

Effect of combined stretching and dynamic splinting on ROM in patient with Adhesive Capsulitis

فيصل حمد صالح الجاسر

سلطان صالح خليفة العقيل

جامعة سلمان بن عبدالعزيز

كلية العلوم الطبية التطبيقية

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Abstract

Adhesive Capsulitis (AC) affects patient of all ages in Shoulder. Stretching and dynamic splinting has been shown effective in contracture reduction from pathologies including Trismus to plantar fasciitis. The purpose of this study was to examine the efficacy of combined stretching of dynamic splinting of ROM on patients with AC. study conducted at physical therapy, In the College of Applied Medical Sciences The application of the 8 patients diagnosed with Adhesive Capsulitis by intervention 8 patients . The intervention categories were as follows: Group I (Control); Group II (Physical Therapy exclusively with standardized protocols); Group III; (Shoulder Dynamic splint system exclusively); Group IV (Combined treatment with Shoulder Dynamic splint and standardized Physical Therapy). The duration of this study was 60 days for all groups, and the main outcome measures were change in active, external rotation. Significant difference was found for all treatment when the mean value was compound pre and post treatment wing t.test. The difference for the combined treatment group was attributed to patients' receiving the best PT combined with structured "home therapy" that contributed an additional 40 hours of end-range stretching. So this adjunct should be included in the standard of care for adhesive Capsulitis.

Introduction

It is characterized by fibrosis, decreased volume of the glenoid capsule, pain, and progressive pain with loss of both active and passive Range of Motion (ROM) This condition therefore is a serious pathology, which is also known as "Frozen Shoulder" with three phases: 1) The Painful stage is characterized by the gradual onset of diffuse shoulder pain and which usually lasts one to two months; 2) The Frozen stage is characterized by progressive loss of motion (particularly glenohumeral external rotation) which lasts several months to a year or longer This stage also exhibits decreased capsular volume which can be visualized with MRI, for differential diagnosis; 3) The Thawing stage is the final stage during which range of motion gradually improves over several months to years. Range of motion deficits may continue to be unresolved for more than 3-5 years following the onset of AC.

Contracture is defined as shortening of connective tissue (ligaments, tendons, and cartilage) caused by excessive arthrofibrosis, immobilization, inactivation, adhesions, or excessive neuromuscular tone . Contracture in the shoulder is primarily seen in decreased capsular volume, and is measured with MRI for differential diagnosis. There are many treatment methods for adhesive capsulitis including physical therapy, corticosteroid injections (intra-articular), hydroplasty, manipulation of the joint while under anesthetics and surger The conservative primary treatment for adhesive capsulitis are intra-articular corticosteroid injections and physical therapy, which was examined by Dudkiewicz et al. They conducted a long-term follow-up (mean 9.2 years) of 54 patients suffering from idiopathic adhesive capsulitis, and their results showed that conservative treatment alone (physical therapy and non-steroidal anti-inflammatory medications) was an effective, long-term treatment method. Current Treatments for AC range from surgical intervention or manipulation under anesthetics stretching protocols combined with glenohumeral intra-articular corticosteroid injections and continuous passive motion devices. Studies of often report benefits from early intervention which Earley and Shannon said may help prevent the "downward spiral of forced disuse" leading to contracture. Joint mobilization and flexibility training are common features in treatment of this condition.

Material and Methods

Subjects:

Physical therapy was applied to 8 patient Adhesive Capsulitis (AC) Using by combined stretching of dynamic splinting of ROM with patients with AC in the College of Applied Medical Sciences and The ages patient ranged from 15 to 55. And all patients had deficits in external rotation. All patients enrolled had been previously treated with cortical steroid injection(s) but no patients had previously undergone manipulation or surgery. Patients were give informed consent and all patients' rights, protection, and privacy have been ensured in this study as required by the Gaspar-PT and ethical approval Patients were independently prescribed treatment in one of the following groups:

- Group I was the control group, and these patients were only treated with cortical steroid injections, (n = 2).
- Group II patients were treated exclusively with standardized (PT): "physical therapy" twice per week, (n = 2).
- Group III patients were treated exclusively with the SDS "Shoulder Dynamic splint systems" as (n = 2).
- Group IV patients were treated with both physical therapy (twice weekly) and the SDS for daily end-range stretching, (n =2).

When enrolled, patients were instructed that if they required additional treatment such as additional cortical steroid injections then their participation in this study would be completed but only two patients required such additional treatment methods. Standardized Training and reporting was used for all patients in all groups. All subject data was transmitted in confidential documents without jeopardizing the patients' privacy according to the federal health information privacy protection act.

Clinical Protocols:

All treatment categories were prescribed by the attending physicians rather than being randomized, which may reflect current treatments in use. Physical therapy was standardized, based on the protocols of Vermuelen, Hsu, and Mulligan these methods included moist heat, patient education and re-evaluation of symptoms, joint mobilization (limited to progressive end-range joint mobilization), passive range of motion, AROM and PNF, and therapeutic exercise. Group II and Group IV patients participated in physical therapy for two or more

times per week, and the SDS was worn twice a day, seven days per week.

Group III and Group IV patients who wore the SDS received a standardized treatment protocol and wearing schedule. These patients were instructed on the use by the physical therapist and a Dynasplint consultant who accomplished a customized fitting of the unit and taught the standardized protocol regarding how to increase tension in the direction of external rotation, with humeral abduction to 90 degrees. Each subject was instructed to fax a weekly tracking form to investigators which reported daily duration(s) in the SDS and tension settings used.

Patients were instructed to begin the dynamic splinting with only the tension setting of #1 for the first week for accommodation, and then they increase the tension setting to #2 which equals 3.0 foot pounds of force. During this period, patients were instructed to increase the duration in the SDS unit for 20-30 minutes, twice each day (with the goal of stretching 60 total minutes per day).

If the patient had post-wear discomfort or stiffness lasting more than one hour after removing the splint, the duration of the treatment was then reduced for the next two scheduled stretching bouts. After the patient was able to tolerate 60 minutes of stretching, (30 min, bid) then the patient was then instructed to increase the tension every two weeks as tolerated, without discomfort lasting more than one hour following each stretching session.

After 90 consecutive days in the SDS the patients' Active External Rotation was measured again by the same, prescribing clinician. While treatment with the SDS may be performed in multiple planes, this study chose to only evaluate ER rotation because it is the most common restricted ROM from Adhesive Capsulitis. Analysis of "Intention to Treat" include the data from patients who were non-compliant (less than 90% PT attendance and/or less than 90% scheduled use of SDS) or did not complete the study duration. All patients' data was included in this analysis.

Data Analysis:

The dependent variable was the change in Active Range of Motion, Supine External Rotation (Humerus abducted to 90°), and the independent variables were groups (Control vs. Physical therapy vs. SDS vs. Combined SDS and Physical Therapy). T-tests were performed to measure difference between groups.

Results

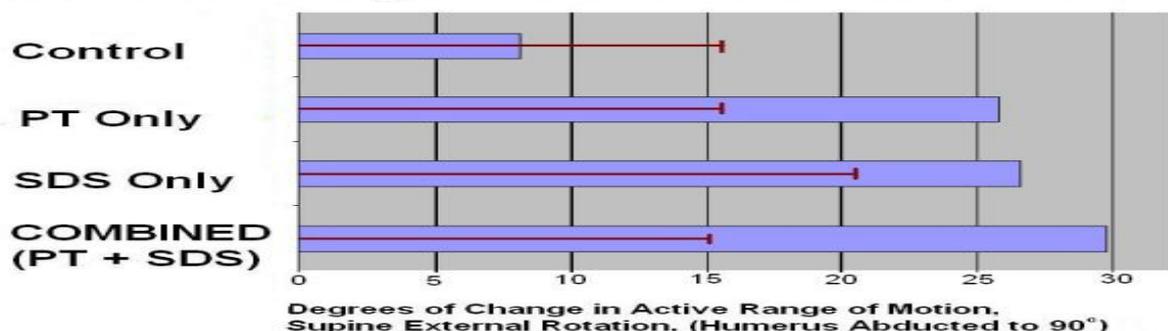
There was a significant difference for each treatment groups (PT Only: $T = 4.441$, $P < 0.001$; SDS Only: $T = 4.887$, $P < 0.001$; Combined: $T = 5.318$, $P < 0.001$). Due to the low power there was not a significant difference between treatment groups but the greatest change and the smallest Standard Deviation was seen for the Combined Treatment Group PT + SDS (mean 29.8° of change and $SD = 12.36$; see Figure (2). This suggests that the SDS is a measurably effective adjunct to physical therapy as a structured home therapy. (See table 11.)

Table 1 :

	Control		PT Only		SDS Only		Combined	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Mean	39.3	47.6	38.3	64.0	38.9	65.3	40.8	70.6
SD	15.3	15.6	15.3	15.5	15.3	20.3	15.1	15.1
N	15		15		16		16	

Figure 2 :

Mean Changes in External Rotation



Discussion

. The purpose of this study was to examine the efficacy of dynamic splinting on adhesive capsulitis in a prospective, cohort study. Although dynamic splinting for other extremity joints has been studied, this is the first controlled study investigating the effects of the dynasplint shoulder system. The results showed the efficacy of dynamic splinting as an effective adjunct to physical therapy. The additional 40 to 50 hours of end-range stretching combined with a standardized physical therapy is considered to be responsible for the greatest change in AROM of external rotation.

The results were in agreement with the study by Griggs et. al. which demonstrated that a conservative treatment protocol of four-direction shoulder-stretching exercise program would benefit shoulder flexibility. This experiment also confirmed the findings of Dudkiewicz et al. which described the efficacy of "conservative protocols." Because ROM deficits frequently exist in external rotation, this experiment chose to examine only that plane following treatment with physical therapy and/or the SDS.

Conclusion

Using a combined stretching and dynamic splinting program with patients with Adhesive Capsulitis. The results showed improvement in patients. Use of the SDS may be an effective adjunct "home therapy" for adhesive capsulitis, and the additional 60 minutes per day of low-load, prolonged-stretch was beneficial. (The mean time recorded was 40 hours in this 60 days study.) Earley and Shannon [7] proposed that conservative interventions of adhesive capsulitis would be the most beneficial when initiated as soon as the diagnosis is made, and DS could be an effective initial modality of conservative treatment.

Confounding variables in this study included lack of randomization. Grouping was done by the prescribing clinician who may have been biased, based on patient history. The total duration that each patient endured Stage II of adhesive capsulitis was not differentiated. Limitations of this study also included that it was only performed on a small number of patients and was limited to examining the Active Range of Motion, Supine External Rotation (Humerus abducted to 90°).

A future study comparing the duration of treatment to discharge between groups would be greatly beneficial in measuring the benefits that the SDS has in treating adhesive capsulitis. A larger subject population would reduce the chance for type two error, and a randomized, controlled trial would eliminate most of the limitations discussed regarding this study .

List of Abbreviations

(AC): Adhesive capsulitis; (ROM): Range of Motion; (SDS): Shoulder Dynasplint systems; (ER): External Rotation (PT): Physical Therapy.

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