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## 외상 후 유착성 견관절낭염 환자에서 관절가동술을 병행한 슬링 운동치료의 효과 : 단일사례연구

권원안, 김연정, 권혜미, 김은지, 박우경, 신혜원, 오정익, 우정희,  
이다혜, 이은정, 정은주, 정재영, 정현경, 최보영, 허은영, 이재홍\*

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## The Effects of Joint Mobilization with Combined Exercise Therapy of Sling on Post-traumatic Adhesive Capsulitis Patient: A Case Report

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### 초 록

본 연구는 43세 남성 환자의 관절가동술과 슬링을 이용한 유착성 관절낭염 환자의 치료사례를 조사하여 그 과정과 결과를 알아보려고 하였다. 어깨통증장애지수(shoulder pain and disability index) 측정과 어깨관절의 굽힘(flexion), 벌림(abduction), 바깥돌림(external rotation), 안쪽돌림(internal rotation)에 대한 관절가동범위를 측정하여 비교하였으며 견관절 주위에 비스테로이드 소염진통 주사 1회, 약물치료를 병행하며 주 3회 8주간 보존적인 물리치료인 온습포(hot pack)와 간섭파(IFT), 관절가동술, 그리고 슬링을 이용한 운동치료를 실시하였다. 결과는 관절가동술과 슬링운동치료의 적용이 유착성 관절낭염 환자의 통증을 줄이고 관절가동범위를 증진시키는데 효과가 있는 것으로 판단된다.

**Key Words** : Adhesive capsulitis, Frozen shoulder, Joint mobilization, Sling exercise

## I. Introduction

Adhesive capsulitis, also called frozen shoulder, is a disorder in which the shoulder experiences gradual loss of both active and passive motion for reasons unknown, accompanied by other symptoms such as pain, restrictive motion of the shoulder joints, and muscle atrophy (Yang et al 2007). This term was first used by Codman in 1934 to describe patients with idiopathic restriction despite plain radiographs. In 1946, Neviaser gave the term adhesive capsulitis for the condition, based on the fact that an arthrography showed definite decrease in joint capacity caused by inflamed articular capsule Codman, 1934; Nevaiser, 1946; Gulzar et al, 2011; Maund et al, 2012). Adhesive capsulitis affects 3-5% of the adult population, and the rate climbs up to 20% for patients with diabetes. Furthermore, it is reportedly difficult to identify the factors contributing to primary and idiopathic adhesive capsulitis. Patients with frozen shoulder usually show chronic inflammatory cells and fibroblast cells, which is believed to be caused by abnormal immune system response (Bridgman, 1972; Pal et al, 1986; Henricus et al, 2006).

Secondary adhesive capsulitis patients usually notice their symptoms after a trauma or surgery. Such cases mostly involve rotator cuff tear, have high correlation with cardiovascular diseases, and are reported to show slow recovery (Gulzar et al, 2011).

Treatment for adhesive capsulitis include manipulation under anesthesia, surgery, stretching protocol, steroid injections, massage therapy, and sling exercises (Bulgen et al, 1984; Stenvers, 1994; Kanbe et al, 2008; Arslan & Celiker R, 2001;

Carette et al, 2003). Some scholars argue that physical therapy accompanied by corticosteroid injections are the only effective treatments (Green et al, 2003), while others claim that joint mobilization therapies which involve physiologic movements or accessory movements are relatively successful (Henricus et al, 2006).

A study on high-grade and low-grade joint mobilization treatments, also known as endrange and mid-range mobilization techniques, revealed that 87% of the patients in both the high-grade and low-grade groups showed noticeable improvements after 3 months (van der Heijden et al, 2000; van den Hout et al, 2005; Vermeulen et al, 2005).

More recently, sling therapy has been gaining popularity due to its active treatment and systemic exercise routines. In another study, patients with impingement syndrome showed a drastic drop in VAS and considerable improvements in mobilization scores after 12 weeks of exercise therapy using Ulla Sling (Jonsson et al, 2006).

This study examined patients simultaneously employing both therapy methods and took a closer look into a case study of a patient using both joint mobilization and sling therapy for adhesive capsulitis. The main objective was to gain better understanding on the progress of the patient and the results of these treatments.

## II. Methods

### 1. Subjects

The subject of this case report was Lee, a 43-year-old male patient who resorted to physical therapy after sensing pain and limited mobility

to the right shoulder for 5 months. The subject stated that he sprained his shoulders 5 previously on a bus ride. The bus made a sudden stop and he grabbed too strongly on the handle above his head. He experienced initial pain on his neck and upper shoulders but did not seek hospital treatment, believing that the symptoms would subside after some time, and continued his daily routine with limited use of his arm. However, the pain gradually exacerbated and he was unable to raise his arms fully above his head. Lying on his left also brought intense pain which prevented sleep. He also reported extreme disruption and inconvenience to his daily activities, and came to the hospital 5 days ago. A simple radiograph of the affected area was negative. A magnetic resonance imaging (MRI) scan was conducted to confirm damages to the muscle and tendinous tissues, and the results revealed signs of subdeltoidal bursitis and subacromial bursitis. Otherwise, there were no other diagnostic symptoms.

## 2. Research tools and measurement methods

### 1) Shoulder pain and disability index(SPADI)

A 13-question survey on shoulder joint pain and disability was filled out by the patient. Each question had a possible score ranging from 0 (no pain) to 10 (severe pain), and the maximum final score was 130. The survey was taken before therapy, 4 weeks into the -rapy, and 8 weeks into therapy(Appendix).

### 2) Range of motion; ROM

The ROM of the right shoulder joint was measured using Goniometer before therapy, 4 weeks into therapy, and 8 weeks into therapy.

More specifically, it measured the glenohumeral joint flexion, abduction, and external rotation, as well as, the internal rotation based on the location of the thumb.

#### (1) Flexion

The flexion was measured when the patient was lying down where the main axis was set roughly 1 inch below the acromion at a lateral angle. The stationary arm was placed parallel to the lateral median line while the moving arm was placed parallel to the long axis of the upper arm. Measurement of the maximum angle was taken of the active angle when the patient bended the joint on his own and the passive angle formed with the examiner's aid.

#### (2) Abduction

The patient was positioned sitting down and the main axis was set in front of the acromion. The stationary arm was set parallel to the front of the sternal rib while the moving arm was placed parallel to the long axis of the upper arm. Measurements were taken of the maximum active abduction angle formed by the patient and passive angle formed with the examiner's aid.

#### (3) External rotation

The patient was positioned sitting down with arms placed on the side of the body, and the elbow was flexed 90 degrees and kept steady. The axis was set at the center of the olecranon process of the elbow joint. The stationary arm and moving arm were placed parallel to the forearm. Measurements were taken of the maximum active rotation angle formed by the patient and the passive rotation angle formed with the examiner's aid.

#### (4) Internal rotation

The patient was positioned sitting down and the hand was placed so as to reach the highest point up the back. Measurement was taken of the position of the thumb up the spine for both active internal rotation formed by the patient and the passive rotation formed with the examiner's aid.



Fig. 1. joint mobilization

#### 3) Intervention

##### 1) Intervention

The patient received 1 injection of nonsteroid anti-inflammatory drug in the shoulder joint and other pharmaceutical treatments. For 8 weeks, the patient also received conventional physical therapy such as hot pack and ICT, as well as, joint mobilization technique and sling exercises 3 times a week.

##### (1) Joint mobilization

Joint mobilization technique was used by positioning the patient on his side and applying mobilization techniques for shoulder blade movement. The patient was then positioned lying face up for lateral traction of the shoulder joints, and implemented 5 sets, where one set consisted of 10 seconds. The shoulder girdle was kept steady and the glide humerus was moved in the posterior direction. The patient was lying face down while keeping the shoulder girdle steady, and mobilized in the anterior direction. The patient was positioned

sitting down and allowed maximum abduction of arms. The arms were placed on the legs of the physical therapist and mobilized by gliding in a downward direction (Fig. 1).

##### (2) Sling exercise

The sling exercise consisted of Push-up-plus-Pull-up and shoulder extension with each exercise taking 4 seconds. The patient implemented 5 sets where 1 set comprised 4 rounds of exercise. (Fig. 2).

### III. Results

The shoulder pain and disability index showed significant improvement in pain and mobility

upon receiving treatment as the scores logged 89 initially and gradually dropped to 65 after 4

weeks and down to 52 after 8 weeks. The active flexion angle started at 95 degrees before treatment and improved to 135 degrees after 4 weeks and 170 degrees after 8 weeks, while the passive angle started at 100 degrees and rose to 142 degrees after 4 weeks and 170 degrees after 8 weeks. Active abduction recorded 38 degrees before therapy and rose to 65 degrees after 4 weeks and 84 degrees after

8 weeks, while passive abduction rose from 41 degrees to 70 degrees after 4 weeks and 87 degrees

after 8 weeks. Active external rotation recorded 20 degrees before treatment and rose to 28 degrees after 4 weeks and 40 degrees after 8 weeks, while passive external rotation rose from 24 degrees to 35 degrees in 4 weeks and 42 degrees in 8 weeks. An active internal rotation test showed thumb placement at right

PSIS before treatment, but improved to the L3 vertebrae in 4 weeks and T10 vertebrae in 8 weeks. The passive internal rotation test showed thumb placement at L4 before treatment, which improved to T12 in 4 weeks and to T8 in 8 weeks (Table 1).

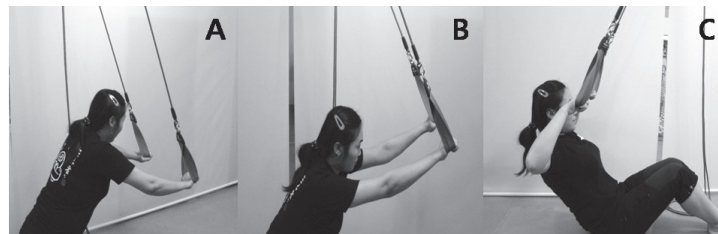


Fig. 2. Sling exercise

Table 1. Change of SPADI and ROM in Post-traumatic Adhesive Capsulitis Patient

		Baseline	After 4 weeks	After 8 weeks
SPADI (score)		89	65	52
Flexion (degree)	Active	95	135	168
Flexion (degree)	Passive	100	142	170
Abduction (degree)	Active	38	65	84
Abduction (degree)	Passive	41	70	87
External rotation (degree)	Active	20	28	40
External rotation (degree)	Passive	24	35	42
Internal rotation (area)	Active	PSIS	L3	T10
Internal rotation (area)	Passive	L4	T12	T8

SPADI : shoulder pain and disability index, ROM: range of motion, PSIS : potero-superior iliac spine, L: lumbar, T: thoracic

## IV. Conclusion

This study explored the effects of combined joint mobilization and sling exercise therapy in a patient suffering from adhesive capsulitis caused by physical trauma. The results demonstrated the effectiveness of clinically proven joint mobilization techniques and sling exercises in reducing pain and improving ROM in a patient suffering from adhesive capsulitis. The results also showed improvements in joint range of motion, which greatly reduced inconveniences in conducting daily routines.

Yet, full recovery was hard to achieve, mostly because the patient tended to stop seeking treatment once the pain subsided. Treatment should also consist of educating the families on exercise therapies so as to improve the chances of continuous treatment. Further research using a wider pool of subjects will be needed in the future to confirm the effectiveness of these methods on a broader level. So, we think it also needs to have PNF approach.

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## 〈Appendix〉 Shoulder Pain and Disability Index (SPADI)

Please place a mark on the line that best represents your experience during the last the week attributable to your shoulder problem.

### Pain scale

How severe is your pain?

Circle the number that best describes your pain where : 0 = no pain and 10 = the worst pain imaginable.

At its worst?	0	1	2	3	4	5	6	7	8	9	10
When lying on the involved side?	0	1	2	3	4	5	6	7	8	9	10
Reaching for something on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Touching the back of your neck?	0	1	2	3	4	5	6	7	8	9	10
Pushing with the involved arm?	0	1	2	3	4	5	6	7	8	9	10

### Disability scale

How much difficulty do you have?

Circle the number that best describes your experience where : 0 = no difficulty and 10 = so difficult it requires help

Washing your hair?	0	1	2	3	4	5	6	7	8	9	10
Washing your back?	0	1	2	3	4	5	6	7	8	9	10
Putting on an undershirt or jumper?	0	1	2	3	4	5	6	7	8	9	10
Putting on a shirt that buttons down the front?	0	1	2	3	4	5	6	7	8	9	10
Putting on your pants?	0	1	2	3	4	5	6	7	8	9	10
Putting an object on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Carrying a heavy object of 10 pounds(4.5 kilograms)	0	1	2	3	4	5	6	7	8	9	10
Removing something from your back pocket?	0	1	2	3	4	5	6	7	8	9	10