

Painful Stiff Shoulder

Adhesive Capsulitis

This was first described as “frozen shoulder” by Codman in the 1930’s. It is characterised by pain and limited movement at the glenohumeral joint. Most cases have a idiopathic cause in an otherwise healthy individual and is known as primary frozen shoulder. Secondary frozen shoulder is associated either with intrinsic conditions such as impingement, biceps tendinitis or rotator cuff tear and/or with systemic disorders like diabetes (associated with a poorer prognosis), thyroid disorders, hyperlipidaemia, Dupuytren’s disease, trauma and cardiac disease. A third category (capsulitis) for the stiff shoulder develops after surgery or fracture of the joint and is often more resistant to surgical and non surgical management.

Pathophysiology

The cause of frozen shoulder is unknown although many theories have been proposed. Bunker and Anthony found histologically the capsule is thickened with increased vascularity together with proliferation of fibroblasts, transformation to myofibroblasts and increased collagen deposition similar to Dupuytren’s disease. They found the synovium to be normal with no inflammatory changes. The contracture acts a checkrein against external rotation resulting in a loss of active and passive movement.

Bunker TD, Anthony PP. The pathology of frozen shoulder. A dupuytren like disease. *J Bone Joint Surg Br* 1995;77:677-683

Clinical Presentation

Frozen shoulder is most common in middle to old age with a slight female preponderance. Clinical evaluation reveals a global restriction of movement especially rotations with external rotation usually affected first. The pain can be severe and restriction variable depending on the stage and severity of the disease. There is usually no tenderness in the shoulder and referred pain can be felt more on the upper lateral aspect of the shoulder (typically described by Codman in 1934).

Hannafin and Chiaia described four stages of adhesive capsulitis. Stage 1 occurs during the first 3 months and is characterised by pain with little loss of motion. The pain is one of insidious onset often noticed by the patient when doing act of stretching and lifting the shoulder as in reaching the back seat of a car, reaching a high shelf and often attributed to the act itself. It is likely that this movement brings the condition to the patient’s attention. There is also night pain and pain with every activity. Stage 2 (freezing stage) occurs between 3 and 9 months and is characterised by pain with a loss of active and passive motion. Stage 3 (frozen stage) occurs 9 to 15 months and is characterised by little pain but with loss of motion. Stage 4 (thawing phase) occurs 15 to 24 months with little pain and a progressive improvement in

range of motion. This has not been borne out in other studies where the course can be protracted running to years without intervention. The stiffness of frozen shoulder has to be differentiated from the developing stiffness of a patient with rotator cuff tear. A careful clinical examination reveals a substantial passive range compared to the restricted active range from the cuff disease.

Hannafin JA, Chiaia TA. Adhesive capsulitis: a treatment approach. Clin Orthop 2000;372:95-109

Shaffer B, Tibone JE, Kerlan RK. Frozen shoulder. A long-term follow-up. J Bone Joint Surg Am 1992;74:738-746

Investigations

This usually takes the form of plain radiographs to exclude other conditions such as glenohumeral arthritis and posterior dislocation. Routine blood tests are usually normal.

Management

The treatment should initially be aimed at pain relief and home exercise program of stretching and range of motion. This and physiotherapy and steroid injection are the first line of treatment and should be pursued for at least 6 months diligently especially the home stretching.

Physiotherapy. More useful if the symptoms have been present for less than 6 months with the aim of maintaining and regaining motion. The physiotherapist plays a useful role in supporting the patient through the natural course of the condition. Griggs et al described 90% satisfaction with non-operative treatment although significant differences, compared to the unaffected shoulder, still remained.

Griggs SM, Ahn A, Green A. Idiopathic adhesive capsulitis: a prospective functional outcome study of non-operative treatment. J Bone Joint Surg Am 2000;82:1398-1407

Steroid injection. Little evidence of long term benefit, but may be effective in providing pain relief and is often combined with other treatment modalities.

The following treatments are the second line in the management of frozen shoulder in the subset of patients refractory to above treatments.

1. Injection of the shoulder and distension (Brisement): It has been shown that Brisement is of help in patients with idiopathic frozen shoulder and may be equivalent to the more commonly performed MUA while avoiding the potential complications of the MUA. Three injections and distensions are necessary before pain relief and recovery at at least 6 week intervals.

J Shoulder Elbow Surg_ 2009 May-Jun;18(3):348-53. Manipulation or intra-articular steroids in the management of adhesive capsulitis of the shoulder? A prospective randomized trial. Jacobs LG, Smith MG, Khan SA, Smith K, Joshi M.

2. Manipulation under anaesthesia (MUA). The mainstay of treatment and often carried out for persistent symptoms greater than 6 months. Humeral fracture is a major complication as well as glenoid rim fractures, dislocations, rotator cuff tears, labral detachments and brachial plexus injuries.

3. Arthroscopic release. This is performed when closed manipulation fails or recalcitrant cases such as diabetics. Release of the anterior capsule is often sufficient although the posterior capsule can be released if required. Complications include damage to the axillary nerve best avoided by not releasing inferior capsule with the arthroscopic wand.

4. Open release. This tends to be reserved for whom manipulation or arthroscopic release does not allow them to regain range of motion or for those where the adhesions are extraarticular. Frozen shoulder in the presence of a shoulder arthroplasty is best done by open release although malposition of the prosthesis may be a factor.

Shoulder arthritis

Osteoarthritis of the shoulder can be primary or secondary (usually due to fractures, dislocations). Uncommon in comparison to the knee or hip. Maximal wear in the primary group tends to occur in the area of the head which articulates with the glenoid between 60 and 90 degrees of abduction where there is maximal joint reaction forces. As the disease progresses the glenoid is eroded posteriorly with resultant posterior head subluxation. The rotator cuff tends to be intact in primary osteoarthritis and differ from rheumatoid patients radiologically by having osteophytes and being generally sclerotic rather than osteopenic in appearance.

Management is similar to that for knee and hip arthritis with arthroplasty reserved when other measures have failed.

Rheumatoid arthritis usually affects the glenohumeral joint but involvement of the AC joint, SC joint and cervical spine can cause symptoms around the shoulder.

There are 3 patterns of involvement as described by Neer. The dry type is characterised by loss of joint space, formation of subchondral cysts, sclerosis and osteophytes together with stiffness. A wet type is characterised by synovial involvement and marginal erosions of the glenoid. The resorptive type is the most destructive which results in extensive resorption of the humeral head and glenoid with medial migration.

Non-operative management follows similar lines to other joints. Surgical procedures described include synovectomy and debridement, capsular releases, subacromial decompression and distal clavicle resection. Joint replacement surgery is usually in the form of hemiarthroplasty as the degree of glenoid erosion can make glenoid replacement difficult. Though total shoulder replacement gives early good pain relief. The problems of TSR are usually that of glenoid wear and glenoid loosening.

Neer CS II. Shoulder reconstruction. Philadelphia: WB Saunders, 1990:273-362 (rheumatoid)

Osteonecrosis. The shoulder is the second most common site after the hip. Idiopathic osteonecrosis is rare with upto 70% associated with steroid use. Other associations are similar to that of the hip and follows a similar management line.

Rotator Cuff Arthropathy

This is characterised by recurrent effusions containing biochemically active enzymes, absence of the rotator cuff, degenerative glenohumeral joint changes with collapse of the humeral head and erosion of the undersurface of the acromion, acromioclavicular joint and distal end of the clavicle. In advanced cases, radiographs also show proximal migration of the humeral head together with anterior escape in a joint deficient of a coracoacromial (CA) ligament.

Contributing factors that have been touted include a crystal arthropathy (McCarty), loss of the cuff resulting in direct wear of the humeral head on the acromion and leakage of synovial fluid in a cuff deficient joint resulting in impaired cartilage nutrition (Neer). Elements of both theories are usually present within the same shoulder.

McCarty DR Jr, Halverson P, Carrera G, Brewer B, Kozin F. Milwaukee shoulder: association of microspheroids containing hydroxyapatite crystals, active collagenase and neutral protease with rotator cuff deficits. 1. Clinical aspects. *Arthritis Rheum* 1981;24:464-491

It characteristically affects the older female patient. Their symptoms can be bilateral and may have been present for many years, with intermittent exacerbations of more intense discomfort. Examination usually shows atrophy, weakness and joint effusion

Seebauer Classification for rotator cuff arthropathy
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IA (Centered Stable)	Type IB (Centered Medialised)	Type IIA (Decentered Limited Stable)	Type IIB (Decentered Unstable)
Intact Anterior Restraints	Intact Anterior Restraints -Force Couple Intact/Compensated	Compromised Anterior Restraints -Force Couple Compromised	Incompetent Anterior Structures
Minimal Superior Joint Migration	Minimal Superior Migration	Superior Translation	Anterior-Superior Escape
Dynamic Joint Stabilisation	Compromised Dynamic Joint Stabilisation	Insufficient Dynamic Joint Stabilisation	Absent Dynamic Joint Stabilisation
Acetabularisation of CA Arch and Femoralisation of Humeral Head	Medial Erosion of the Glenoid, Acetabularisation of CA Arch and Femoralisation of Humeral Head	Minimum Stabilisation by CA Arch. Superior-Medial Erosion and Extensive Acetabularisation of CA Arch and Femoralisation of Humeral Head	No Stabilisation by CA Arch. Deficient Anterior Structures

Management

Arthroplasty

There are number of replacement options available.

Hemiarthroplasty which involves replacement of the humeral head with a stemmed head where fixation is either by press fit/porous coating or by the use of cement. Many newer designs are now modular allowing greater flexibility.

Total shoulder replacement (TSR) involves replacement of the glenoid, with a cemented all polyethylene component or an uncemented HA or porous coated metal backed polyethylene. The metalbacked designs have shown higher revision rates in a study by Cofield et al from the Mayo clinic. This large long-term review shows that diagnoses of posttraumatic arthritis or avascular necrosis were associatedwith increased revision rates.

TSR is normally minimally constrained. Due to the high forces generated across the joint together with the small area of bone available for fixation of the glenoid component loosening remains a real problem and is generally avoided in cuff deficient shoulders or inflammatory joint disease. However it may provide superior pain relief, better range of motion and patient satisfaction (Radnay)

Survival of the glenoid component in shoulder arthroplasty , 18 March 2009
Tyler J. Fox, Akin Cil, John W. Sperling, Joaquin Sanchez-Sotelo, Cathy D. Schleck, Robert H. Cofield Journal of Shoulder and Elbow Surgery
November 2009 (Vol. 18, Issue 6, Pages 859-863)

Radnay CS, Setter KJ, Chambers L, Levine WN, Bigliani LU, Ahmad CS:
Total shoulder replacement compared with humeral head replacement for the
treatment of primary glenohumeral osteoarthritis: A systematic review. J
Shoulder Elbow Surg 2007;16:396-402

Resurfacing the humeral head has become more popular especially with the
success of the Copeland prosthesis. It consists of a hemispherical cup,
which is fixed to a reamed humeral head via hydroxyapatite coating, and a
press fit peg. It preserves bone stock and is relatively easy to maintain correct
version (Levy).

Levy O, Copeland SA: Cementless surface replacement arthroplasty
(Copeland CSRA) for osteoarthritis of the shoulder. J Shoulder Elbow Surg
2004;13:266-271

As it is rarely possible to repair a severely damaged cuff in advanced cuff
arthropathy, surgical management is salvage rather than reconstructive with
the aim of pain relief accepting there is frequently little improvement in
movement and strength. Surgical options include

Hemiarthroplasty which may be performed using a standard or extended
head prosthesis (CTA head or Cuff Tear Arthropathy Head). An intact CA
arch is required to prevent anterior superior escape.

Total shoulder replacement, which have a high rate of loosening of the
glenoid component due to abnormal joint mechanics and poor glenoid bone
stock. The absence of the rotator cuff is considered to be a contraindication to
replacing the glenoid. The reverse shoulder replacement has been used and
is a potential alternative option

Constrained reverse shoulder replacement. A reverse ball and socket
prosthesis typically used in cuff deficient joint where the proximal migration of
the humeral head, through the relatively unopposed contraction of deltoid can
result abnormal forces across the joint and subsequent failure of the glenoid
component in a standard total shoulder prosthesis. The centre of rotation is
medialised, which results in a decrease of the forces across the glenoid
component. The lowering of the humerus increases the tension of deltoid and
optimises the action of the muscle. Although complication rates are generally
higher, compared to a minimally constrained prosthesis, good results have
been reported (Boileau and Frankle).

Boileau P, Watkinson D, Hatzidakis AM, Hovorka I: Neer Award 2005: The Grammont reverse shoulder prosthesis: Results in cuff tear arthritis, fracture sequelae, and revision arthroplasty. J Shoulder Elbow Surg 2006;15:527-540

Frankle M, Siegal S, Pupello D, Saleem A, Mighell M, Vasey M: The Reverse Shoulder Prosthesis for glenohumeral arthritis associated with severe rotator cuff deficiency: A minimum two-year follow-up study of sixty patients. J Bone Joint Surg Am 2005;87:1697-1705

Arthodesis is performed though technically tricky. The ideal position is 30° forward flexion, 20° abduction and 40° internal rotation.

Complications of shoulder athroplasty are similar to other joint replacement including infection, aseptic loosening (especially the glenoid component), dislocation and fracture.