

Distention Arthrography in the Treatment of Adhesive Capsulitis of the Shoulder¹

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PURPOSE: Adhesive capsulitis involving the glenohumeral joint (frozen shoulder) is an insidious and painful condition that results in gradual loss of joint motion. Recovery is frequently prolonged despite multiple therapeutic maneuvers. The authors investigate the mechanism of action and the long-term clinical result of distention arthrography for the treatment of patients with frozen shoulder.

PATIENTS AND METHODS: Sixteen patients with adhesive capsulitis of the shoulder were treated with therapeutic capsular distention by using intra-articular injection of a 30-mL mixture of lidocaine, corticosteroid, and contrast media immediately following diagnostic arthrography.

RESULTS: Capsular disruption was demonstrated in all cases. Thirteen patients (80%) experienced immediate pain relief and increased shoulder mobility. This improvement was maintained over a follow-up interval of 6 months or more. Disruption occurred at the subscapular bursa in eight patients, the subacromial bursa in six, and the distal bicipital tendon sheath in two. These latter two patients had no pain relief.

CONCLUSION: Arthrographic distention of the constricted capsule appears to be an excellent therapeutic intervention for achieving rapid symptomatic relief from adhesive capsulitis.

ADHESIVE capsulitis is a distressful and disabling condition that progressively limits the function of the involved shoulder (1). Arthrography is frequently necessary to help confirm the decreased joint space and contracted capsule and to exclude other causes of shoulder pain (2,3). Pathologic changes include thickening and constriction of the capsule, especially anteriorly and inferiorly, with very little synovial fluid in the joint space (4).

Anti-inflammatory medications, physical rehabilitation programs, corticosteroid injections, and manipulation under anesthesia have been used to methodically treat patients with adhesive capsulitis. Since the symptoms may slowly abate over time, it has been difficult to demonstrate long-term benefit with these various therapies (5, 7).

Hydraulic distention of the contracted capsule by injecting a large volume of fluid intra-articularly has been advocated as a treatment for adhesive capsulitis (8-11). The purpose of this uncontrolled study was to investigate the technique, the mechanism of action, and the clinical outcome of distention arthrography for the treatment of patients with this condition.

PATIENTS AND METHODS

Eighteen patients (13 men, five women) with clinical symptoms of adhesive capsulitis of the shoulder were admitted to this prospective, nonrandomized study. The mean age was 55 years (range, 42-66 years). All patients had shoulder pain and stiffness for at least 6

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months. All patients had nocturnal pain disturbing normal sleep. All patients experienced at least a 50% reduction in total passive range of motion of the shoulder.

Total range of motion was determined as the sum of shoulder motion in three planes: internal-external rotation, flexion-extension, and abduction-adduction. Pain severity was estimated by the patient as none, mild, moderate, or severe and by the ability to sleep on the affected limb.

Patients were excluded if physical, radiographic, or hematologic examinations revealed local or systemic orthopedic, arthritic, or neurologic conditions that could cause shoulder pain or stiffness. Patients with a recent history of trauma or injections into the shoulder and those with a history of allergy to local anesthetics or steroids were excluded. Patients with medical conditions, such as infections or coagulopathies, who would be at risk for an adverse reaction to the steroid injection, were also excluded.

All arthrographic studies were performed with use of a single-contrast technique. No intravenous sedation or analgesia was administered. Informed consent was obtained from all patients. After subdermal local anesthetic administration, ionic contrast media (300 mg of iodine per milliliter) was injected under fluoroscopic guidance intra-articularly via a 20-gauge needle. The total volume injected for acquisition of the diagnostic arthrogram was based on the fluoroscopic assessment of reduced joint volume as manifested by obliteration of the axillary or subscapular recesses, by the presence of adhesions along synovial insertion sites, or by patient indications of pain as the joint was distended. Typically, 6–8 mL of contrast media was injected. With the needle left in position and with no shoulder manipulation, the following views of the shoulder were obtained: external rotation, axil-

lary, and bicipital groove.

If arthrographic evidence of adhesive capsulitis was present—that is, small-volume joint space, synovial irregularities and serrations, non-filling of the bicipital tendon sheath, or obliteration of the subscapular or axillary recesses—a 30-mL therapeutic mixture consisting of 80 mg of methylprednisolone acetate (2 mL), 1% lidocaine (8 mL), and ionic contrast medium (20 mL) was injected intra-articularly under fluoroscopic guidance. The shoulder was carefully and passively exercised, and radiography was repeated.

Patients were observed for approximately 30 minutes and then discharged home with instructions to resume normal activity immediately.

After the outpatient injection, all patients received similar instructions for a home exercise program, which included pendulum, bed, cane, and wall walk exercises. Under the supervision of a rehabilitation medicine physician, individual exercise prescriptions were tailored to each patient depending on baseline ranges of motion and pain severity.

All patients received weekly physical therapy treatments for 10 weeks. These consisted of ultrasonic therapy (1.5 W/cm² for 7 minutes) followed by therapeutic exercises.

A patient's progress was informally reassessed weekly. Formal reevaluations of shoulder joint ranges of motion and perceived pain severity were performed at 2 weeks, 10 weeks, 6 months, and 1 year after the therapy. Patients were interviewed regarding use of the shoulder for normal daily activities and pain severity at least 1 year after the procedure by telephone interview or at a follow-up visit to the rehabilitation medicine department.

Patients were told to continue taking nonsteroidal anti-inflammatory drugs. Narcotics were discontinued prior to entry into the study.

RESULTS

Sixteen of the 18 patients had arthrographic evidence of adhesive capsulitis. One patient with a normal arthrogram and another with a partial rotator cuff tear did not undergo treatment.

All patients showed iatrogenic capsular disruptions after injection of the therapeutic cocktail (Figure). Eight ruptures occurred at the subscapular bursa, six into the subacromial bursa, and two at the distal bicipital sheath.

Thirteen patients (81%) had increased immediate relief of pain and increased mobility following injection. Of the three patients who did not experience pain relief, two had distal bicipital sheath rupture, and one had a subscapular rupture.

The 14 patients available for follow-up examination 2 weeks after capsular distention and rupture reported symptomatic improvement in pain and use of the shoulder. Four were still unable to sleep on the affected side. Total range of motion had improved by 20%–26% over baseline values. Two patients were lost to follow-up.

Ten weeks after the therapeutic injection, 11 of the 14 patients were functioning well with only occasional pain. Two had shoulder pain during extreme shoulder motion. One had only fair pain relief. All but two were able to sleep on the treated side.

After 6 months, all 13 of the patients available for follow-up were able to sleep on the involved shoulder and perform all activities of daily living. Shoulder range of motion had improved 68%–83%.

Nine patients were available for follow-up at least 12 months after the procedure range, (12–22 months). All reported normal use of the shoulder with only mild discomfort and no sleep disturbances from nocturnal joint pain.

No complications from the performance of diagnostic arthrography

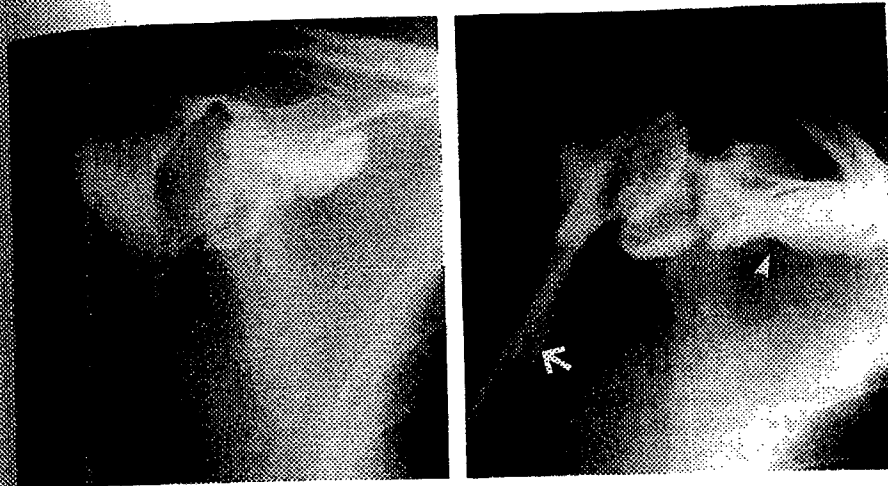


Figure. (a) Diagnostic arthrogram reveals small axillary and subscapular recesses after injection of 5 mL of contrast media. There is no opacification of the bicipital tendon sheath. (b) After treatment with therapeutic "cocktail," rupture of shoulder capsule is identified with dissection of contrast media into subscapular soft tissues (arrowhead) and bicipital tendon sheath (arrow).

or the intra-articular injection were encountered. No patients were treated a second time.

DISCUSSION

Andren and Lundberg first suggested hydraulic distention as a treatment of adhesive capsulitis in 1965 (8). In 1975, Simon (12) described "infiltration brisement." This effective but relatively expensive procedure involved hydraulic distention performed with the patient under general anesthesia followed by a 2-3-day hospitalization with the arm held in lateral traction (12). Because of the risk of brachial plexus injury, manipulation under anesthesia is generally regarded as an option of last resort for refractory cases.

In 1983, Loyd and Loyd reported excellent clinical results with arthrographically guided intra-articular steroid and anesthetic injection (11). In 1989, Fareed and Gallivan reported good results from shoulder distention with 40 mL of saline and steroids (13). This was performed as an office procedure without the

need for arthrography or additional hospitalization.

In this uncontrolled trial, all 16 patients with capsular constriction documented by means of arthrography had capsular rupture after distention with 30 mL of medication. Thirteen of the 14 patients with disruption of the subscapular recess or communication into the subacromial bursa experienced sustained relief. The two patients with rupture at the distal bicipital tendon sheath had no clinical improvement. This suggests that interruption of the constricted capsule at particular locations is important.

The communication with the subacromial bursa seems to indicate a rotator cuff tear as an instigating factor or complicating condition of these patients' adhesive capsulitis. Nevertheless, these patients were successfully treated nonsurgically with distention arthrography and physical therapy.

The exact mechanism of pain relief with this technique is unknown. Theoretically, the arthrographic distention and rupture of the joint capsule reduces intracapsular pressure. This may result in decreased stimu-

lation of pain receptors in the capsule or its periosteal attachments during shoulder motion. The anti-inflammatory and analgesic effects of the corticosteroid and anesthetic enhance the healing process.

The symptomatic decrease in pain and improvement of shoulder motion in this small group of patients exceeded rates observed in controlled studies of physical therapy with capsular stretching and repeated corticosteroid injections (5,6). Thus, it is unlikely that the postarthrography physical therapy regimen or the intra-articular corticosteroids alone were responsible for the dramatic and sustained benefit in our patients.

Diagnostic arthrography allows a definitive diagnosis to be made in patients with clinical symptoms prior to the initiation of treatment. The addition of capsular distention to the procedure offers several therapeutic advantages. Arthrography will confirm proper placement of the effective medications into the small, contracted joint space since intra-articular injection can be challenging in these patients when surface landmarks alone are used. Patients undergoing distention arthrography are able to sleep on and use the affected joint more quickly than patients treated with analgesics, corticosteroid injections, or physical therapy alone. Finally, complications during the arthrographic procedure are essentially nonexistent.

Successful treatment of the patient with adhesive capsulitis of the shoulder requires a concerted multidisciplinary effort by the referring and consulting physicians and occupational or physical therapists. Compared with surgical treatment or intensive rehabilitation programs, distention arthrography is an easily performed outpatient procedure. In a condition in which slow improvement can occur, the appropriate timing of distention arthrographic therapy remains to be determined with a controlled clinical trial.

On the basis of our experience, distention arthrography appears to be a promising and less expensive treatment for adhesive capsulitis of the shoulder. Onset of pain relief is earlier and the rate and degree of return of range of motion appears to exceed that achieved with physical therapy and capsular stretching or repeated steroid injections (6). This is thought to be due to the precise placement of the therapeutic medications with fluoroscopic guidance and maximal joint stretching, as manifested by capsular rupture.

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