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A COMPARATIVE STUDY OF THE EFFICACY OF SOFT TISSUE MOBILIZATION AND PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION IN IMPROVING PAIN AND FUNCTIONAL STATUS IN PATIENT WITH SUPRASPINATUS TENDINITIS: A RANDOMIZED CLINICAL TRIAL

Running Title: Soft Tissue Mobilization vs. Proprioceptive Neuromuscular Facilitation in Supraspinatus Tendinitis

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Abstract

Objectives: The purpose of the study is to analyze and compare the effects of soft tissue mobilization and PNF technique in the patients with supraspinatus tendonitis.

Methods: A single blinded, randomized clinical design was conducted. Patients from DHQ, MTH, Allied Hospital Faisalabad was screened and 28 patients were randomly allocated into two groups. One group received soft tissue mobilization, 2nd group received technique of Proprioceptive neuromuscular facilitation. Functional status assessed by using disability index and pain was measured by numeric pain rating scale. Treatment was given for 4 weeks, 3 sessions per week. Pre, mid and post treatment data was analyzed through SPSS.20.

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Results:

Soft tissue mobilization and proprioceptive neuromuscular facilitation were significantly effective ($p<0.05$) in improving functional status and reducing pain.Proprioceptive neuromuscular facilitation was more effective compare to soft tissue mobilization.

Conclusion:

Both soft tissue mobilization and Proprioceptive Neuromuscular Facilitation were effective in improving Pain and functional limitation but Proprioceptive Neuromuscular Facilitation was more effective than soft tissue mobilization.

Keywords: Supraspinatus tendonitis; Soft tissue mobilization; Proprioceptive neuromuscular facilitation

INTRODUCTION

"Supraspinatus tendinopathy", a common source of shoulder ache in players who play overhead sports, such as handball, baseball, tennis, volleyball. In most cases, this tendinopathy is brought on by the supraspinatus tendon pressing against the acromion as it travels between the acromion and humeral head (1). upraspinatus tendinopathy is a common and disabling condition that becomes more prevalent after middle age and is a common cause of shoulder pain. A predisposing factor is resistive overuse. The mean age of onset of this complication is in the sixth decade (age 50 to 59), and it is more frequent in diabetic patients. It is also a common cause of shoulder pain in athletes whose sports involve throwing and overhead motions (2).

The causes of supraspinatus tendinopathy can be primary impingement, which is a result of increased subacromial loading, and secondary impingement, which is a result of rotator cuff overload and muscle imbalance. The table below gives a view on the different extrinsic and intrinsic factors. patients normally present with Pain/worsening pain (in cases where tears are progressing), the most common symptoms are pain when lifting and lowering your arm or with

specific movement, pain at rest , pain at night, predominantly when you lie on the affected shoulder.Traumatic tears: Sudden, intense pain often accompanied by a snapping sensation and immediate weakness in the upper arm located anterolaterally and superiorly referred to the level of the deltoid insertion with full-thickness tears ,repetitive strain tear: Starts off mild and only when lifting your arm; over time the pain can become more noticeable at rest (3) .Aggravated in overhead or forward-flexed position, limited range of motion ,reduced forward elevation, external rotation and abduction,struggle with activities like reaching behind back, combing hair and overhead activities ,stiffness, weakness when rotating or lifting your arm ,crepitus, clicking, and instability (4).

With an injury such as supraspinatus tendinosis, it is imperative to adequately examine its extent and severity. There are quite a few methods to test for an injury, many of which are non-invasive, such as the Neer's sign, Hawkin's sign, or the drop arm test. Each of these are varying ways to look for pathology concerning the supraspinatus muscle and/or tendon. Shoulder impingement, instability, and/or structural integrity are all potential findings that one may observe (5).

The treatment used to manage a supraspinatus tendinopathy depends on the etiology of the pathology. At first a conservative treatment is preferred. This treatment involves physical therapy, nonsteroidal anti-inflammatory drugs (NSAIDs), ice treatments and resting. Corticoid injections can also be used additional to physical therapy. A surgical intervention can be a solution if there is no improvement after 3-6 months of conservative treatment(6).

The main goal in the acute phase (initial phase) is to alleviate pain, inflammation, prevent aggravation of pain, reduce muscle wasting and normalize the arthrokinematics of the shoulder girdle. A period of rest should be considered in order to avoid further aggravation and shoulder discomfort (7). Passive modalities should be considered in order to avoid painful aggravation. Modalities such as ultrasound, cryotherapy and electrical muscle stimulation can provide temperory relief in acute phase (8). Strengthening exercises such as isometric exercises should be considered in order to work out the shoulder girdle musculatures. Proper home exercise programs should also be taught in conjuction with proper ergonomics (9). The management of a

supraspinatus tendinopathy consists of different progressive exercises. There are three phases of treatment: Immobilization, passive/assisted range of motion, progressive resistance exercises (10).

Aims & Objectives:

- To determine and compare the effects of soft tissue mobilization on Pain and upper extremity function in supraspinatus tendonitis patients.

Hypothesis

- **Null hypothesis:** There is no significant difference in the effects of soft tissue mobilization and PNF in improving functional status and pain.
- **Alternative hypothesis:** There is a significant difference in the effects of soft tissue mobilization and PNF in improving functional status and pain.

Methods

Study Design

It was a Single blinded Randomized Clinical trial. Data was collected from DHQ Hospital Faisalabad, Allied Hospital Faisalabad and Madinah Teaching Hospital Faisalabad. Duration of the study was 6 months. A permission letter signed by the head of department was used to take permission from respective hospitals. The study received ethical approval from institutional review board.The sample size of the study was 30 that was determined using the Open epitool software for precise calculation. 55 patients were assessed for eligibility, 28 were selected through convenient sampling methodology that fulfilled the eligibility criteria. Patients were randomly allocated to two groups using lottery method, ensuring an allocation ratio of 1:1 for each group. 14 participants were included in group A and 14 in group B. Pre, midline and post treatment values were recorded before the start of first session, after treatment of 2 weeks and at the end of last session after 4 weeks**.**

Selection and description of participants

Participants were included who fulfilled the inclusion criteria

Participants who were socially active

- Age;30-50years
- Gender males and females
- Pain; mild to moderate
- Participants of Faisalabad

3.7 Exclusion criteria

- Patients with the history of Infections
- Previous shoulder Surgery
- Previous shoulder Fracture
- Previous implants of shoulder
- Age; More than 40 years

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Data Collection Procedure

This, randomized clinical trial employed a convenient sampling technique to recruit 32 eligible subjects who met the inclusion and exclusion criteria. Each participant provided informed consent prior to their involvement in the study. Following the enrollment phase, Lottery method was used to randomly allocate the participant into two treatment groups. It was a single blinded randomization trial.14 patients were present in each group. For lottery method, each patient was asked to pick one paper from two pieces of paper, with group A and group B written on them. Participants were divided into treatment groups according to the paper they choose. After completing 14 patients in one group, all other participants was assigned to the other treatment group, so that both groups have equal participants.

Outcome measures

The subjective assessment of patients was made by VAS for shoulder pain intensity and SPADI for functional limitation.

Ethical Consideration

All ethical concerns were taken into consideration. To get authorization from the individual hospitals, a permission letter signed by the head of department was utilized. All volunteers were informed about the study's technique, importance, and aim. Only individuals who were willing to participate in this research were considered. Personal information was kept private. Any participant in the study was not be harmed in any way. The participants' dignity was be respected. Prior to the trial, patients were asked to sign an informed consent form.

Statistical analysis

The Shapiro-Wilks test was used to determine the normality of the data. If the significance value of the test statistics is greater than 0.05, the data is considered to be normally distributed. The assumptions of normal distribution were violated by NPRS and SPADI non-parametric tests such

as the Friedman test for within-group analysis and the Mann-Whitney U test for between-group analysis were used. The shoulder range of motion was following the assumptions of the normal distribution so parametric test i.e., for the within group analysis repeated measures ANOVA and for between group analysis independent samples t-test was used.

Results

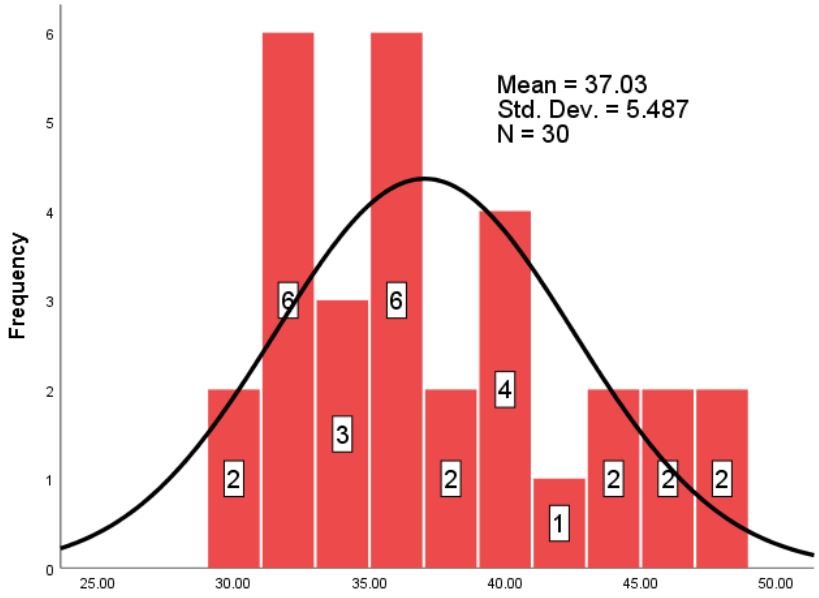
Demographic Data

The interpretation of the demographic data such as Age, gender, BMI is given below.

Age Distribution

The interpretation of the age is given below.

Figure 1 Age distribution



The figure 1 represents the age distribution of the study participants.

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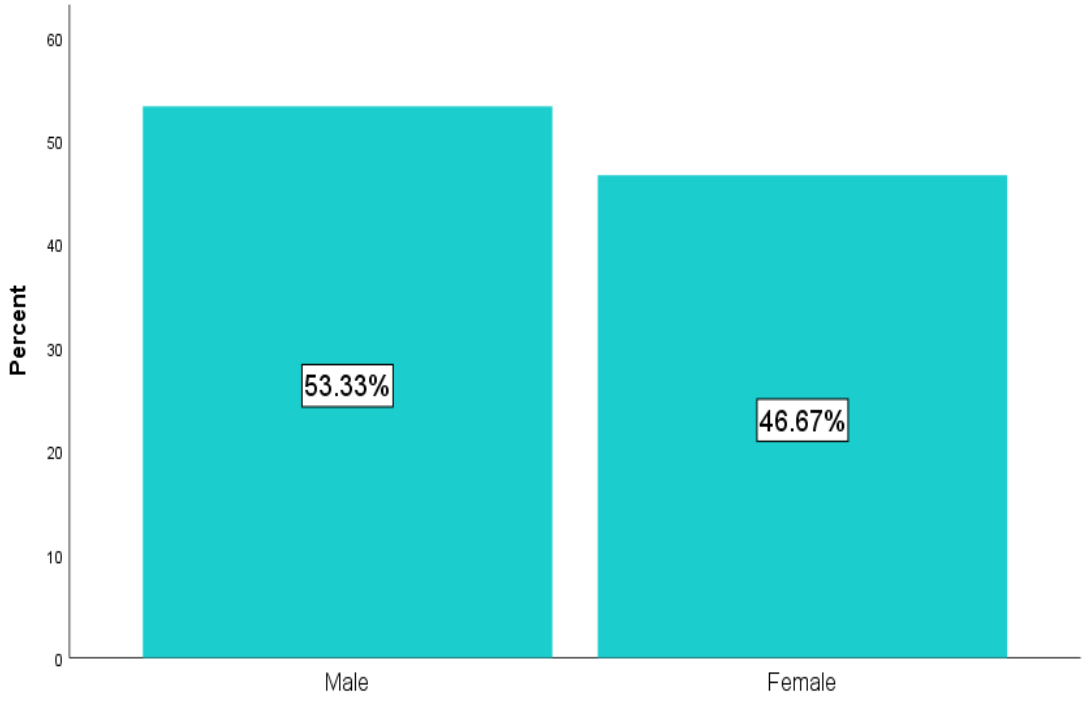
The figure 1 gives the age distribution of participants, the data shows that age was categorized into 3 categories.

Gender Distribution

The distribution of gender is given below.

Figure 2 Gender distribution

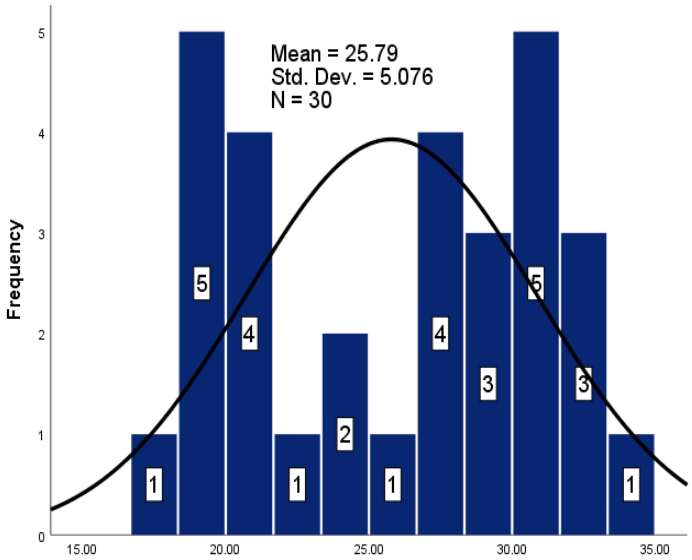


The figure 2 given above shows the gender distribution of the participants, the data shows that out of 30 participants in the study, 53.3 percent were male while the rest 46.7 percent participants were female.

BMI Distribution

The interpretation of the BMI is given below.

Figure 3 BMI distribution



The figure 3 given above shows the BMI distribution of the study participants.

The figure 3 given above shows the BMI distribution of the study participants.The mean body mass index of the participants was 25.78 ± 5.076.

Table 1 Friedman test numeric pain rating scale within group

Group		N	Mean	Std. Deviation	50th (Median)	Asymp. Sig.
Myofascial release technique	Numeric pain rating scale at baseline	14	5.0000	1.41421	5.5000	**0.001**
	Numeric pain rating scale after 2nd week	14	3.5714	1.45255	4.0000	
	Numeric pain rating scale after 4th week	14	2.0000	1.17670	2.0000	
Hold relax PNF	Numeric pain rating scale at baseline	14	5.2143	1.62569	5.0000	

	Numeric pain rating scale after 2nd week	14	3.7857	1.31140	4.0000	**0.002**
	Numeric pain rating scale after 4th week	14	1.6429	1.39268	1.5000	

The table 1 given above shows the descriptive statistics and the friedman test statistics within group analysis and the groupwise data is given, the table shows that the mean of numeric pain rating scale in group A participants before the intervention was 5.00 ± 1.41 and after the treatment it was 2.00 ± 1.17 and the level of significance was below 0.05 i.e., p= 0.001 which means that the Myofascial release technique has brought a difference of 3.00 points on pain among the patients of supraspinatus tendonitis.

The table shows that the mean of numeric pain rating scale in group B participants before the intervention was 5.21 ± 1.62 and after the treatment it was 1.64 ± 1.39 and the level of significance was below 0.05 i.e., p= 0.002 which means that the Hold-relax PNF has brought a difference of 3.57 points on pain among the patients of supraspinatus tendonitis.

Table 2 Mann-Whitney test numeric pain rating scale between group A and B

	Numeric pain rating scale at baseline	Numeric pain rating scale after 2nd week	Numeric pain rating scale after 4th week
Mann-Whitney U	105.500	99.000	83.500
Wilcoxon W	225.500	204.000	188.500
Z	-.297	-.268	-.685
Asymp. Sig. (2-tailed)	.766	.789	.493
Exact Sig. [2*(1-tailed Sig.)]	.775	.813	.041

Table 2 given above shows the Mann-Whitney test statistics numeric pain rating scale between group A and B. It can be seen that pre-test values at baseline for the NPRS was not statistically significant between both groups, which means that the sample was driven from the similar population and no significant difference was present at the baseline values (p=0.775).

By looking at the table above, it can be seen that the post-treatment values of the NPRS between group A and B are having the significance value below 0.05 i.e., p=0.041, which means that there was statistically significant difference between the effect of Myofascial release technique and the Hold-relax PNF on pain among the patients of supraspinatus tendonitis, by looking at the descriptive statistics from within group analysis, it can be observed that the Hold-relax PNF technique has produced statistically significant as compared to myofascial release technique on pain among participants of supraspinatus tendonitis.

Table 3 Friedman test statistics disability index within group analysis

Groups		N	Mean	Std. Deviation	50th (Median)	Asymp. Sig.
Group A	SPADI at baseline	14	70.9286	11.79612	66.5000	**0.003**
	SPADI after 2nd week	14	61.0714	10.95771	57.0000	
	SPADI after 4th week	14	53.0000	10.91224	48.0000	

Group B	SPADI at baseline	14	69.0000	9.36442	68.0000	**0.001**
	SPADI after 2nd week	14	56.4286	9.88172	55.5000	
	SPADI after 4th week	14	42.0000	7.92270	41.5000	

Table 3 given above shows the descriptive statistics and friedman test statistics within group analysis, the table above shows the groupwise description. The data shows that mean of SPADI within group A before the intervention was 70.93 ± 11.8 and post intervention it was 53.00 ± 10.91, the level of significance is below 0.05 i.e., p=0.003, which means the Myofascial release technique has brought a difference of 17.92 in the SPADI among the patients of supraspinatus tendonitis.

The table above shows that mean of SPADI within group B before the intervention was 69.00 ± 9.36 and post intervention it was 42.00 ± 7.92 and the level of significance between the pre and post-test values is below 0.05 i.e., p=0.001, which explains the Hold-relax PNF has brought a difference of 27.00 in the SPADI among the patients of supraspinatus tendonitis.

Table 4 Mann-Whitney test SPADI between group A and B analysis

	SPADI at baseline	SPADI after 2nd week	SPADI after 4th week
Mann-Whitney U	94.500	87.500	43.000
Wilcoxon W	214.500	207.500	148.000
Z	-.749	-.765	-2.533
Asymp. Sig. (2-tailed)	.454	.444	.011
Exact Sig. [2*(1-tailed Sig.)]	.461	.451	.011

The table 4 given above shows the mann-whitney test statistics on SPADI between group A and B. It can be seen that pre-test values at baseline for the SPADI was not statistically significant between both groups, which means that the sample was driven from the similar population and no significant difference was present at the baseline values (p=0.461).

By looking at the table above, we see that the post-treatment values of the SPADI between group A and B are having the significance value at p=0.011, which is below the level of significance, so, after looking at the descriptive statistics from the friedman test we concluded that the Hold-relax PNF had produced statistically significant improvements in the SPADI values as compared to the Myofascial release technique group, which means that Hold-relax PNF have significant effects as compared to Myofascial release technique.

Discussion

The results of the study Ravichandran et al.of supported the hypothesis that both PNF technique and MET are effective in improving the shoulder ROM in subjects with supraspinatus tendonitis. On further analysis, it also supported that there is a significant difference in effectiveness of PNF technique and MET. Subjects treated with proprioceptive neuromuscular technique demonstrated significant improvement in terms of pain relief, restoration of ROM and early return to ADL. The mechanism by which proprioceptive neuromuscular technique caused improvement in shoulder ROM and function could be elongation of tissues, which could be the probable reason helping to improve ROM and function. Panjabi explains that every movement segment depends on three subsystems; the passive, the active and the neural subsystem, which stresses the diagonal pattern of movement in PNF technique while in recent study effects of myofascial release and PNF have been observed in patients of supraspinatus tendonitis and concluded that PNF is more effective in treating supraspinatus tendonitis (11).

The recent study shows that PNF is more effective in reducing pain and improving functional status and range of motion of shoulder than myofascial release. Proprioceptive neuromuscular facilitation technique is aimed at relaxing tense muscles and restricted joints to make quick gains in ROM. Previous studies by Kelley et al. confirmed that joint ROM can be increased significantly by PNF stretching (12). The study of Deshmukh et al. shows clearly that PNF

pattern of exercise is benefit for initiating movements. Thus, recent study validates the use of PNF technique in improving quality of life and recovery from supraspinatus tendonitis (13).

Shivakumar HB et al. conducted a comparative study between the efficacies of ultrasound therapy with cryokinetics versus ultrasound therapy with soft tissue massage (deep friction massage) in acute supraspinatus tendinitis and concluded that ultrasound therapy with soft tissue massage (deep friction massage) is more effective in treating supraspinatus tendonitis while in recent study effects of myofascial release (direct deep stroke) and PNF have been observed in patients of supraspinatus tendonitis and concluded that PNF is more effective in treating supraspinatus tendonitis (14).

CONCLUSION

Both soft tissue mobilization and Proprioceptive Neuromuscular Facilitation are effective in improving Pain and functional limitation but Proprioceptive Neuromuscular Facilitation is more effective than soft tissue mobilization.

Recommendations

- Further trials are recommended with larger sample size and to evaluate long term benefits of the treatment techniques by obtaining follow ups of patients for extended period.
- A double or triple blinded study design is recommended for future studies.
- It would be beneficial to organize training sessions and workshops for physiotherapists and rehabilitation specialists to familiarize them with the most effective application of both techniques. Proper training can ensure optimal outcomes for patients.
- Researchers should consider follow-up sessions with patients after the completion of therapy to monitor the longevity of the therapeutic effects and determine if and when repeat sessions are needed.

CONFLICT OF INTEREST

There are no conflicts of interest that the authors of this work need to disclose.

Funding

No external funding was received for this study.

Data Availability statement

The datasets generated and analyzed in this study are not publicly available due to privacy and confidentiality concerns, ethical restrictions, legal or contractual obligations, and intellectual property considerations. However, the corresponding author is open to sharing the datasets upon reasonable request.

Limitation of study

This study is restricted by certain factors. Firstly in the recent study sample size was small only 28 Participants were allocated which can disturb the validity and generalizability of results. Secondly, long term effects were not assessed due to short duration so it is not known whether the effects of treatment could be maintained for long period of time or not.

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References

1. Bron C, De Gast A, Dommerholt J, Stegenga B, Wensing M, Oostendorp RA. Treatment of myofascial trigger points in patients with chronic shoulder pain: a randomized, controlled trial. BMC medicine. 2011;9(1):1-14.

2. Fugazzotto A, Vallotton J, Brenn S. Partial lesions of the supraspinatus tendon: which treatment? Revue Medicale Suisse. 2021;17(735):794-7.

3. Kim J-j, Lee S-y, Ha K. The effects of exercise using PNF in patients with a supraspinatus muscle tear. Journal of physical therapy science. 2015;27(8):2443-6.

4. Sakaki Y, Taniguchi K, Katayose M, Kura H, Okamura K. Effects of shoulder abduction on the stiffness of supraspinatus muscle regions in rotator cuff tear. Clinical Anatomy. 2022;35(1):94-102.

5. Schumaier A, Kovacevic D, Schmidt C, Green A, Rokito A, Jobin C, et al. Defining massive rotator cuff tears: a Delphi consensus study. Journal of shoulder and elbow surgery. 2020;29(4):674-80.

6. Mahmood T, Hafeez M, Ghauri MW, Salam A. Instrument assisted soft tissue mobilization-an emerging trend for soft tissue dysfunction. Journal of the Pakistan Medical Association. 2021;71(3):977-.

7. Simancek J. Deep Tissue Massage Treatment-E-Book: Elsevier Health Sciences; 2012.

8. Milks RA, Kolmodin JD, Ricchetti ET, Iannotti JP, Derwin KA. Augmentation with a reinforced acellular fascia lata strip graft limits cyclic gapping of supraspinatus repairs in a human cadaveric model. Journal of Shoulder and Elbow Surgery. 2018;27(6):1105-11.

9. Riggs A. Deep Tissue Massage, Revised Edition: A Visual Guide to Techniques: North Atlantic Books; 2007.

10. Harper GM. The short-term effect of Graston instrument-assisted soft tissue mobilization (GISTM) on supraspinatus tendinosis and it's [sic] concomitant findings 2006.

11. Ravichandran H, Balamurugan J. Effect of proprioceptive neuromuscular facilitation stretch and muscle energy technique in the management of adhesive capsulitis of the shoulder. Saudi journal of sports medicine. 2015 May 1;15(2):170-5.

12. Kelley MJ, McClure PW, Leggin BG. Frozen shoulder: Evidence and a proposed model guiding rehabilitation J Orthop Sports Phys Ther. 2009;39:135–48

13. Deshmukh MK, Fating TB, Phansopkar PA. Comprehensive Physiotherapy Rehabilitation on a Complex Case of Combination of Subcoracoid, Subacromial, Subdeltoid, and Supraspinatus Tendinitis. Journal of Evolution of Medical and Dental Sciences. 2020 Oct 12;9(41):3075-9.

14.Shivakumar HB, Chanappa TS, Reddy PK, Dey J. A comparative study between the efficacies of ultrasound therapy with cryokinetics versus ultrasound therapy with soft tissue massage (deep friction massage) in acute supraspinatus tendinitis. Journal of Evolution of Medical and Dental Sciences. 2014 Apr 14;3(15):3898-908.