



Suprascapular Nerve Block as an Adjunct to Exercise Therapy in Periarthritis of Shoulder

Authors

Shehadad Kammili¹, Sreejith Kalathummarathu², P. Sreedevi Menon³,
George Joseph.N⁴

¹Assistant Professor, Dept of Physical Medicine and Rehabilitation, Govt. Medical College, Kozhikode, Kerala, India- 673008

²Assistant Professor, Dept of Physical Medicine and Rehabilitation, Govt. Medical College, Kozhikode
Email: sreejithpmr@gmail.com Mob: 8547184205

³Professor, Dept of Physical Medicine and Rehabilitation, Govt. Medical College, Kozhikode
Email: drdevisreemukund@yahoo.com Mob; 9947412900

⁴Professor, Dept of Physical Medicine and Rehabilitation, Amrita Institute of Medical Sciences, Kochi
Email: georjosen53@gmail.com Mob: 9447071253

Corresponding Author

Dr Shehadad.K

Assistant Professor, Department of Physical Medicine and Rehabilitation, Govt. Medical College
Kozhikode- 673008

Email: drshehadad@gmail.com Mob- 9946909044

Abstract

Background: Periarthritis of the shoulder is a fairly common clinical condition. Mobilisation exercises are the mainstay of treatment and various pain relieving modalities are also used as an adjunct to treatment. Suprascapular nerve block (SSNB) is used to treat painful shoulder condition and is found to be effective in treatment of periarthritis of the shoulder.

Objective: To compare the effectiveness of Suprascapular nerve block with exercise therapy and exercise therapy alone in terms of reduction in pain and improvement in range of motion (ROM) of shoulder in patients with periarthritis of the shoulder.

Study design: Randomized controlled study conducted in a tertiary level multi specialty hospital.

Materials and Methods: 30 patients with periarthritis of shoulder was randomly allocated into a group of exercise therapy and another group of exercise therapy preceded by suprascapular nerve block (SSNB). Pain by VAS and shoulder ROM was assessed in both groups at 0,1,4 and 12 weeks. The parameters were assessed before and immediately after SSNB also.

Results: The SSNB group showed earlier improvement in pain and ROM thus showing a positive impact on morbidity. The results in both groups were comparable at 12 weeks.

Keywords: Periarthritis of shoulder, suprascapular nerve block.

Introduction

The term “frozen shoulder” was first introduced by Codman in 1934¹ for a painful shoulder condition of insidious onset that was associated with stiffness and difficulty in sleeping on the affected side with marked reduction in forward elevation and external rotation. It is also known as periarthritis or adhesive capsulitis^{2 13}. Frozen shoulder patients usually present in the sixth decade of life, and onset before the age of 40 is very uncommon³. The peak age is 56, and the condition occurs slightly more often in women than men^{3 4}

Stages of the disease

There are three overlapping stages for the disease.

- i. Painful freezing phase of duration 10-36 weeks. In this stage there will be pain and stiffness around the shoulder with no history of injury.
- ii. Adhesive phase which may extend to 4-12 months. Here the pain gradually subsides but stiffness remains. Pain is apparent only at the extremes of movement. Gross reduction of glenohumeral movements, with near total obliteration of external rotation is seen.
- iii. Resolution phase which may take 12-42 months⁵.

Pathogenesis

The etiology of frozen shoulder remains unclear. The disease process particularly affects the antero superior joint capsule and the coracohumeral ligament¹³

Arthroscopy shows a small joint with loss of the axillary fold and tight anterior capsule, mild or moderate synovitis, and no adhesions^{3,14}.

Evidence shows there exist synovial inflammation with subsequent reactive capsular fibrosis. A dense matrix of type I and type III collagen is laid down by fibroblasts and myofibroblasts in the joint capsule. Subsequently this tissue contracts. Increased growth factors, cytokines, and expression of matrix metalloproteinases in capsular biopsy specimens obtained from patients with primary and secondary frozen shoulder indicate

that these are involved in the inflammatory and fibrotic cascades seen in frozen shoulder³.

Clinical features

Patients usually present with shoulder pain that is worse at night and difficulty in performing overhead activities. There is limitation of passive ROM especially external rotation. This is the pathognomic sign of a frozen shoulder^{3 4 5}.

Although the natural history of frozen shoulder is for ultimate resolution, this may not be complete. The condition is either primary or associated with many other diseases^{3 6 10 11}.

Investigations

There are few specific laboratory tests or radiological markers for frozen shoulder, and the diagnosis is essentially clinical. Immunological studies (such as human leucocyte antigen B27), C reactive protein, and erythrocyte sedimentation rate are all normal and would be measured only to exclude other conditions. Plain radiographs may show periarticular osteopenia as a result of disuse^{3,12}. Contrast technetium-99m diphosphonate bone scan shows an increased uptake on the affected side in 92% of patients compared with the opposite side or with controls¹². Arthrography shows characteristic findings of limitation of capacity of the shoulder joint (5-10 ml compared with 25-30 ml in the normal joint) and a small or non-existent dependent axillary fold^{3 12 13}. However in most units, arthrography is a historical investigation in frozen shoulder. Ultrasonogram is a useful tool mainly to exclude other pathologies. Magnetic resonance imaging may show a slight thickening in the joint capsule and the coracohumeral ligament as well as the sub coracoid triangle sign³.

Treatment

Educating patients helps to reduce frustration and encourages compliance. Ideally, the treatment of frozen shoulder should be tailored to the stage of the disease.

Treatment in the painful freezing phase

During the initial painful freezing stages, treatment is directed at pain relief. The patient is encouraged to use pain as a guide to limit activity, with movements in slightly painful range allowed. It is traditional to give patients non-steroidal anti-inflammatory drugs (NSAIDs) if they can tolerate these. Gentle exercises in pain free range are perceived to be better than intensive physiotherapy³.

Various studies have found intra articular steroids are effective in a dose dependant manner when used early in the course of disease for pain^{3,16}.

The role of oral steroid is doubtful¹⁸.

Amitryptiline is an effective drug. Suprascapular nerve block is an effective modality for reducing shoulder pain¹⁹

Treatment during adhesive phase

Stretching exercises, manipulation under anaesthesia and arthroscopic release are effective treatment modalities in this stage³.

Review of literature

Frozen shoulder is considered as a self limiting condition but many studies do not support this postulation. Reeves, in a prospective study found that 50% of his patients with frozen shoulder had some degree of pain and stiffness at an average of seven years after onset of the disease⁵.

Bunker TD in 1997 outlined in detail the pathology of frozen shoulder as active fibroblastic proliferation, accompanied by some transformation to a smooth muscle phenotype⁹. A home based stretching programme was found to be useful in the treatment of stage II of the disease in the study conducted by Griggs SM et al in 2007.

Another treatment modality of interest is intra articular steroid injections. The study conducted by Hazelman in 1972 proves the effectiveness of intra articular steroid injection in cases of frozen shoulder¹⁶. D A W M Van der Windt et al conducted a study in 1998 which rated beneficial effects of intra articular steroids superior to that of physiotherapy¹⁷.

Suprascapular nerve block is considered as an effective modality for treatment of shoulder pain. The technique was first described by Wertheim HM and Rovenstine FA in 1941¹⁵. It aims to block the nerves to the glenohumeral joint as they branch from the suprascapular nerve near the scapular notch. Dangoisse et al described a safer technique in 1994 ie. locating the nerve in the suprascapular fossa which virtually eliminated the risk of pneumothorax¹⁸.

In 1992 Wassef MR in his study found out SSNB with bupivacaine to be a useful modality both for relief of pain and for improvement of passive range of shoulder movements in cases of frozen shoulder¹⁹. SSNB was compared with intra articular steroid for relief of shoulder pain. The study conducted in 1999 by David S Jones and C Chattopadhyay concluded SSNB is superior to intraarticular steroid²⁰.

However no study was found comparing the effectiveness of exercise programme alone and SSNB coupled with an exercise programme on searching the literature. There was no study done in the Indian population with regard to SSNB. The plan of this study is to bridge this gap.

Materials and Methods

Subjects

Population

Patients attending the OPD of Department of Physical Medicine and Rehabilitation, Calicut Medical College from April 2015 to July 2015 were included in the study.

Inclusion criteria

The inclusion criteria was based on a modification of the 'Diagnostic guidelines for shoulder complaints' issued by the Dutch College of General Practitioners. They included:

1. Limitation of passive range of motion of shoulder in flexion, abduction and rotations.
2. Tenderness over the anterior joint capsule.
3. X ray of the shoulder showing no abnormality apart from degenerative changes.

Exclusion criteria

The exclusion criteria again was based on a modification of the 'Diagnostic guidelines for shoulder complaints' issued by the Dutch College of General Practitioners. They included

1. Features of shoulder hand syndrome
2. Stroke.
3. Clinical evidence of rotator cuff disease (painful arc and a positive drop arm sign)
4. X ray showing any gross abnormality apart from mild degenerative changes.

Selection process

Subjects were randomly selected from the population and allocated to different groups by card method.

Sample size: The sample size is thirty (30)

Design of the study: Randomized controlled trial.

Tools Used

Goniometer:

This instrument is used to assess the range of motion of the joint. It is calibrated from 0-180 degrees.

Visual Analogue Scale (VAS)

VAS is used for the objective assessment of pain severity. In this scale 0 represents 'No pain' and 10 represent the 'Worst imaginable pain'. Subject is asked to mark a point on the line which best suites his/her pain.

RMS EMG PK II EMG machine

Using this EMG machine the nerve was located with the help of a needle connected to the stimulator of the machine.

Description of the method:

The patients were randomly allocated into an exercise group (control) and an SSNB group. Each group contained 15 patients each. After entry into the study, Passive Range of Motion (PROM) of the involved shoulder joint in flexion, abduction and rotations were measured using a goniometer. The pain which the patient experiences was measured using the Visual Analogue Scale (VAS) for pain. After this the exercise group was prescribed a home based

exercise programme which included assisted movements including flexion, abduction, rotations and circumduction which were slightly in the painful range. The patients were instructed to repeat these exercises 6 times at hourly intervals. The exercise programme was somewhat similar to the one adopted by Griggs SM in his study of non operative treatment of frozen shoulder. The PROM of shoulder joint and VAS for pain was assessed at baseline after 1 week, 4 weeks and 12 weeks.

The patients in the SSNB group were assessed in the same way as for the exercise group ie. the PROM of shoulder joint and VAS for pain were assessed. Prior to SSNB patients were tested for sensitivity to lignocaine. Then SSNB was given to these patients. The active electrode of the EMG machine was connected to the needle of a 21 G canula with the help of a wire. The ground electrode was applied near the shoulder. The location of the point of nerve block was determined using the landmark approach described by Dangoisse et al 18. The technique is as follows. The midpoint of the spine of the scapula is marked by a skin marker. The canula with needle was introduced through the skin 2 cm cephaloid to the midpoint of spine of scapula. The nerve was located at the point where a twitch in the supraspinatus muscle with slight abduction and external rotation of the shoulder was obtained at a current strength of 1 mA. After locating the nerve the stilet was withdrawn and a mixture of 40 mg of triamcinolone and 10% lignocaine to a total volume of 5 ml was injected in the supraspinous fossa. Before and immediately after the SSNB, PROM of shoulder and VAS for pain was assessed. After this, the patients were followed up as in the case of the exercise group ie. at 1 week, 4 weeks and 12 weeks.

Statistical analysis

Statistical analysis was done by using the software SPSS 13.0. Independent T test and paired T test were used to assess the data.

Results

Exercise group and SSNB group consisted of 15 patients each. 11 patients were male (4 in exercise group and 7 in SSNB group) and 19 patients were female (11 in exercise group and 8 in SSNB group).The age group varied from 40-75years with most of the patients in the age group of 40-55 (63.3%). Independent T test was done for different variables under study in both the exercise group and SSNB group. Paired T test was done between variables at different weeks of treatment program in exercise group and SSNB group. The independent T test showed significant p value only in case of VAS at week 1. In the exercise group paired T test showed significant p value for flexion 0-4, 0-12, 1-12 and 4-12, for abduction 0-

4, 0-12, 1-4, 1-12 and 4-12, for internal rotation 0-4,0-12, 1-4, 1-12 and 4-12, for external rotation 0-4, 1-4, 1-12, 0-12 and 4-12 and for VAS 0-4, 0-12, 1-4, 1-12 and 4-12. In the SSNB group significant p value was present for all pairs of flexion, abduction, internal rotation and external rotation. For VAS significant p value was present for pairs 0-1, 0-4, 0-12, 1-4 and 1-12. Both the ROM parameters and VAS showed significant p value when compared before and immediately after SSNB. The age (<40 & >40), Sex, diabetic status, duration (<4 months & >6months) and work showed no statistically significant difference in terms of pain and range of movement during the study period in either groups.

Figure 1. Comparison of shoulder flexion between two groups at different weeks

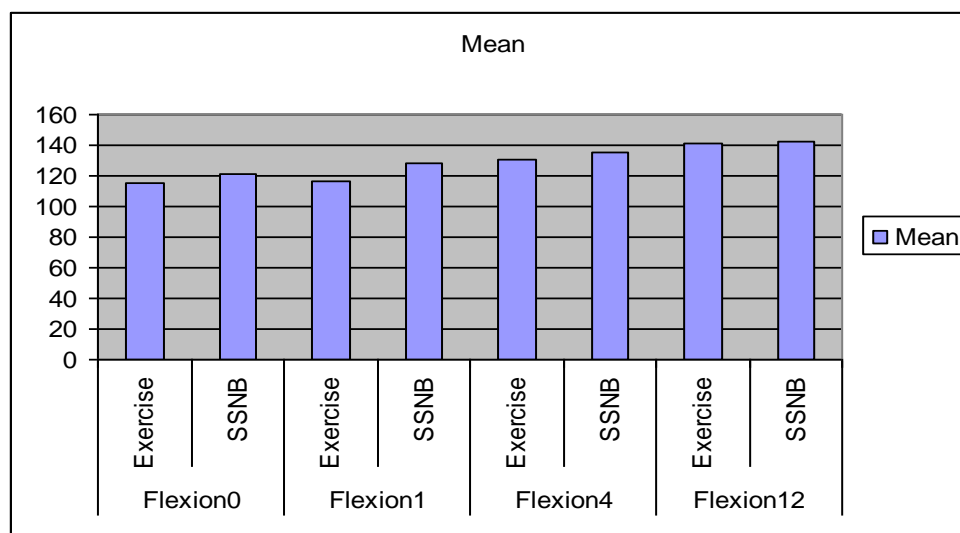
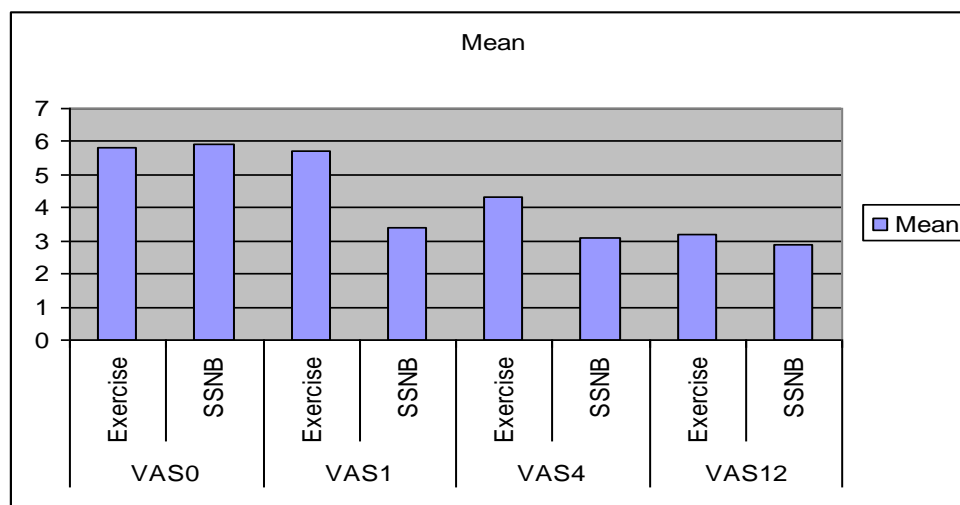
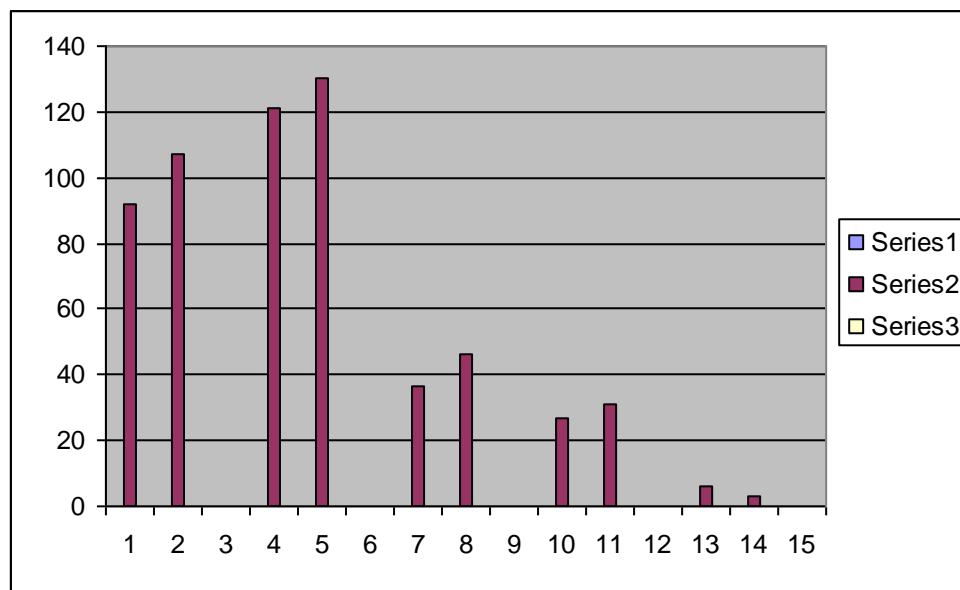


Figure 2. Comparison of pain between two groups at different weeks



VAS- Visual Analogue Scale for pain

Figure 3 Shoulder ROM and pain before and after SSNB



1&2 –Abduction pre and post SSNB
 4&5- Flexion pre and post SSNB
 7&8- Internal rotation pre and post SSNB
 10&11- External rotation pre and post SSNB
 13&14- VAS pre and post SSNB

Comparison of pain as measured by VAS between the groups at different weeks

Variable	Group	Mean	SD	SED	t value	p value
VAS0	Exercise	5.84	1.67	0.43	-0.12	0.904
	SSNB	5.92	1.90	0.49		
VAS1	Exercise	5.70	1.39	0.36	4.04	0.000*
	SSNB	3.38	1.74	0.45		
VAS4	Exercise	4.30	1.18	0.30	2.29	0.029*
	SSNB	3.08	1.69	0.44		
VAS12	Exercise	3.19	1.39	0.36	0.60	0.554
	SSNB	2.86	1.59	0.41		

Shoulder ROM and pain before and immediately after SSNB

Pair	Mean	SD	SEM	t value	p value
F pre-F post	-9.00	6.60	1.70	-5.28	0.000*
ABD pre-Abd post	-15.67	14.86	3.84	-4.08	0.001*
IR pre-IR post	-9.33	8.21	2.12	-4.40	0.001*
ER pre-ER post	-4.33	2.58	0.67	-6.50	0.000*
VAS pre-VAS post	-2.89	2.20	0.57	5.07	0.000*

*- p value is significant

Discussion

This study tried to evaluate the effectiveness of suprascapular nerve block (SSNB) in improvement of pain and range of motion. Because it innervates up to 70% of the posterior shoulder joint, the acromioclavicular joint, the subacromial bursa and the coracoclavicular ligament¹⁸, it is

reasonable to assume that SSNB would be a valuable analgesic adjunct to treat shoulder pain. It was clearly shown in the paired T test that both pain and ROM were significantly reduced in the SSNB group and the reduction was evident even in the earlier weeks. But, for the exercise group statistically significant reduction was evident only

later. In this group, both flexion and abduction showed statistically significant improvement only at the week 12 whereas internal and external rotations started showing improvement at week 4 itself. VAS started showing reduction from week 4 onwards. In the SSNB group flexion, abduction, internal rotation, external rotation and VAS started showing improvement immediately after SSNB itself.

An important finding is the reduction in VAS and improvement in ROM that were seen immediately after the SSNB. The reduction in VAS is due to the effective blockade of nerve. The ROM improvement can be explained due to the reduction in muscle spasm that is expected to occur as a protective mechanism against pain.

The age, sex, side, occupation, duration or diabetic status has not shown any difference in the outcome in this study. This cannot be taken as significant because of the small sample size.

The long term benefit of both the modalities seems comparable in this study, both in terms of pain and ROM. So, SSNB is having a role mainly in terms of pain reduction and ROM improvement early in the phase of the disease thus reducing the overall morbidity.

Conclusion

SSNB is effective in reducing pain and improving ROM earlier in the course of the disease in periarthritis of shoulder in comparison to exercise therapy alone. Thus it helps in reducing the morbidity. However the long term effect is similar to exercise therapy.

Limitations of the Study

The major limitations of the study seemed to be the following.

1. The study was not blinded.
2. Placebo effect could not be excluded because the control group did not receive any sham injections.
3. Shoulder function was not assessed by specific functional tools like SPADI.

4. There was no tool for measuring the compliance of patients towards the exercise program.
5. The sample size was small.

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