ULTRA-SOUND GUIDED SUPRASCAPULAR NERVE BLOCK IN HEMIPLEGIC SHOULDER PAIN

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ABSTRACT

BACKGROUND

Hemiplegic shoulder pain is associated with reduced functional improvement, a higher incidence of depression, interference with rehabilitation, and an increased length of hospitalisation. Supra- Scapular Nerve Block (SSNB) has shown efficacy in various chronic shoulder pain management but lacks clinical evidence in case of hemiplegic shoulder pain management.

MATERIALS AND METHODS

A prospective randomised controlled trial was done to look for the efficacy of suprascapular nerve block in hemiplegic shoulder pain which included 60 patients divided in to two groups. Group A received ultra-sound guided suprascapular nerve block and exercise therapy (n=30); Group B received exercise therapy alone (n=30). Pain outcome was measured using Visual Analogue Scale (VAS) at rest and at movement of affected shoulder at 1st week, 4th week and 12th week.

RESULTS

The VAS score, both at rest and at movement, improved significantly in group A with p-value 0.000 which was evident at 1st week post injection. The improvement in VAS score at rest is from 4.67 ± 1.42 to 1.53 ± 1.93 and in VAS score at movement is from 7.53 ± 1.50 to 2.37 ± 1.97 in group A.

CONCLUSION

Therefore, we conclude that SSNB is a safe and effective treatment option for patients with hemiplegic shoulder pain in the first year after stroke. The intervention can be easily performed using ultra-sound guidance in clinical settings, offering a practical and important advancement for shoulder pain management in this patient population.

KEYWORDS

Shoulder Pain; Post Stroke Pain; Suprascapular Nerve Block; Hemiplegic Shoulder Pain.

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BACKGROUND

Shoulder pain and stiffness are unfortunately, frequent complications in hemiplegia after stroke. It is reported as one of the four most common medical complications of stroke.[1] Approximately a 16% to 72% of stroke patients develop hemiplegic shoulder pain.[2,3,4] It may occur in up to 80% of stroke patients who have little or no voluntary movement of the affected upper limb.[5]

Hemiplegic shoulder pain (HSP) has been shown to affect stroke outcome in a negative way.[6] It interferes with recovery after a stroke, it can cause considerable distress and reduced activity and can markedly hinder rehabilitation.[7,8,9] Good shoulder function is a prerequisite for effective hand function, as well as for performing multiple tasks involving mobility, ambulation, and activities of daily living (ADL). Hemiplegic shoulder pain can begin as early as 2 weeks post-stroke but typically occurs within 2-3 months poststroke.[10]

The causes of hemiplegic shoulder pain are multifactorial. Some of the most frequently suspected factors contributing to shoulder pain include Subluxation, Capsulitis, Contractures, Complex regional pain syndrome (CRPS) type-1, Rotator cuff injury, Impingement syndrome, and Spastic muscle imbalance of the glenohumeral joint, peripheral nerve entrapment, neglect, sensory impairment, central pain, central sensitization.[11,12,13,14] However, identifying the exact mechanism(s) of shoulder pain can be difficult. Hanger and colleagues suggested it to be highly probable that the cause is multifactorial, with different factors contributing at different stages of recovery (i.e. flaccidity contributing to subluxation and subsequent capsular stretch, abnormal tonal and synergy patterns contributing to rotator cuff or scapular instability, etc).[15] Therefore, early intervention in the shoulder pain is not only

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necessary because of the difficulty in treating once established but also the impact it may cause on this population.

Suprascapular nerve block (SSNB) is a safe and efficacious treatment of shoulder pain associated with rheumatoid arthritis, degenerative shoulder conditions and post-operative shoulder pain management.[16-21] The objective of this study is to evaluate the use of suprascapular nerve block as part of an interdisciplinary approach for the treatment of shoulder pain following stroke.

MATERIALS AND METHODS

This study is prospective randomised control trial. A total of 60 participants, for proper randomisation and increased accuracy, were included in the study. All participants were recruited from All India Institute of Physical Medicine And Rehabilitation, inpatients as well as out-patient department.

Inclusion Criteria

1. Age >18 years with stroke within the previous 12 months.
2. Shoulder pain with VAS score more than 3cm (10cm scale).
3. Mini mental status examination >23 with no language deficits (ability to follow 2-stage command).
4. Patients who are ready to come for follow-up.

Exclusion Criteria

1. Previous trauma history affecting shoulder.
2. Shoulder pain and loss of motion before stroke.
3. Difficulty in cooperating due to aphasia.
4. Hemi-neglect assessed by line bisection test.
5. Any kind of shoulder injection before participation in this study.
6. Allergic to drug (Bupivacaine).

All 60 participants fulfilling above criteria were divided in 2 groups using lottery method;

Group A: Supra-scapular Nerve Block + Exercise therapy (n=30)

Group B: Exercise therapy (n=30)

Data analysis is done with the help of SPSS Software version 15. Student T test for inter group analysis, Friedman RM Analysis test and Tukey test for intra group analysis was applied.

Intervention

After baseline demographic evaluation participants were randomly assigned to Group A and Group B using lottery method. Exercise therapy included, positioning of arm by the side of body with proximal shoulder sling and abduction roll to prevent subluxation in standing position and on arm rest in sitting position, regular therapeutic exercises, which include stretching, range of motion exercises and Proprioceptive Neuromuscular Facilitation exercises. None of the study patient received any form of electrotherapy or local heat therapy during the study duration.

Group A received Ultrasound guided supra-scapular nerve block using 6mL 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 supraspinatus fossa. Within the fossa supra-scapular artery can be visualised using Doppler, it acts as landmark for suprascapular nerve which lies in close proximity to artery (as identifying suprascapular 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 (Figure 1). After localising nerve, part prepared and excess jelly was wiped and cleaned with surgical spirit. SCNB was given using 21-gauge 38-mm needle under ultra-sound guidance (Figure 2). No medications for pain were prescribed post injection. Patients were followed up for up to 2 hours post injection to look for any signs of discomfort or allergy.

Figure 1. Ultrasound Image of Supraspinatus Fossa with Supra Scapular Notch and Transverse Scapular Ligament

Figure 2. Supra-Scapular Nerve Block using Ultrasound Guidance

Outcome measures for pain in both groups were assessed using Visual Analogue scale (10 cm) during movement of arm and at rest position of arm at baseline, after 1 week, 4th week and 12th week.

RESULTS

The baseline demographic data (Table 1) do not show any significant difference between two groups.

The average duration of stroke was 6.13 (±2.73) months in group A and 7.40 (±2.71) months in group B. The mean pain duration in group A and B was 10.37(±8.89) weeks and 12.90(±8.19) weeks respectively. The P value was not statistically significant.

Demographic Data		Group A	Group B	P Value
Age		65.53±11.23	64.07±10.97	0.611
Sex	Male	27 (90%)	20 (66.7%)	0.028
	Female	3 (10%)	10 (33.3%)	
Dominance	Left	2 (6.7%)	0 (0%)	0.150
	Right	28 (93.3%)	30 (100%)	
Hemiplegia	Left	13 (43.3%)	12 (40%)	0.793
	Right	17 (56.7%)	18 (60%)	
Type	Haemorrhagic	9 (30%)	7 (76.7%)	0.837
	Thrombotic	21 (70%)	23 (23.3%)	
Duration Stroke (Months)		6.13±2.73	7.40±2.71	0.076
Duration Pain (Weeks)		10.37±8.89	12.90±8.19	0.256

Table 1. Demographic Details of Study Population

Outcome

There was no significant difference in pre procedural evaluation of VAS score at rest and movement with p-value 0.358 and 0.645 respectively (table 2 and 3).

VAS (Rest)	Group A		Group B		P Value (T Test)
	Mean	Std. Dev.	Mean	Std. Dev.	
Pre procedure	4.67	1.42	5.00	1.36	0.358
1st week	2.27	1.82	4.37	1.16	0.000
4th week	1.83	1.86	4.03	1.40	0.000
12th week	1.53	1.93	3.63	1.59	0.000

Table 2. Comparison among Study Group on Visual Analogue Scale at Rest

VAS (Movement)	Group A		Group B		P Value (T Test)
	Mean	Std. Dev.	Mean	Std. Dev.	
Pre procedure	7.53	1.50	7.37	1.27	0.645
1st week	3.97	1.56	6.37	1.63	0.000
4th week	2.93	1.84	6.07	2.10	0.000
12th week	2.37	1.97	5.53	2.34	0.000

Table 3. Comparison Among Study Group on Visual Analogue Scale at Movement

Post procedure there was significant improvement in VAS score (rest and movement) seen at all follow-ups with p-value=0.000.

The improvement in VAS score at rest, in terms of Mean±SD, is from 4.67 (±1.42) to 1.53 (±1.93) in Group A and from 5.00 (±1.36) to 3.63 (±1.59) in Group B (Figure 3). The improvement in VAS score at movement is from 7.53 (±1.50) to 2.37 (±1.97) in Group A and from 7.37 (±1.27) to 5.53 (±2.34) in Group B (Figure 4). Within the group analysis using Friedman RM Analysis test and Tukey test significant difference was seen in 1st week post procedure in Group A, whereas, difference became significant after 4th week in Group B.

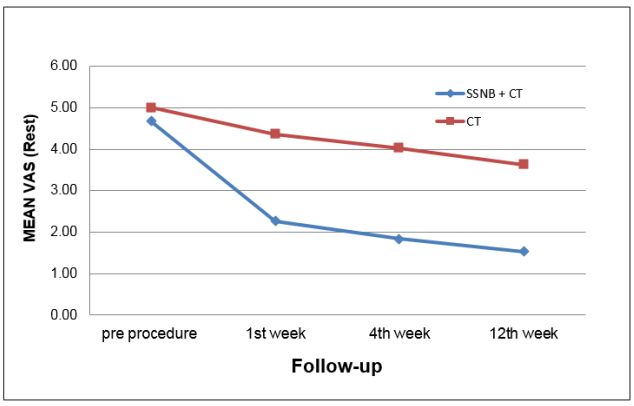

Figure 3. Change in Vas Score (Rest) at Each Follow-up.

SSNB+CT= suprascapular nerve block along with Exercise therapy.

CT= Exercise therapy alone.

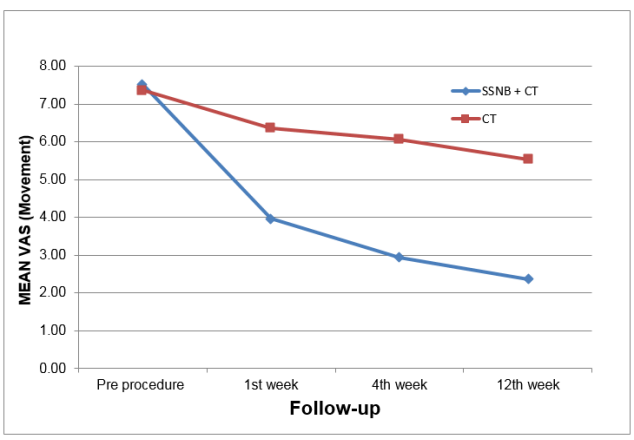

Figure 4. Change in VAS (movement) at Each Follow-up

SSNB+CT= suprascapular nerve block along with Exercise therapy.

CT= Exercise therapy alone.

DISCUSSION

All the participants included in this study completed the study; there was no incidence of any dropouts or loss of follow-up. There was no incidence of any complication reported during study duration. The baseline demographic data do not show any significant statistical difference between two groups suggestive of successful randomisation (Table 1). The duration of stroke and duration of pain onset was more or less similar in both groups with no statistical difference.

In our study, it is clearly seen that suprascapular nerve block is effective for pain management in case of hemiplegic shoulder pain. The results were found similar and comparable with Adey-Wakeling et al.[22] The pain reduction was seen with more than >20 mm reduction in VAS scale at 1st week with suprascapular nerve block. Also the VAS scale improved significantly at each follow up with comparable results. Whereas, >20 mm reduction in VAS scale was seen at 4 weeks after Exercise therapy alone. It is also notable that the amount of drug (Bupivacaine HCl) used was just 6ml for suprascapular nerve block. Ultra-sound guidance has added an advantage of precisely localising the nerve site in supraspinatus fossa and injecting the drug, providing better nerve block with lesser amount of drug.

There are many systematic review published with respect to management of hemiplegic shoulder pain, however, they do not include suprascapular nerve block as primary modality for management because of lack of evidence based studies. Although there are few studies done earlier to our study, but the efficacy of suprascapular nerve block cannot be derived from these studies because of small number of participants and absence of placebo control trails. The exact mechanism of action of SSNB with its effect lasting more than pharmacological effect of the drug is not clearly understood. In chronic shoulder pain conditions, the afferent fibers of SSN may become entrapped by injured tissues or sensitized due to chronic pain.[18,23] The SSN block provides temporary cessation of nociceptive information from the affected shoulder to CNS.[16-21] Shanahan et al.[16] postulated "wind down" phenomenon in which, the decrease in central sensitisation of dorsal horn nociceptive neurones because of a reduction of peripheral nociceptive input has been suggested. A depletion of substance P and nerve growth factor in the synovium and afferent C fibres of the glenohumeral joint after the blockade may also contribute to the longer term relief. SSNB has been found effective in chronic shoulder pain, post shoulder surgery pain, adhesive capsulitis and cancer pain management. It can easily be performed as an outpatient procedure with potentially less side effect and early pain relief.

CONCLUSION

The exact cause of hemiplegic shoulder pain is multifactorial; to diagnose them at a given stage of recovery is difficult. Suprascapular nerve block effectively minimises the hemiplegic shoulder pain at any stage of recovery with negligible side effects. This will indirectly improves participation in rehabilitation programme, minimises hospital stay and improves functional outcome. Therefore, we conclude that suprascapular nerve block is effective in managing hemiplegic shoulder pain. It is easy, safe and can be performed as an outpatient procedure without any significant side effect. The use of Ultrasound can add to the strength of precision for localising the nerve and results in effective blockade with considerably less amount of drug.

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