ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

POST ARTHROSCOPIC REHABILITATION OF SHOULDER IMPINGEMENT SYNDROME (COMPARATIVE STUDY)

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Manuscript Info

Manuscript History:

Received: 14 January 2016
Final Accepted: 15 February 2016
Published Online: March 2016

Key words:
Arthroscopic subacromial decompression surgery, early activation program, protective program, rehabilitation.
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Abstract

Purpose:- The purpose of this study was to investigate the effect of early activation program versus protective program of rehabilitation after arthroscopic subacromial decompression in patients with shoulder impingement.

Subjects:- Thirty patients with stage II Neer classification of shoulder impingement syndrome (SIS) have participated in this study.

Methods:- Patients were randomly assigned into two equal groups. The first experimental group consisted of 15 patients, with a mean age of 38.47(+6.96) years; and received early activation program. The second experimental group consisted of 15 patients, with a mean age of 39.67(+5.92) years; and received protective program of rehabilitation. Treatment was given 3 times per week, every other day, for 8 consecutive weeks. Patients were evaluated pretreatment and post-treatment for shoulder pain severity, shoulder functional disability, shoulder flexion, abduction, and internal and external rotation motions.

Results:- Patients of both groups showed significant improvement in all of the measured variables. Statistical analysis between groups showed a more significant improvement in the first group than in the second group in the entire measured variables.

Conclusion:- Early activation program was more effective than protective program as rehabilitation after arthroscopic subacromial decompression surgery.

Introduction:-

Shoulder pain has been reported as the second most common musculoskeletal disorder **(Picavet et al., 2003)**.

The vast majority of people with impingement syndrome relate their symptoms to occupational or athletic activities that involve frequent overhead use of the arm **(Ludewig and Cook, 2000).**

Recently, impingement has been described as a group of symptoms rather than a specific diagnosis, it is thought that numerous underlying pathologies may cause impingement symptoms **(Cools et al., 2007).**

Subacromial impingement is divided into 3 stages: stage I consists of inflammation, edema and hemorrhage of the rotator cuff tendons, usually encountered in patients aged < 25 years. Stage II consists of fibrosis and tendonitis from repeated mechanical irritation, noted in persons aged 25 to 40 years, and stage III consists of complete rotator cuff tear **(Lim et al., 2007).**

The treatment of impingement syndrome includes rest and subacromial corticosteroid injections, arthroscopic decompression and acromioplasty with or without bursectomy **(Buchbinder et al., 2003)**, the treatment also includes physiotherapy **(Michener et al., 2009)**.

Klintberg et al. (2008) reported that arthroscopic subacromial decompression is used to repair the structural pathology, and recommended that physiotherapy after surgery should focus on restoring the functional deficits.

Shoulder impingement is always associated with posterior capsular tightness. Tightness of the posterior portion of the shoulder joint capsule causes superior displacement of humeral head; which occurs with shoulder flexion and cross body movements **(Lewis et al., 2005)**.

It is therefore vital to restore rotator cuff control following surgery to prevent excessive and uncontrolled superior migration of the humeral head **(Klintberg et al., 2008)**.

Early activation of rotator cuff muscles is effective in stimulating the healing of injured tissues (subacromial bursa and posterior capsule of the affected shoulder) after arthroscopic subacromial decompression surgery in SIS, while Protective program of rehabilitation is used to regain ROM, correct posture and recover strength of the infra and supra-spinatus and scapular muscles **(Klintberg et al., 2008)**.
There are some studies which investigated the effect of exercises in treatment of SIS. Selection of an effective treatment regimen often proves difficult, because of the multi-factorial nature of SIS (**Michener et al., 2003**).

There is Alteration in the shoulder kinematics and associated muscle activity in people with symptoms of SIS. The scapular tipping" rotation about medial to lateral axis" and serratus anterior muscle function are important to consider in rehabilitation of patients with symptoms of SIS related to occupational exposure to over head work (**Ludewig and cook, 2002)**.

Subjects with signs and symptoms of shoulder impingement have clear deficits in shoulder force production in multiple directions. These deficits support the need for exercise rehabilitation and may be related to pain and to true changes in neuromuscular and periarticular connective tissues deficits **(Mcclure et al, 2006).**

According the author's knowledge, no studies have compared between early activation program and protective program of rehabilitation to find out which is more effective, in providing better improvement in shoulder pain, ROM and function in patient with SIS, after arthroscopic subacromial decompression. Therefore this study has been applied for that purpose.

Patients and methods:-

Subjects:-

Thirty male and female patients with SIS due to mechanical causes, who ranged in age between 25 to 45 years (Stage II Neer classifications), participated in this study.

They were randomly assigned in two equal experimental groups:-
Group (A): received early activation program of rehabilitation.
Group (B): received protective program of rehabilitation.

Exclusion criteria:- Patients were excluded from the study if they had previous surgery of the shoulder joint, or any other diagnosis that can interfere with the treatment of shoulder impingement (e.g. rheumatoid arthritis, neurological disorders, cervical disorders or shoulder dislocation).

Procedures:-

a) Assessment procedures:-

All patients who participated in the study were assessed immediately after arthroscopic subacromial decompression and after 8 weeks.

Pain and functional disability:- were assessed by using the SPADI (Appendix I) which is a valid and reliable index for measuring shoulder pain and disability. It consists of two parts, part one which assesses pain and part two which assesses functional disability (**Roddey et al., 2000**).

Range of motion assessment:- Shoulder flexion, abduction, internal rotation and external rotation were measured by using goniometer.

b) Treatment procedures:-
All patients who participated in this study received arthroscopic subacromial decompression, after that they were distributed randomly into two groups (A) and (B)
Group (A): received early activation program of rehabilitation.
Group (B): received protective program of rehabilitation.

The early activation programs is based on work of Klintberg et al. (2008) includes:-

Day of surgery:-
- Light warm-up exercises of the shoulder: Flexion – extension, Abduction- adduction from stooping position (20 repetitions).
- Specific activation of the rotator cuff: Active internal & external rotation (30 repetitions), Active assisted ROM in flexion of the shoulder (as tolerable), Elevation of the arm in the plane of scapula (0-45°) for 20 repetitions.

Two weeks post-operative:-
- Gravity resisted exercise for internal rotators and external rotator muscles of the affected shoulder from prone position.
- Active elevation of the arm 0-45° in plane of scapula with bent elbow or when pain free with straight elbow.
- Rhythmic stabilization: Activation of scapular stabilizers (scapular protraction and retraction) from supine position.
- Stretching exercises for (upper trapezius muscle and pectoralis major muscle).

Six weeks post operative:-
- Strengthening exercise by Theraband for the rotator cuff muscles.
- Scapular retraction and protraction, with straight arm (20 repetitions)
- Internal / external rotation with elbow in 90 degree flexion(20 repititions)
- Resistive exercise of internal and external rotation by using external loading (dumbbells). Forced
- Passive ROM for all movements of shoulder joint to restore full range of motion.
- Self stretching exercises of posterior capsule of shoulder joint from sitting position.

Eight weeks post operative:
- Increasing the manual resistance gradually, within the pain free level to reach full ROM against maximum resistance.
- Forced Passive ROM for all shoulder movements to restore full range of motion.

The protective program is based on work of Klintberg et al. (2008) includes:-

Day of surgery:-
- Light warm up exercises: (Raise and Lower the shoulders in abduction and adduction 20 repetitions).
- Shoulder retraction / protraction (20 repetitions)
- Pendulum exercises: Shoulder flexion / extension (10 repetitions), abduction / adduction (10 Repetitions)
- Active assisted ROM exercises for: Flexion, standing or supine lying position (5-10 repetitions), elevation of the arm in the plan of scapula (10 repetitions)

Two weeks post- operative:-
- Active exercises of rotator cuff muscles (shoulder internal and external rotation) with no external resistance (30 repetitions).
- Active elevation of the arm in the plane of scapula with bent elbow, or when pain –free; with straight elbow (30 repetitions).
- Activation of scapular stabilizers through (scapular retraction and protraction) (30 repetitions).
- Stretching exercises of upper trapezius muscle.
- Passive stretching exercises of posterior capsule.

Six week post – operative:-
- The previous exercises have been applied.
- Manual strengthening exercises for rotator cuff muscles.

Eight weeks post – operative :
- Using weights to strengthen the rotator cuff muscles.
- Resistance is adjusted to individual capacity.
- Passive ROM for all shoulder motions.

Results:-

Shoulder pain severity within groups:
- Using paired t-test, a significant decrease in shoulder pain severity was found between the pretreatment mean of 8.07 (+0.78) and the post treatment mean of 1.33 (+0.58) with ($t = 29.272$, $P < 0.001$).
- Using paired t-test, a significant decrease in shoulder pain severity was found between the pretreatment mean of 8.56 (+0.36) and post treatment mean 2.40 (+0.72) with ($t=29.278$,$p = 0.001$).

Between groups difference for shoulder pain severity:-
- Using unpaired t-test, a significant difference was found between groups in favor of the experimental group (A) which had a mean difference of 6.16 (+0.21) while group (B) had a mean difference of 6.736 (+0.23) with ($t=29.272$, $P<0.001$).
- This means that early activation program of rehabilitation is more effective than protective program in decreasing shoulder pain severity after arthroscopic subacromial decompression surgery.

Shoulder functional disability within groups:-
- Using paired t-test, a significant decrease in shoulder functional disability was found between the pretreatment mean of 7.98 (+63) and post treatment 1.18 (+0.39) with ($t = 4.908$, $P < 0.001$).
- Using paired t-test, a significant decrease in shoulder functional disability was found between the pretreatment mean of 8.72 (+1.943) and post treatment mean of 2.09 (+0.59) with ($t = 4.908$, $P < 0.001$).

Between groups difference for shoulder functional disability:-
- Using unpaired t-test, a significant difference was found between groups in favor of group (A) which had a mean difference of 6.790 (+0.899) while the experimental group (B) had a mean difference of 6.63 (+1.39), with ($t=31.320$, $P <0.001$).
- This means that early activation program of rehabilitation is more effective than protective program in decreasing shoulder functional disability after arthroscopic subacromial decompression surgery in SIS patients.

Shoulder flexion within groups:-
- Using paired t-test, a significant increase in shoulder flexion was found between the pretreatment mean of 58.33 (+19.2) degrees and the post treatment mean of 172.0 (+8.40) degrees with ($t=28.866$, $P<0.001$).
- Using paired t-test, a significant increase in shoulder flexion was found between the pretreatment mean of 59.87 (+12.1) degrees and the post treatment mean of 169.67 (+19.57) degrees with ($t=1.688$, $P<0.103$).

Between groups difference for shoulder flexion:-
- Using unpaired t-test, a significant difference was found between groups in favor of experimental group (A) which had a mean difference of 113.67 (+5.221) degrees, while the experimental group (B) had a mean difference of 109.80 (+3.80) degrees, with($t=21.773$, $P <0.001$).
- This means that early activation program of rehabilitation is more effective than protective program in increasing shoulder flexion after arthroscopic subacromial decompression in SIS patients.

Shoulder abduction within groups:-
- Using paired t-test, a significant increase in shoulder abduction was found between the pretreatment mean of 45.67 (+7.28) degrees and the post treatment mean of 169.33 (+9.42) degrees with ($t=37.319$, $P<0.001$).
- Using paired t-test, a significant increase in shoulder abduction was found between the pretreatment mean of 42.0 (+11.96) degrees and the post treatment mean of 151.33 (+19.57) degrees with ($t=25.392$, $P<0.001$).

Between groups difference for shoulder abduction:-

- Using unpaired t-test, a significant difference was found between groups in favor of the experimental group (A) which had a mean difference of 118 (+12.31) degrees while the experimental group (B) had a mean difference of 109.33 (+16.676) degrees with (t=2.901, P <0.007).
- This means that early activation program of rehabilitation is more effective than protective program in increasing shoulder abduction in SIS patients.

Shoulder internal rotation within groups:-

- Using paired t-test, a significant increase in shoulder internal rotation was found between the pretreatment mean of 23.0 (+3.16) degrees and the post treatment mean of 41.80 (+2.51) degrees with (t=18.359, P<0.001).
- Using paired t-test, a significant increase in shoulder internal rotation was found between the pretreatment mean of 22.33 (+9.16) degrees and the post treatment mean of 38.0 (+2.53) degrees with (t=29.278, P<0.001).

Between groups difference for shoulder internal rotation:-

- Using unpaired t-test, a significant difference was found between groups in favor of the experimental group (A) which had a mean difference of 18.8 (+3.968) degrees while the experimental group (B) had a mean difference of 15.67 (+3.716) degrees with (t=9.123, P <0.007).
- This means that early activation program of rehabilitation is more effective than protective program in increasing shoulder internal rotation in SIS patients.

Shoulder external rotation within groups:-

- Using paired t-test, a significant increase in shoulder external rotation was found between the pretreatment mean of 25.33 (+3.5) and the post treatment mean of 42.13 (+2.47) degrees with (t = 19.539, P <0.001).
- Using paired t-test, a significant increase in shoulder external rotation was found between the pretreatment mean of 21.20 (+9.32) degrees and post treatment mean 39.0 (+4.30) degrees with (t=13.663,p = 0.001).

Between groups difference for shoulder external rotation:-

- Using unpaired t-test, a significant difference was found between groups in favor of the experimental group (A) which had a mean difference of 19.80 (+4.475) degrees while the experimental group (B) had a mean difference of 17.80 (+596) with (t=2.442, P<0.02)
- This means that early activation program of rehabilitation is more effective than protective program after arthroscopic subacromial decompression surgery in increasing shoulder external rotation in SIS patients.

Discussion:-

In our current study group A and B showed a significant decrease in shoulder pain severity; functional disability and an improvement in shoulder motions of flexion, abduction, internal rotation and external rotation. These findings are consistent with those reported by **Klintberg et al., (2008)** who concluded that early activation using a comprehensive, well-defined and controlled PT protocol can be used safely after arthroscopic subacromial decompression

Klintberg et al., (2008) reported that the early activation protocol after arthroscopic subacromial decompression produced no adverse effects compared with the protective protocol. Therefore they felt that early activation protocol may be a step forward into new ideas for rehabilitation of patients after arthroscopic subacromial decompression without taking substantial risks. The current study showed that the early activation program of rehabilitation gives the patients good recovery more than protective program of rehabilitation.

In shoulder impenigment syndrome, the humeral head depression by rotator cuff muscles is believed to be insufficient to counteract the deltoid action; leading to excessive superior migration of the humeral head and excessive reduction of the acromiohumeral distance **(Reddy et al; 2000)**, this supports the necessity of using early activation of rotator cuff muscles through strengthening exercise, after arthroscopic subacromial decompression. Therefore; helping to increase acromiohumeral distance and improve patient symptoms. This program is better than the protective program which delays the strengthening of rotator cuff muscles.

Jarvela et al., (2010) reported also that early ROM after arthroscopic subacromial decompression is very important to be allowed and encouraged, and if the instructions for the early rehabilitation are not followed, the results can be a stiff and painful shoulder despite otherwise technically successful operations.

Our study provides a detailed picture of the patient course up to eight weeks post-operatively, following two different PT protocols. Therefore this study can be used when drawing up clinical guidelines, and setting goals for patients after arthroscopic subacromial decompression.

Conclusion:-

From the finding of the current study we can conclude that both early activation program of rehabilitation and protective program after arthroscopic subacromial decompression are effective interventions to reduce shoulder pain severity, functional disability and to increase shoulder flexion, abduction, and internal and external rotation motions. However, early activation program is more effective than protective program in improving all of the measured variables.

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Appendix I

Shoulder pain and disability index (SPADI)

Part I : Place mark on the line to show how much PAIN you have had in the past week for each question.

1-At its worst ?

No pain worst pain imaginable

2-When lying on the involved side ?

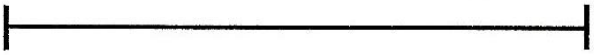
No pain worst pain imaginable

3-Whe reaching for smoothing on a high shelf ?

No pain worst pain imaginable

4-when touching the back of your neck?

No pain worst pain imaginable



5- When pushing with the involved arm?

No pain worst pain imaginable

Part II : place a mark on the line to show how much DIFFICULTY you have had in the past week to do the activity listed below.

1-Washing your hair?

No difficulty — So difficult required help

2-Wahsing your back ?

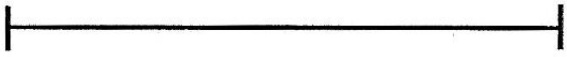
No difficulty — So difficult required help

3-Putting on an undershirt or pullover shirt?

No difficulty — So difficult required help

4-Putting on a shirt that buttons down the front ?

No difficulty — So difficult required help



5-Putting on your pants?

No difficulty — So difficult required help

6-placing on object on a high shelf?

No difficulty — So difficult required help

7-Carrying a heavy object of 10 pounds or more?

No difficulty — So difficult required help

8-Removing something from your back pocket?

No difficulty — So difficult required help