The effectiveness of exercise versus arthroscopic surgery of subacromial impingement syndrome of the shoulder

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ABSTRACT

Background: The subacromial impingement syndrome of the shoulder is a general term, which is often used to describe pain and dysfunction in the area around the shoulder. It is the most frequent reason for shoulder pain.

Objective: The effectiveness of exercise versus arthroscopic surgery to patients suffered from subacromial impingement syndrome of the shoulder.

Methods: The online databases «PubMed, PEDro, Physical Therapy, MEDLINE and Science Direct from 2000 until April 25th 2015 were searched.

Results: The researches showed an equal improvement of the symptoms in the exercise versus the combined surgical repair.

Conclusions: Therapeutic exercise combined with surgical repair indicated an equal improvement mainly on pain and functionality in the long term.

Key words: exercise, subacromial impingement syndrome, rotator cuff repair, arthroscopic surgery, decompression
Η αποτελεσματικότητα της άσκησης σε σχέση με την αρθροσκοπική χειρουργική επέμβαση σε σύνδρομο υπακρωμιακής προστριβής του ώμου. Μία ανασκόπηση της βιβλιογραφίας.

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ΠΕΡΙΛΗΨΗ

Εισαγωγή: Το σύνδρομο της υπακρωμιακής προστριβής του ώμου είναι ένας γενικός όρος, ο οποίος χρησιμοποιείται συχνά για να περιγράψει πόνο και δυσλειτουργία στην περιοχή του ώμου. Είναι η πιο συχνή αιτία πόνου στον ώμο.

Σκοπός: Η αποτελεσματικότητα της άσκησης σε σχέση με την αρθροσκοπική χειρουργική επέμβαση σε ασθενείς με σύνδρομο υπακρωμιακής προστριβής του ώμου.


Αποτελέσματα: Οι έρευνες έδειξαν ίση βελτίωση των συμπτωμάτων με την άσκηση σε σχέση με την συνδυαστική χειρουργική αποκατάσταση.

Συμπεράσματα: Η θεραπευτική άσκηση σε συνδυασμό με την χειρουργική αποκατάσταση έδειξε ίση βελτίωση, κυρίως στον πόνο και στη λειτουργικότητα μακροπρόθεσμα.

Keywords: άσκηση, σύνδρομο πρόσκρουσης υπακρωμιακού, επισκευή στροφικού πετάλου, αρθροσκοπική χειρουργική, αποσυμπίεση

INTRODUCTION

The subacromial impingement syndrome of the shoulder is a general term, which is often used to describe pain and mobility problems in the shoulder area (Holmgren, et al., 2012; Swainik, 2002).

It is defined as pain in the shoulder due to the impingement of soft tissues in the subacromial area (Holmgren, et al., 2012). The term “subacromial impingement syndrome of the shoulder” is widely used, as it includes many pathologic-anatomic structures in the shoulder area.

The frequency of shoulder pain from the impingement syndrome is 44-60 % of the population (Picavet and Schouten, 2003; Holmgren, et al., 2012).

The etiology of the disease is multifactorial and is attributed to extrinsic and intrinsic mechanisms (Holmgren, et al., 2012; Emura, et al., 2014; Edmonds and Dengerink, 2014; Umer, Qadir and Azam, 2012).

Pain in the shoulder joint, dyskinesia and difficulty in functional activities of the upper limb (Freitas, et al., 2014). The shoulder pain usually appears gradually within a few weeks and is more intense at night and also in the everyday activities, such as combing hair or trying to take objects from the top (Umer, Qadir and Azam, 2012).

The treatment includes conservative physiotherapy and surgical intervention (Holmgren, et al., 2011; Bhattacharyya, Edwards and Wallace, 2014). The most common treatment, is the exercise of the
muscles of the shoulder, such as strengthening exercises, stabilization for rotator cuff, scapula muscles and stretching exercises too (Kuhn et al., 2009). The arthroscopic decompression of the subacromial area has succeeded 70-80% in pain and functionality of the shoulder (Holmgren et al., 2012; Ingwerson et al., 2015). The effectiveness of exercise versus arthroscopic surgery to patients suffered from subacromial impingement syndrome of the shoulder.

MATERIALS AND METHODS

Computerized searches were performed from December 2014 to April 25th 2015 through the following online databases: «Pub Med, PEDro, Physical Therapy, Science Direct, MEDLINE and Bio Med Central». The key words used were exercise, subacromial impingement syndrome, rotator cuff repair, arthroscopic surgery decompression and trials. The articles found were 220, of which three articles included in the results of the present study. This is due to having found only three studies, which compared exercise versus surgical repair after the year 2000. Therefore, studies were systematically excluded, which conducted during past years, even though they had similar design and results.

Inclusion-Exclusion criteria

The articles have been selected from 2000 until April 25th 2015. Studies are required to compare the conservative treatment (therapeutic exercises) to the surgical intervention for the subacromial impingement of the shoulder. Still, only randomized controlled trials and clinical trials were included. The articles included patients of both sexes over 18, who have been diagnosed with clinical symptoms of subacromial impingement of the shoulder by doctor’s physical examination and radiological findings.

The titles and abstracts of all studies were assessed for the above eligibility criteria. If it was absolutely clear from information provided in the title and/or abstract that the study was not relevant, it was excluded. If it was unclear from the available abstract and/or the title, the full text article was retrieved. There was no blinding to study author, place of publication, or results. The researcher assessed the content of all full text articles, making the selection criteria. Some trials included various types of exercises, like strengthening exercises for the rotator cuff, stretching exercises, mobilizing exercises, stabilization exercises of scapula muscles and also other types of exercises. These exercises performed in the clinic or at home, within conservative and postoperative process.

In addition, the outcome measures were selected according to conditions of the outcome of this review, such as pain, functional loss or disability, the quality of life, strength, the joints width and other measures.

Studies, which investigated frozen shoulder, the acromioclavicular joint osteoarthritis, the inflammatory rheumatoid arthritis, pain in the cervical spine by lifting the shoulder and other diseases except for the subacromial impingement of the shoulder, were rejected. The same thing happened in the studies, which compared the exercise to a natural mean by using corticosteroids, non-steroid anti-inflammatory drugs and also researches which aim at finding the effectiveness of the mean and not of the exercise.

A total of 220 articles were identified. After review of the completed texts 30 articles were excluded, because of being study reviews. A number of 134 studies were excluded, as there was not a comparison between exercises and surgical repair. Moreover, 53 articles did not have a full text, with sufficient elements, so as to be read by the researcher in order to be included in the study. Finally, 3 articles were used. (Figure 1.1 Flow chart)

Key words

The key words were used both as single words and in combination, so as to identify articles, which comprised different word combinations. They are the following: exercise, shoulder impingement syndrome, subacromial impingement syndrome, shoulder pain, rotator cuff tendinopathy, Arthroscopic Rotator cuff, rotator cuff repair and arthroscopic surgery.

RESULTS

The article titles found from this literature search were a total of 220. Then, the titles were further reviewed in order to identify whether they met the entry criteria of this study. In the review, totally 3 article titles were included (Flow chart 1).

EXERCISE VERSUS SURGICAL REPAIR

In the reference, different kinds of intervention are mentioned for the treatment and rehabilitation of subacromial impingement syndrome of the shoulder, where surgery and conservative treatment are possible. Therefore, the above title is the research inquiry. The purpose of the research of Haahr, et al., (2005), was the comparison between the effectiveness of physiotherapy training of the rotator cuff muscles with the arthroscopic decompression of the subacromial area on patients with subacromial impingement of the shoulder. The treatment started with hot and cold compresses and soft tissues techniques. Then, strengthening exercises were carried out on the muscles around the shoulder. The pain and functionality were measured, asking questions, through a total of grading from 0 to 36. Moreover, the active range of motion of the shoulder joint was measured with goniometer and the isometric strength in kilograms with portable analyzer of muscle strength. Both groups (arthroscopy group are 41 and exercise group are 43 participants) showed improvement on pain, functionality, range track motion and strength from the 3th, 6th month until the 12th month. The groups had the same effectiveness in all reassessments, on pain, functionality, range track joint and strength (p>0.05). However, the exercise was improved more in the 3rd reassessment, compared to the surgical repair, as it shows an improvement on the range track motion, but the result is not statistically significant (Table 1).

The research of Ketola, et al., (2013), aimed at indicating the effectiveness of arthroscopic acromioplasty against conservative rehabilitation on patients during the 2nd phase of subacromial impingement of the shoulder. The patients in the exercise group were supervised at home. The strengthening exercises of the tendons were also marked. The patients in the surgery group were given an exercise program, after the surgery. The shoulder
pain, disability, the work ability, pain at night, the painful days during the past 3 months, the percentage of painless patients and the quality of life (measured using the tool 15-D) were used as the outcome measures. A significant reduction on pain was marked for the exercise group, from the beginning to the 5th year of supervision, i.e. the pain was reduced from 6.4 down to 1.9. Between the two groups the same reduction of pain (p=0.44) was marked. The effectiveness was equal during five years of supervision, between the two groups, on disability, work ability, pain at night, painful days during the past 3 months, the percentage of painless patients and the quality of life. The adjusted age had a statistically significant improvement on the activities conditions and on discomfort (p=0.037), in comparison with the general population for the exercise group (p=0.040).

The research purpose of Ketola, et al., (2008), was to identify whether arthroscopic acromioplasty provides any additional value in the treatment of shoulder impingement syndrome. The outcome measures used were pain, disability, pain at night, work ability and the middle duration of symptoms, which was measured in years. Information was given to the exercise group by a trainee physiotherapist. Then, the exercise program would be carried out individually at home. The strengthening was carried out with an elastic Thera-band or free weights. After a week, free active motions were given to patients operated on the rotator cuff. Provided the patients started assisted pendulum motions, later they received a similar exercise program to the exercise group. In 24 months, 66 patients completed the research for the exercise group and 68 patients for the combined group. Pain for the exercise group was improved from 6.5 to 2.9 and from 6.4 to 2.5 for the combined group. There was a significant effectiveness for both intervention groups (p<0.001). Moreover, there was the same effectiveness between the two groups in the course of time (p=0.65). Still, the painless patients were 42 in 24 months’ time for the exercise group and 43 patients for the combined group (p=0.90). The combined therapy group for most outcome measures showed a faster improvement during 3, 6 and 12 months, as the group indicated better short-term results.

DISCUSSION

The aim of the current study was to identify the effectiveness of exercise versus surgical repair and surgical repair with exercise on patients with subacromial impingement of the shoulder.

According to the research results, it was found that the exercise conservatively and surgery showed an equal improvement on pain, functionality, range of motion, strength, disability, work ability and quality of life. In contrast, the combined surgical intervention with the same exercises, compared to conservative exercises, had a greater improvement on mobility, sleep and discomfort, but also, it presented a faster improvement on the outcome measures during 3, 6 and 12 months.

The trials included, were studying the therapeutic exercise as main treatment comparing it to the surgical repair of subacromial impingement syndrome of the shoulder (Haahr, et al., 2005; Ketola, et al., 2013; Ketola, et al., 2008). All the researches included in the review are randomized controlled trials (Haahr, et al., 2005; Ketola, et al., 2008; Ketola, et al., 2013). Still, a single blindness was made to the physiotherapist in the reassessments (Ketola, et al., 2008; Ketola, et al., 2013), but in the study of Haahr, et al., (2005), there was not blindness of the examiner. A considerable number of sample was collected from the three researches. The sample randomization was successful, which shows an objective distribution of the sample in the intervention groups. There was no significant withdrawal of the patients from the researches (Haahr, et al., 2005; Ketola, et al., 2008), but in the study of Ketola, et al., (2013), there was a significant withdrawal due to labor problems.

Furthermore, subjective scales were used in all the studies, such as pain, dysfunction, quality of life and others. The scales can be subjective, but according to Camargo, et al., (2007) and Diercks, et al., (2014), these scales must be used for the above outcome measures, as they are reliable, both for the upper limb disorders and the syndrome as well.

In the study, researchers with a lower mean age were used from other researches, which is increasingly based epidemiologically the recent years, because it shows that more and more younger patients are suffering from the syndrome (average age used, under 56) (Haahr, et al., 2005; Ketola, et al., 2008; Ketola, et al., 2013).

The researches included common entry criteria of the patients. More specifically, they chose the age of the patients, over 18, shoulder pain, clinical symptoms presentation of the syndrome, persistent symptoms lasting at least 3 and 6 months, after surgery for post-surgical patients. In addition, one of the clinical trials is positive, such as Neer, Hawkins-Kennedy test, Jobe test and the painful arc.

The strengthening and stretching exercises were mainly used in all the exercise protocols. The exercise protocols included strengthening exercises of the cuff and scapula muscles (Haahr, et al., 2005; Ketola, et al., 2008; Ketola, et al., 2013), for 19 sessions of 60 minutes and continued at home after 12 weeks of supervision, using elastic band or dumbbells (Haahr, et al., 2005). The above exercises were carried out at home 4 times a week, 9 exercises from 30 to 40 repeats of 3 sets (Ketola, et al., 2008; Ketola, et al., 2013). Above, it seemed that is not given the exact description of strengthening exercises type, that are used in the researches.

In the comparison between the results of the conservative exercise and the combined surgery with the same exercises, it seemed that they had the same results on the outcome measures, as the exercise appears to be the ultimate point in the rehabilitation of the syndrome. So, there was a significant improvement of the patients through conservative-postoperative exercises and combined surgical rehabilitation on pain (Haahr, et al., 2005; Ketola, et al., 2013; Ketola, et al., 2008), in a percentage of painless patients, (Ketola, et al., 2008; Ketola, et al., 2013), on functionality- mobility (Haahr, et al., 2005; Ketola, et al., 2013; Ketola, et al., 2008), on range of motion- strength (Haahr, et al., 2005) and pain at night.
(Ketola, et al., 2008; Ketola, et al., 2013). Additionally, there was improvement on disability-incapacity (Ketola, et al., 2013; Ketola, et al., 2008), on work ability (Ketola, et al., 2013; Ketola, et al., 2008), discomfort, sleep and quality of life (Ketola, et al., 2013). Moreover, there was improvement on the outcome measures among the studies (Haahr, et al., 2005; Ketola, et al., 2008), during the same time periods of reassessment, from the 3rd, 6th until the 12th month. The comparison between the present study and three past studies of Brox, et al., (1993), Brox, et al., (1999) and Andersen, et al., (1999), which compared the exercise to the combined surgery, show an equal effectiveness between the exercise program and the surgical rehabilitation.

CONCLUSION

The present study indicated considerable benefits in patients suffered from subacromial impingement of the shoulder mainly on pain, functionality, quality of life, range of motion and strength. All the exercise programs, but also the combined surgical rehabilitation with the same exercises brought postoperatively same benefits to the patients in the course of time after 3, 6 or 12 months after treatments. This long-term improvement is probably due to the pathology of the syndrome, which takes a long time to heal the subacromial structures, such as tendons. In conclusion, the exercise in relation to the combined surgical treatment with the same exercises, provide the same effectiveness in the outcome measures of the patients.

REFERENCES


APPENDIX

Total articles resulting from the research ($n=220$)

Articles were excluded, because of being study reviews ($n=30$)

Total studies resulting for further evaluation ($n=190$)

Studies rejected which did not have a full text ($n=53$) and there was not a comparison between exercises and surgical repair ($n=134$)

Total studies resulting for further evaluation ($n=3$)

Total final studies of the review ($n=3$)

Flow chart 1: Results representation of the strategic research.
Table 1. Results overview of the exercise versus surgical repair

<table>
<thead>
<tr>
<th>A/A</th>
<th>Research</th>
<th>Country</th>
<th>Research population</th>
<th>Intervention surrounding</th>
<th>Intervention type</th>
<th>Outcome measures</th>
<th>Duration</th>
<th>Results</th>
</tr>
</thead>
</table>
|     | Haahr, et al., (2005) | Denmark   | 90                  | Pharmacy Department in hospital Herning and therapies continued at home | I. Arthroscopy
Same exercises given like in the exercise group | Pain (VAS)
Functionality (ADL)
Range of motion
Isometric strength (with portable strength analyzer)
Pain and functionalty (scale Likert, measured after one year of intervention) | 12 weeks,
Continuation of the same exercises at home | Improvement of both groups on pain, functionality, range of motion and strength, from 3<sup>rd</sup>, 6<sup>th</sup> and 12<sup>th</sup> month. (p<0.05) Same benefit among groups in all the follow-up’s and outcome measures (p>0.05) No statistically significant improvement for the exercise group during the 3<sup>rd</sup> reassessment, mainly on range track (p=0.09) o Pain reduction, for the exercise group from 6.4 down to 1.9 (p<0.05) o Same improvement on pain, between the two groups (p=0.44) o There was not statistically significant difference during five years of observation, between the two groups in disability, work ability, pain at night, painful days of the past 3 months, percentage of painless patients and quality of life (p>0.05) o The two treatments had the same effectiveness, as the outcome measures |
|     | Ketola, et al., (2013) | Finland  | 140                 | Kanta-Hame central hospital Hmeenlinna But mainly in patients’ houses | I. Strengthening exercises of tendons of shoulder girdle (4 times/week, from 3 sets/30-40 rep. And while there was improvement on the outcome measures during 6-7 followup’s, increasing resistance and reducing repetitions
II. Combined therapy
Arthroscopy
Exercises: free motions, pendulum motions and same exercises with the exercise group | Pain (VAS)
Work ability (VAS)
Pain at night (VAS)
Painful days during the past 3 months (SDQ)
Percentage of painless patients (VAS)
And quality of life (15-D) | 5 years observation |
| Ketola, et al., (2008) | Finland | 140 | 52 men and 88 women | Kanta-Hame central hospital, Hmeenlinna | Exercises carried out at home | 1. Exercises: Information given by physiotherapist, strengthening exercises with elastic band or dumbbells and exercises of muscles dynamic stability and glenohumeral and scapulothorasic joint (4 times/week, with 9 different exercises, from 3 sets/ of 30-40 rep. Improvement of capacity and strength, patients increase resistance and reduce repetitions II. Arthroscopic acromioplasty Same postoperative exercises with the exercise group | Average symptoms duration in years | 2 years observation | 1. Improvement of self-reported pain, for the exercise group (from 6.5 to 2.9) and combined group (from 6.4 to 2.5) | 2. There was statistically significant effectiveness with both interventions (p<0.001) | 3. There was not difference among the groups concerning the course of time (p=0.65) | 4. There was no difference between the two groups, in the number of painless patients during 24 months (p=0.90) | 5. Combined intervention had a faster improvement on the outcome measures, during 3.6 and 12 months | 6. It showed better short term results. | were found (p>0.05) | The combined intervention was beneficial for mobility (p<0.001), on sleep (p=0.049) and discomfort (p=0.028) |