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Effectiveness of thrust manipulation on restricted shoulder mobility in patients with adhesive capsulitis

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Abstract
Background: With an incidence of 3% to 5% in the general population and up to 20% in people with diabetes, adhesive capsulitis represents one of the most common, self-limiting disorders of the musculoskeletal system. 30 to 50% of patients diagnosed with adhesive capsulitis.
Long term effects of glenohumeral joint thrust manipulation on range of motion, pain, and function in patients with adhesive capsulitis were studied.
Methodology: Thirty patients underwent by thrust manipulation of the glenohumeral joint. Changes in range of motion and pain were assessed before manipulation and immediately after manipulation at early follow-up (4 weeks), and at long term follow-up (8 weeks).
Result: Passive range of motion increased significantly for flexion, abduction, external rotation, and internal rotation. Significant decreases in visual analog pain scores between initial evaluation and the follow-up assessments also occurred. Wolfgang's criteria score increased significantly between initial evaluation and follow-up assessments.
Conclusion: Thrust manipulation appears to be an effective treatment modality for decreasing pain, increasing ROM, and improving function for those who suffer from adhesive capsulitis acutely and long term and should be considered by those practitioners skilled in joint manipulation.

Keywords: Adhesive capsulitis, thrust manipulation, ROM, shoulder mobility

Introduction

Background: With an incidence of 3% to 5% in the general population and up to 20% in people with diabetes, adhesive capsulitis represents one of the most common, self limiting disorders of the musculoskeletal system. 30 to 50% of patients diagnosed with adhesive capsulitis suffer long term range of motion (ROM) limitations although pain and functional limitations plague sufferers of adhesive capsulitis.

Adhesive capsulitis (AC) is a common shoulder condition that involves progressive loss of glenohumeral mobility and leads to significant functional limitations. It can be classified as being primary, occurring with an insidious onset, or secondary, associated with a predisposing condition. The progression of AC commonly follows a pattern of three stages. Stage 1 is characterized by intense pain even at rest with a small loss of range of motion (ROM). Stage 2 is characterized by a more significant loss in ROM but is typically less painful, especially at rest. Stage 3 is considered to be the recovery stage and is marked by a slow increase in mobility. Adhesive capsulitis is considered to be 'self-limiting', with the potential of spontaneous resolution within 3 years. However, some patients can suffer long-term pain and restricted shoulder motion well beyond this time.

The shoulder is a region comprised of several disparate joints, numerous muscles, and other soft tissue structures spanning the anterior, superior, lateral, and posterior aspects of the upper thoracic region. Musculoskeletal shoulder conditions can present a diagnostic and treatment challenge due to the complex biomechanical characteristics and interrelationships between the associated joints and soft tissue structures. Musculo-ligamentous connections between the scapulae, ribs, and the cervico-thoracic spine create the potential for symptom production from nearby structures. Likewise, shoulder pain can develop from dysfunction in adjacent anatomical regions.

Thrust manipulation is a treatment option for shoulder pain and Spinal or extremity-directed thrust manipulations are varyingly referred to as Grade V mobilizations or high-velocity low-amplitude (HVLA) manipulations. Thrust manipulation to the spine is also called spinal manipulative therapy (SMT). SMT may exert a therapeutic effect through several potential and sometimes overlapping mechanisms. SMT has been shown to alter brain and spinal cord sensory processing and contribute to reduced pain sensitivity in the extremities. Thrust manipulation to the spine and extremity joints is thought to disrupt fibrous adhesions arising from disuse, injury, or degenerative conditions Disruption may help restore motion and augment rehabilitative exercise performance, which leads to increased proprioceptive signaling. Pain perception is also potentially altered by the inhibitive effect of increased proprioceptive signaling leading to a gating phenomenon and altered reflex activity or firing patterns within autonomic circuits.

The purpose of this study was to evaluate the long term effects of glenohumeral joint thrust manipulation on ROM, pain, and function in patients with adhesive capsulitis.

Materials and Methods

Thirty patients, average patient age 48 years participated in this study. Both genders were studied. Patients participated in a physical therapy program an average visits before undergoing manipulation (approximately 3 weeks). All patients received moist heat, ultrasound, joint mobilization, and a therapeutic exercise program to be performed at home. Patients were included in this study with a diagnosis of adhesive capsulitis including decreased active and passive ROM, painless resisted tests, pain at end range of available passive motion, and decreased function the total ROM loss exceeded 40% (total ROM loss = flexion + abduction + internal rotation + external rotation) of normal as defined in Norkin and White. They had a duration of pain and loss of ROM for more than 2 months, they reported subjective complaints of decreased functional mobility of the upper extremity Patients were excluded from the study if they had (1) history of cancer, (2) severe osteoporosis, (3) rotator cuff tear as shown by magnetic resonance (MR) imaging or clinical examination, (4) compromised cardiopulmonary status, (5) Rheumatic disease, (6) prolonged steroid therapy, (7) recent fracture, or (8) severe neurologic deficits of the involved upper extremity. Passive ROM for flexion, abduction, internal rotation, and external rotation was assessed at Three times: before manipulation after manipulation (early follow-up, 4weeks), and at long term follow-up (8 weeks). Range of motion measures were done with the patient in the supine position. Rotation was measured at 90" abduction. If patients were unable to abduct to 90°, rotation was measured at the maximum amount of abduction obtainable. Each patient was self assessed with a visual analog pain scale and a Wolfgang functional scale31 at the time of initial evaluation, Manipulation first was performed inferior to increase abduction and flexion. This was followed by posterior manipulation to increase internal and external rotation. The improvement in inferior mobility made during the inferior manipulation assists in avoiding sub acromial compression during the posterior manipulation. All manipulations initially were performed with a slow, progressive translational force at the end range of capsular tension. If an increase in passive ROM occurred, but some restriction remained, up to three additional attempts of manipulation were made at the new end of range. In the absence of contraindications and without increase in passive ROM after three trials of slow progressive force, a high velocity, low amplitude thrust manipulation was performed. The manipulator abducted the humerus to its end range. The manipulator's right hand applied external rotation to the humerus to avoid sub acromial compression of the greater tuberosity and lateral traction along the shaft of the humerus to avoid glenohumeral joint compression while maximizing capsular stretch. The manipulator's left hand provided an inferior translational force to the humeral head, adjacent to the joint line and parallel to the glenoid. Care was taken not to abduct the distal humerus additionally during the manipulation, thus generating angular long lever forces at the joint, increasing the risk of complications. To manipulate the right shoulder posteriorly the patient lay supine with the affected arm flexed to approximately 80' (to avoid sub acromial impingement) and horizontally adducted to its end of range. The scapula was stabilized against the thorax with the right hand while the left hand provided lateral traction and a posterior translational force at the humeral head that was directed along the long axis of the humerus. After the manipulation, Patients underwent physical therapy daily for 1 week after manipulation followed by therapy three times per week for an additional 1 to 5 weeks. Therapy consisted of ice with high volt galvanic electrical stimulation, ultrasound, joint mobilization, and exercise for strength and mobility. Data on ROM, visual analog pain scales, and the Wolfgang functional scale" changes with time (before manipulation, after manipulation, and at long term).

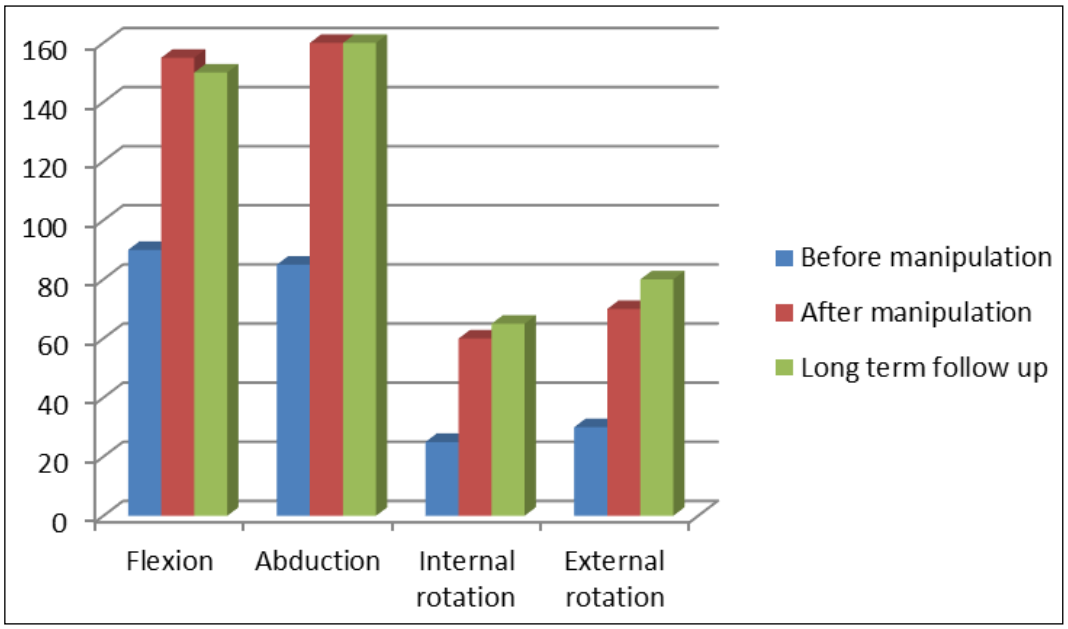
Results

Mean ROM for flexion, abduction, internal and external rotation increased significantly after manipulation and remained significantly increased at long term Pain was reduced significantly (p<.001) at the time of long term follow-up. Wolfgang's functional assessment score (0 = completely disabled, 16 = normal function) increased significantly long term follow-up Range of motion outcome was independent of the patient's age, gender, etiology (traumatic versus insidious), duration of symptoms, or the number of physical therapy visits before or after manipulation. Patients had greater increases in Wolfgang functional scores the longer the duration of their symptoms before manipulation, No patient had any decrease in ROM or Wolfgang score after manipulation. Furthermore, no patient reported any increase in pain at the time of discharge from physical therapy or at long term follow-up because of the manipulative procedure. Overall, thrust manipulation of the Glenohumeral joint provides significant increases in ROM, decreases in pain, and increases in functional levels for patients who have adhesive capsulitis, accurately and long term.

Table 1: Mean Range of Motion (χ2)

Time	Flexion	Abduction	Internal rotation	External rotation
Before manipulation	90	85	25	30
After manipulation	155	160	60	70
Long term follow up	150	160	65	80

*Significantly different from before manipulation (p<0.001).

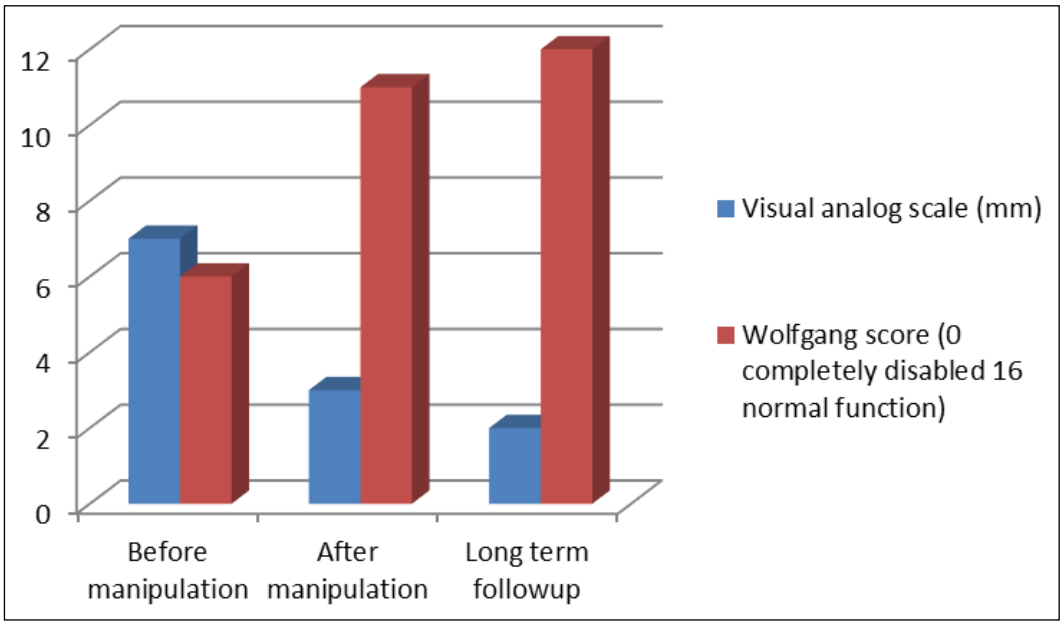


Graph 1: Mean Range of Motion ($\chi 2$)

Table 2: Mean Results in outcome measure parameter

Time	Visual analog scale (mm)	Wolfgang score (0 completely disabled 16 normal function)
Before manipulation	7	6
After manipulation	3	11
Long term follow-up	2	12

*Significantly different from before manipulation (p<0.001)



Graph 2: Mean Results in outcome measure parameter

Discussion

Adhesive capsulitis is a self-limiting disease, some advocate only home exercise and non-steroidalanti-inflammatory drugs treatments to avoid costly treatment modalities. On the other hand, home exercise and non-steroidal anti-inflammatory drugs are not as efficacious as various other treatment modalities. Shaffer *et al*, reported that 7 years after the onset of adhesive capsulitis, '/2 of the patients treated with physical therapy or a home exercise program alone, continued to report mild pain and stiffness. Miller *et al*, reported that home exercise increased ROM of 80" flexion and 5" external rotation to 146" flexion and 32" external rotation after 14 months of home exercise therapy. Thrust manipulation proved superior to angular manipulation increasing ROM for flexion, abduction, and external rotation Patients undergoing thrust manipulation also had significantly greater flexion and abduction ROM Thus, thrust manipulation produced a more reliable outcome. Finally, thrust manipulation provided significantly greater increases in ROM acutely and long term the biomechanical alterations that occur with thrust manipulation remain uncertain. Normal movement of the shoulder requires rolling (angular motion). Spinning and concurrent translational (gliding) motion to promote normal

joint mechanics. Kalten born stressed the importance of promoting joint glides for increasing capsular mobility and preventing joint compression and peri-articular soft tissue injury that may occur with long lever angular manipulations. Uitvlugt et described tearing at multiple areas of the joint capsule that occur with long lever manipulations, applied as gentle stretching motions while attempting to gain a 50% increase in ROM in all planes of the glenohumeral joint.

Harryman ET investigated normal and abnormal motion of the glenohumeral joint on fresh cadavers, and reported that external rotation pushes the humeral head into a posterior translation secondary to anterior capsular tension. Likewise, with internal rotation, the humeral head is pushed into anterior translation by posterior capsular tension. In a previous study on (gliding) manipulation, Roubal et suggested that decreases in capsular volume associated with adhesive capsulitis may result in the humeral head becoming fixed in its most anterior position manipulating in the posterior direction, the total allowable anterior to posterior translational excursion is increased and internal and external rotation also is increased. The normal spin and gliding motions associated with active elevation depend on the laxity of the inferior joint capsule. As described by Roubal *et al*, flexion and abduction did increase after manipulation in the inferior direction. This supported the importance of the natural inferior capsular redundancy and the normal superior and inferior translation that must be present for normal elevation mechanics to occur.

Conclusion

Thrust manipulation safely provides immediate increases in ROM and function, while decreasing pain, promoting early return to work. Thrust manipulation appears to be an effective treatment modality for decreasing pain, increasing ROM, and improving function for those who suffer from adhesive capsulitis acutely and long term and should be considered by those practitioners skilled in joint manipulation.

Conflict of Interest

Not available

Financial Support

Not available

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