Adhesive Capsulitis of the Shoulder: Current Concepts and Treatment

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ABSTRACT: Primary adhesive capsulitis of the shoulder is a common cause of a painful shoulder in clinical practice. The pathogenesis remains unclear. Many patients continue to have significant long-term restrictions in their range of motion although few are functionally restricted. Prevention is the ideal treatment. Patients respond to treatment plans directed at pain relief and improving the range of motion, however, ongoing controlled therapeutic trials are necessary to better refine the selection of treatment for individual patients.

The painful stiff shoulder remains an orthopedic curiosity. The condition was described initially by Duplay as "periartrite scapulo-humerale."1 Patients presenting with restricted range of shoulder motion remain a therapeutic dilemma. Codman, Neviasar, McLaughlin, and DePalma have all expressed their frustration in identifying a satisfactory explanation for this clinical phenomenon.2-5 In this review the terms adhesive capsulitis and frozen shoulder are considered to be synonymous. Ongoing ambiguity as to pathogenesis has led to the proposal of several distinctly different treatment programs on an empirical basis.6-8 Controlled clinical studies comparing outcome are very few. Recent prospective studies attempting to identify useful therapeutic modalities are most welcome. To date, the number of patients in these studies have been small, but trends are indicated and their clinical value will be confirmed or rebuked as larger patient groups are studied.

There is a continuing need to make more accurate diagnoses in the management of patients with shoulder complaints. Of the most common shoulder problems presenting in clinical orthopedic practice, listed in Table 1, patients with adhesive capsulitis form a distinct subgroup which can be identified clinically.

Adhesive capsulitis of the shoulder may present alone or may be a component of a more complex clinical presentation. Lundberg made a distinction between primary and secondary frozen shoulders.9 Patients with a diagnosis of primary frozen shoulder have a restriction of motion localized to the glenohumeral joint without other clinical or radiological findings which could explain the decrease in the range of motion. In this way, post-traumatic conditions, arthritic conditions, and neurologic disorders are eliminated.

Essential to making the diagnosis of adhesive capsulitis is a careful physical examination and the recording of shoulder range of motion. The examination recommended by the American Shoulder and Elbow Surgeons, outlined in Table 2, allows the recording of the restricted range of motion of the shoulder in the important functional planes of motion. In practice these measurements are usually a "best estimate," but where any prospective clinical research is undertaken, the use of a hydrogromiometer, as described by Clarke, is essential.10

Clinical Features

In the classic description of adhesive capsulitis there are three clinical phases: a painful phase, a phase of progressive stiffness, and a thawing phase of gradual return of motion. Adhesive capsulitis occurs during the fifth to seventh decades affecting the females more frequently than males. Reports of bilateral involvement range from 10% to 40%.9-12 The same shoulder is rarely involved again with adhesive capsulitis.7,9

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Initially, the clinical picture in adhesive capsulitis is one of an insidious onset of generalized aching discomfort about the shoulder which is poorly localized and may radiate down the arm as far as the elbow. Often, no specific precipitating event can be recalled. Some patients may casually remember a minor clinical event reported as nonspecific neck, shoulder, or arm discomfort. The increasing shoulder discomfort is associated with a slow, often unnoticed onset of progressive shoulder stiffness. Patients often describe the shoulder pain increasing at night; often they are unable to sleep on the affected side. As the shoulder stiffens there is a progressive loss of glenohumeral motion. The most significant loss usually is in external rotation with a lesser loss of abduction and internal rotation. The patients may report their functional restrictions as difficultly using the arm above chest level, reaching to the side or in the movement of putting on a coat. The restriction of internal rotation is exhibited by functional restrictions in dressing or performing personal hygiene activities. There may be discomfort over the acromioclavicular joint which can be secondary to increased scapulothoracic movement. Pain at the end point of the restricted shoulder motion is characteristic. Typically, patients with primary adhesive capsulitis do not have pain on the resisted use of specific muscle groups about the shoulder.

The typical clinical findings on examination are the limitation of active and passive shoulder movement. Loss of shoulder motion in external rotation, abduction, and internal rotation is typical. No specific pattern of the loss of shoulder motion, however is universal.

Natural History

Population studies have shown that: females have a better range of shoulder motion than age matched males, the non-dominant arm usually has the better range of motion and shoulder motion tends to deteriorate with increasing age. The time course of adhesive capsulitis has been described as classically lasting 18 to 24 months. Recent studies have challenged this commonly held belief. Reeves noted that the mean duration of symptoms was 30 months. Patients describing themselves as functionally recovered tend to underestimate their loss of motion. Reeves described some restriction in shoulder motion in over 50% of patients in a 5- to 10-year follow up but functional impairment was identified in only 7%. Clarke found 42% of patients had persisting limitation of shoulder motion after 6 years follow up. Binder, in a prospective study, noted that 90% of patients did not regain the minimum range of motion when matched for age and sex with a control group 6 months after diagnosis. Binder also noted that 40% of participants failed to regain the minimum range of motion when matched for age and sex with a control group when followed for a minimum of 3 years.

Diagnostic Aids

Radiographs

The plain films of the shoulder should be normal for this specific age group, however, there may be some nonspecific osteopenia depending on the duration of symptoms. It is also helpful to have normal radiographs of the cervical spine, although such films are not a universal finding in the fourth to seventh decades.

Blood Work

No specific tests are diagnostic. The sedimentation may be raised in 20% of patients. There remains ongoing controversy about the significance of the reported increased levels of immune complexes in patients with adhesive capsulitis.
Bone Scan

Initial reports by Wright suggested a relationship between a hot bone scan (99m pertechnetate) and successful treatment with steroid injection. Stodell noted increased uptake on bone scans but found no correlation with the patients' pain. Binder found the 99m-technetium diphosphate scan uptake to be increased in 35 of 38 patients but this finding was of no value in predicting clinical outcome.

Arthrography

Arthrography is a useful investigational technique when there is any question as to the diagnosis. The glenohumeral joint space (volume) is progressively restricted in adhesive capsulitis; at times accepting only 0.5 cc to 3 cc of dye. Obliteration of the axillary fold is a useful diagnostic sign. Lundberg made a correlation between joint volume and the severity of disease. On the other hand, others have found no correlation between the arthrographic findings and clinical outcome.

Injection

The use of diagnostic injections of 1% lidocaine hydrochloride with or without an accompanying steroid preparation can be helpful to rule out other painful shoulder conditions. Injection of an acromioclavicular joint with 1 cc of 1% lidocaine hydrochloride can relieve any contribution from the acromioclavicular joint to the overall clinical picture. Injection of local anesthetic into the sub-acromial space can relieve the impingement symptoms where impingement and adhesive capsulitis co-exist. Intra-articular injection of a local anesthetic into the glenohumeral joint may be helpful in relieving a major component of the pain in adhesive capsulitis which may make the pattern of loss of motion more apparent.

Arthroscopy

Use of an arthroscope to document the intra-articular pathology has been advocated by Neviser. Wiley and Older found no obliteration of the infraglenoid recess in the patients who they examined. Ha'eri and Maitland described one third of their patients having increased vascularity of the synovium with villous hypertrophy and some chronic synovitis, but no intra-articular adhesions were visualized. The role of arthroscopy in documenting the intra-articular pathology and directing further treatment protocols remains to be defined.

Differential Diagnosis

The most serious mis-diagnosis among patients with painful, stiff shoulders, in this author's experience, has been a missed posterior glenohumeral dislocation with marked restriction of external rotation. The possibility of a posterior dislocation is eliminated by taking a careful history, noting the characteristic physical findings, and doing a careful examination of radiographs of diagnostic quality.

The diagnosis of adhesive capsulitis does not necessarily include any component of tendonitis. Pain on resisted activity of the specific affected tendon is the hallmark of tendonitis. Patients with primary adhesive capsulitis do not have pain on the resisted use of specific muscle-tendon units but rather discomfort at the end point of their arc of motion.

In subacromial impingement there is a painful restriction of forward elevation and abduction, but not usually a restriction of passive external rotation. The history of a painful arc is not a necessary part of the clinical picture of adhesive capsulitis. Injection of the subacromial bursa with lidocaine hydrochloride in patients with impingement will usually relieve the pain on forward elevation and abduction whereas the range of motion remains unchanged in adhesive capsulitis following injection of the subacromial-subdeltoid bursa.

Symptomatic degenerative arthritis of the acromioclavicular joint may be associated with adhesive capsulitis because of the common age groups in which they present (40 to 70 years). It is postulated that the increased scapulothoracic motion seen in patients with the limited glenohumeral mobility of adhesive capsulitis may aggravate acromioclavicular symptoms. In both acromioclavicular disease and adhesive capsulitis, patients report pain when lying on the affected side. Pain with activity above chest level and/or horizontal adduction, suggests pathology originating from the acromioclavicular joint. Whether the acromioclavicular pathology is primary or secondary often only becomes clear with subsequent clinical follow up. A useful adjunct to physical examination is the injection of 1% lidocaine hydrochloride into the acromioclavicular joint from above. This injection usually relieves the symptomatic contribution from the acromioclavicular joint and may unmask the underlying adhesive capsulitis.
Adhesive capsulitis does not usually present as a block to motion in only one plane of shoulder movement. Where there is a block to shoulder motion in one plane only, it is appropriate to consider other diagnoses such as a large calcific deposit in the supraspinatus tendon or an intra-articular loose body. The uncommon diagnosis of degenerative arthritis of the glenohumeral joint usually can be ruled out on review of suitable radiographs. Shoulder hand syndrome is a type of reflex sympathetic dystrophy and may present with restricted shoulder motion. The distinctive clinical features of dystrophic skin changes and vasomotor instability suggest a reflex sympathetic dystrophy rather than adhesive capsulitis. The radiographs demonstrating peri-articular patchy osteoporosis are easily distinguished from the normal or slightly osteopenic radiographs seen in adhesive capsulitis.\textsuperscript{31}

**Physiotherapy**

Physiotherapy programs to restore glenohumeral mobility both as arcs of motion and the normal gliding of the humeral head on the glenoid have been described.\textsuperscript{34} Heat and/or ultrasound have been used in an effort to decrease discomfort and improve overall range of motion. TENS is another useful modality to assist in pain control. The outcome of physiotherapy protocols needs better documentation. The value of physiotherapy as the only treatment of adhesive capsulitis has been questioned.\textsuperscript{8}

**Manipulation**

Manipulation under anesthesia must be done with great care and limited force. Manipulation can significantly improve the range of motion but does not appear to shorten the overall length of aching symptoms.\textsuperscript{9} Manipulation is usually done under general anesthesia. Haines et al described manipulation into abduction with downward pressure on the humeral head followed by injection of steroid and 1% lidocaine into the joint.\textsuperscript{35} Although specific numbers for range of motion were not available, they stressed that 83% of the patient group (n=78) regained "normal" shoulder movement by 2 months. Ten percent of patients failed to regain 80% of normal glenohumeral abduction. Helbig et al emphasized the need to perform manipulation under anesthesia in all cases of long standing stiffness.\textsuperscript{27} He suggested mobilizing the shoulder in the least restricted direction first and then to proceed to abduction and then finally to rotation. Repeat manipulations were carried out in 25% to 30% of patients.

Neviaser recommended manipulation early if there was any delay in progress or if the condition of the shoulder deteriorated.\textsuperscript{33} He stressed the need for mobilization in abduction and suggested supporting the arm in abduction on discharge to the recovery room. Patients are usually hospitalized three to five days for postoperative physiotherapy. It is recommended that the arm be abucted at night for 3 weeks.

Rizk et al suggested a progressive program of stretching in abduction using pulley traction.\textsuperscript{36} They compared the outcome with another group of patients who underwent physiotherapy mobilizations, heat, and strengthening exercises. A TENS stimulation device was recommended to control discomfort. The outcome after eight treatments suggested that the pulley traction abduction stretching...
was beneficial. Rizk reported more rapid resolution of night pain in the traction group and the range of motion at 8 months was significantly better in elevation, external rotation, and abduction.36

**Distention Arthrography**

Distention or brisement arthrography has been described as a method of stretching the joint capsule. The glenohumeral joint is injected progressively with pressures up to 1500 mmHg in an attempt to dissect the capsule free from the adjacent humeral head and glenoid.24,37 This technique is not recommended for the acute painful phase of adhesive capsulitis.38 Ruptures of the capsule associated with a fall in intra-articular pressure occur into the axillary pouch or the subscapular recess.39 The reporting of the combination of distention arthrography with manipulation makes it difficult to decide on the intrinsic value of the distention alone.

**Steroids**

Kessel recommended the combination of oral steroid administration with manipulation in patients with symptoms lasting greater than 6 months.7

Binder, in a prospective study, analyzed the effectiveness of a limited course of oral steroid therapy compared to a nontreatment group who were allowed non-salicylate analgesics and diazepam at bedtime as requested.32 All patients were advised to do home pendulum exercises on an hourly basis. The oral steroid group had a more rapid initial recovery but at 8 months there were no appreciable differences in outcome between the two groups. The transient benefits of the steroids in the treatment of adhesive capsulitis need to be weighed against the potential risks of systemic steroid administration.

**Preferred Treatment**

The author prefers to start with analgesics and the local application of heat. The patient should be shown pendulum exercises progressing to auto-assisted stretching in forward elevation, external rotation, and internal rotation at regular intervals each day. If the patient is not capable of doing his/her own exercises at this point, a physiotherapist should be involved. The physiotherapy program will depend on the amount of discomfort experienced. If there is moderate discomfort, the rental of a TENS unit is advised. Ultrasound to the anterior and inferior capsule appears to help patients during the stretching program. Stretching exercises in external rotation, internal rotation, and forward elevation are started. Maitland type mobilization is frequently helpful. Stretching in abduction should be avoided until later in the recovery phase as patients consistently develop subacromial impingement signs if abduction stretching is started too early. Strengthening exercises within the regained range of motion are started as an isometric program progressing to resisted strengthening through the full arc of motion.

If pain continues, an intra-articular injection of 1% lidocaine hydrochloride (8 cc) and 20 mg of triamcinolone acetonide via the posterior route is recommended.

An arthrogram should be considered if the diagnosis was unclear. This author does not use arthrography routinely but considers it to be of value where the response to treatment is not proceeding as expected. Manipulation under general anesthesia with subsequent intra-articular injection of a long-acting steroid preparation in those cases not responding to the above treatment methods should be considered. The patients may be kept in the hospital following manipulation until a free range of motion is achieved. A second manipulation should be considered if a good range of motion achieved at the first manipulation was lost while in hospital.

There remains a small group of patients who are refractory to the above mentioned treatment modalities. In the absence of any other pathology, ongoing observation is probably the most appropriate treatment.

**References**