

CONCLUSION(S)

On the basis of this study, it can be concluded that both IA steroid injection and SSNB are effective treatment options for PA shoulder. However, IA steroid injections provide better results as compared to SSNB on long term basis. Therefore, SSNB may be used as an adjunct to exercise therapy and as an alternative to IA steroid injection if deemed necessary.

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