The Effectiveness of Physiotherapy Exercises in Subacromial Impingement Syndrome: A Systematic Review and Meta-Analysis

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Objective: To evaluate the effectiveness of exercise in the treatment of people with subacromial impingement syndrome (SAIS).

Methods: A systematic review and meta-analysis were conducted. Ten electronic databases were searched from the dates of their inception until August 2010. Included studies were randomized controlled trials investigating exercise in the management of SAIS. Outcomes were pain, strength, function, and quality of life. Data were summarized qualitatively using a best evidence synthesis. Treatment effect size and variance of individual studies were used to give an overall summary effect and data were converted to standardized mean difference with 95% confidence intervals (standardized mean difference (SMD) (CI)).

Results: Sixteen studies were included ($n = 1162$). There was strong evidence that exercise decreases pain and improves function at short-term follow-up. There was also moderate evidence that exercise results in short-term improvement in mental well-being and a long-term improvement in function for those with SAIS. The most common risk of bias across the studies was inadequately concealed treatment allocation. Six studies in the review were suitable for meta-analysis. Exercise had a small positive effect on strength of the rotator cuff in the short term (SMD −0.46 (−0.76, 0.16); $P = 0.003$) and a small positive effect on long-term function (SMD −0.31 (−0.57, 0.04); $P = 0.02$).

Conclusions: Physiotherapy exercises are effective in the management of SAIS. However, heterogeneity of the exercise interventions, coupled with poor reporting of exercise protocols, prevented conclusions being drawn about which specific components of the exercise protocols (ie, type, intensity, frequency and duration) are associated with best outcomes.

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Approximately 1% of adults seek medical attention for shoulder pain each year (1). As such, it is the third most common musculoskeletal reason for general practitioner consultations and estimates of its prevalence in the UK range from 7% to 26% (2-4). Because the shoulder stabilizes the upper limb in its activities, shoulder pain, and particularly subacromial impingement syndrome (SAIS) pain, produces significant impairments in function and quality of life (QoL) (5,6).

SAIS was first described as a reduction in the subacromial space leading to impingement of the rotator cuff

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tendons against the coracoacromial arch (7). However, recent literature suggests that SAIS is, in fact, the final pathway for numerous pathologies of the shoulder and that it may be considered a descriptive term for a broad spectrum of symptoms rather than a single diagnosis (8-10).

Physiotherapy management of SAIS can include multiple interventions, eg, exercise, electrotherapy, manual joint mobilizations, acupuncture, advice, and education (1,3,11). The selection of treatment is often subjective and dependent on the skill and training of the therapist rather than on any rigorous evaluation of best evidence; however, one of the fundamentals of any physiotherapy program is exercise (9,11).

The goal of a shoulder exercise program is to relieve pain, increase strength, promote healing, reverse abnormal muscle imbalances, and restore pain-free joint range of motion (12). Stretching exercises are used to improve healing, in addition to reducing tendon stiffness, and enhancing its elasticity (13). Isometric and isotonic exercises are designed to strengthen the weakened rotator cuff musculature, thus restoring its ability to counteract the action of the deltoid muscle (14-16). Scapular stability exercises are included in the rehabilitation of people with SAIS because electromyographical studies have highlighted increased activity in the upper trapezius, with decreased activity in serratus anterior and the middle and lower fibers of trapezius, and asynchronous timing deficits, in subjects with SAIS (16-20).

Despite widespread anecdotal support for exercise in the management of SAIS and some published work on the cost-effectiveness of exercise compared to usual care on the outcomes for patients with chronic musculoskeletal shoulder pain (1,18,21,22), few trials have demonstrated the effectiveness of exercises that target the scapular muscles in the clinical setting.

Several reviews have been published relating to the nonsurgical management of SAIS and all have commented on the effectiveness of conservative modalities in general, but with limited attention to the effectiveness of exercise (11,21,23-29). Only 3 reviews have specifically addressed exercise (23,24,29) and, because they contain few randomized controlled trials (RCTs) and show significant weaknesses, clinicians remain unsure regarding the overall effectiveness of exercise, which muscles should be targeted, and the optimal strengthening approach. The lack of evidence and inconsistency of treatment approach are confirmed by the fact that the long-term outcomes of current conservative management of SAIS are poor (11,30,31).

Given the lack of clear guidelines for clinicians managing people with SAIS, the limitations of previous reviews, and the fact that further studies have been published, there is a need for a thorough, accurate, and transparent review to be conducted.

The aim of this review and meta-analysis was to determine the overall effectiveness of exercise in the management of SAIS with respect to pain, function, and QoL. A subsidiary aim was to determine if there is evidence to guide therapists regarding the mode, frequency, duration, intensity, and progression of exercise interventions.

MATERIALS AND METHODS

This study was conducted adhering to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines and the Cochrane Handbook for Systematic Reviews of Interventions (32,33). The protocol for the review was registered with the Centre for Reviews and Dissemination (CRD32010000598).

Data Sources and Searches

One researcher (CH) conducted an electronic literature search of Allied and Complementary Medicine Database, Cochrane Central Register of Controlled Trials, Cumulative Index to Nursing and Allied Health, EMBASE, MEDLINE, Pedro, ProQuest Health and SPORTDiscus, Index to Theses, and openSIGLE databases. All databases were searched from their date of inception to August 2010. The search keywords were dependent on the database. A Cochrane search strategy was used, ie, all keywords were searched independently and then combined using relevant Boolean terms. Reference lists of all retrieved work were searched for further relevant material. Titles and abstracts of potentially eligible studies were screened by CH and ambiguous studies were discussed with two additional researchers (JMcV, DK).

Study Selection

RCTs published in English, investigating any mode of exercise in the management of stage I or II SAIS or rotator cuff disease/tendinopathy, were reviewed. Trials were excluded if they had recruited patients with rotator cuff rupture, alternative diagnoses (eg, adhesive capsulitis, calcific tendonitis, posterior superior glenoid impingement, and shoulder instability), or postsurgical patients. Studies in which exercise was a minor component of a multimodal approach were also excluded, as the treatment effect of the exercise component could not be determined accurately. Outcomes of interest were pain, strength, patient-reported function (PRF), and QoL.

Data Extraction

One researcher (CH) extracted data on participant characteristics (mean age, duration of symptoms, and medication use), type of exercise intervention, the exercise protocol used, and results. Adverse events were recorded. For statistical analysis, data were extracted for outcomes at short-term (6 to 12 weeks) and long-term follow-up (>12 weeks). Where repeated observations fell within the one category of follow-up, the time point closest to that of the majority of studies was used to allow for accurate comparison of data (33).