EFFECT OF SUPRASCAPULAR NERVE BLOCK IN SHOULDER PAIN AND DISABILITY

A Dissertation submitted to **The Tamilnadu Dr. M.G.R Medical University, Chennai** in partial fulfillment of the requirements for the award of the degree of

DOCTOR OF MEDICINE
IN
PHYSICAL MEDICINE AND REHABILITATION

By

(Register No. **20109013**)

2010- 2011

Reg. No. 20109013,
M.D. in Physical Medicine and Rehabilitation,
The Tamilnadu Dr. M.G.R Medical University, Chennai.

DECLARATION

I, **Reg. No. 20109013** hereby declare that the dissertation entitled, "**Effect of Suprascapular Nerve Block in Shoulder Pain and Disability patients"** submitted to The Tamilnadu Dr. M.G.R Medical University, Chennai in partial fulfillment of the requirements for the award of the degree of M.D. in Physical Medicine And Rehabilitation is a record of original research work done by me during 2010-11, the research work has not formed the basis for the award of any other Degree, Diploma, Associate ship, Fellowship or any other similar titles.

Place:
Date:

Reg. No. 20109013,
M.D. in Physical Medicine and Rehabilitation.

INTRODUCTION

ANATOMY OF SHOULDER JOINT:

A normal shoulder is a highly mobile diarthrodial (synovial), ball and socket joint with a remarkable range of movement.[1] Normal function of the shoulder complex requires the coordinated movements of the sternoclavicular (SC), acromioclavicular (AC), and glenohumeral (GH) joints, as well as the scapulothoracic articulation and the motion interface between the rotator cuff and the overlying coracoacromial arch.

Approximately 10% of the general adult population will experience an episode of shoulder pain in their lifetime[2] pain in the shoulder is exceeded only by pain in the low back and the neck[3] shoulder pain is a common reason for care seeking as it impacts upon on a range of activities of daily living, including sleep. It is estimated that around 95% of people with shoulder pain are treated in primary care settings[4].

Many people presenting with acute shoulder pain are likely to have conditions that will resolve spontaneously regardless of treatment. Indeed, there are reports that 50% of people with shoulder pain do not seek care at all. Van der Windt DA et al[5] reported that 23% of all new episodes of shoulder pain resolve fully within one month and 44% resolve within three months of onset. However, the results of studies on the natural history of shoulder pain vary considerably because of the range of definitions used to describe shoulder disorders.

In these guidelines, the term ‘acute’ is defined as pain that has been present for less than three months; it does not refer to the severity or quality of pain. Chronic pain is pain that has been present for at least three months[6]

There is no universal definition of shoulder pain. For the purposes of these guidelines, ‘shoulder’ refers to the articulations of the scapula, clavicle and humerus together with the ligaments, tendons, muscles and other soft tissues with a functional relationship to these structures.

The articular surfaces consist of proximally the glenoid cavity of the scapula and distally the rounded head of the humerus.

The capsule consists of relatively loose connective tissue with a surface area more than twice that of the humeral head. Rotator cuff tendons and glenohumeral ligaments support the capsule from above and from the side. Below, the capsule has no support and forms a lax fold with a potential space, the inferior recess.[7]

The blood supply to the joint is from the anterior & posterior circumflex humeral arteries and the subscapular & suprascapular arteries. The innervations of this joint are from the musculocutaneous nerve, axillary nerve and the suprascapular nerve.

The movements of the shoulder joint is controlled by the spinal cord segments namely; C5 & C6 controls flexion, abduction and lateral rotation, C6, C7 & C8 controls extension adduction and medial rotation.

SHOULDER PAIN:

Shoulder pain is common in the community; affecting 15–30% of adults at any one time.[8] Causes include trauma, degenerative disease affecting the glenohumeral and

acromioclavicular joints and supporting soft tissue structures, and inflammatory diseases such as rheumatoid arthritis (RA), seronegative spondyloarthropathies, and crystal arthropathies, vascular diseases and may also be referred from the hand, neck, or viscera.[9] In one survey of patients with RA, shoulder pain affected 40% of patients early in the disease and the majority eventually had shoulder pain.[10] The resultant pain and loss of function is also a major cause of disability in people with these conditions, particularly in the elderly.[11] Evidence for the efficacy of various treatments of shoulder pain is limited.[12,13,14] Most studies of interventions are of questionable quality and frequently lack outcome data relating to disability. There is little evidence to support or refute the efficacy of common interventions for shoulder pain. From a clinician's perspective, therapeutic options for the management of this problem are limited. Simple analgesia, non-steroidal anti-inflammatory drugs (NSAIDs), intra-articular steroid injection, and surgery all have their limitations, particularly in older populations with comorbidities.

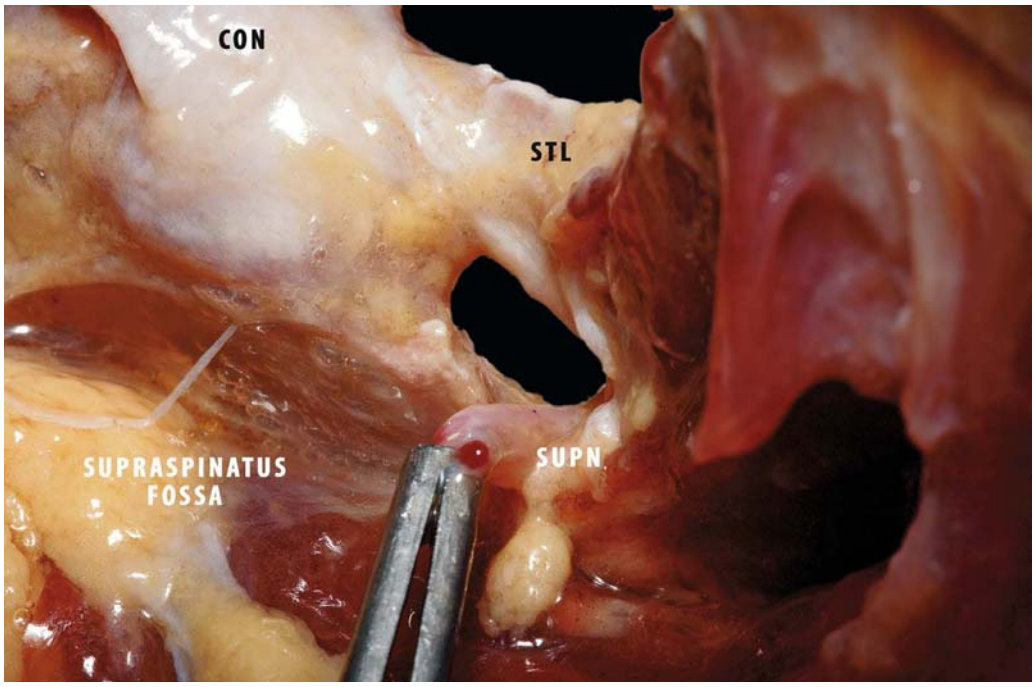
Although there are still many treatment modalities aiming at increasing the range of motion (ROM), relieving pain and as a result improving disability, the results reported about their effectiveness are inconsistent.[15]

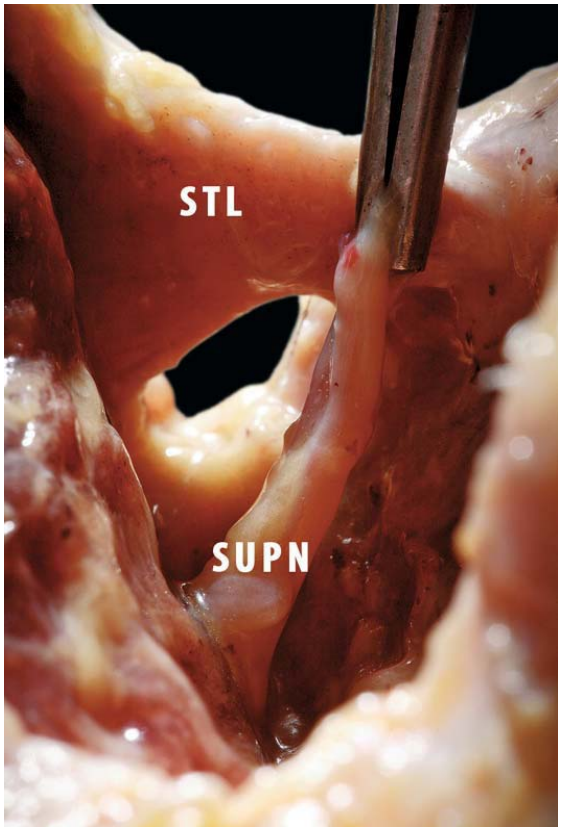
SUPRASCAPULAR NERVE:

The suprascapular nerve arises from the superior trunk of the brachial plexus at Erb's point (C5 & C6) and runs an oblique course through the posterior cervical triangle toward the suprascapular notch, where it arrives together with the suprascapular vein and artery.

The suprascapular nerve enters the suprascapular fossa beneath the superior transverse scapular ligament, while the artery and vein travel above the ligament and laterally in relation to the nerve.

From its origin at the brachial plexus, the suprascapular nerve runs as a mixed motor and sensory peripheral nerve toward the suprascapular notch, where it passes underneath the superior transverse ligament. Here, the suprascapular nerve releases a motor branch that usually innervates the supraspinatus muscle with two branches. The suprascapular nerve then travels around the lateral margin of the base of the scapular spine, passing the spinoglenoid notch, and enters the infraspinatus fossa.



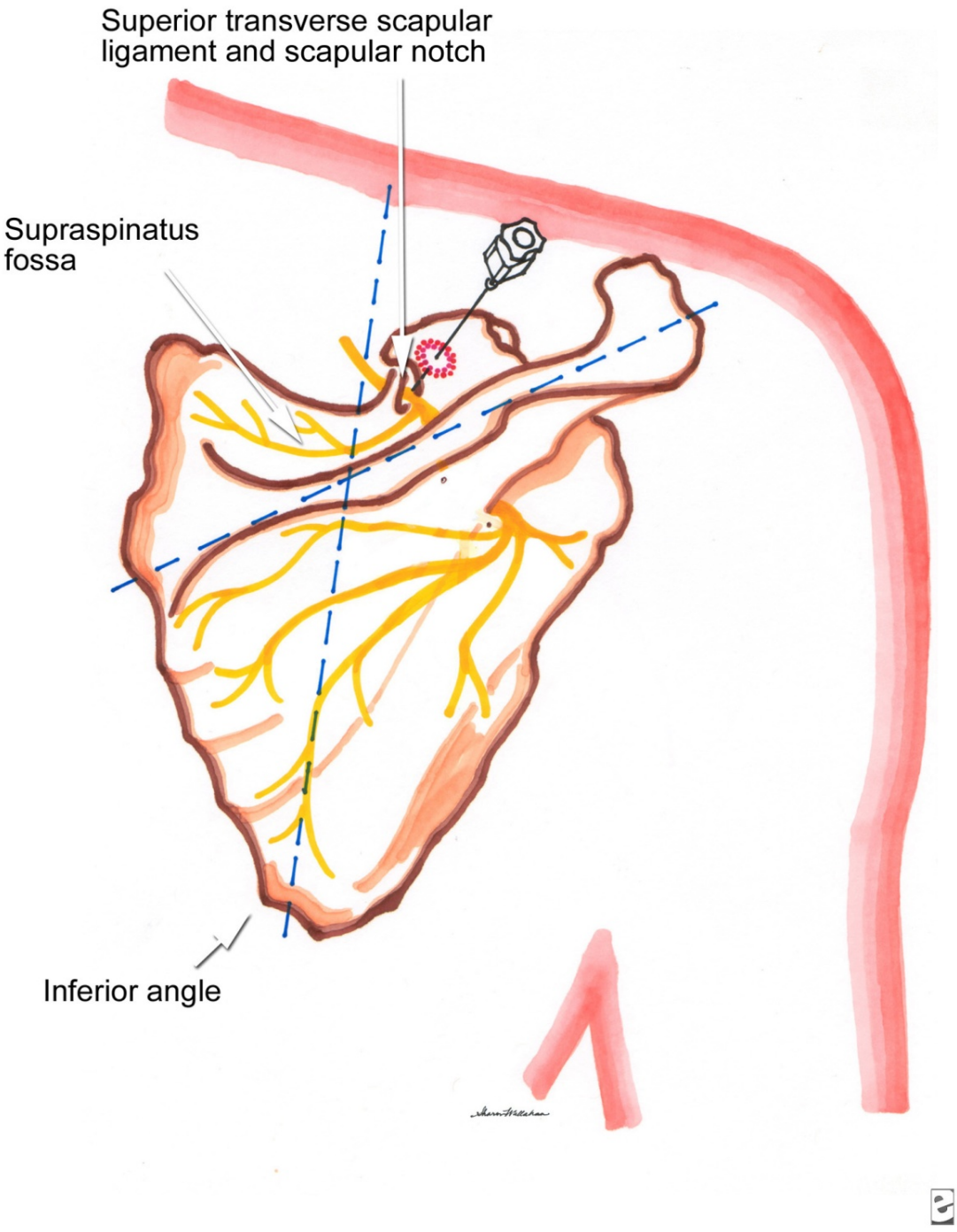


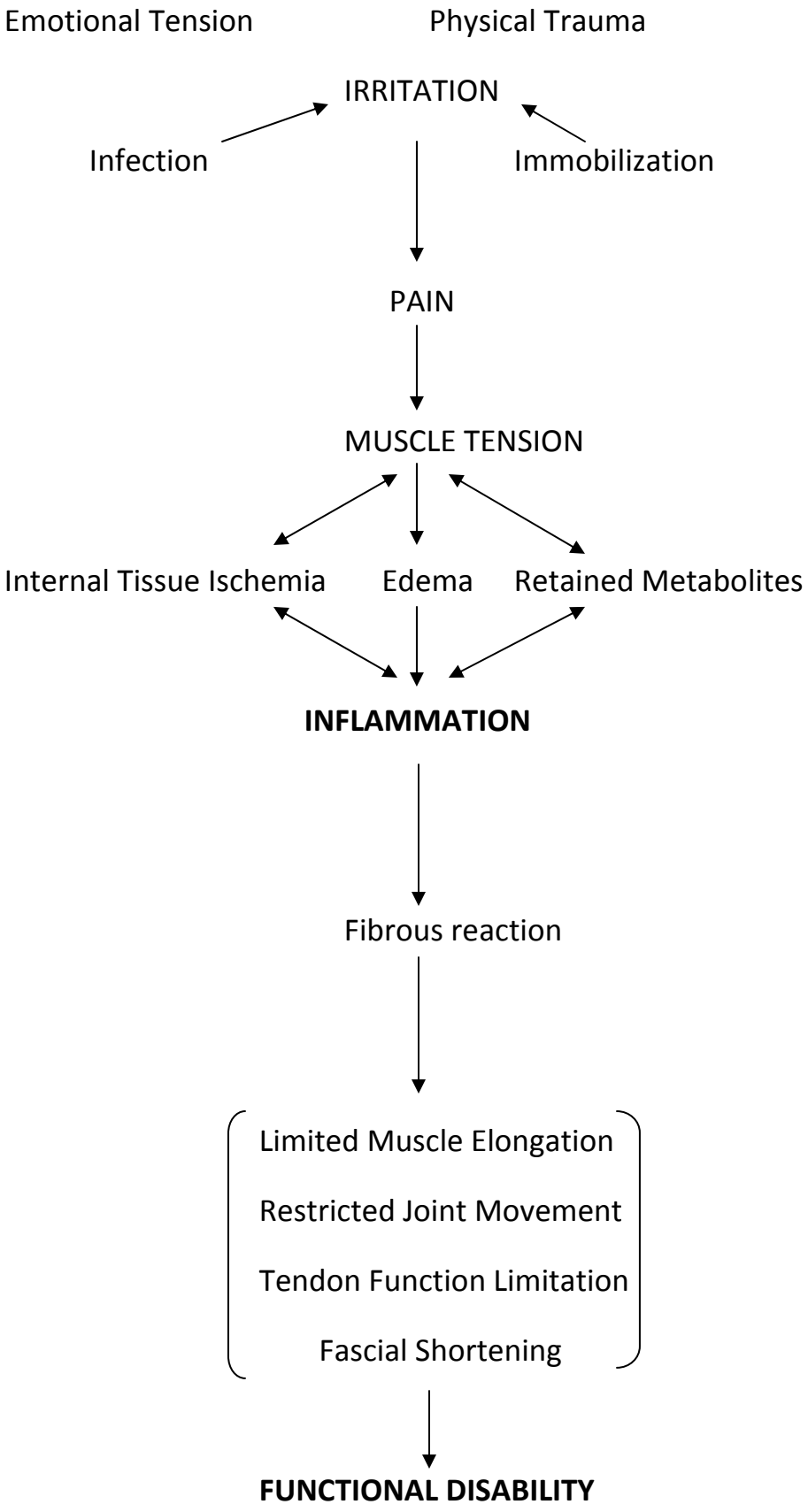
STL – Superior Transverse Ligament

SUP N – Suprascapular Nerve

At the spinoglenoid notch the nerve may be covered with the spinoglenoid ligament, also known as the inferior transverse scapular ligament. Thereafter, it divides into two, three or four motor branches innervating the infraspinatus muscle. All motor branches to the infraspinatus muscle are of the same length and diameter. The motor branches to the infraspinatus are significantly longer and slightly thicker than those to the supraspinatus.

The suprascapular nerve supplies sensory fibres to about 70% of the shoulder joint, including the superior and postero-superior regions of the shoulder joint and capsule,[16] and the acromioclavicular joint. Suprascapular nerve block has shown some promise as an alternative treatment for patients with shoulder pain due to arthritis.[18,19] A suprascapular nerve block in most studies consists of 10ml of 0.5% bupivacaine hydrochloride and 40 mg of methylprednisolone acetate (Depo-medrone).


Superior transverse scapular ligament and scapular notch
Supraspinatus fossa
Inferior angle


Emotional Tension
Physical Trauma
IRRITATION
Infection
Immobilization
PAIN
MUSCLE TENSION
Internal Tissue Ischemia
Edema
Retained Metabolites
INFLAMMATION
Fibrous reaction
Limited Muscle Elongation
Restricted Joint Movement
Tendon Function Limitation
Fascial Shortening
FUNCTIONAL DISABILITY

REVIEW OF LITERATURE

Shanahan EM et al., 2003, has noted in his study that suprascapular nerve block is safe and efficacious treatment of shoulder pain associated with rheumatoid arthritis and degenerative shoulder conditions.

Asadolah S N et al., 2005, discussed in their study that 67% of patients were cured with only one session of suprascapular nerve block in the first week and accordingly there was no significant change in pain level between the first, fourth, or twelfth week after therapy, if patients follow the supplementary medical exercise and special health-care instructions. Therefore, concluded that if pain relief is obtained in the first week, it could last permanently unless other problems occur later.

M Ahern et al., 2002, concluded that Suprascapular nerve block is a safe and efficacious treatment for the treatment of shoulder pain in degenerative disease and/or arthritis. It improves pain, disability, and range of movement at the shoulder compared with placebo. It is a useful adjunct treatment for the practising clinician to assist in the management of a difficult and common clinical problem. Further, it may prove to be a useful treatment for patients who are unfit or unwilling to consider surgical intervention.

M Wetherall 2004, showed significant improvements in all pain scores and disability in the shoulders receiving both CT guided and anatomical landmark approach of the suprascapular nerve block, with no significant differences in the improvement in pain and disability between the two approaches at any time. Improvements in pain and disability scores were clinically and statistically significant. No significant adverse

effects occurred in either group. Patient satisfaction scores for pain relief using either approach were high.

M Smith et al., 2003, have demonstrated that suprascapular nerve block is efficacious without the need to image the area by ultrasound or fluoroscopy during the procedure. This study shows that this treatment not only reduces pain but also decreases disability and gives clinicians a proven efficacious treatment for patients with shoulder pain. Whether the efficacy would be further improved with guidance of the needle under direct imaging is unknown. The combination of nerve block with other approaches to pain relief would also be a potentially worthwhile area to study.

Sean P McCully et al., 2005, found that the suprascapular nerve block resulted in no significant changes in clavicular rotations and scapular posterior tilting. However, there was a significant increase in scapular external rotation and upward rotation. While kinematic changes returned to baseline within 25 min of the block, force measurements did not return to baseline until 75 min post-block.

Karatas and Meray 2002, have reported that nerve block close to the nerve with electromyography (EMG) guidance is more effective than blind injection in the suprascapular fossa.

Dominic Harmon and Conor Hearty 2007, stated that potential complications of suprascapular nerve block may be avoided through the use of ultrasound guidance and that pneumothorax has been reported following the procedure. They postulated that avoiding entering the suprascapular notch in the vertical plane will decrease the risk.

Hossein Khatibi et al., 2005, stated that trigger point injections and suprascapular nerve block (SSNB) are advocated to break down the pain phenomenon and ease exercise.

Van der Heijden 1999, has denoted that approximately 10% of the general adult population will experience an episode of shoulder pain in their lifetime pain in the shoulder is exceeded only by pain in the low back and the neck shoulder pain is a common reason for care seeking as it impacts upon on a range of activities of daily living, including sleep.

Van der Windt DA et al., 1996, reported that 23% of all new episodes of shoulder pain resolve fully within one month and 44% resolve within three months of onset. However, the results of studies on the natural history of shoulder pain vary considerably because of the range of definitions used to describe shoulder disorders

METHODOLOGY

STUDY DESIGN:

The design used in this study is double blinded randomised controlled trail.

STUDY SETTING:

This study was conducted in Department of Physical Medicine and Rehabilitation, Directorate of Health & Family Welfare Services, Government of Puducherry.

STUDY POPULATION:

The population of this study included patients with shoulder pain in the age group of 30 to 60 yrs.

SAMPLE SIZE:

The total number of participants in this study was n=20.

SELECTION CRITERIA:

- Pain in the shoulder- due to local causes and referred pains are excluded.
- Age group- 30 to 60yrs.
- Pain due to trauma without fracture and dislocations.
- Post traumatic stiffness and Degenerative shoulder pain.
- Pain due to soft tissue of the shoulder like Adhesive Capsulitis.

MATERIALS:

- Shoulder Pain and Disability Index (SPADI):

The SPADI is a self-administered questionnaire that consists of two dimensions, one for pain and the other for functional activities. The pain dimension consists of five questions regarding the severity of an individual's pain. Functional activities are assessed with eight questions designed to measure the degree of difficulty an individual has with various activities of daily living that require upper-extremity use. It takes 5 to 10 minutes for a patient to complete and is the only reliable and valid region-specific measure for the shoulder. To answer the questions, patients place a mark on a 10cm visual analogue scale for each question. Verbal anchors for the pain dimension are ‘no pain at all’ and ‘worst pain imaginable’, and those for the functional activities are ‘no difficulty’ and ‘so difficult it required help’. The scores from both dimensions are averaged to derive a total score. It shows good internal consistency, test-retest reliability, and criterion and construct validity. It can detect change over time and accurately discriminates between patients who have improved or worsened.

- Drugs used:

Injection depometral 40 mg + locally acting anaesthetic agent-0.5% bupivivocane hydrochloride (or) 1% xylocaine.

PROCEDURE:

Patients were recruited conveniently from the Department of Physical Medicine and Rehabilitation, Puducherry. All the participants were interviewed and examined to ensure that the selection criteria were fulfilled. Patients took part in the study after informed consent had been obtained and the procedure has been explained. The rights and privacy of the participants were protected at all times. The participants were grouped into two. Group A received Suprascapular Nerve Block and Exercises. Group B received Heat modalities and Exercises.

RANDOMIZATION:

Following completion of all pre-intervention assessments, participants were randomly assigned to one of the two groups Experimental group & Control (Placebo) Group via a computer generated random number sequence.

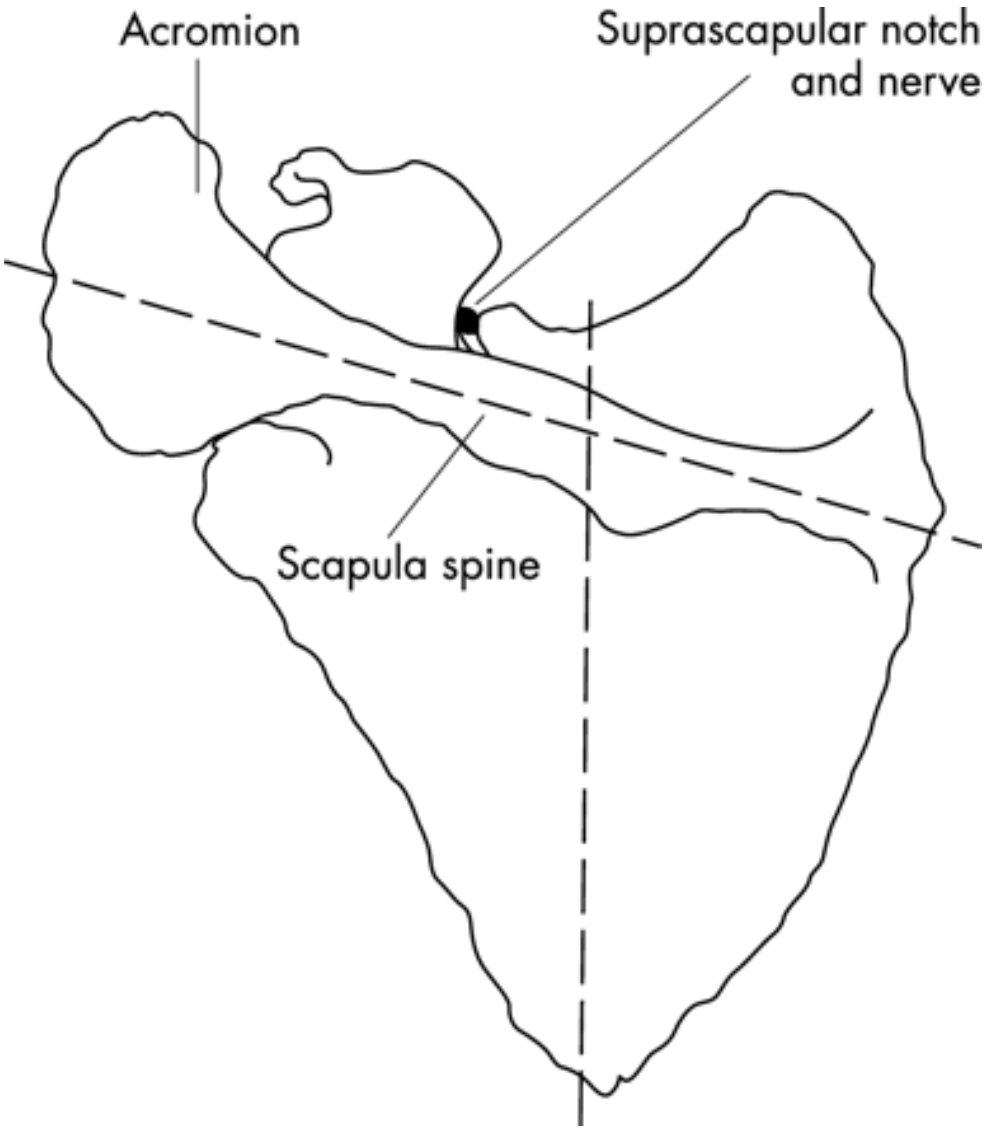
PREPARATION:

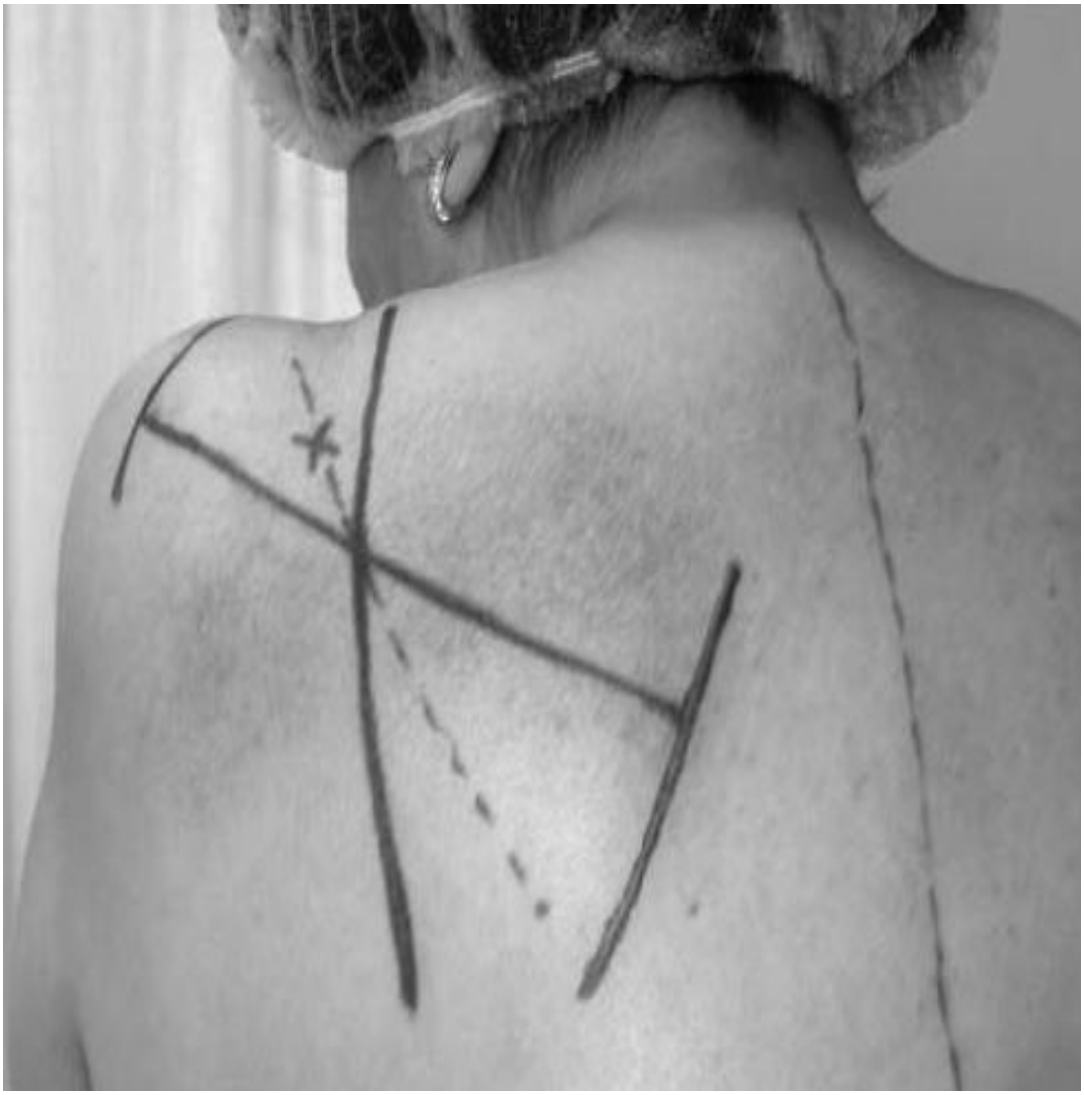
All the participants underwent a set of investigation procedures like Hb, T.C, D.C, ESR, X-ray, MRI Scan, Blood sugar and ECG. They were given the Shoulder Pain and Disability Index (SPADI) questionnaire and instructed to place a mark on the line that best represents their experience during the last week attributable to their shoulder problems.

The participants were tested initially for any allergic reaction of the local anaesthetic. The procedure is done bedside. The affected side shoulder and scapular region is cleaned and prepared for the preocedure. The site of injection is covered with a central hole towel.

IDENTIFICATION OF THE INJECTION SITE:

Draw a line from the base of the neck to the posterior axillary fold and another line over the spine of the scapula i.e, tip of the acromian to D4 verterba spine (exactly over the spine of scapula). Where these two line crosses is the point of injection.



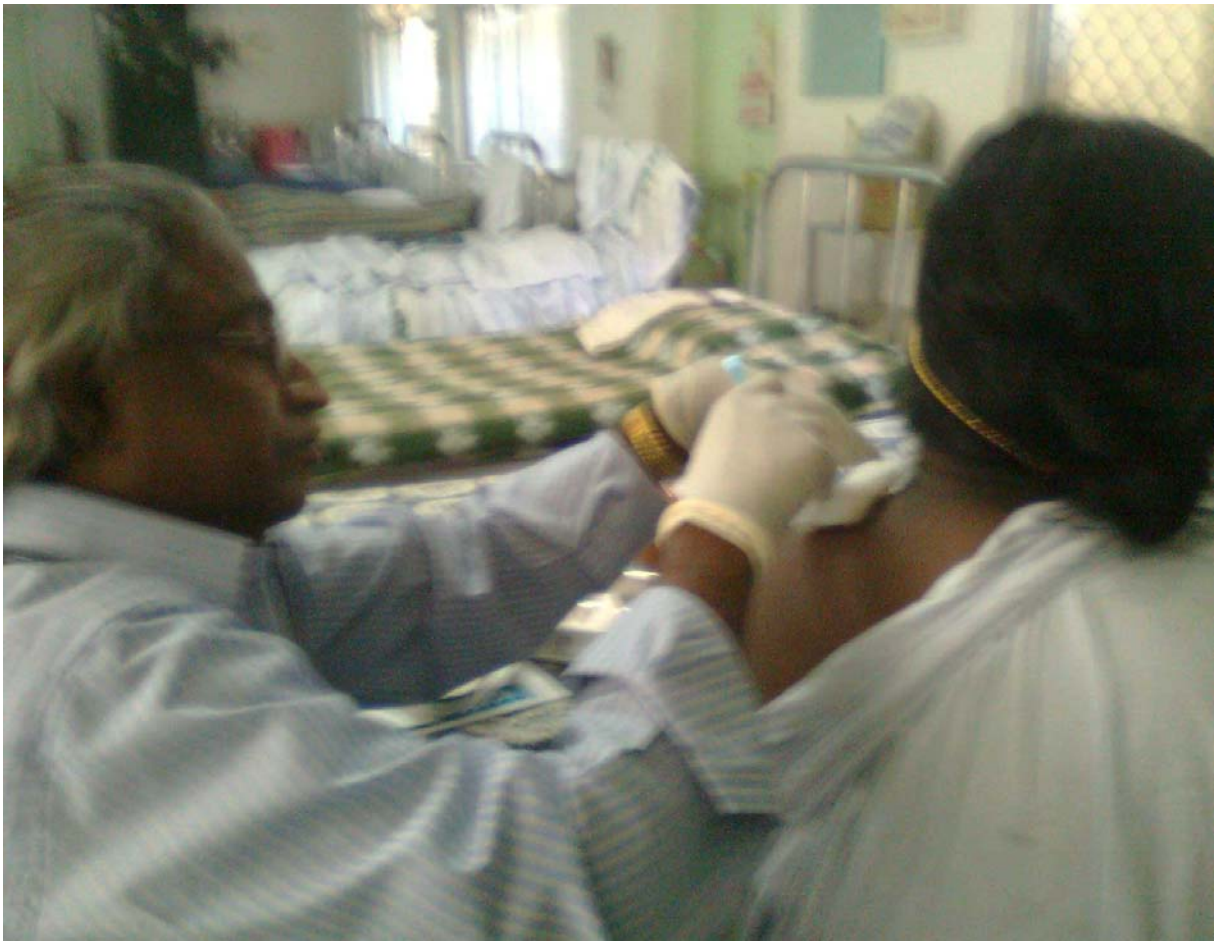


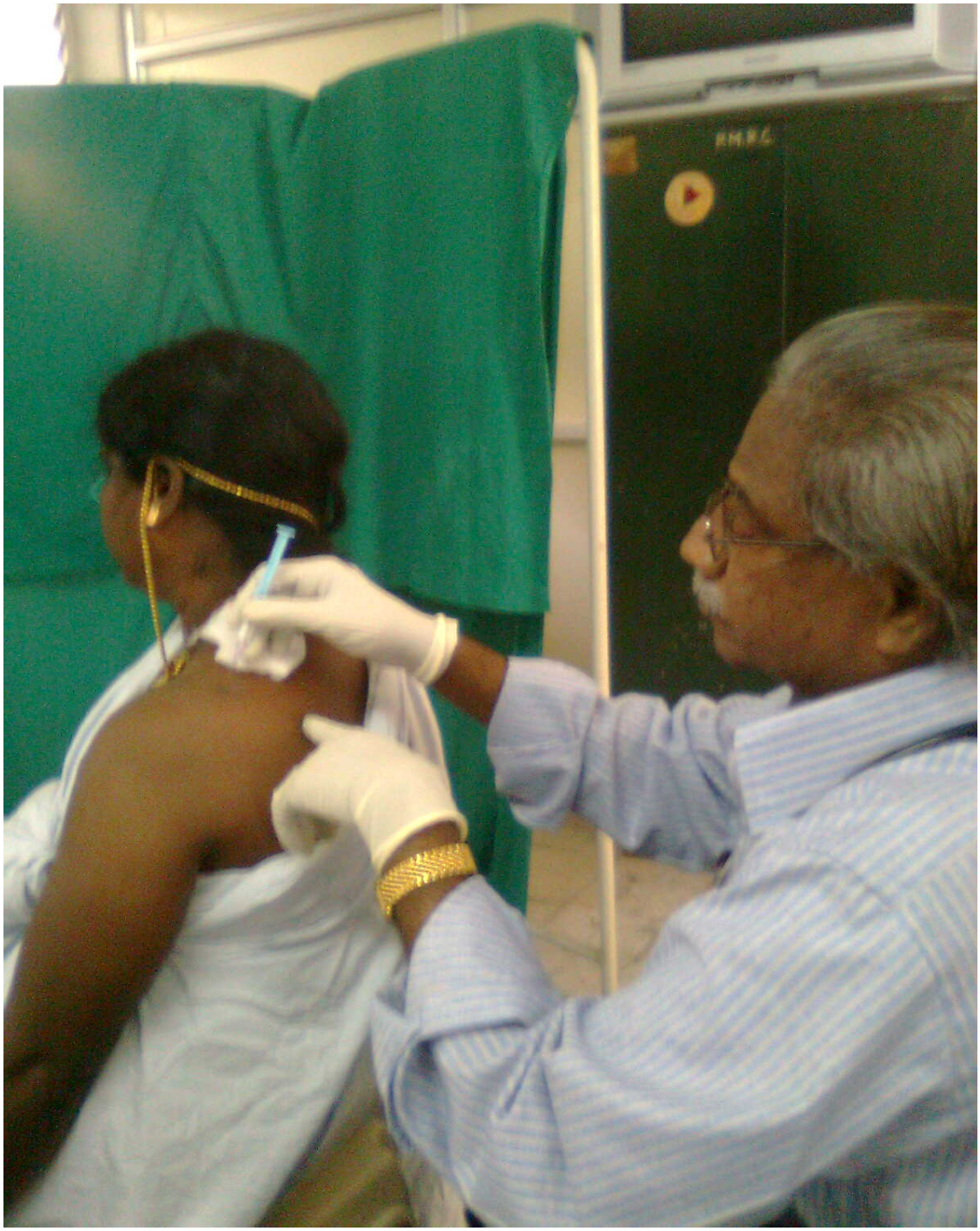
The active treatment required an 11 ml injection into the suprascapular fossa with 10 ml of 0.5% bupivacaine and 40 mg of methylprednisolone after a subcutaneous injection of 1% lidocaine (lignocaine) for local analgesia.[14]

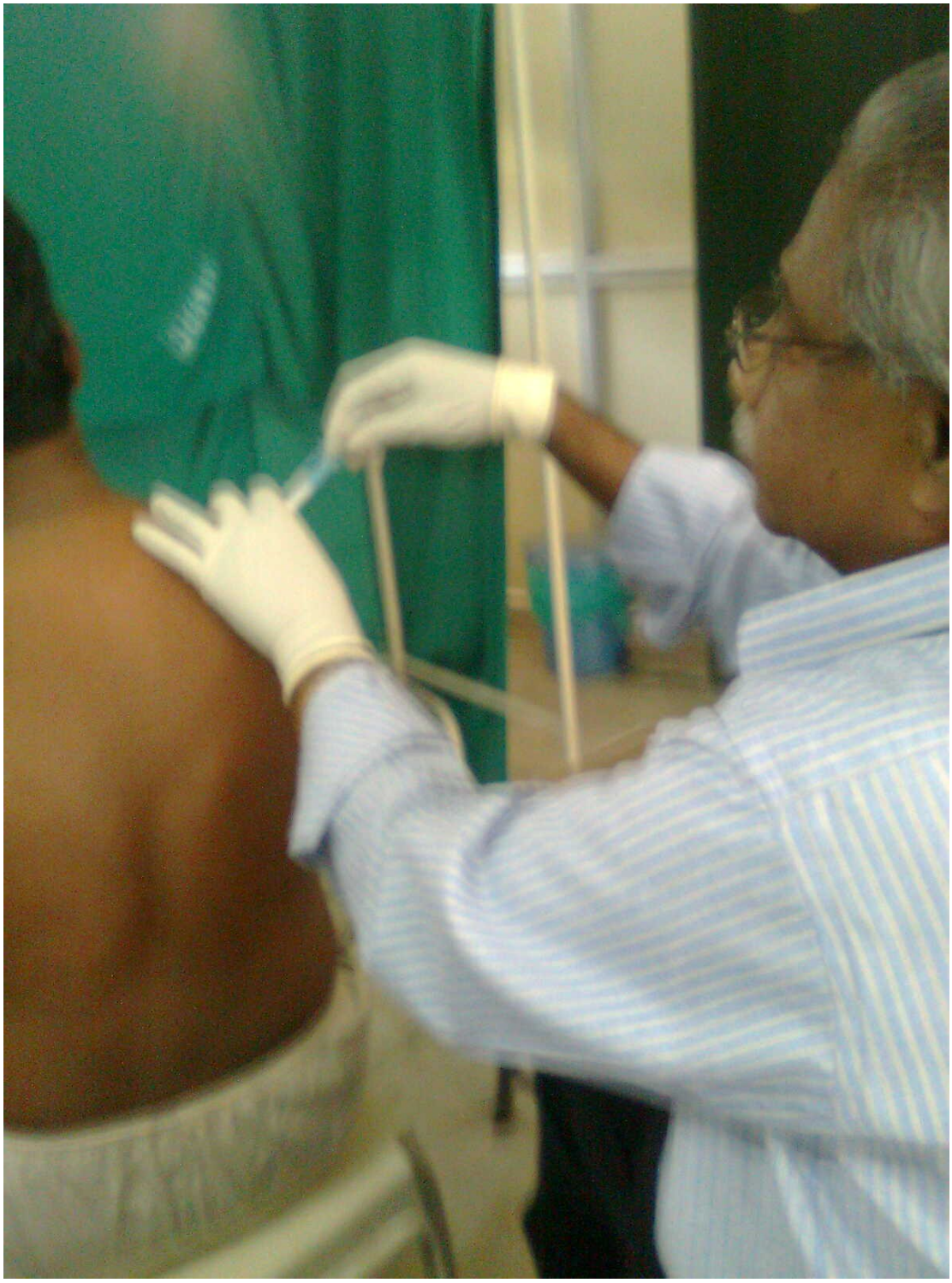
The needle was directed over the spine in the plane of the scapula and advanced to the hub of the needle or until contact was made with the floor of the suprascapular fossa. After attempted aspiration, the agent was slowly injected to fill the fascial contents of this fossa to produce an indirect suprascapular nerve block. At this point the

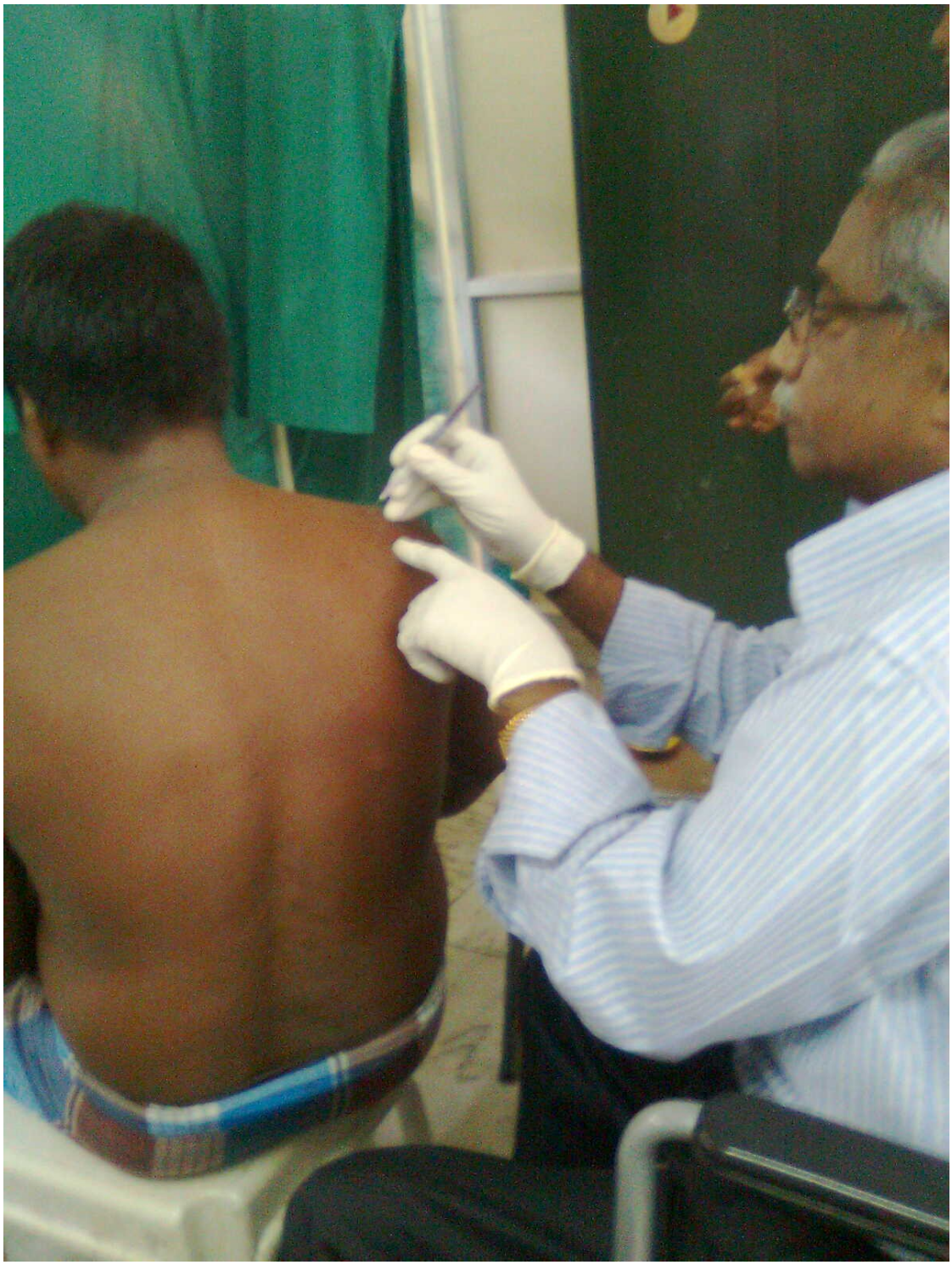
suprascapular nerve gives off branches to supply the glenohumeral joint, the acromioclavicular joint, and the supraspinatus muscle.

The placebo injection consisted of 5 ml normal saline infiltrated subcutaneously after the 2 ml subcutaneous 1% lidocaine infiltration. The use of a subcutaneous injection as placebo,well away from the suprascapular nerve,was thought to be important because of the theoretical possibility of saline itself being potentially active in providing some degree of nerve blockade. The injections were performed out of the line of vision of the patients. They were all performed by a single operator who did not see the patients during the follow up period. The patient assessor was unaware of the nature of the injection. To check whether the blinding was effective, immediately after the injection patients and assessors were separately asked to guess which injection the patient had received. The results of this assessment confirmed the adequacy of the blinding for the patient and the assessor.









DATA ANALYSIS & RESULTS

Table-1

Outcome values of **Shoulder Pain and Disability Index (SPADI)** in Group-A at baseline (Pretest), 5 days post-intervention (Post 1) and 10 days post-intervention (Post 2).

SPADI	**Group - A**			**Group - B**		
Sl	Pre	Post 1	Post 2	Pre	Post 1	Post 2
1	85.1	14.6	12.3	81.2	40.5	24.6
2	87.1	20.0	12.1	85.1	48.7	21.1
3	84.6	8.1	7.5	83.8	44.8	19.1
4	83.8	5.0	4.0	87.1	49.7	20.1
5	83.8	5.0	4.0	85.1	47.7	24.6
6	84.8	8.1	8.1	78.0	38.5	16.0
7	81.2	5.0	4.0	84.8	44.3	21.1
8	78.0	5.0	4.0	84.6	46.8	16.0
9	83.8	6.8	6.8	83.2	42.2	19.0
10	87.1	18.7	14.6	81.2	44.8	21.1
MEAN	83.93	9.630	7.740	83.41	44.80	20.27

WITHIN GROUP ANALYSIS

Table – 2

ANALYSIS OF IMPROVEMENT IN SPADI

Sl. No	Group	Analysis	Mean ± SD	"t" value	Significance
1	A	Pre test	83.93±2.694	54.91	P > 0.05
		Post test 1	9.630±5.897		
2	B	Pre test	83.41±2.623	69.28	P > 0.05
		Post test 1	44.8±2.603		

The results of this study from the above table indicate that, in Within Group analyses of Improvement in Shoulder Pain And Disability Index**(SPADI)** shows that extremely significant in individuals of both Group A & Group B.

Figure - 1

ANALYSIS OF IMPROVEMENT IN SPADI

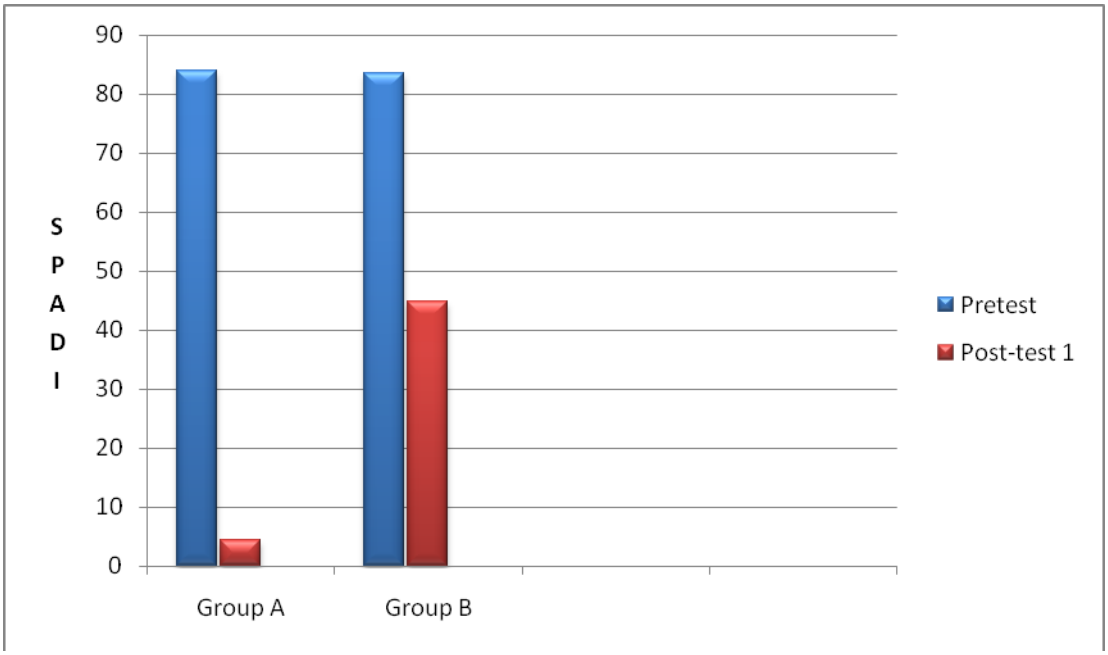


Table - 3

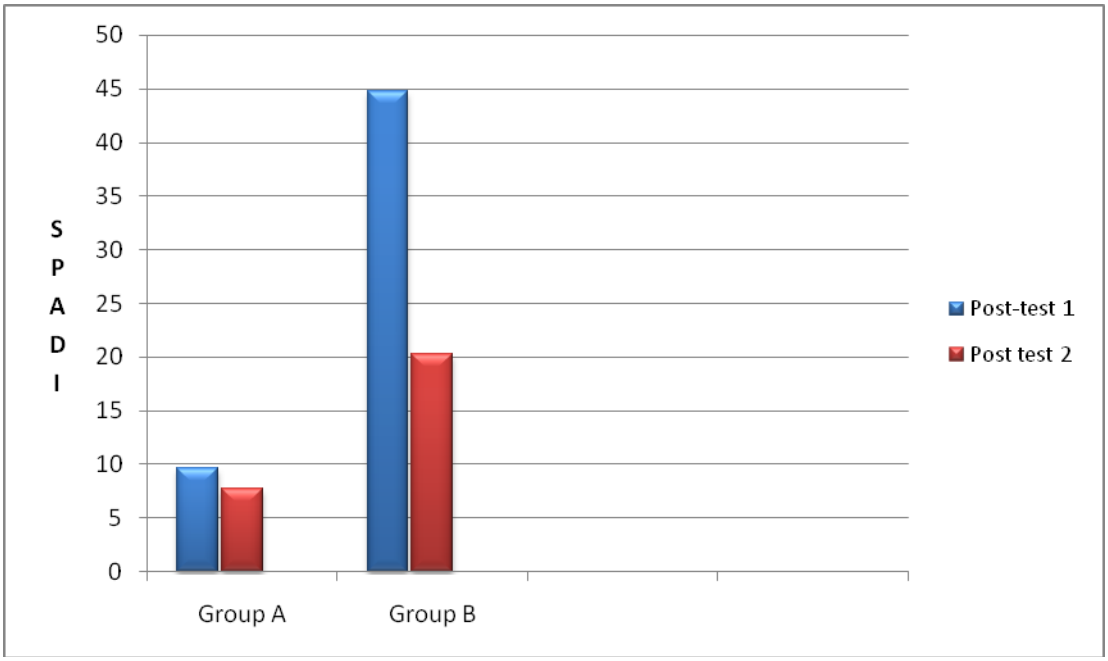
ANALYSIS OF RETENTION OF SPADI

Sl. No	Group	Analysis	Mean ± SD	"t" value	Significance
1	A	Post test 1	9.630±5.897	2.459	P > 0.05
		Post test 2	7.740±3.998		
2	B	Post test 1	44.80±3.603	18.36	P > 0.05
		Post test 2	20.27±2.964		

The results of this study from the above table indicate that, in Within Group analyses of Retention in Shoulder Pain And Disability Index**(SPADI)** shows that extremely significant in individuals of both Group A & Group B.

Figure - 2

ANALYSIS OF RETENTION OF SPADI



BETWEEN GROUP ANALYSIS

Table – 4

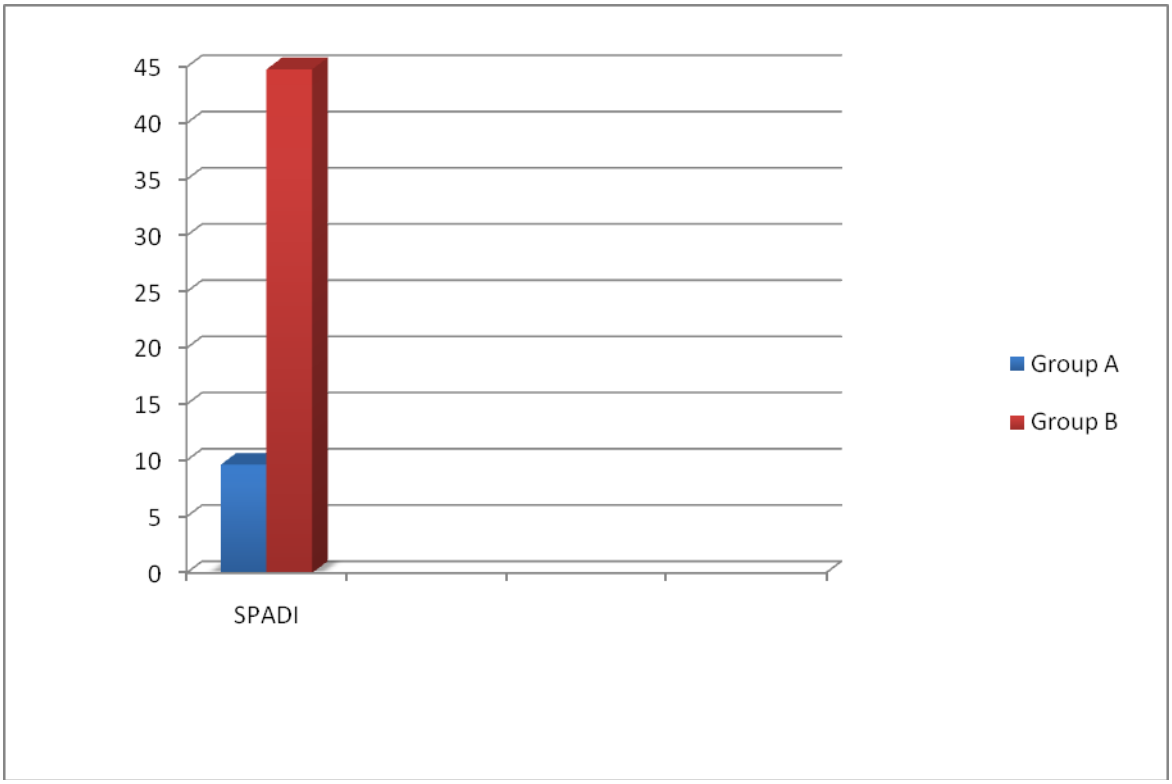
ANALYSIS OF DIFFERENCE IN SPADI

Sl. No	Group	Mean ± SD	Mean Difference	"t" value	Significance
1	A	9.630 ± 1.865	35.17 ± 2.185	16.09	P > 0.05
2	B	44.80 ± 1.139			

The results of this study from the above table indicate that, in Between Group analyses of Shoulder Pain And Disability Index**(SPADI)** is significantly improved in the Group A individuals who receive Suprascapular nerve block than Group B.

Figure – 3

ANALYSIS OF DIFFERENCE IN SPADI



DISCUSSION

The results of this study show a clear benefit from the use of suprascapular nerve block using depometral and bupivivocane hydrochloride in patients with shoulder pain. There was a statistically and clinically significant reduction in pain. This benefit was prolonged, with benefit still present at 12 weeks. There were no significant side effects from the injection, which was well tolerated by most of the patients.

As suggested by Carette in a recent editorial[20], we included a valid and reproducible measurement of disability as a primary end point measurement. There was also an overall modest, but clinically significant, improvement in disability as measured by the disability subscale of the SPADI. Although most of the patients had structurally very abnormal shoulders, a reduction in pain seems to have reduced the level of their measurable disability at the shoulder.

An improvement of 10 on the SPADI has been shown to represent significant clinical improvement. In this study about two thirds of the patients who received the active injection had at least this level of improvement at weeks 1 and 4. The percentage improvement decreased after this, but more than 50% of the subjects had clinical improvement over baseline at follow up as compared with less than 20% in the placebo group. Interestingly, while both pain and disability subscales improved significantly, the pain subscale improved more than the disability scale. This may be because many of the patients had structurally abnormal shoulders due to long duration of disease.

As a result, the level of disability was not likely to show much improvement. The range of movement improvement was modest, with only abduction and the hand behind back combined movement showing any significant improvement.

Values are mean scores and error bars are 95% confidence intervals.

We have included all relevant clinical and radiological information on the patients in the study in order to describe the group as clearly as possible. Even the presentation of the data was difficult because of the lack of uniform clinical descriptors in shoulder studies, and the lack of valid and reliable scoring systems for radiological imaging of the shoulder.

In general, our patients were elderly and had longstanding shoulder pain from degenerative and/or rheumatoid disease. The results suggest that suprascapular nerve block reduces pain and disability at the shoulder for patients with shoulder pain, irrespective of their clinical diagnosis.

The low incidence of reported side effects is an advantage. In addition, the procedure is easy to learn and has a short “learning curve”.

That pain relief from the block extends beyond the pharmacological effect of the drug is well described. There are a number of possible explanations for this:

- Decreases in central sensitisation of dorsal horn nociceptive neurones or a “wind down” (because of a reduction of peripheral nociceptive input) have 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.
- It is also interesting to speculate on the potential contribution to pain relief from the direct infiltration of the supraspinatus muscle, and the possible blockade of those fibres of the nerve supplying the supraspinatus muscle and possible "downstream" blockade of the infraspinatus muscle. No reduction in the power of these muscles was reported, although this could not be formally tested because of the severity of the shoulder pathology in most of the patients studied.

We have demonstrated that suprascapular nerve block is efficacious without the need to image the area by ultrasound or fluoroscopy during the procedure. This study shows that this treatment not only reduces pain but also decreases disability and gives clinicians a proven efficacious treatment for patients with shoulder pain. Whether the efficacy would be further improved with guidance of the needle under direct imaging is unknown. The combination of nerve block with other approaches to pain relief would also be a potentially worthwhile area to study.

In summary, this study provides evidence that suprascapular nerve block is a safe, effective, and well tolerated treatment for patients with shoulder pain. It can be performed in an outpatient department and provides the clinician with an alternative or additional approach to oral drug treatment and intra-articular injection. Further, it may prove to be a useful treatment for patients who are unfit or unwilling to consider surgical intervention.

CONCLUSION

In this study, Group A individuals who depended purely on the Suprascapular Nerve Block and Exercises, showed a greater improvement than the Group B individuals who depended on Heat Modalities and Exercises, which suggests that the influence Suprascapular Nerve Block and Exercises are better in use clinical setting.

From this study it is concluded that Suprascapular Nerve Block and Exercises significantly improve the Shoulder Pain and Disabilities in individuals with Shoulder Pain.

Hence, Suprascapular Nerve Block and Exercises can be implemented in the rehabilitation program of every individual with Shoulder Pain in order to reduce Pain and Disabilities.

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