Frozen shoulder: a clinical review

Frozen shoulder is a common condition which can cause considerable morbidity for a prolonged duration. With recognition of the condition's time scale, management can be directed to help reduce the morbidity. Many treatments are recognized and the gold standard is still to be identified.

Frozen shoulder has been defined as a condition of uncertain aetiology, characterized by substantial restriction of active and passive shoulder movement. As Itoi et al (2004) reported this occurs in the absence of a known intrinsic shoulder disorder. In the literature the condition was first described by Duplay (1872) as scapulohumeral periarthritis. However little was known until 1934 when Codman first described the 'frozen shoulder' and its common features (Codman, 1934) (*Table 1*). Ten years later the phrase 'adhesive capsulitis' was used to describe the condition (Neviaser, 1945).

Natural history

Classical or primary frozen shoulder is described as having no known causative aetiology. Secondary frozen shoulder occurs when there is a precipitating event (Lundberg, 1969). Diabetes and trauma are the most common associations. Diabetic patients have a higher incidence compared to the general population. The symptoms can be more severe and the duration of symptoms twice as long.

Hand et al (2008) reported the incidence in the general population is at least 2%. Females are more often affected and it is a condition of middle age (40–60-year-olds). The condition may affect the opposite side in up to a fifth of cases. Recurrence is rare.

Primary frozen shoulder has traditionally been described as having three phases (*Table 2*). Initially there is pain. This is of gradual onset, diffuse in nature and is most symptomatic at night. The stage lasts from a few weeks to a few months. This is followed by a stiff phase, thought to be the result of the pain relief of immobility, which lasts for 4–12 months. Finally, there is the thawing phase which may have a subjective resolution over months. Different patterns of the natural history have been described with patients having a varying time frame of recovery (Hand et al, 2008).

Table 1. Codman's features of frozen shoulder

Slow onset
Pain near the insertion of the deltoid
Inability to sleep on the affected side
Painful and restricted elevation and external rotation
Normal radiological appearance

From Codman (1934)

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Pathology

The aetiology remains unknown. A review of the pathology stated that 'frozen shoulder includes a chronic inflammatory response with fibroblastic proliferation which may be immunomodulated' (Hand et al, 2007).

Microscopically there is an initial inflammatory synovitis and the capsule is unaffected. This is followed by a hypertrophic proliferative capsulitis. Next there is capsular maturation (reduced vascularity) and last, burnt-out synovium with dense scar formation. Extracellular matrix remodelling is seen and the expression of growth factors, cytokines and matrix metalloproteinases is altered (Bunker and Anthony, 1995). Similar histological appearances to Dupuytren's disease have been reported (Lundberg, 1969; Bunker et al, 2000). It must be noted, however, that these have opposing clinical features: Dupuytren's disease is not painful but presents with a progressive digital contracture.

Macroscopically the rotator interval is especially involved (*Figure 1*).

Clinical features

On clinical examination there is classically no tenderness on palpation. The range of movement is restricted. Forward elevation to 90° may be present, but this is usually from scapulothoracic movement. Asking the patient to brace his/her shoulders will stabilize the scapula and the limited glenohumeral elevation can be demonstrated. Examination of rotation demonstrates minimal external rotation and limited internal rotation (often only reaching the patient's buttocks). External rotation is also the last movement to return. On testing the rotator cuff there is usually good strength and no pain.

Table 2. The phases of frozen shoulder

1. Freezing	Gradual onset of pain, diffuse nature, worse at night
2. Frozen	Stiff joint from disuse
3. Thawing	Gradual restoration of movement and function

Investigations are usually undertaken to rule out any other pathology. Inflammatory blood markers may be slightly raised but not significantly. Radiographs by definition are usually normal and eliminate other causes, commonly osteoarthritis. The only specific investigation for diagnosis is a direct arthrogram, although this is not commonly used (*Figure 2*). Magnetic resonance imaging can sometimes show a thickened capsule at the rotator interval and occasionally other pathology is seen, such as supraspinatus tendinopathy.

Treatment

The natural history of frozen shoulder is thought to be benign. In general it is felt to be a self-limiting condition with the most severe cases resolving (Codman, 1934). The mainstay of management has historically been supervised neglect, but a considerable number of untreated patients have chronic pain and a permanent disability (Binder et al, 1984; Shaffer et al, 1992; Hand et al, 2008). It has also been suggested that there is a varying natural history in different subgroups of patients (Chambler and Carr, 2003). Hence some patients may benefit from treatment that shortens the duration of symptoms and reduces any potential disability.

The non-operative options include oral steroids, corticosteroid injections, physiotherapy, hydrodilation and nerve blockades. Operative management includes manipulation under anaesthesia, arthroscopic and open release of contractures. The evidence for these individual treatments is not well established. Few randomized controlled trials have been performed. It is not known whether individual interventions or a combination of interventions is better.

Non-operative management

Data from two placebo-controlled trials have shown that oral steroids provide significant short-term benefits in pain, range of movement of the shoulder and function but the effect may not be maintained beyond 6 weeks (Blockey and Wright, 1954; Buchbinder et al, 2004). Intra-articular injections of steroid compared to local anaesthetic with distension have shown no difference in outcome (Jacobs et al, 1991). Physiotherapy and home exercises have been advocated to reduce pain and aid functional recovery (Nicholson, 1985), but the evidence for this is weak.

Hydrodilatation involves the intra-articular injection of normal saline with or without steroid to distend and rupture the capsular adhesions (Andren and Lundberg, 1965). Variable results have been described and this has been shown to be marginally superior to manipulation under anaesthesia (Quraishi et al, 2007). A meta-analysis reported only a short-term benefit (Buchbinder et al, 2008).

Operative management

Re-establishment of the full range of shoulder movement can be achieved with a manipulation under anaesthesia. Many studies with variable designs and treatment protocols have reported long-term favourable results (Farrell et al, 2005). However, it is not clear whether manipulation under anaesthesia alters the natural progression of recovery (Chambler and Carr, 2003). With this treatment there is a small but significant risk of humeral fracture, rotator cuff tear, articular damage and brachial plexus injury (Loew et al, 2005).

Surgical interventions include open or arthroscopic capsular release. The aim is to restore the movement and allow a faster rehabilitation of the pathology. Open surgery originally involved releasing the coracohumeral ligament (Leffert, 1985). Patterns of capsular tears have been shown to correlate with specific arcs of motion regained, thus capsular release is sequenced to maximize the results (Speer, 1993; Pearsall et al, 1999). The optimal timing of this procedure is when the painful phase has settled, so

Figure 1. The shoulder anatomy with the rotator interval illustrated.

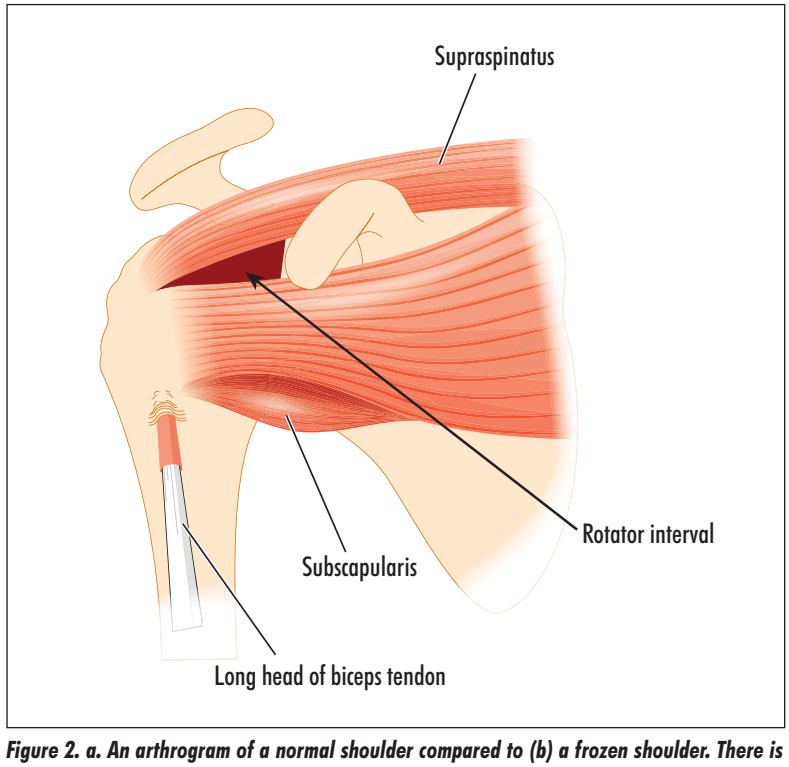
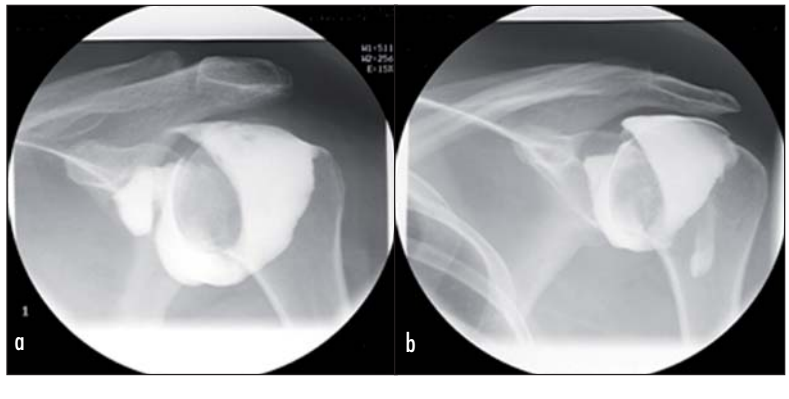


Figure 2. a. An arthrogram of a normal shoulder compared to (b) a frozen shoulder. There is less fluid within the joint of the frozen shoulder. Fluid can be seen tracking down the biceps tendon sheath because of the increased pressure required to dilate the joint.



rehabilitation will be possible after surgical release. Some studies have shown capsular release to be superior to manipulation under anaesthesia (Ogilvie-Harris et al, 1995). As arthroscopic techniques and equipment have advanced open surgery is performed less frequently. The importance of pain relief postoperatively to allow physiotherapy can not be overstated. Local anaesthesia regional blocks can give excellent pain relief.

Conclusions

Frozen shoulder is a common condition. There have been important advances in the understanding and management of frozen shoulder in the last 10 years. However, the full aetiology is not understood and the optimal management has not clearly been defined. Further randomized controlled trials are required to determine the best management. BJHM

Conflict of interest: none.

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KEY POINTS

- Classical frozen shoulder has an unknown aetiology.
- The natural history involves a painful phase, a stiff phase and a rehabilitation phase.
- There are many non-operative and operative treatments available.
- Treatments are all aiming to reduce the time frame of the stiff and rehabilitation phases.

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