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Effectiveness of Rehabilitation for Patients with Subacromial Impingement Syndrome

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Clinical Question: Which physical rehabilitation techniques are effective in reducing pain and functional loss for patients with subacromial impingement syndrome (SAIS)?

Data Sources: Investigations were identified by MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Cochrane Central Register of Controlled Trials Register searches from 1966 through October 2003 and by hand searching the references of all retrieved articles and relevant conference proceedings. The search terms were *shoulder, shoulder impingement syndrome, bursitis,* and *rotator cuff* combined with *rehabilitation, physical therapy, electrotherapy, ultrasound, exercise,* and *acupuncture* and limited to clinical trial, random assignment, or placebo.

Study Selection: Inclusion criteria involved randomized controlled trials or clinical trials comparing nonsurgical, nonpharmacologic physical interventions for patients with SAIS with another intervention, no treatment, or a placebo treatment. Included studies required clinically relevant and well-described outcome measures of pain, disability, or functional loss. The study was limited to adult patients who met specific inclusion criteria for the signs and symptoms of SAIS and exclusion criteria for systemic impairment, cervical involvement, degenerative joint changes, clinical findings of other shoulder injury, previous history of surgery or physical therapy treatment, and workers' compensation claim/litigation.

Data Extraction: A 23-item checklist, with each item assigned 0, 1, or 2 quality points for a total of 46 possible points, was used independently by 2 examiners to assess each study. In their original report, Michener et al stated that the 23-item checklist was worth a possible 69 points. However, in a conversation with L. A. Michener, she stated that this was an inadvertent publication error and confirmed that the possible point value for this checklist was indeed 46. This checklist encompasses 7 major areas, including the rationale for the research question, study design, subjects, intervention, outcome, analysis, and recommendations. If a discrepancy of more than 1 quality point was present for any item, the 2 investigators discussed it to reach a consensus. The total quality points were summed for each independent evaluator, and the average of the 2 final scores was used to determine the total quality score for an individual study.

Main Results: The specific search criteria identified a total of 635 papers for review, of which only 12 met the inclusion and exclusion criteria for study. The average total quality score of these 12 studies was 37.6 (range, 33.5–41) of 46 possible points. Analysis of the inclusion criteria for SAIS revealed that shoulder pain was present in all 12 trials, painful or weak resisted abduction was present in 7 trials, positive Neer test was present in 6 trials, painful arc was present in 5 trials, positive Hawkins-Kennedy test was present in 4 trials, painful or weak resisted shoulder internal and external rotation in 4 trials, and positive impingement injection test was present in 2 trials. Physical interventions, performed in isolation or in combination, for patients with SAIS were divided into 5 types: exercise, joint mobilization, ultrasound, acupuncture, and laser. Authors employed a variety of outcomes measures, with all studies using a numeric rating or visual analog scale for pain, a direct measure of functional loss or disability (in 10 of 12 studies), or an indirect measure of a global rating of change or a measure of strength in a functional position (in 2 of 12 studies). Therapeutic exercise was the most widely studied form of physical intervention and demonstrated short-term and long-term effectiveness for decreasing pain and reducing functional loss. Upper quarter joint mobilizations in combination with therapeutic exercise were more effective than exercise alone. Laser therapy is an effective single intervention when compared with placebo treatments, but adding laser treatment to therapeutic exercise did not improve treatment efficacy. The limited data available do not support the use of ultrasound as an effective treatment for reducing pain or functional loss. Two studies evaluating the effectiveness of acupuncture produced equivocal results.

Conclusions: These data indicate that exercise, joint mobilization, and laser therapy are effective physical interventions for decreasing pain and functional loss or disability for patients with SAIS. The current evidence does not support the use of ultrasound, and studies evaluating the effectiveness of acupuncture were equivocal. The number of trials evaluating the effectiveness of physical rehabilitation interventions for patients with SAIS is limited, and those available are of moderate quality. Clinicians should interpret the conclusions with these limitations in mind.

COMMENTARY

Shoulder disorders, of which subacromial impingement syndrome (SAIS) is the most prevalent, have a high occurrence in the physically active population.[1,2] Shoulder rehabilitation performed by certified athletic trainers (ATCs) may incorporate a variety of different physical intervention techniques, including therapeutic exercise, manual therapy, and physical agents. Choosing an effective intervention strategy for achieving the best rehabilitative outcomes represents

a significant clinical challenge. A good clinician should be able to choose appropriate intervention techniques to produce optimal treatment outcomes. Therefore, determining which physical rehabilitation techniques are effective in reducing pain and functional loss for patients with SAIS is highly relevant to any clinical athletic training setting.

The findings regarding the effectiveness of therapeutic exercise are very important for ATCs to consider, and the authors provide a good framework for further clinical research. Michener et al[3] recommended further research to determine which clinical measurements may be useful in predicting patient response to therapeutic exercise or for determining different levels of intervention necessary. For instance, can we determine from measures of glenohumeral motion or strength those patients who will most likely benefit from stretching or strengthening exercises? A comparison of the effectiveness of therapeutic exercise to surgical intervention for patients with SAIS was provided, and Michener et al[3] concluded that the results conflict. However, this was not the primary aim of the systematic review, and the authors did not include all studies examining surgical outcomes. Regardless, their recommendation that future researchers attempt to determine those patients who are most likely to respond positively to exercise or surgery is valid and should be given consideration.

Further research was recommended to determine which joint mobilization techniques are the most effective and which patients are most likely to respond favorably to various joint mobilization techniques. For example, glenohumeral joint mobilization techniques may not be indicated in a swimmer with multidirectional instability leading to secondary impingement but may be warranted in a patient with glenohumeral joint stiffness resulting from capsular tightness causing altered humeral kinematics and subsequent SAIS.

The limited current evidence does not support the effectiveness of ultrasound for the treatment of SAIS. Only 2 level 2 (individual cohort) studies were found evaluating ultrasound intervention for patients with SAIS; one used pulsed ultrasound,[4] and the other failed to report the type of ultrasound used.[5] Further research with clearly defined treatment parameters is warranted to determine whether the addition of ultrasound therapy to therapeutic exercise and manual therapy increases treatment effectiveness. Further study was also recommended to evaluate the physiologic mechanism, optimal dosage, and clinical utility of laser therapy in the treatment of SAIS. Continued study of the short-term and long-term effectiveness of acupuncture therapy in patients with SAIS is also warranted.

Orthopaedic rehabilitation should utilize a problem-oriented approach to direct treatment. That is, specific problems should be identified for each patient, such as loss of glenohumeral joint internal rotation, scapular winging, thoracic kyphosis, and so on, and a treatment plan should be developed to address the specific problems observed. The nature of clinical trials to evaluate specific interventions makes it difficult, if not impossible, to utilize a problem-oriented approach, and generalized treatments are often applied universally to patients with various problems. For example, one patient included in the treatment group of a study may not have glenohumeral stiffness yet may be receiving joint mobilizations. This can confound the ability to determine treatment efficacy because patients who would not be expected to benefit from specific interventions may be randomized to that treatment group. Furthermore, it is not always clear that the interventions studied are evidence based themselves, and often insufficient information is provided with which to evaluate them. For example, Berry et al[5] failed to identify the settings (pulsed or continuous) of the ultrasound intervention they used, thereby limiting the ability to draw meaningful conclusions regarding the effectiveness of ultrasound treatment from their findings.

A confounding problem in the study of SAIS is the various operational definitions that exist for the condition. Numerous definitions of SAIS have been presented in the literature, and various types of SAIS have been suggested on the basis of the underlying cause of the condition. For example, impingement of the subacromial structures secondary to a hypermobile glenohumeral joint (secondary impingement) is not the same condition as impingement of these structures resulting from a hooked acromion or calcific deposits in the subacromial space (primary impingement), yet both may be termed SAIS on the basis of the resulting impingement of the subacromial structures.[6]

Another limitation to consider is that the subjects' ages and levels of physical activity were not evaluated and accounted for as contributing factors to the observed outcomes. One may reasonably expect various degrees of treatment effectiveness for SAIS given significant differences in age or physical activity levels. It should be noted that none of the patient populations in the studies reviewed by Michener et al[3] were competitive athlete cohorts, and they were primarily of an age range and physical activity level that would be observed in a clinic environment as opposed to a competitive athletics environment. Because so many patient-specific factors may contribute to SAIS, it is difficult to classify SAIS as a single condition that may or may not respond universally to specific treatment interventions. Michener et al[3] used sound inclusion and exclusion criteria that would reduce heterogeneity in their SAIS population, but patient-specific variability in SAIS is an inherent limitation of studying this condition that should be considered when interpreting these findings.

Numerous outcome measures exist, and attempts to compare intervention studies that use different types or scales of outcomes are difficult. This problem is compounded by variation in when the investigators obtained the outcome measures. Comparing the results of pain or functional outcomes after different interventions from measures taken 3 months versus 6 months posttreatment may be quite different, leading one to suggest a difference in treatment effectiveness that may not be real. This concern is exemplified by the findings regarding acupuncture, in which short-term studies suggest effectiveness, but long-term follow-up does not. It is important to understand the limits of synthesized information regarding treatment effectiveness for a diagnosis with such a broad range of causes and contributing factors, when the interventions may not be problem oriented and may lack patient specificity and various outcome measures are obtained at various measurement intervals.

In conclusion, the systematic review of SAIS by Michener et al[3] is an excellent paper. However, it is clear from their study that the value of the current clinical evidence evaluating physical interventions for SAIS is limited, thereby restricting the validity of any conclusions that may be drawn from it. Subacromial impingement syndrome is a multifactor problem and there are inherent concerns of which clinicians should be aware when interpreting studies of this condition. The recommendations for future clinical research proposed by Michener et al[3] should be given serious consideration so that valid

conclusions, based on high-quality evidence, about the effectiveness of physical interventions for patients with SAIS may be drawn. Certified athletic trainers have an excellent opportunity to contribute to the body of knowledge regarding the treatment of SAIS by following these research recommendations and conducting clinical outcomes research to demonstrate the effectiveness of our interventions for one of the most common diagnoses in the physically active patient.

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