

Holmgren T, Hallgren HB, Oberg B, and et al. Effect of specific exercise strategy on need for surgery in patients with subacromial impingement syndrome: randomized controlled study. British Medical Journal 2012; 344:e787 doi: 10.1136/bmj.e787.

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Design: Randomized controlled trial

Objective: To evaluate if a specific exercise strategy, focusing on strengthening the rotator cuff and scapula stabilizers, improves shoulder function and reduces pain more than unspecific exercises in patients with subacromial impingement syndrome, thereby decreasing the need for arthroscopic subacromial decompression.

Population /sample size/setting:

- 102 consenting patients (97 completed the trial) aged 30 to 65 (mean age = 52, 61 males, 36 females) on a waiting list for arthroscopic subacromial decompression were recruited from the Department of Orthopaedics in a Swedish university hospital. Two patients were excluded later after developing frozen shoulder and 3 patients dropped out.
- Eligibility criteria included diagnosis of primary subacromial impingement syndrome from an orthopaedic specialist; a typical history with pain located in the proximal lateral aspect of the upper arm, especially with the arm raised; six month duration of the current episode; and lack of response to various conservative treatments (including exercise treatment) for at least 3 months. In addition, they had to have 3 of the following: impingement sign according to Neer, impingement sign according to Hawkins-Kennedy, positive result on Jobes test, and positive result on Patte's maneuver. Finally, the Neer's impingement test was performed on all participants and they had to have a positive test result for inclusion in the study.
- Exclusion criteria included radiologically verified malignancy; osteoarthritis of the glenohumeral joint; os acromiale decreasing the subacromial space; acromioclavicular arthritis; previous fractures in the shoulder complex or shoulder surgery on the affected side, or both; clinically verified polyarthritis, rheumatoid arthritis, fibromyalgia, instability in any joint of the shoulder complex, frozen shoulder, or symptoms from the cervical spine and pseudoparalysis; receipt of a corticosteroid injection in the previous three months for the current problem; or an inability to understand written and spoken Swedish.

Interventions:

- All participants were randomized to one of two exercise protocols at the first visit to the physiotherapist.
- All patients received a subacromial corticosteroid injection at the inclusion visit. The exercises were introduced 2 weeks after the injection. Both groups received ergonomical advice and correction of their posture. The included patients visited the research physiotherapist (PT) once a week for the first two weeks and once every other week for the next 10 weeks (a total of 7 visits). In between these supervised sessions, participants performed home exercises once or twice a day for 12 weeks. An exercise diary was used in both groups to monitor adherence.

- The specific exercise group (n=51, 37 men, 14 women) focused on strengthening eccentric exercises for the rotator cuff and strengthening concentric/eccentric exercises for the scapula stabilizers. The program consisted of 6 different exercises: two eccentric exercises for the rotator cuff (<http://www.youtube.com/watch?v=TE2Kfr7MCB8>), three concentric/eccentric exercises for the scapula stabilizers (http://www.youtube.com/watch?feature=player_detailpage&v=ia9-pF3bLiY), and a posterior shoulder stretch. Each strengthening exercise was repeated 15 times in 3 sets twice daily for 8 weeks and then once a day for the next 4 weeks. The posterior shoulder stretch was performed for 30-60 seconds and repeated three times twice daily. The exercises were individually adjusted and progressed with increased external load by using weights and elastic rubber band at the physiotherapist visits. When necessary, the physiotherapist performed manual treatment by stretching the posterior glenohumeral capsule and pectoralis minor during the visits.
- The control exercise group (n=46, 24 men, 22 women) protocol consisted of 6 unspecific movement exercises for the neck and shoulder without any external load (shoulder abduction in the frontal plane, shoulder retraction, shoulder elevation, neck retraction, stretch of upper trapezius and pectoralis major). Each movement exercise was repeated 10 times, and each stretching exercise three times twice daily at home and once every other week at the physiotherapist visits. The patients did the same program without any progression for 12 weeks.

Main outcome measures:

- The primary outcome was the Constant-Murley shoulder assessment score evaluating shoulder function and pain. The score consists of both objective (range of motion and strength) and subjective measurements (pain assessment, work load, and leisure time activities), which are summarized in a score between 0 and 100. A higher score indicates better shoulder function.
- Secondary outcomes were patients' global impression of change because of treatment and decision regarding surgery. At the three month assessment, after the end of treatment, the orthopaedic specialist asked the patient whether they still wanted or thought they needed surgery. The patient's global impression of change in symptoms because of treatment was also registered on a five point Likert scale: worse, unchanged, small improvement, large improvement, or recovered.
- The same orthopaedic specialist evaluated all primary and secondary outcome measures at the inclusion visit before patients started the exercises (baseline) and after three months when patients had completed their exercise program. The specialist was blinded to the exercise group allocations for the patients throughout the study.
- All patients were blinded to treatment assignment and had the same number of individual sessions with the physiotherapist. Patients were unaware of the study's hypothesis and only knew that both interventions were thought to be equally effective.
- There were no differences in the background variables at baseline, except for more men in the specific exercise group, and no statistical differences between the groups in any of the outcome measures at baseline.
- The specific exercise group had significantly greater improvement than the control exercise group in the primary outcome of shoulder function and pain evaluated with the Constant-Murley score. The mean difference between groups was 15 points (95%

confidence interval 8.5 to 20.6). This mean difference of 15 points in the Constant-Murley score between the 2 groups does demonstrate a clinically important difference. This 15% mean difference is not only statistically significant, but it equates to a moderate effect size as defined by Cochrane (moderate > 10% and < 20%).

- The mean change in the Constant-Murley score increased 24 points in the specific exercise group and 9 points in the control exercise group.
- Significantly more patients in the specific exercise group reported a successful outcome due to treatment (defined as large improvement or recovered) according to the patients' global assessment of change (69% (35/51) vs. 24% (11/46) in the control exercise group. Patients in the specific exercise group were 2.8 times more likely to report a successful outcome than patients in the control exercise group.
- A significantly lower proportion of patients in the specific exercise group subsequently chose surgery (20% (10/51) vs. 63% (29/46) in the control exercise group. At the 3 month assessment, patients in the control exercise group were 3 times more likely to still choose surgery than patients in the specific exercise group.
- Adherence to physiotherapist visits and the exercise protocols in each group was similar.

Authors' conclusions:

- A specific exercise strategy, focusing on strengthening eccentric exercises for the rotator cuff and concentric/eccentric exercises for the scapula stabilizers, is effective in reducing pain and improving shoulder function in patients with persistent subacromial impingement syndrome.
- This specific exercise strategy reduces the need for arthroscopic subacromial decompression within the three month timeframe used in the study.
- Though both groups reported significantly decreased pain over time, participants in the specific exercise group reported a significantly greater decrease.
- The patients' global impression of change showed that the treatment reported by the specific exercise group (69% much improved or recovered) is comparable with the success rates reported by patients one year after arthroscopic subacromial decompression (75%).
- The positive treatment effect observed in this study needs to be proven in a primary care setting with longer follow-up before possible implementation in primary care.
- This study evaluated a new strategy for patients in whom earlier exercise treatments have failed. It adds valuable knowledge for managing patients with persistent subacromial impingement syndrome.
- Eccentric exercises might be an important component of the rehabilitation strategy. Eccentric exercises might provide a greater remodelling stimulus and also cause damage to the pathological nerves and neovessels around the affected tendon. Strengthening exercises for the scapula stabilizers are thought to normalize the altered shoulder kinematics in patients with subacromial impingement syndrome and, therefore, to reduce the risk for impingement.

Comments:

- All patients were recruited from the surgical waiting list of one orthopaedic clinic which might affect the external validity of the results.
- This study was able to enroll a scarce population. Studies evaluating the efficacy of exercise treatment in patients with “persistent” subacromial impingement syndrome who are on the waiting list for surgery are scarce.
- The strengths of this study are the strict study design, good attendance of the participants, and successful blinding. In addition, the standardized exercise protocol provides guidance about content, dose, and progression, which enables implementation into everyday practice.
- A major strength of the study was that it was adequately powered to detect a mean 10 point difference in the Constant-Murley score between groups with a sample size of 82 total participants.
- One strength of the study was that the exercise protocols consisted of only a few exercises, which could be completed in a reasonable amount of time. In addition, regular follow-ups by the physiotherapist focused on hands-on guidance to facilitate appropriate performance of the exercises. Both aided in attaining good adherence by the participants.
- Only one physiotherapist was involved in treatment and was not blinded to group assignment, which decreases the external validity of the results. The interaction and the number of visits with the physiotherapist was however similar in both groups. Lack of blinding could inflate the differences found between the 2 groups away from the null. Although it is impossible to blind the physiotherapist directing the intervention, it is likely that the physiotherapist may have treated the participants in each group differently. If true blinding cannot be achieved, then it would be preferable for the physiotherapist to be unaware of the study’s hypothesis and not know which intervention is thought to be superior. The non-blinding could influence the direction of the bias, and may influence the conclusions of the study. This potential bias does not undermine the conclusions of this study, since the effect size observed was quite large, thereby making it less susceptible to the influences of bias.
- The exclusion criteria did not specifically exclude rotator cuff tears. The study did not use any definitive imaging to exclude patients with rotator cuff tears. As a result, they may have included patients with tendinopathy from partial rotator cuff tears.
- The study did not include a third intervention group with no exercise treatment, and so it could not evaluate the influence of natural recovery of subacromial impingement syndrome. However, the study is ethically correct to not include this third no-treatment group.
- The expectations about treatment effects did not differ between the treatment groups and cannot help explain the favorable results for the specific exercise group.

Assessment:

- This study is adequate for some evidence that a specific exercise strategy, focusing on strengthening eccentric exercises for the rotator cuff and concentric/eccentric exercises for the scapula stabilizers, is effective in reducing pain and improving shoulder function in patients with persistent subacromial impingement syndrome. In addition, this specific exercise strategy reduces the need for arthroscopic subacromial decompression within the three month timeframe used in the study.