TO STUDY THE EFFECT OF EMPTY CAN VS FULL CAN EXERCISE IN CHRONIC SUPRASPINATUS TENDONITIS- A COMPARATIVE STUDY

Setoo N. Jain[1], Yagna U. Shukla[2], Maulik A. Shah[3]

1. *MPT (Musculoskeletal), Government Physiotherapy college, Ahmedabad*
2. *MPT (Musculoskeletal) Senior Lecturer, Government Physiotherapy College, Ahmedabad*
3. *MPT (Musculoskeletal), CMT*

ABSTRACT

Background: The Supraspinatus has a primary role for the initiation of abduction and its tendonitis can cause a considerable functional restriction. This study focuses on finding most effective exercise for treating chronic cases.

Objectives: To compare efficacy of Empty Can & Full Can Exercise in treating Chronic Supraspinatus Tendonitis.

Study Design: Comparative Study.

Method: 18 patients, aged 25-45years, both male & female having chronic Supraspinatus Tendonitis were selected for the study. They were divided into 3 groups-

Group1: Received Conventional Exercises

Group2: Received Empty Can + Conventional Exercises

Group3: Received Full Can + Conventional Exercises

They received treatment for 3 weeks. Visual Analogue Scale (VAS), Shoulder Pain and Disability Index (SPADI) & Supraspinatus strength were taken Pre & Post Treatment. Thereby data analysis was done using appropriate tests.

Results: There was significant improvement ($p<0.05$) in VAS & SPADI in group3 compared to group2.

Conclusion: Full can exercise is more effective compared to Empty can exercise.

KEYWORDS: Empty Can Exercise, Full Can Exercise, Chronic Supraspinatus Tendonitis, VAS, SPADI, Supraspinatus Strength.

INTRODUCTION

Shoulder disorders are the third most common musculoskeletal condition. The human shoulder is an intricate system of bones, joints, connective tissues and muscles that place the arm and hand in a position that allows them to function. It derives its stability from a group of four small muscles (known as the rotator cuff) and another five muscles that stabilize the scapula (shoulder blade) and guide the entire shoulder joint along the rib cage during arm motions. The four rotator cuff muscles (supraspinatus, infraspinatus, teres minor and subscapularis) work in concert to allow the arm relatively free movement in numerous positions while pulling humeral head (the ball) downward and inward within the glenoid fossa (socket)[1]**.** Thus provide stability and mobility to the shoulder joint. This supraspinatus tendon is positioned between the humeral head and the acromion bone which provides a roof above the ball and socket joint. In its role as a dynamic stabilizer of the shoulder joint, supraspinatus, as part of the rotator cuff group, functions to prevent the deltoid from superiorly translating the humeral head during abduction. Rathban *et al.,* stated that with the arm in the 90 degree abducted position, with weak Supraspinatus, Teres Minor, Infraspinatus (or pain/reflex inhibition) the deltoid overpowers the lower rotator cuff muscles, causes superior translation and causes a compression on the bursal side of the supraspinatus causing the "wringing out" effect.

The most common tendon involved in tendonitis is the Supraspinatus tendon. Supraspinatus tendonitis is inflammation of the tendon of Supraspinatus muscle. The causes of supraspinatus tendonitis 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. It is often seen in the general population and a predisposing factor is resistive overuse[1]**.** It is typically seen in people aged 25-60 yrs. The Supraspinatus muscle stabilizes the shoulder, externally rotates and helps abduct the arm.

Patients with Supraspinatus Tendonitis show weakness in the shoulder and arm. Weakness and dysfunction of these muscles leads to elevation of the humeral head during arm abduction which causes compression of the tissues under the acromion process. Edema and hemorrhage of the supraspinatus tendon occur which can eventually lead to the tendon degeneration and rupture. The muscles that should be strengthen to correct biomechanics of the shoulder that cause supraspinatus tendonitis are external and internal rotators, deltoid, and scapular stabilizers

(rhomboids, trapezius, serratus anterior, latissimus dorsi) Few risk factors for Supraspinatus tendonitis are chronic wear and tear of the supraspinatus tendon as it passes under the acromion and anatomical factors such as the shape of the acromion or a tight subacromial space due to a thickened ligament.

The problems that patient with Supraspinatus Tendonitis complain of [2]

- Pain when moving arm when lifting up high & Lying on affected Shoulder at night
- Inflammation
- Decreased ROM
- Decreased Strength, Function

On inspection: Localized swelling, Muscle Atrophy, Tenderness below Acromion & over Greater Tuberosity, Painful Arc between 60º and 120º of shoulder abduction, progressive Sub-deltoid aching aggravated by abduction, elevation & overhead activity.

Conservative treatment is generally in form of ice-packs, N-SAIDS, Deep friction massage and Manual Therapy.

However repetitive strain over supraspinatus by microtrauma causes persistence of symptoms and becomes chronic.

The Empty Can has long been a staple in physical therapy circles when it comes to shoulder rehabilitation. Dr Frank Jobe, a well-known shoulder specialist, was the first to come up with this exercise. Since then it has become widely known as an isolation exercise for the supraspinatus. While few of the recent researches have come up with the idea of Full Can Exercise. So it was necessary to find out which of the above is better.

NEED OF THE STUDY

This study focuses on finding most effective exercise out of Empty can and Full can exercise for treating chronic cases.

AIMS & OBJECTIVES

- To study effect of Empty Can + Conventional exercises in Chronic Supraspinatus Tendonitis.
- To study effect of Full Can + Conventional exercises in Chronic Supraspinatus Tendonitis.
- To compare the effect of Empty Can exercise & Full Can Exercise in Chronic Supraspinatus Tendonitis.

METHODOLOGY

1) MATERIALS

- Consent Form
- Plinth
- BASELINE Push-Pull Dynamometer
- SPADI
- VAS
- Dumbbell
- Pen
- Camera

2) SAMPLE SIZE: 18

3) STUDY DESIGN: Comparative Study

4) STUDY SETTING: OPD of Government Physiotherapy College, Civil Hospital, Ahmedabad

5) SAMPLING DESIGN: Convenience sampling

6) INCLUSION CRITERIA

- Patients willing to participate in the study
- Age group:25-45yrs
- Both males & females selected
- Patient who were able to comprehend the commands
- Supraspinatus Tendonitis > 3 months as diagnosed by medical expert.
- Painful arc of movement between 60º–120º.
- Tenderness over Greater Tuberosity of Humerus

7) EXCLUSION CRITERIA

- History of cervical &/or thoracic pathology
- Previous neck or shoulder surgery
- Presence of shoulder instability
- History of disease of Elbow, Wrist & Hand
- History of spinal or upper limb fracture

TECHNIQUE

Prior to the study, all patients were explained about the procedure & written informed consent taken. 18 patients having Chronic Supraspinatus Tendonitis were taken as per selection criteria. Through convenience sampling, they were divided into 3 groups.

- **Group1:** Received Conventional Therapy
- **Group2:** Received Conventional Therapy + Empty Can Exercise
- **Group3:** Received Conventional Therapy + Full Can Exercise

For 3 weeks duration; 5times/week

No. of patients in each group = **6.**

Visual Analogue Scale (VAS), Shoulder Pain and Disability Index (SPADI) and Supraspinatus Strength were taken Pre and Post treatment. Thereafter data analysis was done using appropriate statistical tests.

Outcome Measures:

1)**VAS** is a pain measurement scale where the patient was asked to place a mark on 10cm horizontal line to indicate how much severe the pain was. Left end represents no pain and right end represents severe, unbearable pain.
2)**SPADI** assesses pain and routine functional skills. It has subscales of pain and disability during various activities. The patient is asked to circle the number which describes his problem best. Total score out of 130 was calculated and converted into percentage.
3)**Supraspinatus Strength**[3, 4, 5] was measured using BASELINE Push-Pull Dynamometer (Figure1). All movements tested with the dynamometer demonstrated excellent reliability for the interrater trial (ρ = 0.79-0.92). The dynamometer was the most reliable and discriminatory means for assessing strength (lb/Kg) of the rotator cuff in symptomatic subjects. The subject was asked to build to a maximum contraction over a 1- to 2-second period and to hold the maximum effort against applied resistance for a further 4 to 5 seconds. The recorded measure reflected the maximum isometric value. The patient's shoulder in a sitting/standing position was put in 30° abduction and 90° flexion. The resistance was applied just above the elbow. The patient was asked to resist the force applied with the dynamometer. All measurements in this study were taken in pounds.

FIGURE1: BASELINE PUSH-PULL DYNAMOMETER

TREATMENT PROTOCOL

- 5 times/wk
- 10 repetitions-1 set
- 50-60% of 10 RM of uninvolved limb

Conventional Therapy:

- Pectoralis Minor Stretching-30secs hold for 3 times
- Sitting Shoulder Flexion with dumbbell
- Sitting Shoulder Abduction with dumbbell
- Side-lying Shoulder External Rotation with dumbbell
- Prone Arm Abduction with dumbbell
- Prone Arm Elevation with dumbbell
- Prone Row with dumbbell

Empty Can Exercise: [6]

The empty can exercise, in which subjects abducted their arm to 90° in the scapular plane with internal rotation such that patient's thumb down towards the floor with a dumbbell. Empty can exercise is completed from a range of motion of 0º-90º in scapular plane and then back down to starting position.

Full Can Exercise: [6]

The full can exercise, in which subjects abducted their arm to 90° in the scapular plane with external rotation such that patient's thumb up with a dumbbell. Full can exercise is completed from a range of motion of 0º-90º in scapular plane and then back down to starting position.

RESULTS

- Data analysis done using Paired t-test within the groups & Unpaired t-test between the groups in Microsoft Excel 2007.
- Gender Distribution-Group1: 4male, 2female; Group2: 3male, 3female; Group3: 3male, 3female.
- Mean Age in years- Group1: 32.16 ± 4.95; Group2: 34.16 ± 5.63; Group3: 32.33 ± 5.4.

TABLE 1: COMPARISON OF VAS WITHIN THE GROUPS

	Pre-treatment	Post-treatment	t-value	p-value
Group1	7.66 ± 0.81	3.71 ± 0.77	2.36	>0.05
Group2	6.5 ± 1.04	5.2 ± 0.97	0.001	>0.05
Group3	6.66 ± 1.21	3.5 ± 1.04	7.44	<0.001

TABLE 2: COMPARISON OF SPADI WITHIN THE GROUPS

	Pre-treatment	Post-treatment	t-value	p-value
Group1	48.71 ± 2.9	33.19 ± 1.64	3.44	<0.05
Group2	48.2 ± 4.55	42.17 ± 4.97	0.0002	>0.05
Group3	47.56 ± 3.27	32.53 ± 2.54	3.36	<0.05

TABLE 3: COMPARISON OF SUPRASPINATUS STRENGTH WITHIN THE GROUPS

	Pre-treatment	Post-treatment	t-value	p-value
Group1	5.33 ± 1.96	6.38 ± 3.18	0.04	>0.05
Group2	5.16 ± 1.72	11.98 ± 2.56	3.45	<0.05
Group3	5.75 ± 2.09	12 ± 2.52	3.2	<0.05

TABLE 4: COMPARISON OF MEAN DIFFERENCE BETWEEN GROUP1 & GROUP2

	Group1	Group2	t-value	p-value
VAS	3.95	1.3	1.004	>0.05
SPADI	15.51	6.02	1.91	>0.05
Supraspinatus Strength	1.5	6.81	3.20	<0.05

TABLE 5: COMPARISON OF MEAN DIFFERENCE BETWEEN GROUP1 & GROUP3

	Group1	Group3	t-value	p-value
VAS	3.95	3.16	0.03	>0.05
SPADI	15.51	15.12	0.69	>0.05
Supraspinatus Strength	1.5	6.25	5.81	<0.05

TABLE 6: COMPARISON OF MEAN DIFFERENCE BETWEEN GROUP2 & GROUP3

	Group2	Group3	t-value	p-value
VAS	1.3	3.16	2.44	<0.05
SPADI	6.02	15.12	2.43	<0.05
Supraspinatus Strength	6.81	6.25	0.41	>0.05

DISCUSSION

This study shows that Full can exercise should be given to the patient along with conventional therapy. It causes reduction in pain, improves function and supraspinatus strength. The Supraspinatus, have distinct anterior & posterior sub-regions, is most commonly considered an abductor of humerus, but has also been shown to induce Humeral rotation. (Gates et al; 2010) [7] In scapular plane, the anterior sub-region of supraspinatus acts as both internal & external rotator depending on initial position. The posterior sub-region either acts as external rotator or doesn't induce rotation.

Takeda *et al*; 2002, conducted a study to find the most effective strengthening exercise for Supraspinatus by MRI evaluation & found both Empty Can & Full Can Exercise were equally effective in activating Supraspinatus[6].

Celik [3]*et al* studied muscle strength and pain in Subacromial Impingement Syndrome (SIS) on 20 patients aged 32-60yrs and found that there exists a relation between them. He found weakness in supraspinatus, anterior deltoid, serratus anterior, middle trapezius, which states that these muscles must be evaluated and strengthened to avoid sub-acromial impingement. It has been postulated that the pain might be responsible for the muscle weakness with reflex inhibition, resulting in SIS, while muscle weakness itself might also be the primary cause of SIS, resulting in pain.

With Empty Can Exercise, there is increase in Scapular internal rotation & anterior tipping, which decrease the volume of Supraspinatus Outlet (Thigpen CA, *et.al*. AJSM, 2005)[8]. There was also statistically significant activity of Middle Deltoid on EMG analysis (Reinhold, MM, *et.al.* 2007). Thus strong pull of Deltoid pulls the Humerus head superiorly, overpowers Supraspinatus & Rotator Cuff muscles that act to depress & stabilize head of Humerus & thereby creates Forced Impingement.

Full Can Exercise is appropriate for selective strengthening of Supraspinatus & it maintains the subacromial space also. On EMG analysis, Full Can Exercise produces much less activity of Deltoid. This allows the Humerus to stay in Glenoid Fossa in neutral position. As well, by not forcefully internally rotating humerus, it doesn't recreate impingement in subacromion space.

Thus the best way to isolate the supraspinatus muscle for strengthening is Full can exercise. If a muscle cannot function in an isolated muscle pattern, there is no way it can function normally in a functional pattern. It is important to develop isolated muscle function before progression to more complex multi-planar functional exercises. It provides the patient with a firm base to build on.

CONCLUSION

Full can exercise when given along with conventional exercise have been found to be most effective in reducing pain, improving function & increase supraspinatus strength. It is found that when there is pain, there is reflex inhibition of muscle, leading to its weakness. So, while treating such cases isolated strengthening must be focused.

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