

**A critical appraisal of “Effects of Deep AND superficial heating in
the Management of Frozen Shoulder”**

By

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Abstract

Adhesive capsulitis is a condition that results in the pain and tightening of the shoulder capsule, greatly limiting ROM for as long as 4 years. In this literature, it was examined whether heat application for frozen shoulder patients before PT treatment would improve the prognosis of ROM. Upon a literature search, the article *Effects of Deep and superficial heating in the Management of Frozen Shoulder* was chosen. This literature review assesses all aspects of this article to determine its validity and implication to the research question.

Key words

Frozen Shoulder

Adhesive Capsulitis

Short Wave Diathermy (SWD)

Deep Heat

Superficial Heat

Introduction

Adhesive capsulitis of the shoulder is a condition of usually unknown origin that causes pain and drastic tightening of the shoulder capsule. In order to regain full ROM, it often takes several years, impacting the quality of life for patients. As a result, this literature review seeks to find a treatment that improves the prognosis for patients with adhesive capsulitis. In particular, it examines the effect of heat application before therapy sessions on long term shoulder ROM in these patients.

Methods

Setting out to find relevant research studies examining this relationship, PubMed and the ASU Library database were used. The keywords used to search were “Adhesive capsulitis OR frozen shoulder AND heat” and “Heat AND joint capsule” in PubMed, while “Heat AND ligaments AND physical therapy” was used in the ASU database. The word “AND” was utilized in these searches to weed out any research that was relevant to heat therapy or frozen shoulder, but didn’t analyze the relationship between the two. Generally, a turnout of 100 hits or less was pursued. Any results that examined the effects of heat on muscle tissue were excluded due to their lack of relevance to the shoulder capsule, while studies examining the effects of heat on ligaments and joint capsules were included due to their similar qualities of tensile strength and lack of elasticity.

Ultimately, the research used in this literature review to examine the effects of heat treatment on the ROM of patients with adhesive capsulitis was *Effects of Deep and superficial heating in the Management of Frozen Shoulder* conducted by May S. F. Leung, MSc and Gladys L. Y. Cheing,

PhD. It appeared in the Journal of Rehabilitation Medicine in 2008, and was conducted at The Hong Kong Polytechnic University. This study was chosen because of its direct application to the research question being assessed.

Results

Summary of the study

Frozen shoulder is an insidious condition that can be of idiopathic or traumatic causes, and results in a stage of pain followed by a loss of mobility. Previous studies examining heat treatment have drawn mixed conclusions on their effects on the extensibility of soft tissues. The aim of the study is to determine whether superficial or deep heating in combination with stretching is more beneficial than stretching alone. 30 subjects in the stiffness phase of adhesive capsulitis took part in the study. Subjects were randomly assigned to 3 groups: a deep heat and stretching group utilizing a shortwave diathermy (SWD) machine; a superficial heat and stretching group using a heat pad (HP); and a stretching only group. Baseline measures were obtained before the start of treatment, with subsequent measures being taken at sessions 6 and 12, as well as at the 4 week follow up. The superficial and deep heat were applied and adjusted according to the patient's perception of "comfortable warmth," and followed by stretching exercises. Final assessments were performed using the ASES assessment by a physician blind to the treatment assignments. The final shoulder scores of the deep heat, superficial heat, and stretching only group increased by 63.4%, 45.2%, and 38.4% respectively. In addition, SWD showed the greatest increases in shoulder ROM in all mentioned shoulder stretches except external rotation with the arm by the side. All in all, the SWD deep heat group showed a

significantly greater score on the shoulder assessment than the stretching alone group, while there wasn't a significant difference between the superficial heat and the stretching alone. Additionally, the deep heat group demonstrated a significantly greater ROM on most movements than the superficial heat group.

Appraisal of the study introduction

The introduction of the article is adequate in giving preliminary information about frozen shoulder and the current literature on the effects of heat treatment on soft tissues. They give preliminary information about adhesive capsulitis, mentioning the causes, stages, and treatment modalities used in therapy treatment. The authors state that according to previous literature, increasing the heat of soft tissue has shown to decrease tensile stress, with deep heat generally being shown to be more effective in increasing ROM than superficial heat. In contrast, the authors also mention that studies have found deep heat to have no benefits over control groups, although these studies may have had inadequate treatment time and controls. However, despite previous studies, it is stated that there is a lack of adequate research to provide reason for using SWD or HP in combination with stretching to treat frozen shoulder.

Conversely, the introduction lacks preliminary information regarding all outcome measurements. According to the title and key words, the dependent variables are the clinical outcomes of the each treatment group. These variables are mostly addressed in the introduction; however, the introduction mainly focuses on the dependent variable of ROM, which is only one aspect of the clinical outcomes. When noting that most of the possible clinical outcomes are going to stem from alteration in ROM, it seems logical to only assess literature for ROM.

Appraisal of the study methods

This study utilizes an experimental research design in which 30 subjects in the stiffness phase of adhesive capsulitis were assigned to groups using a randomization software. The groups consisted of a superficial group, deep heat group, and a stretching control group. It was a single blind study, with the outcome assessors being unaware of the group assignments. This allowed for the elimination of the placebo effect and bias of the assessors. In addition, there was no attrition of the 30 subjects. When describing the application of the treatment groups and outcome measures, the authors go into sufficient detail to allow others to potentially replicate the study. The frequency and orientation of the SWD machine, size and temperature of the heat pad, position of the subjects, and explanation of reliable outcome measures were all provided. Lastly, SPSS for Windows was used for repeated ANOVA tests, followed by Tukey's post hoc multiple comparisons test. These were appropriate tests to choose, as the study consisted of three groups, all with multiple sessions. The ANOVA allowed for the exposing of significant findings, and the post hoc test determined the interaction effects.

Although the 3 treatment groups were randomized and similar to each other in injury stage, two of the groups had a 4:1 ratio of female to male, while the other had a 1:1 ratio. In addition, although the compliance of subjects to the home stretching program was checked by the therapist, it is impossible to determine whether the patients all had the same degree of compliance without constant monitoring. Additionally, although the subjects and assessors were blind to treatment groups, the awareness of the treating therapist to treatment groups could have introduced bias.

Appraisal of the study results

The results presented correspond well with the research question, examining whether SWD or HP improve patient prognosis compared to stretching alone. The results were organized by the outcome measurements, and within each paragraph, the authors mention whether the results were significant within and between the groups. All in all, the statistically critical findings presented in the article are the between group differences for shoulder score index, shoulder flexion, external rotation with arm by side and at 90 degrees of abduction, and hand-behind-back. Therefore, the SWD group was statistically significantly better than the other interventions in all outcome measures other than cross body adduction. The results section focuses on these measures at session 12 of the study rather than the 4 week follow up, ensuring that they're evaluating the shoulders when the most controls are present.

The authors present some information in the results section that can mislead the reader in respect to the outcome measures. Primarily, the calculations presented in the "external rotation with arm by side" paragraph differ from the data in the table. According to the table, the percent increases for the 3 interventions are 20.8, 15.6, and 9.6 respectively, while they report the values of 14.5%, 21.1%, and 22.6% in the text. In addition, the results section presented the outcome measures as percent increases or decreases along the treatment sessions, which can misrepresent the data if the baseline values between interventions vary from each other. Lastly, the authors fail to mention what numerical values for the SSI and ROM tests are clinically significant, leaving the reader to determine whether the statistically significant results are noteworthy.

Appraisal of the study discussion

The discussion portion of the article begins by evaluating the results using previous literature. The research they utilize in the discussion section are credible, as they average an impact factor greater than 6. Most are recent literature, but some studies cited are from the 20th century. They explain that SWD has been found in previous studies to increase the temperature of tissues to a greater extent than a heating pad, thereby increasing the thermal effects. In addition, the researchers speculate why the cross body adduction had statistically insignificant results. They attribute this to the thickness in the posterior shoulder as well as the structure of their study. According to research, SWD increases the temperature of tissue for about 7 minutes. However, in this study, over 7 minutes had gone by before the subjects got to the cross body adduction stretch. In the closing remarks of the discussion, the authors begin to look ahead to future studies as well as examine what they could have done better. They mention that their research may have had inadequate controls due to the fact that the SWD and HP groups had more contact with a therapist, which could be beneficial. They conclude by takeaway from the study, which is that SWD before stretching provides better pain and function improvements for adhesive capsulitis patients.

Discussion

The research question of this literature review was whether heat application before therapy sessions improves the ROM of patients with adhesive capsulitis. The examined article answers that question and takes it a step further by examining the pain and functional outcomes of heat application. In addition, it distinguishes between the effects of deep and superficial heat, which

are different in their mechanism of action. However, it only examines one deep heat modality, and therefore doesn't assess the use of deep heat for frozen shoulder as a whole, but rather just for SWD.

From this study, it is evident that heat improves the prognosis for patients with adhesive capsulitis. Additionally, this study exposed the differences that deep heat may have from superficial heat, thereby provoking the question of whether SWD should be utilized for frozen shoulder patients. SWD was found to improve the pain, functional outcomes, and ROM outcomes for patients with adhesive capsulitis. Therefore, you would expect its widespread use among therapists. However, the safety concerns surrounding SWD have resulted in its decline, with a subsequent increase in ultrasound use. Ultrasound is a deep heat modality that is less effective in heating tissue, but requires much less precautions.

Nonetheless, for patients with adhesive capsulitis, deep heat should be applied before therapy sessions. Despite minor shortcomings of the study, one can conclude that deep heat is more effective than both superficial heat and stretching alone. Deep heat was found to have a significant improvement from stretching alone in almost all outcome measures. However, the study assesses only one method of deep heat application. Therefore, in order to further validate deep heat as a frozen shoulder modality, more research needs to be demonstrated. A study determining the differences in outcome measures between SWD and ultrasound would be helpful to determine whether the possible benefits of SWD are worth safety precautions required for its use.

All in all, this study aimed to determine the effects of heat treatment before therapy sessions for patients with adhesive capsulitis. Despite minor imperfections in research design and reporting of outcome measures, the results are in favor of the use of SWD in frozen shoulder treatment.

Therefore, it is important to note that the answer to this research question depends on the type of heat therapy being assessed. In general, deep was more effective in improvement in outcome measures than superficial heat. Therefore, it would be telling to compare the therapeutic effects of multiple deep heat modalities, including ultrasound.