Manipulation in the Treatment of Frozen Shoulder

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ABSTRACT: The treatment of frozen shoulder has been an area of controversy in orthopedics for many years. The natural history of this condition would indicate that most patients recover painless range of motion of the shoulder by 2 years after the onset of symptoms. However, work and economic pressures often make it important to establish a treatment program that can enable these patients to return to a functional, painless range of motion as soon as possible. In this retrospective study, 17 frozen shoulders in 15 patients who did not respond to physical therapy were manipulated. Of those patients not able to work prior to their shoulder problems, 70% had returned to work within an average of 2.6 months of manipulation. All of the patients in this study had a significant improvement in shoulder flexion and abduction, returning to a functional range of shoulder motion. Manipulation allowed the patients studied to return to a normal lifestyle and to work much sooner than the reported natural history of this condition would indicate.

The stiff painful shoulder has proven to be a problem, both in attempts to identify the cause as well as in administering the best treatment. Duplay in 1872 described periarthritis scapulohumeral, a painful stiffening of the shoulder. He was the first author to attempt to distinguish the syndrome of the frozen shoulder from the stiff painful shoulder secondary to arthritis of the glenohumeral joint. In his paper he discussed the manipulative treatment of a patient who had this condition. Codman in 1934 was the first one to use the term frozen shoulder for a painful restriction in the range of motion of the shoulder. He described it as, “a condition difficult to define, difficult to treat, and difficult to explain from a point of view of pathology.” Neviser in 1946 was the first to coin the term adhesive capsulitis based on his findings at arthrography of the shoulder joint in patients with this condition.

Numerous structures about the shoulder have been implicated in this condition (Fig. 1). The exact etiology of this condition is unknown. There have been several theories put forward in attempts to explain why certain individuals develop this syndrome, but studies to date have been unable to conclusively prove any of these correct. DePalma felt that in all cases muscular inactivity and dependency of the arm preceded the onset of the disease. Certain individuals may have a constitutional factor that makes them more susceptible to this condition than others. DePalma also believed that this is more likely to develop in patients with degenerative changes about the shoulder joint and felt that this explained why individuals in their 40s and 50s are more likely to develop this condition than younger individuals. Others have reported this condition in patients who have been subjected to prolonged immobilization, and in patients with impairment of consciousness, hemiparesis, or prolonged IV infusion in one arm. Attempts have also been made to delineate a premorbid personality that might make these individuals more susceptible to this condition. Subsequent studies, however, have not confirmed this. The liter-
ature also reports an increased incidence of the frozen shoulder in individuals with HLA-B27, but again subsequent studies have been unable to reproduce this.\textsuperscript{6}

The treatment of the frozen shoulder has been an area of controversy. Numerous individuals have advocated everything from simply keeping the patient comfortable to surgery on the shoulder in attempts to regain motion. The natural history of the disease indicates that this can be a prolonged process. Simmonds in 1949 reported 21 cases of frozen shoulder and found that only 6 of these had recovered full range of motion within 3 years.\textsuperscript{7} However, more recently, Reeves looked at 41 shoulders in patients that were treated with analgesics and hypnotics and found that the average time to recovery was 30 months, with only three shoulders left with functional limitations.\textsuperscript{7} Grey looked at 25 frozen shoulders, likewise treated with analgesics and hypnotics.\textsuperscript{8} He found that 24 of these shoulders had painless full range of motion by 2 years from onset of these symptoms. These studies would indicate that the natural history of the disease is such that most patients will recover within 2 to 3 years.

The clinical course of the frozen shoulder can be divided into three phases.\textsuperscript{3,9} Phase I, the initial or freezing phase, is characterized by pain about the shoulder, either secondary to minor trauma to the shoulder, itself, or to an injury distal to the shoulder joint. The patient insidiously develops painful range of motion of the shoulder and has progressive loss of motion. Phase II, the intermediate or frozen phase, occurs when the patient develops a poorly localized pain about the shoulder and has a progressive loss of motion. These individuals typically have pain which is worse at night and makes it difficult for them to sleep. With the decreasing range of motion, these individuals can develop atrophy of the musculature about the shoulder. This phase then slowly progresses into Phase III, the final or thawing phase. At this point, the patient has a painless shoulder which continues to have markedly decreased range of motion. Over a variable time period, the patient then begins to develop a gradual increase in range of motion in the majority of patients. By 2 to 3 years, they will have a painless full range of motion of the
shoulder area.

Economic pressures often make it important to establish a treatment program that can enable these patients to return to a functional, painless range of motion. The purpose of this article, therefore, is to report the effects of manipulation and if patients of this treatment regain full range of motion sooner than the natural recovery.

**Materials and Methods**

Included in this retrospective study were individuals who had previously been diagnosed as having frozen shoulder but had not responded to an adequate documented trial of physical therapy. The individuals in this study had their shoulders manipulated between August 1981 and November 1984. There was a total of 15 patients with 17 involved shoulders experiencing manipulation during this time. All patients who had manipulation during this period were included in the study. During the study period, 118 patients were treated for adhesive capsulitis of the shoulder.

Attempts were made to contact all of these patients and, of the 15, 9 were able to return to the clinic. Three of the patients were unable to return for follow up, but were interviewed over the telephone. Three patients were lost to follow up.

The patients were divided into two groups, Group A being those who were available for follow up examination and interview. In this group, there were four male and five female patients, with a total of nine involved shoulders. Group B comprised the patients who were unavailable for follow up examination but who were interviewed over the telephone. There were two males and one female with four involved shoulders.

Average age of the patients at the time of manipulation was 51 years (ranging 35 to 73 years). Average time to follow up was 22 months (ranging 14 to 33 months).

In Group A, six of the nine individuals in this group had physical therapy. The remaining three patients had participated in physical therapy prior to being seen in the clinic and had not responded prior to manipulation. Two of these six were also treated with nonsteroidal anti-inflammatory medications. Two patients with the diagnosis of reflex sympathetic dystrophy were treated with a series of stellate ganglion blocks. Average duration of physical therapy in this study was 2.2 months (ranging 1 to 4 months). Average duration of symptoms prior to manipulation was 5.4 months (ranging 1 to 12 months). All of the patients manipulated were felt to be in Phase II or the frozen phase.

**Procedure**

Once it was ascertained that the individual was not responding to a program of active range of motion therapy to the shoulder, a decision was made to perform a manipulation of the involved shoulder.

Under general anesthesia, the shoulder was manipulated gently into abduction, then into flexion, and them combined with internal and external rotation. The patient was then placed in the lateral decubitus position and the hand was placed on the perineum and the back of the head to ensure that the patient was able to perform such activities as grooming, dressing, and perineal care.

During these maneuvers, the stress was placed as proximally on the humerus as possible avoiding the use of the humerus as a lever arm. During the manipulation, tearing of adhesions could be heard as the shoulder was taken through its range of motion. Once the maximum motion was obtained and prior to recovery from the anesthetic, 40 mg of triamcinolone acetonide suspension in 9 ml of 0.5% bupivacaine hydrochloride, without epinephrine, was placed into the glenohumeral joint, and a similar 10 cc solution was then placed anterior to the subscapularis tendon.

Once the patient was fully recovered from the anesthetic, he was taken to physical therapy where he was again instructed in active range of motion exercises of the shoulder joint. The patient was given analgesics to help relieve the pain associated with the manipulation. He was instructed to do the active exercises three times a day and was seen in physical therapy once a day, five times a week for 2 weeks and then three times a week for a subsequent 2 weeks.

**Statistical Analysis**

Four measures of range of shoulder motion were obtained for each patient in Group A: abduction, flexion, internal rotation, and external rotation. These measurements were obtained prior to shoulder manipulation, immediately postmanipulation, and 14 to 33 months following manipulation. Paired t-tests were used to test the significance of changes in each of these four measures from premanipulation to postmanipulation and from postmanipulation to follow up. Results were considered statistically signifi-
Fig. 2: Range of shoulder motion measured pre-manipulation, postmanipulation, and at follow up. Postmanipulation measurements were made at the physical therapy session immediately after manipulation.

significant if $P$ values were less than 0.05.

Results

Of the nine patients in Group A, two had retired prior to the onset of their shoulder problems. They were using their shoulder for their regular activities with no complaints within 2 months of manipulation. Of the remaining seven patients, six were not working prior to the onset of shoulder problems because of other injuries to their upper extremity. By the time the shoulder became a problem, most of the other upper extremity problems had resolved to the point where they would otherwise have been able to return to work. One patient was working prior to onset of shoulder problem. At follow up, five of the seven patients were back to work at an average of 3.2 months (ranging 1 to 7 months) after manipulation. Two of the seven had not returned to work because of other upper extremity problems. One patient was given disability income and the other patient, who had been working prior to experiencing shoulder problems was retrained due to injuries to his contralateral hand.

In Group B, two of the three patients were working prior to their shoulder problems, and both were back to work 1 month after manipulation. The other patient had Guillain-Barré syndrome and was unable to work.

Of the 7 patients in Group A who were working prior to their initial problem, 6 were on worker’s compensation of which 4 returned to work after manipulation, 1 was retrained, and 1 received disability. Of the two patients in Group B who were working, both were on worker’s compensation and returned to work.

Looking at the combined results of the two groups, seven out of ten patients (70%) were unable to work prior to manipulation. At the time of follow up, these patients had returned to work within an average of 2.6 months (ranging 1 to 7 months) after manipulation. Of the six patients in Group A that were unable to work prior to shoulder manipulation, five (83%) returned to work.

Figure 2 shows a graphic representation of the average range of motion of the shoulder premanipulation and immediate postmanipulation at the first physical therapy session and at the time of follow up. Paired $t$-tests performed on Group A showed a significant increase in mean abduction from premanipulation to postmanipulation to follow up ($P = 0.0017$), but no significant change from postmanipulation to follow up ($P = 0.05$). Paired $t$-tests showed a significant increase in mean flexion from premanipulation to postmanipulation ($P = 0.0143$) and a significant decrease from postmanipulation to follow up ($P = 0.0337$). This decrease in flexion was not noticed by the patients in regards to their functional abilities. However, for internal and external rotation, the changes from premanipulation to postmanipulation and from postmanipulation to follow up were not statistically significant ($P = 0.05$).

A rating system was devised to determine how the patient was doing overall. On exam, patients were given an improved rating if they had a functional range of motion without subjective complaints of restriction of function due to either loss of motion or to pain. A slightly improved rating was administered if they had either a nonfunctional range of motion or subjective complaints of restriction of function due to loss of motion or pain. An unimproved rating was given if they had no subjective or objective improvement in function or pain as compared to the premanipulation status. The Table shows the overall results from this study.

There were no complications associated with anesthesia, manipulation, corticosteroid injection, or physical therapy in this study.
TABLE
RESULTS OF THE STUDY USING FUNCTIONAL RATING SYSTEM

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved</td>
<td>7 (78%)</td>
<td>2 (67%)</td>
<td>9 (75%)</td>
</tr>
<tr>
<td>Slightly Improved</td>
<td>2 (22%)</td>
<td>1 (33%)</td>
<td>3 (25%)</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
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Discussion

The syndrome of frozen shoulder seems to involve women more often than men, and it is more often seen in whites than in blacks. It has been reported by several authors that this condition is rarely seen in patients under 40 years of age, however, three of the studied patients were in their 30s (Fig. 3). Bilateral involvement has been reported to occur in approximately 8% to 17% of the patients, and it is not uncommon for the uninvolved shoulder to become involved as the other shoulder is improving.

For treatment of the shoulder during Phase I, it has been recommended that the patient be treated with analgesics, sedatives, and therapy modalities such as hot packs, deep heat, and massage. Patients are also instructed in a course of active and active-assisted exercises which emphasize placing the shoulder through the entire range of motion. Stellate ganglion blocks, corticosteroid injections, and nonsteroidal anti-inflammatories have been recommended as needed. The Phase II recommendation is to proceed as for Phase I, if there has been no documented adequate trial of physical therapy prior to the patient being seen in the office.

Different authors have recommended several options if there has been no progression with a documented physical therapy trial. In reviewing the literature, Rizk reported 28 shoulders treated with range of motion exercises, as well as pulley traction, and the use of TENS units during traction time. All patients had 90% of full range of motion and pain-free sleep by 8 months. The length of the follow up was brief. Murrenghan reviewed 15 shoulders treated with physical therapy and felt that 90% of these were better at 1 year, and 87% were pain-free with good range of motion at 2 years.

Another treatment modality has been hydraulic distension of the joint capsule. Andrén and Lundberg looked at a series of patients in which they did serial injections of x-ray contrast material to distend the joint. They found that the milder the loss of motion, the better the results. Loyd and Loyd injected local anesthetic, corticosteroid, and contrast material combined with gentle manipulation. They felt that 94% of these improved at an average of 8 months follow up, however, follow up was short in this study, also.

Manipulation of the shoulder has been advocated as a safe and effective means of enabling these patients to return to functional motion about the shoulder area. Haggart and Dignam looked at 97 patients treated with manipulation of the shoulder joint. They found that 95% had excellent or good results at 4 to 9 years follow up. Harmon reported 400 manipulated shoulders. In three separate follow up studies 2 to 3 years postmanipulation, he found that there was full painless motion in 64% to 94% of the patients. Haines and Hargadon found 83% good results at 12 weeks, however, there was no indication of the length of their follow up.

In this study, 9 out of 12 (75%) of the patients had painless full range of motion of the shoulder joint at the time of follow up, 3 out of 12 (25%) of the patients continued to complain of minimal aching about the shoulder joint after vigorous activity, but did not feel that this was impairing their ability to function. All of the patients felt that they were able to perform satisfactorily at their job, during activities of daily living, and during recreational activities. Five out of six
(83%) of the patients who were not working prior to their shoulder problems returned to work within an average of 3 months after manipulation. Those patients who were working prior to their shoulder problems were back to work within 1 month of manipulation.

In this study, manipulation was found to be a safe means of treating adhesive capsulitis and significantly shortened the course of the disease. Manipulation allowed the patients to return to a normal lifestyle and to work much sooner than the reported natural history of this condition would indicate.

References