EFFECTIVENESS OF DERMONEUROMODULATION ON PAIN REDUCTION AND SHOULDER INTERNAL ROTATION IMPROVEMENT IN POST OPERATIVE SLAP TEAR AMONG ATHLETES – AN EXPERIMENTAL STUDY

A dissertation submitted in partial fulfilment of the Requirements for the degree of

MASTER OF PHYSIOTHERAPY

ELECTIVE – PHYSIOTHERAPY IN SPORTS

To

The Tamil Nadu Dr. M.G.R. Medical University

Chennai-600032

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RVS COLLEGE OF PHYSIOTHERAPY

(Affiliated to the Tamil Nadu Dr. M.G.R Medical University, Chennai – 32)

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CERTIFICATE

Certified that this is bonafide work of **Mr. K. Mathankumar** of R.V.S. College of Physiotherapy, Sulur, Coimbatore submitted in partial fulfilment of requirements for Master of Physiotherapy Degree course from the Tamilnadu Dr. M.G.R Medical University under the Registration No. 271750024

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INTERNAL EXAMINER

EXTERNAL EXAMINER

A dissertation submitted in the partial fulfilment of the requirement for the degree of **Masters of Physiotherapy-May 2019** to the Tamilnadu Dr. MGR Medical University, Chennai - 600032.

DECLARATION

I hereby declare and present my project work entitled **"EFFECTIVENESS OF DERMANEUROMODULATION ON PAIN REDUCTION AND SHOULDER INTERNAL ROTATION IMPROVEMENT IN POST OPERATIVE SLAP TEAR AMONG ATHLETES – AN EXPERIMENTAL STUDY".**

The outcome of the original research work undertaken and carried out by me, under the guidance of **Prof..Dr. Kannabhiran, M.P.T, Ph. D., R.V.S. College of Physiotherapy**, Sulur, Coimbatore.

I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from the **Tamil Nadu Dr.M.G.R Medical University.**

Place: Signature

Date:

K. Mathankumar

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I express my sincere thanks to God, the almighty for providing me the strength and knowledge to complete my study successfully.

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K. Mathankumar

CONTENTS

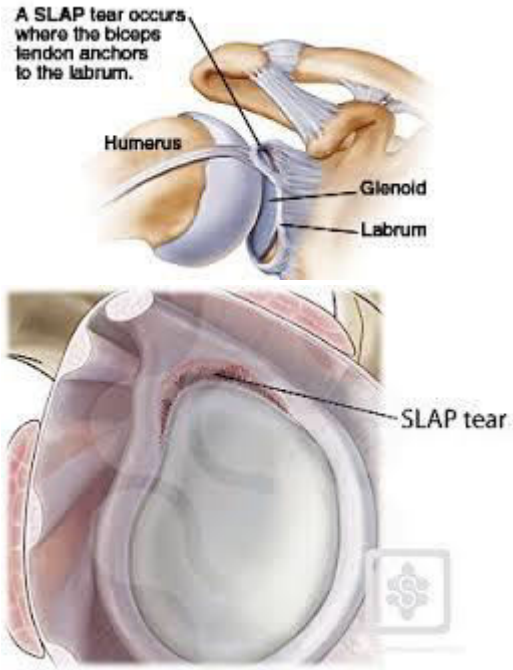
Introduction

1. INTRODUCTION

SLAP LESION

Definition/Description

A SLAP tear or SLAP lesion is an injury to the glenoid labrum (fibrocartilaginous rim attached around the margin of the glenoid cavity). Tears of the superior labrum near to the origin of the long head of biceps were first described among throwing athletes by Andrews in 1985. The label of 'SLAP', an abbreviation for superior labrum anterior and posterior, was coined by Snyder et al.



Clinically Relevant Anatomy

The major joint in the shoulder complex is the Glenohumeral Joint, which is also called the 'ball in a socket' joint . A circumflexial rim of fibrocartilaginous tissue called labrum glenoidalis firmly attaches to the glenoid fossa thereby increasing the articular surface area and the stabilisation of the glenohumeral joint.

The long arm of the biceps inserts directly into the superior labrum, which also provides stabilisation to the superior part of the joint. In addition, the rotator Cuff muscles are essential to ensure dynamic shoulder stability as they prevent excessive translations of the humeral head at the level of the glenoid fossa.

Epidemiology/Aetiology

The age of the patient has an impact on the superior labrum. From the average age of 35, the superior labrum is less firmly attached to the glenoid than in people under the age of 30. In the age category 30 to 50, there are more chances of tears/defects in the superior and anterior-superior regions of the labrum (noted in cadavers).

There are a lot of different mechanisms of injury that can result in a SLAP lesion. The following causes have been found:

repetitive throwing,

hyperextension,

a fall on an outstretched arm,

heavy lifting,

direct trauma.

The two most common mechanisms are falling on an outstretched arm in which there is a superior compression, and a traction injury in the inferior direction.

Falling on an outstretched arm is an acute traumatic superior compression force to the shoulder. In this situation the shoulder is abducted and slightly forward-flexed at the time of the impact.

A subsequent study found that the most common mechanism of injury was a fall or direct blow to the shoulder, occurring in 31% of

patients. A significant number of patients with superior glenoid lesions and concomitant impingement or rotator cuff disease in the absence of trauma has also been identified. Indeed, Snyder et al found partial-thickness or full-thickness rotator cuff disease in 55 (40%) of 140 patients with SLAP lesions. Superior migration of the humeral head can result from a rotator cuff that is not effectively performing its role as a humeral head depressor. The superior labrum and biceps anchor could theoretically be gradually lifted off the glenoid as a result of chronic repetitive superior translation of the humeral head on the glenoid rim. Other authors supported the theory of an inferior traction mechanism on the basis of a sudden, traumatic, inferior pull on the arm or repetitive microtrauma from overhead sports activity with associated instability.

Throwers can have repetitive microtrauma. At the moment of the impact the glenohumeral contact point is shifted posterosuperiorly and increased shear forces are placed on the posterior-superior labrum, which results in a peel-back effect and eventually in a SLAP lesion. Thus, it is evident that the SLAP tear is very common in individuals with sports and athletic activity.

Clinical Presentation

The most common complaint in patients that present with SLAP lesions is pain. Pain is typically intermittent and often associated with overhead movements. Isolated SLAP lesions are uncommon. The majority of patients with SLAP lesions will also complain of:

sensations of painful clicking and/or popping with shoulder movement

loss of glenohumeral internal rotation range of motion

pain with overhead motions

loss of rotator cuff muscular strength and endurance

loss of scapular stabiliser muscle strength and endurance

inability to lie on the affected shoulder

Athletes performing overhead movements, especially pitchers, may develop “dead arm” syndrome in which they have a painful shoulder with

throwing and can no longer throw with pre-injury velocity. They may also report a loss of velocity and accuracy along with discomfort in the shoulder.

It is important to keep in mind that the scapula is an important factor during shoulder movements. When the scapula does not perform its action properly there is a scapular malposition. This decreases the normal shoulder function. It changes the activation of the scapular stabilising muscles, which are the serratus anterior, rhomboid major and minor, levator scapulae and trapezius. The rotator-cuff muscles are important as well to anchor the scapula and guide the movement.

Differential Diagnosis

The glenoid labrum is often involved in shoulder pathology. Sometimes morphological varieties can be confused with pathological aspects and therefore diagnosis should be established following careful analysis of the case history and a physical examination. There are two regions where anatomic variants can appear: the superior region, where it's mostly related to age, and the anterosuperior region, where sometimes there is no labrum (12%) or a cord like ligament that is in continuity with the biceps footplate (13,5%).

According to **William F.B.,** SLAP lesions had an association of 43% with the medial sheath lesion the author postulates that forces that affect the biceps anchor may also damage the pulley system of the bicipital sheath and, as such, this anatomic structure should be evaluated, especially when SLAP lesions are present.

Beside biceps tears, other problems, such as bursitis and rotator cuff tears, are often identified, In combination with SLAP lesions. According to **Morgan CD et al.,** Rotator cuff tears were present in 31% of patients whit SLAP lesion and were found to be lesion-location specific.

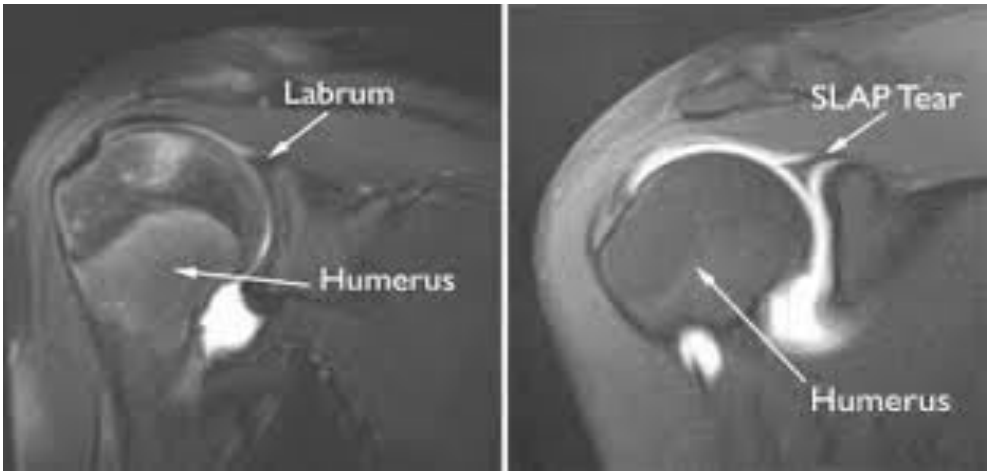
Also suprascapular neuropathy secondary to cyst compression in the spinoglenoid notch may occur in association with SLAP tears.

Diagnostic Procedures

This can be followed by these tests that are positive when there is a presence of a SLAP lesion: positive anterior drawer (53%), positive apprehension at 90° of abduction and maximal external rotation (86%), and positive relocation test (86%).

In addition, several special tests can be used to help identify the presence of a SLAP lesion including the Clunk test, the crank test, O' Briens, Anterior Slide test, Biceps Load I and II test, and the Active Compression test.

Another very important diagnostic element is the use of clear radiological and arthroscopic images of the labrum - conventional MRI, CT arthrography, MR arthrogram.



Medical Management

The surgical intervention depends on the type of labral lesion, but an advanced arthroscopic technique is most commonly used. Studies of surgical labral repairs show that they are generally good to excellent to allow the patient to return to a pre-injury level of function. Knowing the type of SLAP lesion is important for post-operative rehabilitation.

Type I: are treated with debridement. Straightforward arthroscopic shaving, without damaging the biceps anchor, is enough for the surgical treatment of this type of lesion.

Type II: can be treated with arthroscopic fixation of the superior labrum to establish biceps anchor stability.

Type III: can easily be debrided by an arthroscopic shaver. There is no need to repair this type of injury. After the resection of the free fragment, a pain free shoulder can be established.

Type IV: can be repaired with multiple sutures.

Field and Savoie reported 100% good results at an average follow-up of 21 months. Also **Pagnani et al.,** reported that superior glenoid lesions with unstable biceps anchors (type IV lesions), which were stabilised with absorbable tacks obtained good results. At their 2-year follow-up, 86% of the patients had satisfactory results, and no complications were related to use of the tack. **Stetson et al.,** presented the long-term results of 140 SLAP lesions with follow-up available on 130 patients at an average of 3.2 years. Type IV lesions in 17 patients (13%) were debrided.

Physical Therapy Management

When conservative treatment fails, a surgical approach is in order. After surgery, for 3 to 4 weeks, the shoulder of the patient is placed in a sling, which immobilises the shoulder in internal rotation and leads to general loss of motion and stiffness. Postoperative rehabilitation (which is explained in the methodology) is determined by the type of SLAP lesion, the chosen surgical procedure and other concomitant pathologies and procedures performed.

It is important to note that every treatment depends on the type of the SLAP lesion and that conservative treatment may fail and is not suited to every patient.

DERMONEUROMODULATION

MIRON et. al., (1989) states that an additional complication in understanding the influence of attention on pain is the observation that pain itself modifies an individual's ability to focus attention. Pain is in general an attention – demanding modality, so that when a person is asked to devide his attention between pain and another sensory modality, attention to pain dominates. Hence, its inevid of necessary to modulate pain before treating the source. In DermoneuroModulation, we treat the condition via., focussing mainly on modulation of pain by passifying it.

Dermoneuromodulation (DNM) is a structured, interactive approach to manual therapy that considers the nerves system of the patient from skin cell to sense of self. Techniques are slow, light, kind, intelligent, responsive and effective. Positioning of limbs and trunk affects deeper nerve root trunks, and is combined with skin stretch directed toward cutaneous fields of nerves that branch outward into skin.

Manual handling of a patient's physicality is only a small part of developing a complete therapeutic context for change – while optional, it can also be optimal. Included are simple ways of explaining the nervous system and pain mechanisms to patients prior to treatment.

DNM facilitates the cutaneous nerves and modulates the pain and biomechanical deviations by combined action of skin and the nervous system both peripherally and centrally. It sees the biomechanical deviations as a structural response and not as a defect.

1.1 NEED FOR THE STUDY

As there is a gross restriction in all planar ROM of shoulder after prolonged post operative immobilisation period with sling, it affects the athlete in returning back to sports activities. Early physical therapy intervention is necessary to bring the athlete again on field and even to his daily life activities. Internal rotation is very much essential for daily life activies and also for sports activity such as throwing, weight lifting, bowling, hitting the ball with hockey stick or bat, pacing the badmidton raquet, etc.,. With these considerations, we started treating the athletes aiming to improve internal rotation mainly in amidst the other goals of therapy.

As there will be a lot of pain and ROM restriction after immobilisation period, it is not easy for the therapist to treat the athlete. This really becomes a challenge and frustrating for both the athlete as well as the therapist. Hence, it is necessary to bring full range of motion especially the internal rotation and start strength training as early as possible.

This study evaluates the effectiveness of DermoneuroModulation on Pain reduction and improving shoulder Internal Rotation in Post Operative SLAP tear among athletes and bring them back on field.

1.2 OBJECTIVE

a) To determine the effects of DermoneuroModulation along with conventional physiotherapy on pain reduction and Shoulder Internal Rotation improvement in Post Operative SLAP tear among athletes.

b) To determine the effects of conventional physiotherapy alone on pain reduction and Shoulder Internal Rotation improvement in Post Operative SLAP tear among athletes.

c) Compare and contrast the effects of DermoneuroModulation along with conventional physiotherapy and conventional physiotherapy alone on pain reduction and Shoulder Internal Rotation improvement in Post Operative SLAP tear among athletes.

1.3 STATEMENT OF THE PROBLEM

The Purpose of the study was to find out the **"Effectiveness of DermoneuroModulation on Pain reduction and Shoulder Internal Rotation improvement in Post Operative SLAP tear among athletes".**

1.4 HYPOTHESIS

a) Null Hypothesis

Based on the literature review study the Null hypothesis is stated as "There is no significant improvement with DermoneuroModulation along with Conventional Physiotherapy on Pain reduction and Shoulder Internal Rotation improvement in Post Operative SLAP tear among athletes".

b) Alternative Hypothesis

The alternative hypothesis is stated as **"There is significant improvement with DermoneuroModulation along with Conventional Physiotherapy on Pain reduction and Shoulder Internal Rotation improvement in Post Operative SLAP tear among athletes".**

1.5 EXPECTED OUTCOME

With standing the strong evidence based representations of the possibility of pain reduction and ROM improvement, it is assured that DermoneuroModulation along with conventional physiotherapy resulted better on pain reduction and ROM improvement than conventional physiotherapy alone in the post operative SLAP tear among athletes.

Review of Literature

2. REVIEW OF LITERATURE.

MOHAMMED FARGHALLYAMIN et. al., (2012) states that MR arthrography is a sensitive minimally invasive technique for detection and grading of SLAP lesions, it can help in avoiding patients unnecessary diagnostic arthroscopy.

ERIC J HEGEDUS et. al., (2012) states that the use of any single ShPE test to make a pathognomonic diagnosis cannot be unequivocally recommended. There exist some promising tests but their properties must be confirmed in more than one study. Combinations of ShPE tests provide better accuracy, but marginally so. These findings seem to provide support for stressing a comprehensive clinical examination including history and physical examination. However, there is a great need for large, prospective, well-designed studies that examine the diagnostic accuracy of the many aspects of the clinical examination and what combinations of these aspects are useful in differentially diagnosing pathologies of the shoulder.

CECILIE PIENESCHRODER M.D. et. al., (2012) states that long-term outcomes after isolated labral repair for SLAP lesions are good and independent of age. Postoperative stiffness was registered in 13.1% of the patients.

BRIAN R. NERI M.D. et. al., (2010) states that return to preinjury level of competition for elite overhead athletes after type II SLAP lesion repairs was 57%, despite high American Shoulder and Elbow Surgeons scores. Return to play status correlated with the presence of a partial-thickness rotator cuff tear. The Kerlan-Jobe Orthopaedic Clinic score, designed specifically for the evaluation of the overhead athlete, was a more accurate assessment tool than was the American Shoulder and Elbow Surgeons in this population of elite overhead athletes with SLAP tears.

H.J.IQBAL et. al., (2010) states that MR Arthrogram is a useful technique for the diagnosis and preoperative planning of suspected SLAP lesions. It may also save patients from unnecessary diagnostic arthroscopy.

STEPHEN F. BROCKMEIER et. al., (2009) states that arthroscopic treatment of superior labral lesions has evolved. Coexistent pathology is common and should be addressed at the time of arthroscopic repair. On the basis of our findings, favorable clinical outcomes can be anticipated in the majority of patients after arthroscopic SLAP lesion repair. Overall, approximately three of four patients will be able to successfully return to the previous level of athletic ability. However, patients with a distinct traumatic etiology have a higher level of satisfaction with regard to their outcome, which is likely due to their substantially greater likelihood of a successful return to competition.

LAURIE M.KATZ M.D. et. al., (2009) states that 71% of patients (mean patient age, 43 years) with a poor outcome after SLAP repair were dissatisfied with conservative treatment. Therefore, once a patient has a poor outcome after SLAP repair, there is a high chance of conservative treatment failing. Although patients have better outcomes with operative intervention, 32% will continue to have a suboptimal result.

E J HEGEDUS et. al., (2008) states that the diagnostic accuracy of the Neer test for impingement, the Hawkins−Kennedy test for impingement and the Speed test for labral pathology is limited. There is a great need for large, prospective, well-designed studies that examine the diagnostic accuracy of the numerous physical examination tests of the shoulder. Currently, almost without exception, there is a lack of clarity with regard to whether common OSTs used in clinical examination are useful in differentially diagnosing pathologies of the shoulder.

FRANCESCO FRANCESCHI et. al., (2007) states that there are no advantages in repairing a type II SLAP lesion when associated with a rotator cuff tear in patients over 50 years of age. The association of rotator cuff repair and biceps tenotomy provides better clinical outcome compared with repair of the type II SLAP lesion and the rotator cuff.

SONJA STANDER et. al., (2004) states that vanilloid receptor subtype 1 is widely distributed in the skin, suggesting a major role for this receptor, e.g. in nociception and neurogenic inflammation.

J. LORENZ et, al., (2003) states that the presence of nociceptor sensitization following topical treatment with capsaicin strongly enhances the engagement of the frontal lobe during painful heat stimulation.

BOUAZIZ et. al., (2002) states that after three-in-one block, an F nerve block may have been taken for an obturator nerve block in 100% of the cases when the cutaneous distribution of the obturator nerve was assessed on the medial aspect of the thigh. Therefore, the only way to effectively evaluate the obturator nerve function is to assess the adductor strength.

VILLEMURE et. al., (2002) states that an additional complication in understanding the influence of attention on pain is the observation that pain itself modifies an individual's ability to focus attention. Pain is in general an attention – demanding modality, so that when a person is asked to devide his attention between pain and another sensory modality, attention to pain dominates.

PIERRERAINVILLE (2002) states that activity within the anterior cingulate cortex and possibly in other classical limbic structures, appears to be closely related to the subjective experience of pain unpleasantness and may reflect the regulation of endogenous mechanisms of pain modulation.

REIKO URASHIMA, M. MIHARA, (1998) states that pruritus in lichenified atopic skin is probably not caused by damage to the cutaneous free nerve endings. In such lesions, the number of the cutaneous free nerve endings is greatly increased, but they may have a normal function.

H. SUGIURA et. al., (1997) states that The number of SP-positive nerve fibers in AD lesions was far less than one-tenth of the number of PGP-positive nerve fibers.

LAUTENBACHER, S. Ph.D., ROLLMAN, G. B. Ph.D, (1997) states that pain modulation, produced by a concurrent tonic stimulus in healthy persons, was not seen in the fibromyalgia group. The patients either had deficient pain modulation or were unable to tolerate a tonic stimulus

intense enough to engage a modulatory process. It remains to be established whether the pain reduction found in the healthy subjects was the conventional DNIC effect, another effect (e.g., distraction), or a combination of both.

S. S. KARANTH et. al., (1991) states that antiserum to PGP 9.5 is the most suitable and practical marker for the demonstration of cutaneous nerves. Species differences exist in the density of peptidergic innervation, but apparently not for specific peptides. Not all sensory axons immunoreactive for CGRP and substance P/NKA are capsaicin-sensitive. However, all sympathetic TH- and NPY- immunoreactive axons are totally responsive to 6-OHDA; but no change was seen in VIP-immunoreactive axons, suggesting some demarcation of cutaneous adrenergic and cholinergic sympathetic fibers.

P.HOLZERA, BUCSICS F, LEMBECK, (1982) states that These results indicate a widespread innervation of cutaneous and visceral tissues by sensory nerve fibres containing immunoreactive substance P (ISP).

ALLAN I. BASBAUM, HOWARD L. FIELDS (1979) states that there are differential contribution of several brainstem neuronal groups, including the serotonergic nucleus, raphe magnus, the ventromedial reticular formation of the medulla, and various catecholamine-containing neurons of the dorsolateral pontine tegmentum to the analgesia produced by opiates and electrical brain stimulation.

AKIO OHNISHI, MD; PETER JAMES DYCK, MD, (1974) states that in Fabry Disease there were axonal degeneration and segmental demyelination, probably due to a metabolic derangement in cytons. At the cyton, degenerating neurons were recognized by histologic abnormalities, decreased endoplasmic reticulum, and deposition of lipid granules.

Methodology

3. MATERIALS AND METHODOLOGY

The purpose of the study is to record the **"Effectiveness of DermoneuroModulation on Pain reduction and Shoulder Internal Rotation improvement in Post Operative SLAP tear among athletes".**

The research design was selected so that it may serve as a guideline for planning and implementing the study in a way that is more likely to achieve the goal.

3.1 MATERIALS

Dycem

High couch or Manual Therapy couch

High Wooden Chair

Pillows and bolsters

Weight cuffs

Resistance Bands

Universal Goniometer

3.2 METHODOLOGY

Study design

Pretest and post test comparative group design; experimental study.

Study setting

The study was carried out in any kind of athletes with Post Operative SLAP tear who had been got consent and treated primarily by me in the out patient Department of RVS College of Physiotherapy, Coimbatore, under the supervision of staff and Principal of the RVS College of Physiotherapy, Coimbatore.

Sample Size

A total of 32 athletes were selected for the study. 12 of them were excluded for various reasons. Out of 20 patients 10 were assigned to each group.

Sampling

The athletes with Post Operative SLAP tear were assessed and selected on the basis of convenient sampling and were assigned in two groups.

Group - I

10 athletes were undergoing DermoneuroModulation along with conventional physiotherapy.

Group - II

10 athletes were undergoing only conventional physiotherapy.

3.3 SELECTION CRITERIA

Inclusion Criteria

Age between 20 - 38 years.

Only athletes who came to our college out patient department.

Both sexes included.

Athletes from various sports were included.

Athletes were included with initial assessment of shoulder ROM tests and then chosen who are all present with restricted ROM, especially internal rotation, and pain.

Only athletes who crossed 4 weeks of immobilization were included.

Ability to communicate and willingness to cooperate.

Exclusion Criteria

Proximal humeral, clavicle, scapula fractures or idiopathic frozen shoulder, adhesive capsulitis, shoulder impingement syndrome cases in which later causes shoulder stiffness were excluded.

Aged above 38 years were excluded

Athletes who had any cervical pathology like cervical spondylosis, tumors which later cause shoulder weakness, spasticity or pain were excluded.

Hypersensitivity.

Skin lesions and open wounds.

Presence of severe contracture and deformity.

General contra indications for manual therapy.

Unable to cooperate.

Refused participation.

3.4 DURATION

Study duration

The study was carried out for a period of 10 months.

The athletes were treated after 1 month period of immobilization.

Follow up was done for 4 months.

Treatment duration

10 minutes, 1 session in a day, 3 days in a week. After that, follow up was done for 4 months with continuing physiotherapy home program. The values of the parameters selected were assessed on the day of initial assessment with first session of treatment and last session of treatment.

3.5 DESCRIPTION OF THE TECHNIQUE

Group -I

DermoneuroModulation with conventional physiotherapy.

Group – II

Conventional physiotherapy.

DermoneuroModulation

This technique is a current update in clinical practice in pain management building evidences for the effectiveness of the use of DermoneuroModulation in the shoulder conditions. DermoneuroModulation given here to restore the internal rotation and reduce pain of post operative SLAP tear. Along with that, ROM exercises and strengthening protocol also delivered in the conventional physiotherapy to increase the effectiveness of DermoneuroModulation and reduce the risk of recurrence of SLAP tear.

Target Neural Structures :

Motor nerves of Brachial Plexus C5 to C8 and cutaneous nerves of ventral rami of T1 – T2 (medial brachial cutaneous nerve, medial antebrachial cutaneous nerve and intercostobrachial nerve).

Nerves to muscles attached to the scapula :

Dorsal scapular
Suprascapular
Subscapular
Long thoracic

Procedure

Patient position

Side lying with elbow in the air and placing the hand on the cheek with pronated forearm. Elbow can be supported with pillow also.

This position is obtained by taking up the arm slowly and carefully back into elevation until a slight resistance is felt. This represents the limit of the range.

Therapist position

Sitting behind the head of patient.

Hand placement

Left hand gently over the lateral border of the scapula.
Right hand over the entire elbow.

Treatment

Gently, but inexorably, press to move the scapula medially. Go slow.

Await for ease to present itself.

Gather the skinover the elbow up into the other hand. Hold for few mins.

Gently allow hands and skin under hands to come back to neutral.

Remove hands slowly.

Reassess. Ask the patient to stand up and move their own arm around, perform internal rotation.

Frequency

Atleast 10 mins per session, continuously without interval.

CONVENTIONAL PHYSIOTHERAPY

Generally pendulum and elbow range-of-motion exercises are allowed during the period of immobilization. External rotation must absolutely be avoided and abduction limited to 60°. Assisted and passive techniques are used at 4 weeks post-operative to increase shoulder mobility. Between week 4 and 8, internal and external rotation ROM are progressively increased to 90° of shoulder abduction. Resistance exercises can be initiated at approximately 8 weeks post-operative, in which scapular strengthening should be emphasized. Since the metabolism of cartilage depends partly on its mechanical environment, resistance training can contribute to gaining mobility. However, the achievement of adequate shoulder mobility is an important condition to begin resistance training. At month 4 to 6, dependent on the type of sport practiced, patients should be able to start sport-specific training and gradually return to their former level of activity.

3.6 VARIABLES

3.6.1 INDEPENDENT VARIABLES

DermoneuroModulation

Conventional physiotherapy

3.6.2 DEPENDENT VARIABLES

Shoulder Internal Rotation

3.7 PARAMETERS

Shoulder Internal Rotation
Post Operative SLAP Tear

3.8 MEASUREMENT TOOLS

The following measurement tools were used for analysis of outcome.

- **General Sports Physiotherapy Evaluation Chart**
- **Shoulder ROM Tests**
- **Pain Numerical Rating Scale**
- **Goniometry Standards**

3.9 STATISTICAL TOOLS

Paired ‘t’ test

Paired ‘t’ test was used to compare the pre-test and post-test values of the two groups, each group seperately.

Formula

$$s_d = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\bar{d}}{s}\sqrt{n}$$

Where,

d = difference between the pre-test and post-test

$\bar{d}$ = mean difference

n = total number of subjects

S = standard deviation

Unpaired ‘t’ test

The unpaired ‘t’ test was used to compare the post-test values between the two groups for Pain Numerical Rating Scale and Goniometry Standards.

Formula

$$t = \frac{\overline{X_1} - \overline{X_2}}{S}\sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

$$S = \sqrt{\frac{\sum (X_1 - \overline{X_1})^2 + \sum (X_2 - \overline{X_2})^2}{n_1 + n_2 - 2}}$$

$\overline{X_1}$ = Mean of Group I.

$\overline{X_2}$ = Mean of Group II

n_1 = Number of subjects in Group I

n_2 = Number of subjects in Group II

S = Standard deviation

Data Analysis & Result

4. DATA ANALYSIS AND RESULTS

The Study was conducted with the two groups, Group I and Group II.

Group-I: Treated with DermoneuroModulation and Conventional Physiotherapy

Group-II: Treated with Conventional Physiotherapy alone.

Pre-test and post-test values were taken and the improvement on the pain reduction and Internal Rotation in post operative SLAP Tear were evaluated using the following parameters.

- **Pain numerical rating scale**
- **Goniometry standards**

Paired 't' test

Paired 't' test was used to compare the pre-test and post-test values of the two groups, each group seperately.

Unpaired 't' test

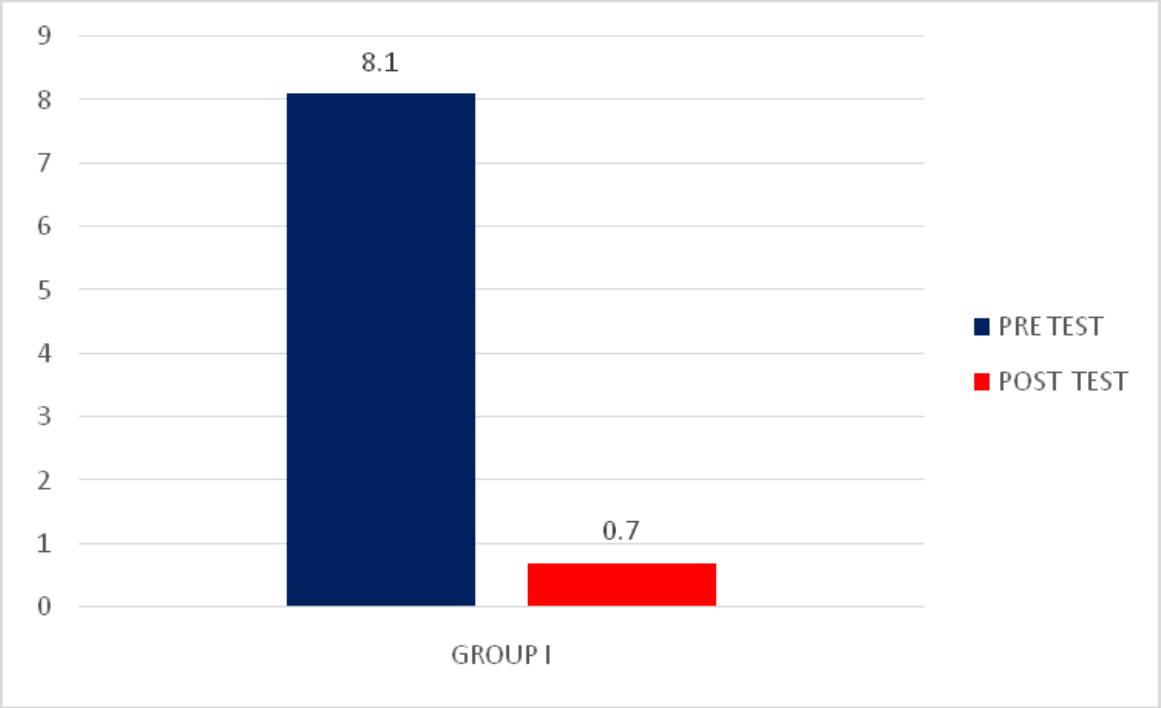
The unpaired 't' test was used to compare and analyze the post-test values between the two groups for Pain Reduction and Internal Rotation improvement in Post Operative SLAP Tear.

PAIN REDUCTION IN POST OPERATIVE SLAP TEAR

GROUP I (pre and post test values of pain in NRS – paired 't' test)

TESTS	N	MEAN	STANDARD DEVIATION	CALCULATED 't' TEST	TABLE 't' VALUE
PRE TEST	10	8.10	0.88	18.5000	2.262
POST TEST	10	0.70	0.67		

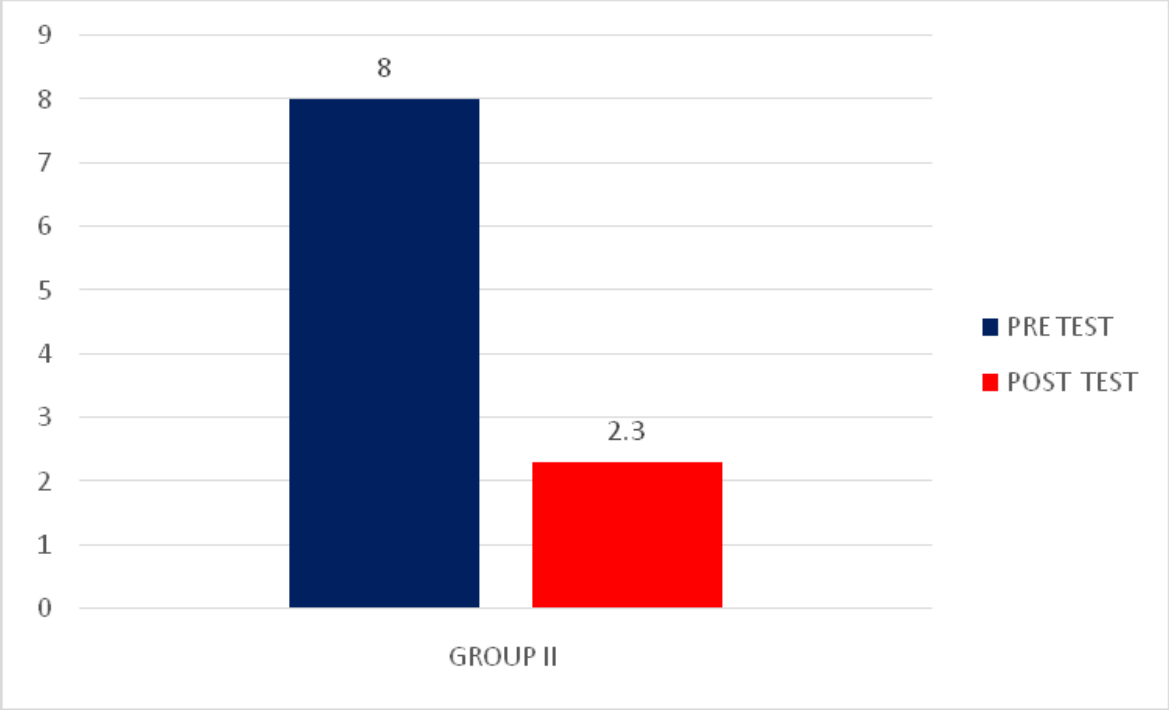
Degree of freedom = 9
Standard error of difference = 0.400



GROUP II (pre and post test values of pain in NRS – paired 't' test)

TESTS	N	MEAN	STANDARD DEVIATION	CALCULATED 't' TEST	TABLE 't' VALUE
PRE TEST	10	8.00	0.82	17.0151	2.262
POST TEST	10	2.30	0.95		

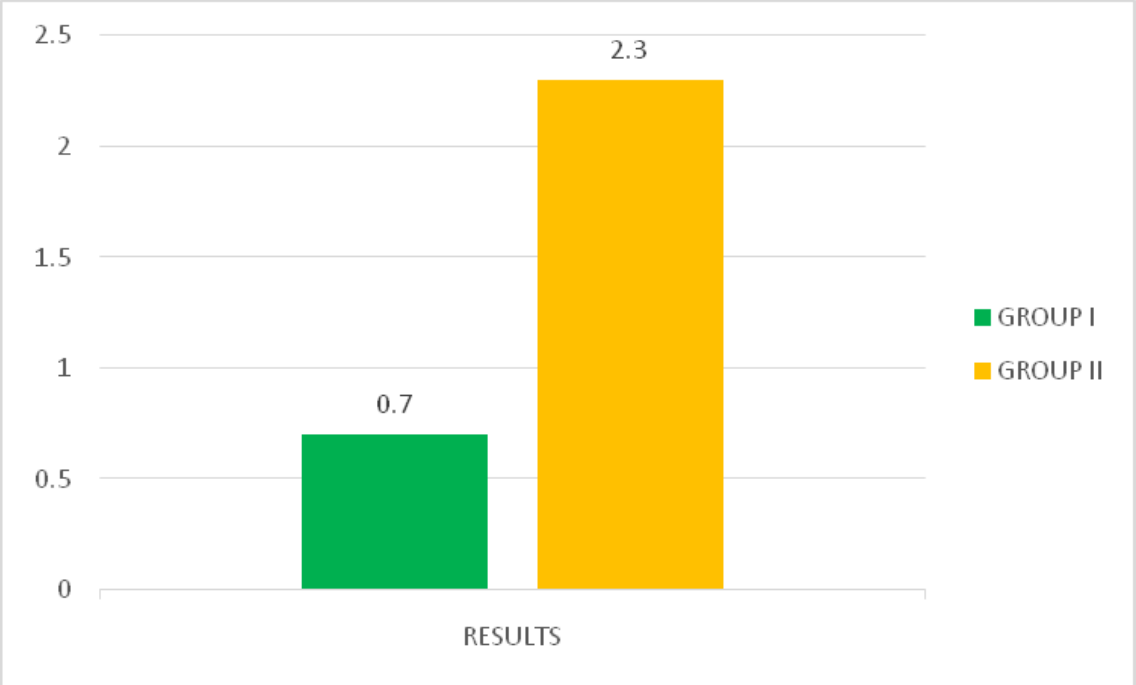
Degree of freedom = 9
Standard error of difference = 0.335



Post test values of both GROUP I and GROUP II of pain in NRS - Unpaired 't' test

TESTS	N	MEAN	STANDARD DEVIATION	CALCULATED 't' TEST	TABLE 't' VALUE
GROUP I	10	0.70	0.67	4.3457	2.101
GROUP II	10	2.30	0.95		

Degree of freedom = 18
Standard error of difference = 0.368

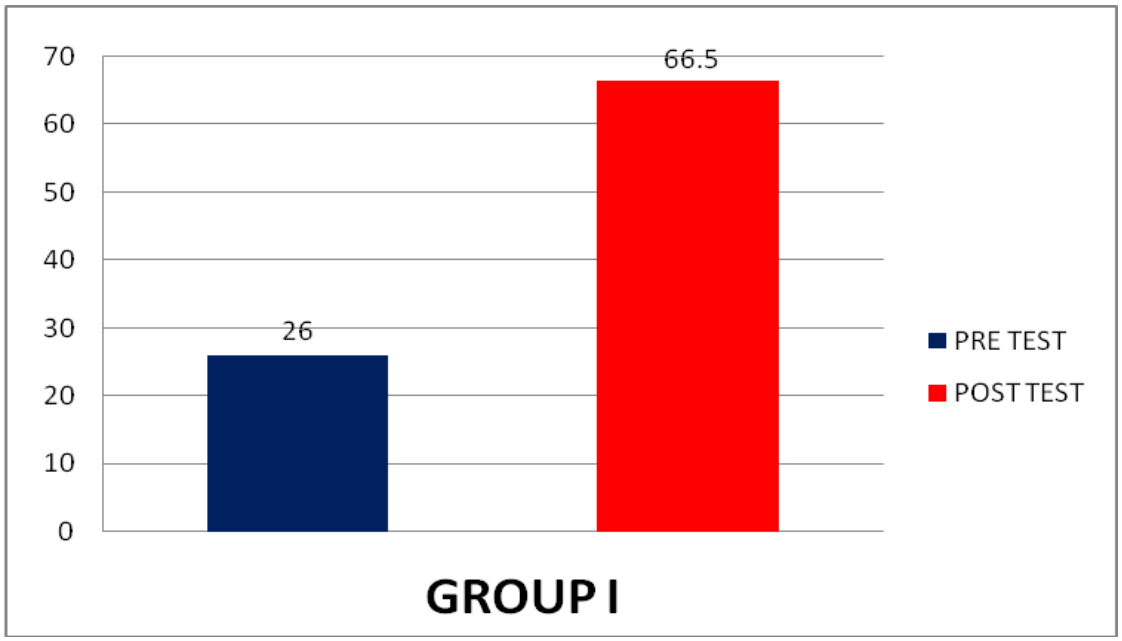


INTERNAL ROTATION IMPROVEMENT IN POST OPERATIVE SLAP TEAR

GROUP I (pre and post test values of internal rotation in Goniometry Standards - paired 't' test)

TESTS	N	MEAN	STANDARD DEVIATION	CALCULATED 't' TEST	TABLE 't' VALUE
PRE TEST	10	26.00	5.68	19.9073	2.262
POST TEST	10	66.50	4.12		

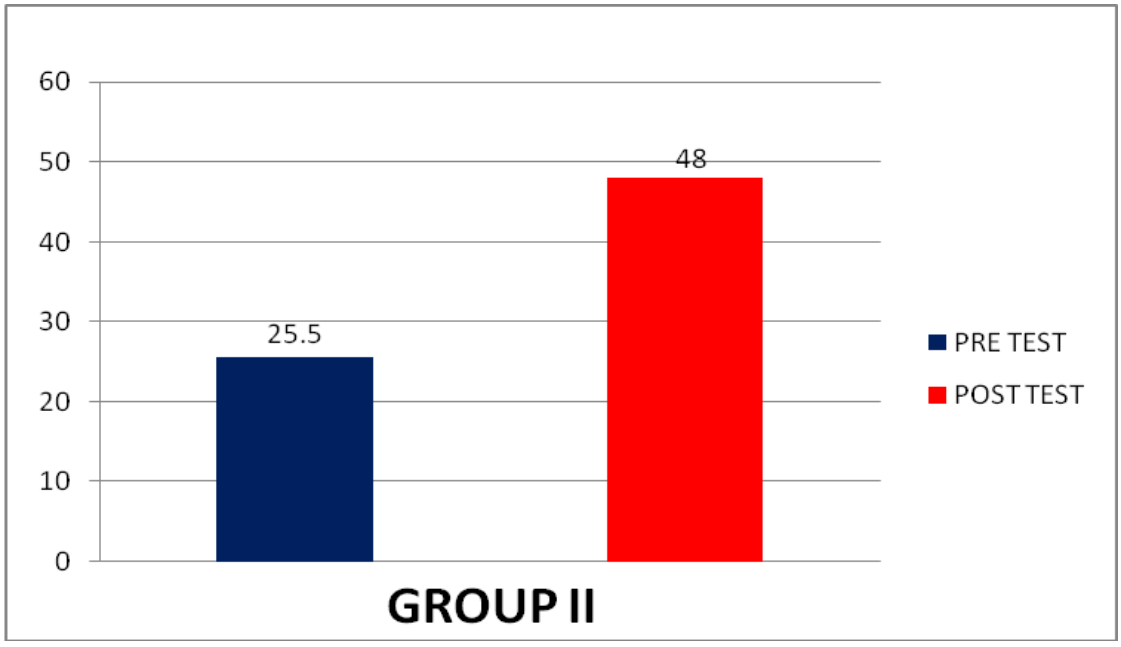
Degree of freedom = 9
Standard error of difference = 2.034



GROUP II (pre and post test values of internal rotation in Goniometry Standards - paired 't' test)

TESTS	N	MEAN	STANDARD DEVIATION	CALCULATED 't' TEST	TABLE 't' VALUE
PRE TEST	10	25.50	5.99	6.8802	2.262
POST TEST	10	48.00	6.75		

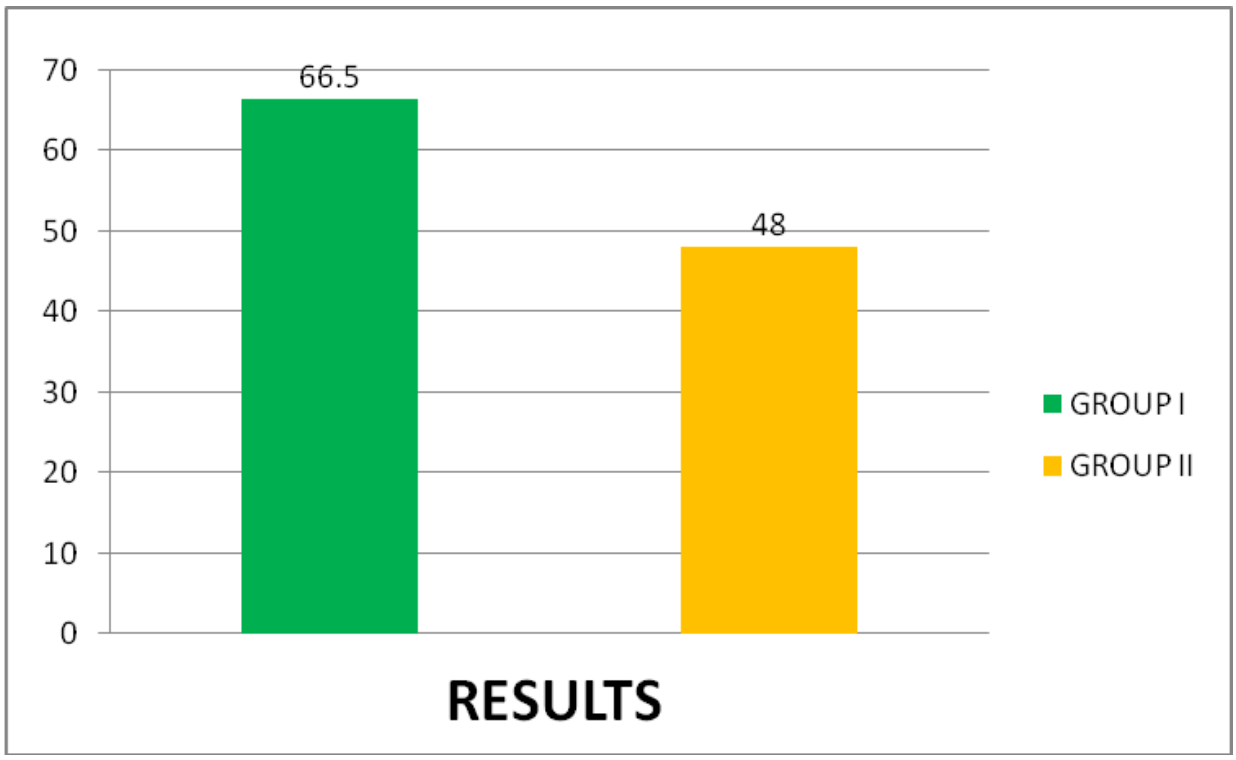
Degree of freedom = 9
Standard error of difference = 3.270



Post test values of both GROUP I and GROUP II of internal rotation in Goniometry Standards - Unpaired 't' test

TESTS	N	MEAN	STANDARD DEVIATION	CALCULATED 't' TEST	TABLE 't' VALUE
GROUP I	10	66.50	4.12	7.4000	2.101
GROUP II	10	48.00	6.75		

Degree of freedom = 18
Standard error of difference = 2.500



RESULTS

This Statistical analysis performed within the **Group I** showed the following outcome, in **Pain Numerical Rating Scale** with a mean improvement of **8.10** and **0.70** respectively for **pre-test and post-test**. The value of the **standard deviation** for pre-test and post-test are **0.88** and **0.67** respectively. The "**t**" value for the **dependent 't' test** calculated within the Group I is **18.5000** which is significant at the level **0.05%** at **9** degrees of freedom . The Standard **error of difference is 0.400**

This Statistical analysis performed within the **Group II** showed the following outcome, in **Pain Numerical Rating Scale** with a mean improvement of **8.00** and **2.30** respectively for **pre-test and post-test**. The value of the **standard deviation** for pre-test and post-test are **0.82** and **0.95** respectively. The "**t**" value for the **dependent 't' test** calculated within the Group II is **17.0151** which is significant at the level **0.05%** at **9** degrees of freedom . The **Standard error of difference is 0.335**

This Statistical analysis performed **between Group I and Group II** showed the following outcome, in **Pain Numerical Rating Scale** with a mean improvement of **0.70** and **2.30** respectively for Group I and Group II. The value of the **standard deviation** for Group I and Group II are **0.67** and **0.95** respectively. The "**t**" value for the **independent 't' test** calculated between the groups is **4.3457** which is significant at the level **0.05%** at **18** degrees of freedom . The **Standard error of difference is 0.368**

The Statistical analysis performed within the **Group I** showed the following outcome, in **Goniometry Standards** with a mean improvement of **26.00** and **66.50** respectively for **pre-test and post-test**. The value of the **standard deviation** for pre-test and post-test are **5.68** and **4.12** respectively. The "**t**" value for the **dependent 't' test** calculated within the Group I is **19.9073** which is significant at the level **0.05%** at **9** degrees of freedom . The Standard **error of difference is 2.034**

This Statistical analysis performed within the **Group II** showed the following outcome, in **Goniometry Standards** with a mean improvement of **25.50** and **48.00** respectively for **pre-test and post-test**. The value of the **standard deviation** for pre-test and post-test are **5.99** and **6.75** respectively. The "**t**" value for the **dependent 't' test** calculated within

the Group II is **6.8802** which is significant at the level **0.05%** at **9** degrees of freedom . The **Standard error of difference is 3.270**

This Statistical analysis performed **between Group I and Group II** showed the following outcome, in **Goniometry Standards** with a mean improvement of **66.50** and **48.00** respectively for Group I and Group II. The value of the **standard deviation** for Group I and Group II are **4.12** and **6.75** respectively. The "**t**" value for the **independent 't' test** calculated between the groups is **7.4000** which is significant at the level **0.05%** at **18** degrees of freedom . The **Standard error of difference is 2.500**

Discussion

5. DISCUSSION

This study is aimed to assess "**Effectiveness of DermoneuroModulation on Pain reduction and Internal Rotation improvement in Post Operative SLAP Tear among Athletes**''.

The Study involved 20 athletes of various sports selected on basis of convenient sampling.

DermoneuroModulation and Conventional Physiotherapy were given in Group I students; 10 minutes, 1 session in a day, 3 days in the week. Group II students were treated with Conventional Physiotherapy alone. After that, follow up was done for 4 months with continuing physiotherapy home program. The values of the parameters selected were assessed on the day of assessment with first session of treatment and the last session of the last day of treatment. The improvement of these assigned athletes is evaluated following treatment of each week, even though 4 months follow up done with continuing Physiotherapeutic Exercises to achieve long term benefit of the treatment and reduce the possibilities of recurrence of SLAP tear or dislocations.

Due to prolonged immobilization for 4 weeks after the surgery, the muscles around the shoulder complex will show atropic changes. This may be due to the lack of firing in the shoulder muscles and entrapment of suprascapular, dorsal scapular, subscapular and long thoracic nerves within the contractured muscle structures. **Henlin et al.** report seven clinical and electromyographical cases of pure infraspinatus muscle paralysis. **Liveson et al.** report three cases of suprascapular nerve lesions at the spinoglenoid notch. Compensation by other muscles in the shoulder girdle covers the loss of strength in abduction and rotation. **Esslen et al.** found teres minor hypertrophy. Pain in the acromioclavicular joint and reduced sensitivity to vibration in the same region complete the clinical picture of the syndrome. Patients may complain of a feeling of abnormal shoulder motion, which might also be decreased. Additionally, **Fisher and Gorelick** thought that nerve compression might be an unsuspected component of shoulder pain. Clinically, dorsal scapular nerve injury produces a mild form of scapular winging in the resting position. The medial border and inferior scapular spine are lifted off the chest wall. Several tests can further illustrate the weakness of the rhomboid and

levator scapulae muscles. Patients will have trouble or find it impossible to try to bring their scapulae together. Additionally, forward elevation of the arm will lift the medial border of the scapula and pull the inferior angle forward off the chest wall; therefore, observation through a range of motion is key to diagnosis. Electromyographic analysis will demonstrate injury to the rhomboid and levator scapulae muscles. Patients typically present with vague complaints of weakness and pain. Shoulder strength is decreased, especially in abduction and elevation. Range of motion in these planes may not be significantly limited. Patients will have trouble with overhead tasks. The telltale sign of long thoracic nerve compromise is winging of the scapula. This can be best demonstrated by having patients do push-ups. If they are unable, they can lean against a wall and push away from the wall. Serratus anterior muscle weakness allows the medial margin of the scapula to lift off the chest wall, while the scapula itself shifts up, with the inferior scapular spine swinging medially toward the spine.

This is treated with DERMONEUROMODULATION which brings about changes from the higher center level by modulating the neuronal output. By modulating the input from the skin via cutaneous distributions of dorsal and ventral rami of cervical nerves, we can alter the neuronal output and thus modulate the pain and improve range of motion. This study focused on modulating the cutaneous distributions of dorsal and ventral rami of cervical spinal nerves corresponding to the shoulder region to treat the post operative SLAP tear athletes.

Data collected through this study showed improvement on pain reduction and Internal Rotation range in Post Operative SLAP Tear among athletes when given DermoneuroModulation along with Conventional Physiotherapy programme. This result supports the studies of **Diane Jacobs**, in which they concluded DermoneuroModulation increases range of motion and shoulder mobility.

The improvement is not only in the pain reduction, but also in the restricted range of motion of shoulder in all planes, especially internal rotation. The improvement in the all planar shoulder mobility is further assessed seperately by the same ROM tests used to assess before the treatment, but not included for the purpose of data analysis. These **results further strongly holds on and supports the studies of Diane Jacobs.**

These clinical outcomes with manual ROM tests also correlates with the evaluation through Pain Numerical Rating Scale.

Both the groups showed significant improvement. Yet, analyzing the statistics and clinical outcomes, it shows **Group I** is better than **Group II**.

Conclusion

6. CONCLUSION

The results of the statistical analysis showed significant improvement in both the groups and the dependent 't' values within the groups are: **18.5000** and **17.0151** for Group I and Group II in **Pain Numerical Rating Scale** and **19.9073** and **6.8802** for Group I and Group II in **Goniometry Standards** respectively. It showed that the treatment protocol provided for each group is valid.

Comparing the post-test values of both groups, Group I had significantly more improvement than Group II with the independent 't' value **4.3457** in **Pain Numerical Rating Scale** and **7.4000** in **Goniometry Standards respectively.**

Hence we reject the null hypothesis and accept the alternative hypothesis which is stated as there is significant improvement with DermoneuroModulation along with Conventional Physiotherapy than Conventional Physiotherapy alone on pain reduction and internal rotation improvement in post operative SLAP tear among athletes.

7. LIMITATIONS

1. The study was stretched over a period of 10 months

2. Left and right sided differences are not considered, eventhough it is really important in neuroplasticity during the immobilization period, between the dominant and non dominant side.

3. Gender is not considered, though female athletes mostly have protective tendency during rehabilitation towards pain.

4. Only shoulder complex is considered, even though it is important to deal with overall upper trunk posture, as there will be protective deviations.

5. Only athletes within 20 to 38 years of age is included in this study.

6. Hemineglígence develop as a pain protective mechanism is not considered.

7. DermoneuroModulation can be compared with other manual therapy approaches like graded mobilization, dry needling, fascial manipulation, muscle energy technique, etc.,

8. Only small sample size with 20 athletes were taken into study.

9. The study does not focused much on the other causes like pathological SLAP tears due to idiopathic degeneration of intra articular structures.

8. RECOMMENDATIONS

More research is needed to further explore the real benefits of DermoneuroModulation including post immobilization SLAP tear in non surgical cases.

Further studies including large sample sizes with in randomized clinical trial should be considered.

To elucidate the mechanisms underlying the facilitated recovery and reduction in the volume of tissue adhesion and the factors that promote maximal recovery (eg: fascia over the shoulder region).

Dominant and non-dominant hand involvement could be analyzed separately, as it may contribute in the trapezius tightness and accommodation of cervical muscles and lateral trunk muscles.

Study with other etiological factors and larger sample size, can be done.

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Annexure

APPENDICES

APPENDIX I

INITIAL EVALUATION FORM KomanOrthopedics and Sports Medicine

NAME: _____
Age: _____ Today's Date: _____
Date of Birth: _____
Height: _____ Weight: _____
Who referred you to us?
If yes, please give name/address of person/physician:
_____
Occupation? _____
Where is your problem? (please circle)
Shoulder Elbow Wrist/Hand
Knee Hip Ankle/foot
Back Neck Other
Which side(s)? Right / Left / Both
Dominant Arm?Right / Left
Problem(s) (please check all that apply):
Pain
Weakness
Instability /giving way /dislocation
Stiffness
Swelling
Other _____
How did you injure yourself?
No injury
Sports (which sport?) _____
Motor vehicle accident
Work/ job -
Workers claim? Yes / No
Date of injury? _____
Sports level: none/recreational/college/ professional
How long have you had symptoms?
_____Days _____Mos. _____ Yrs.
Please briefly describe the injury:
_____
_____
Diagnosis (if you know or have been told)?
_____
_____
Previous treatments (other than surgery)?
(medications, physical therapy, injections, bracing)
_____
_____
Previous surgery for this problem (include dates)
_____
_____
How severe is the pain? (*0 = none, 10 = severe pain)*

At rest? 0 1 2 3 4 5 6 7 8 9 10
At its worst?0 1 2 3 4 5 6 7 8 9 10
Do you have night pain? Yes / No
Does it waken you from sleep? Yes / No
Are you currently working? Yes / No / Retired
Normal job? Limited duty?
What makes your problem better?
_____
_
What makes your problem worse?
_____
_
Please describe your current limitations?
_____
_
Have you had any previous imaging studies?
X-rays Yes / No date: _____
MRI Yes / No date: _____
CT scan Yes / No date: _____
Other Yes / No date: _____ **INITIAL EVALUATION FORM KomanOrthopedics and Sports Medicine**
_____
_____
_____

PAST MEDICAL HISTORY: ALLERGIES:

□ High blood pressure _____ □ NO KNOWN DRUG ALLERGIES
□ Heart problems _____ □ Penicillin
□ History of heart attack _____ □ Sulfa
□ Stroke _____ □ Other _____
□ Kidney disease _____
□ History of Cancer _____
□ Osteoporosis _____ **SOCIAL HISTORY:**
□ Blood clot/embolus _____ Marital status: _____
□ Blood clotting disorder _____ Alcohol use: □ Daily □Socially □ Never
□ Diabetes _____ Tobacco use: □ Yes - Packs per day _____
□ Skin infections _____ □ No
□ MRSA _____
□ Other _____

MEDICATIONS: (please list all medications you are currently taking)

_____
_____
_____

FAMILY HISTORY: (list diseases that run in your family)

□ Blood clots_____
□Bleeding disorders _____

PAST SURGICAL HISTORY: (include dates)

_____
_____

□Other _____
_____

REVIEW OF SYSTEMS:

-GENERAL □ None□ Recent weight change □ Fever □ Weakness/fatigue
□ Other _____
-EYES □ None□ Vision change □ Glasses/Contacts □ Glaucoma □ Cataracts
□ Other _____
-EARS, NOSE, □ None□ Loss of hearing □ Ear ache/infection □ Ringing in ear □ Hoarseness
THROAT □ Other _____
-CARDIOVASCULAR □ None□ Chest pain □ Swelling in legs □ Shortness in breath □ Palpitations
□ Other _____
-RESPIRATORY □ None□ Shortness of breath □ Wheezing/Asthma □ Frequent Cough
□ Other _____
-GASTROINTESTINAL □ None□ Heartburn □ Acid Reflux □ Nausea or Vomiting □ Abdominal pain
□ Other _____
-MUSCULOSKELETAL □ None□ Arthritis/joint stiffness □ Muscle Aches □Swelling of Joints
□ Other _____
-SKIN □ None □ Rash □ Ulcers □ Abdominal Scars □ Sores
□ Other _____
-NEUROLOGICAL □ None□ Headaches □ Fainting/Blackouts □ Numbness, tingling, loss of sensation □
Dizziness □ Other _____
-PSYCHIATRIC □ None □ Depression □ Nervousness □ Anxiety □ Mood Swing
□ Other _____
-ENDOCRINE □ None □ Excessive thirst or hunger □ Hot/cold intolerance □ Hot Flashes
□ Other _____

-HEMATOLOGICAL □ None□ Easy bruising □ Easy bleeding □ Anemia
□ Other _____
Signature: _____ Date: _____

APPENDIX II

SLAP Lesion

Definition/Description

A SLAP tear or SLAP lesion is an injury to the glenoidlabrum (fibrocartilaginous rim attached around the margin of the glenoid cavity). Tears of the superior labrum near to the origin of the long head of biceps were first described among throwing athletes by Andrews in 1985. The label of 'SLAP', an abbreviation for superior labrum anterior and posterior, was coined by Snyder et al, who went on to create a classification system for these lesions.

A total of four types of superior labral lesions involving the biceps anchor have been identified.

Type I concerns degenerative fraying with no detachment of the biceps insertion.

Type II is the most common type and represents a detachment of the superior labrum and biceps from the glenoid rim.The Type II SLAP lesions have been further divided into three subtypes depending on whether the detachment of the labrum involves the anterior aspect of the labrum alone, the posterior aspect alone, or both aspects.

Type III represents a bucket-handle tear of the labrum with an intact biceps tendon insertion to the bone.

Finally, **type IV** lesions, the least common type represents an intra-substance tear of the biceps tendon with a bucket-handle tear of the superior aspect of the labrum.

The above classification system has been expanded to include an additional three types:

Type V: a Bankart lesion that extends superiorly to include a Type II SLAP lesion.

Type VI: an unstable flap tear of the labrum in conjunction with a biceps tendon separation.

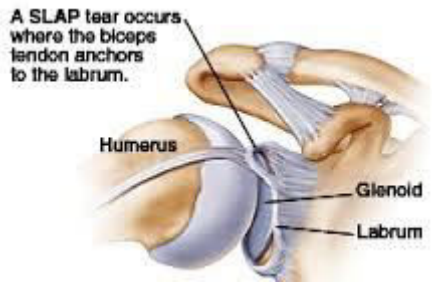
Type VII: a superior labrum and biceps tendon separation that extends anteriorly, inferior to the middle glenohumeral ligament.

Recently Nord and Ryu have added several previously unclassified lesions to the classification scheme.

A **Type VIII** SLAP lesion is a SLAP extension along the posterior glenoidlabrum as far as 6 o'clock.

A **Type IX** lesion is a pan-labral SLAP injury extending the entire circumference of the glenoid.

A **Type X** lesion is a superior labral tear associated with posterior-inferior labral tear (reverse bankartlesion).



APPENDIX III

CONVENTIONAL PHYSIOTHERAPY

At Home

You may remove your post-op dressing 2 days after the operation and replace it as needed. Do not remove the strips of tape (steri-strips) that are across your incision. Allow them to fall off on their own. You may shower after 2 days, but use a water-tight dressing until your sutures are removed. Bathing without getting the shoulder wet or sponge baths are a good alternative. You may wash under the affected arm by leaning forward and letting the arm dangle. Do not attempt to actively move your arm at the shoulder joint for any reason until your doctor allows you. You may remove your sling several times a day and gently move your hand, wrist and elbow and perform shoulder pendulum exercises.

Medication

Your surgeon will prescribe pain medicine for you after the operation. Please call the doctor's office if you have any questions regarding medication.

Ice

You must use ice on your shoulder after the operation for management of pain and swelling. Ice should be applied 3-5 times a day for 10-20 minutes at a time. Always maintain one layer between ice and the skin. Putting a pillow case over your ice pack works well for this.

Sling

You will be provided with a sling to wear after the operation. You should wear this sling most of the time for at least the first 2 weeks after the operation. Remove it when bathing/showering, or to do your exercises. Some patients may require the use of the sling for the first 4 weeks after the operation. Your doctor will give you specific instructions regarding how long you should use your sling.

Sleeping

You may sleep with a pillow propped under your arm to keep it slightly away from the body. For many patients lying flat is uncomfortable at first. It is generally easier to sleep propped up or in a recliner for a short period of time after the operation. Do not attempt to sleep on your operated shoulder for at least 6 weeks.

Rehabilitation

Phase 1 (0-4 Weeks) Passive ROM Phase

Goals
Control Pain and Swelling
Protect Healing Tissue
Begin to Restore Range of Motion

Precautions
Do not actively reach arm behind back.
Do not actively reach overhead.
Do not actively reach arm behind your head.
Do not lift anything with your arm.

Recommended Exercises
Passive ROM limitations
- Flexion as Tolerated
- 0-2 Weeks ER to 15^0 IR to 45^0 in Scapular Plane
- 2-4 Weeks ER to 30^0 IR to 60^0 in Scapular Plane
- Abduction to 80^0

Pendulums
Standing Scapular Mobility (no resistance)
Supine or Standing Passive External Rotation
Supine, Seated or Standing Passive Shoulder Flexion (elevation)
Passive Internal Rotation
Sub-maximal Isometric Shoulder Internal and External Rotation
Ball Squeeze

Guidelines
Perform these exercises 3-5 times a day. Do 1-2 sets of 10-20 repetitions of each exercise.

Phase 2 (4-8 Weeks) Active ROM Phase

Goals
Continued protection of healing tissue
Continue to improve ROM
Initiate gentle peri-scapular and rotator cuff strengthening
Begin using your arm for daily activities in front of body only

Precautions

Discontinue use of sling if you have not already

Be careful with raising your arm, especially overhead, away from your body and behind you
Continue to avoid lifting or carrying anything heavy

Recommended Exercises
ROM
Continue passive ROM with physical therapist
Passive ROM limitations
    Continue Flexion as Tolerated
    Beginning at 4 Weeks ER to 50^0 IR to 60^0 (in 45^0 of Abduction)
    Beginning at 6 Weeks Gently Progress to ER at 90^0 of Abduction
Pendulums
Supine stick flexion and table slides
Supine or Standing Passive External Rotation
Internal Rotation
Strengthening (Resistance Band or Body Weight Against Gravity)
Row
Prone Extension
Prone Horizontal Abduction
Standing/Prone Scaption
Internal Rotation (Neutral) *work from full IR to neutral*
External Rotation (Neutral) *work from full IR to neutral*
Dynamic Strengthening with Physical Therapist
Gentle proprioceptive drills
Rythmic stabilization with therapist

Guidelines
Perform all ROM and Strengthening exercises once a day. Do 2-3 sets of 15-20 repetitions.

Phase 3 (8-12 Weeks) Strengthening Phase

Goals
Continue to acquire normal ROM (both passive and active)
Progress strengthening of rotator cuff and shoulder blade muscle groups
Begin to use arm for daily activities in all planes

Precautions
No lifting away from your body or overhead greater than 1 or 2 pounds
Caution with repetitive use of arm especially overhead
Stop activity if it causes pain in shoulder

Recommended Exercises

Range of Motion

Continue passive ROM with physical therapist as needed gradually progress to full ROM

Continue ROM exercises from phase 2 until ROM is normalized

Gentle progression of abduction angle with external rotation stretch

Gentle supine or standing cross body stretch

Gentle sidelying internal rotation stretch ("sleeper") *caution to not cause impingement*

Strengthening (Resistance Band or Dumbbell)

Row

Prone Extension

Prone Horizontal Abduction

Standing Scaption with progression to Prone

Internal Rotation

External Rotation

Dynamic Strengthening

Manual Resistance Rythmic Stabilization

Proprioceptive Drills (90^0 of Elevation or Below)

Guidelines

Perform ROM and stretching exercises once a day until normal ROM is achieved. Do 2 sets of 15-20 Reps. Once normal ROM is achieved continue exercises to maintain ROM 3-5 times a week.

Perform strengthening exercises 3-5 times a week. Do 2-3 sets of 15-20 Reps. Strict attention must be paid to scapula-humeral rhythm with completion of all strengthening exercises.

Phase 4 (12-16 Weeks) Sport Specific Phase

Goals

Progress to normal ROM and strength

Continue to encourage progressive use of arm for functional daily activity

Precautions

Encourage return to full use of arm for daily activities

Pay particular attention to scapula-humeral rhythm especially with abduction and overhead activity

Still restricted from return to sports

Recommended Exercises

ROM and Stretching

Continue ROM and stretching exercises from phase 2-3

Maintain full active and passive ROM

Strengthening
Continue strengthening exercises from phase 3
May begin supervised weight training pending surgeons clearance
Dynamic Strengthening
Progress manual resistance patterns
Progress proprioceptive drills to include rhythmic stabilization
Push up progression

Guidelines
Perform ROM and stretching program 1-3 times a week to maintain normal ROM. Do 1-2 sets of 15-20 Reps. Perform ROM and stretching more frequently in any planes of motion that are still deficient
Perform strengthening 3 times a week. Do 2-3 sets of 15-20 Reps.

Phase 5 (16-24 Weeks) Return to Activity Phase

Goals
Maintain adequate ROM and strength
Continue progressive dynamic strengthening
Begin return to sport progressions pending surgeon's clearance

Precautions
Gradual return to sport pending surgeon's clearance
Work with surgeon or Physical Therapist to develop specific return to sport progression

Recommended Exercises
ROM and Stretching
Continue ROM and stretching exercises in any planes of motion that are deficient
Continue cross body stretch and sidelying internal rotation stretch following workouts
Strengthening
Continue strengthening exercises from phase 4
Dynamic Strengthening
Progress Manual Resistance Patterns
Progress Proprioceptive, Plyometric, Rebounder Drills to include overhead

Guidelines
Perform 1-2 sets of 15-20 repetitions of ROM and stretching exercises 1-3 times a week in all deficient planes of motion. Perform 1 set of 15-20 repetitions of ROM and stretching exercises after all return to sport activities.

Perform 2-3 sets of 15-20 repetitions of all strengthening exercises 2-3 times a week. Perform dynamic strengthening program 1-2 times a week while undergoing return to sport progression.

APPENDIX IV

Pain Numeric Rating Scale

1. On a scale of 0 to 10, with 0 being no pain at all and 10 being the worst pain imaginable, how would you rate your pain RIGHT NOW.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Worst Pain Imaginable

2. On the same scale, how would you rate your USUAL level of pain during the last week.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Worst Pain Imaginable

3. On the same scale, how would you rate your BEST level of pain during the last week.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Worst Pain Imaginable

4. On the same scale, how would you rate your WORST level of pain during the last week.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Worst Pain Imaginable

APPENDIX V

Shoulder Internal/External Rotation
Measurement Tool: Universal Goniometer

Testing Position: Supine with the shoulder and elbow abducted 90°.
The forearm is midway between pronation/supination
with the entire humerus is supported by the table.

Stabilization: Stabilize the distal humerus through the full ROM
and stabilize the thorax/scapulaat the end ROM

Goniometer Axis: The olecranon process of the ulna projecting through
the humeral shaft toward thehumeral head

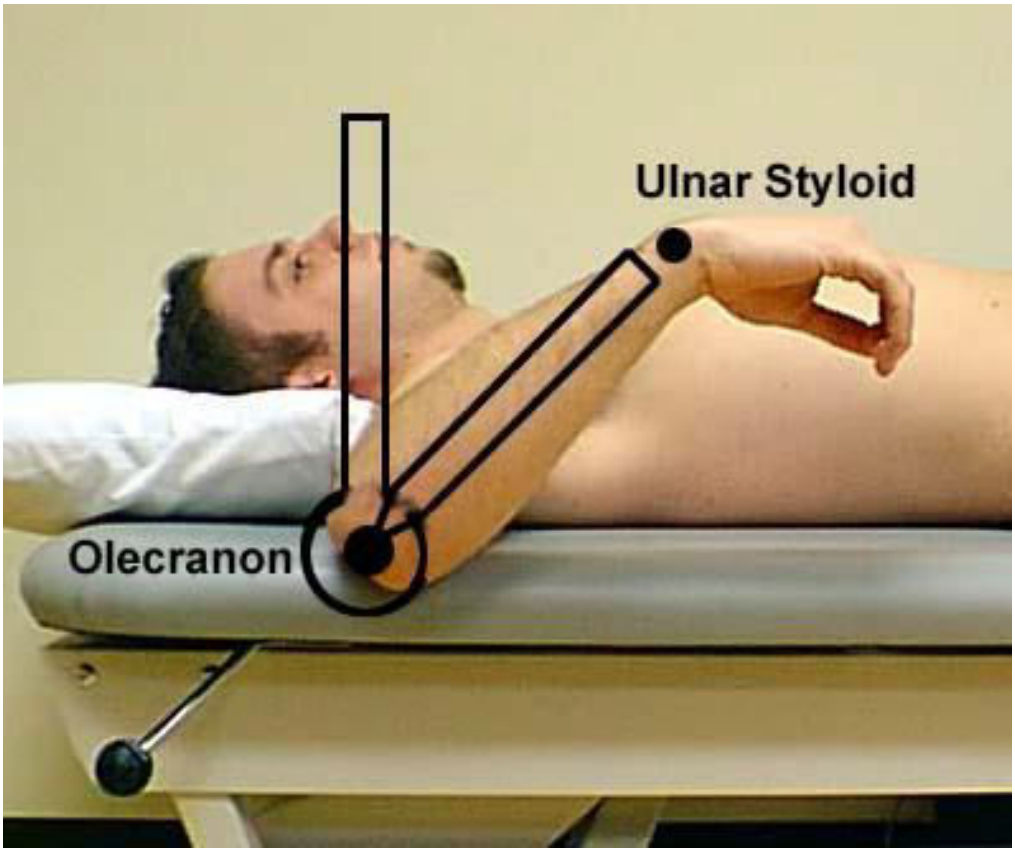
Stationary Arm: Parallel to the supporting surface or perpendicular to
the floor

Moving Arm: Parallel to the longitudinal axis of the ulna pointing
toward the styloid process

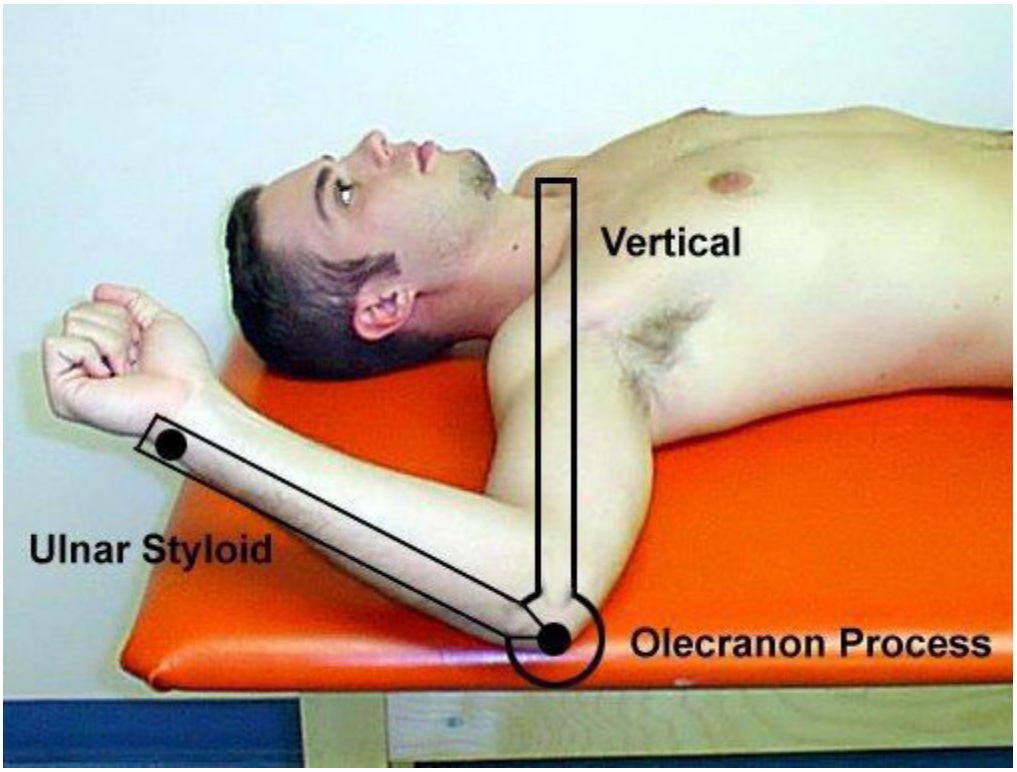
Movement: Internal and External Rotation

Expected ROM: 70° internal rotation; 90° external rotation

Substitutions: Elbow extension, scapular elevation, tilting, or
Protraction.The amount of motion available is
influenced by the position of abduction in the
frontal plane and whether the measurements are
performed in the scapular or frontal planes.
Specifically record the position during measurement.



Shdr Complex Int. Rotation: Pt supine; 90^{o} shoulder abduction, 90^{o} elbow flexion; stabilize trunk; (Stabilize scapula if measuring pure gleno-humeral joint motion)



Shdr Complex Ext Rotation: Pt supine; 90^{o} shoulder abduction, 90^{o} elbow flexion; stabilize trunk; (Stabilize scapula if measuring pure gleno-humeral joint motion)

APPENDIX VI

PAIN REDUCTION IN POST OPERATIVE SLAP TEAR

GROUP I (pre and post test values of pain in NRS – paired 't' test)

S. No:	*PRE TEST*	*POST TEST*
1	*8*	*1*
2	*9*	*0*
3	*9*	*0*
4	*9*	*1*
5	*7*	*1*
6	*7*	*0*
7	*8*	*2*
8	*8*	*1*
9	*9*	*0*
10	*7*	*1*

GROUP II (pre and post test values of pain in NRS – paired 't' test)

S. No:	*PRE TEST*	*POST TEST*
1	*9*	*3*
2	*9*	*2*
3	*8*	*2*
4	*8*	*3*
5	*8*	*4*
6	*7*	*3*
7	*7*	*1*
8	*8*	*2*
9	*9*	*2*
10	*7*	*1*

Post test values of both GROUP I and GROUP II of pain in NRS – Unpaired 't' test

S. No:	*GROUP I*	*GROUP II*
1	*1*	*3*
2	*0*	*2*
3	*0*	*2*
4	*1*	*3*
5	*1*	*4*
6	*0*	*3*
7	*2*	*1*
8	*1*	*2*
9	*0*	*2*
10	*1*	*1*

INTERNAL ROTATION IMPROVEMENT IN POST OPERATIVE SLAP TEAR

GROUP I (pre and post test values of Internal Rotation in Goniometry Standards – paired 't' test)

S. No:	*PRE TEST*	*POST TEST*
1	*30*	*65*
2	*35*	*70*
3	*25*	*60*
4	*20*	*70*
5	*20*	*65*
6	*20*	*60*
7	*25*	*70*
8	*35*	*65*
9	*25*	*70*
10	*25*	*70*

GROUP II (pre and post test values of Internal Rotation in Goniometry Standards – paired 't' test)

S. No:	*PRE TEST*	*POST TEST*
1	*25*	*55*
2	*25*	*45*
3	*35*	*40*
4	*35*	*55*
5	*30*	*40*
6	*20*	*55*
7	*20*	*45*
8	*25*	*40*
9	*20*	*55*
10	*20*	*50*

Post test values of both GROUP I and GROUP II of Internal Rotation in Goniometry Standards – Unpaired 't' test

S. No:	*GROUP I*	*GROUP II*
1	*65*	*55*
2	*70*	*45*
3	*60*	*40*
4	*70*	*55*
5	*65*	*40*
6	*60*	*55*
7	*70*	*45*
8	*65*	*40*
9	*70*	*55*
10	*70*	*50*

APPENDIX VII

INFORMED CONSENT FORM

I _____ agree to take part in the project study, conducted by_____**,** post graduate student (MPT), RVS College of physiotherapy, Dr.MGR University.

I acknowledge that the research study has been explained to me and I understand that agreeing to participate in the research means that I am willing to,

- Provide information about my health status to the researcher.
- Allow the researcher to have access to my medical records, pertaining to the purpose of the study.
- Participate in the analysis program.
- Make myself available for further analysis if required.

I have been informed about the purpose, procedures and measurements involved in the research and my queries towards the research have been clarified.

I understand that my participation is voluntary and can withdraw at any stage of the research.

Signature of the patient/care giver:

Contact Address:

Signature of investigator: Date: