

# A review on frozen shoulder

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## ABSTRACT

**Of all the joints in the human body, the shoulder has the greatest range of motion. This allows complex movements and functions to be carried out, and is of vital importance to the activities of daily living and work. Any restriction or pain that involves the joint puts a huge amount of strain on patients, especially those who are in their most productive years of life. Frozen shoulder, a frequently encountered disorder of the shoulder, has been well recognised since the early 1900s. Although benign, it has great impact on the quality of life of patients. This article aims to provide an overview of the nature and the widely accepted management of this condition based on other studies.**

**Keywords: adhesive capsulitis, frozen shoulder, shoulder joint**

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## INTRODUCTION

Frozen shoulder, a term coined by Codman in 1934, is an orthopaedic condition that is commonly encountered in general practice. Codman used this term to describe a condition with symptoms of shoulder pain and discomfort that is slow in onset and located around the deltoid insertion. Patients generally complain of an inability to sleep on the affected side. Restricted glenohumeral elevation and external rotation, together with unremarkable radiographic findings, are also observed.<sup>(1)</sup> The condition can be broadly divided into two categories: primary, in which there are no obvious causes, and secondary, where a cause is identified (from history, clinical examination and radiographic appearances).

Frozen shoulder mainly affects individuals 40–60 years of age, with a female predominance. The exact incidence and prevalence of frozen shoulder are unknown, but various authors have quoted figures of 2%–5% in the general population. Nevertheless, those with diabetes, prolonged shoulder immobility (trauma, overuse injuries or surgery) or systemic diseases (hyperthyroidism, hypothyroidism, cardiovascular disease or Parkinson's disease) are at a higher risk.<sup>(2,4)</sup> In addition, there is evidence that protease inhibitors used for antiretroviral therapy have been associated with the development of frozen shoulder.<sup>(5,6)</sup>

## PATHOGENESIS AND COURSE

Knowledge of the pathogenesis and natural progression of any illness or disease contributes to decision-making in managing a patient. Research conducted by the Nuffield Orthopaedic Centre, Oxford, United Kingdom studied the pathology of primary frozen shoulder in 22 patients at a mean time from onset of 15 (range 3–36) months. Histology findings of tissue taken during manipulation under anaesthesia and arthroscopic release revealed the presence of fibroblasts and chronic inflammatory cells. The study concluded that the pathology of frozen shoulder includes a chronic inflammatory response with fibroblastic proliferation.<sup>(7)</sup>

Primary frozen shoulder generally progresses through three clinical phases: (1) Painful phase, where there is a gradual onset of aching shoulder, usually worst at night and when lying on the affected side, and lasts for 2–9 months; (2) Stiffening or frozen phase, in which the pain level is often not altered and the patient experiences difficulty with simple activities of daily living. The stiffness progresses and may lead to muscle wasting due to disuse atrophy. This phase lasts for 4–12 months; and (3) Thawing phase, where the patient experiences a gradual increase in the range of movement and improvement in pain, although it may reappear as the stiffness eases. This phase lasts for 5–12 months.

In another study, Nuffield Orthopaedic Centre followed up 223 patients with a diagnosis of primary frozen shoulder for an average of four years from the onset of symptoms, so as to gauge the overall natural course of the disease. The results revealed that in the long term, slightly less than half (41%) of the patients reported some ongoing symptoms. 94% of those who had ongoing symptoms only had mild symptoms, while 6% had severe symptoms of pain and functional loss.<sup>(8)</sup> Shaffer et al monitored 68 patients for approximately seven years, and found that on objective motion measurement, about one-third of the patients were restricted when compared with the opposite unaffected side, while half had persistent pain or stiffness.<sup>(9)</sup> Hence, frozen shoulder may in fact run a rather protracted course. This is unacceptable, especially for patients in their productive years of life, and suitable treatment should thus be administered.

## PRESENTATION AND DIAGNOSIS

### History and examination

True frozen shoulder is a clinical diagnosis. The three

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hallmarks of frozen shoulder are progressive shoulder stiffness, severe pain (especially at night) that results in the inability to sleep on the affected side and a near complete loss of passive and active external rotation of the shoulder. Proper history-taking includes the onset and duration of symptoms, site, function and preceding trauma. Past medical and surgical history is relevant and should be obtained. On inspection, mild disuse atrophy of the deltoid and supraspinatus in longstanding cases is usually observed. The arm may be adducted and internally rotated. Tenderness would be positive on palpation of the glenohumeral joint. Both active and passive range of motion are affected, especially that of abduction and external rotation. Movement in the thoracoscapular joint, which may aid abduction, should be noted.

In patients with a considerable amount of pain, a local anaesthetic can be used. Those with frozen shoulder will still have a decreased range of abduction and external rotation. The signs and symptoms of rotator cuff tendinitis overlap with those of frozen shoulder. However, in contrast to the former, where pain is the main limiting factor, patients with pure frozen shoulder may complain of chronic pain; however, symptoms of stiffness predominate. In addition, the signs and symptoms of cervical radiculopathy and upper limb neurology should be evaluated, as cervical spondylosis or other cervical disc disease may lead to or coincide with frozen shoulder. On the same note, cardiac conditions, especially coronary artery disease, may present with shoulder pain (referred pain). Ernstene et al reviewed 133 cases of myocardial infarction and found 17 patients whose original complaint was shoulder pain.<sup>(10)</sup> Hence, good cardiac history-taking and examination are advised.

#### **Laboratory studies and imaging**

Laboratory studies do not contribute to the diagnosis of frozen shoulder. However, with regard to secondary frozen shoulder, certain tests, such as full blood count, erythrocyte sedimentation rate, C-reactive protein, serum blood glucose and thyroid function tests, may be ordered if an undiagnosed comorbidity is suspected based on the history.

Plain films of the shoulder should be routinely taken to rule out any other pathology, and cervical spine radiography should also be performed in cases of likely cervical disease. Magnetic resonance (MR) imaging may be required if another pathology is suspected based on the history and examination, or if the patient does not improve after a period of time (usually around three months) of conservative therapy. Research conducted in Switzerland concluded that thickening of the coracohumeral ligament (CHL) and the joint capsule in the rotator cuff interval, as well as the subcoracoid triangle sign (complete

obliteration of the fat triangle between the CHL and the coracoid process), are characteristic findings in frozen shoulder.<sup>(11)</sup> Nonetheless, MR imaging is performed mainly to exclude rotator cuff tears or intra-articular pathology and not for diagnosis per se. As with MR imaging, ultrasonography is recommended only if the physical examination indicates the possibility of another shoulder pathology such as rotator cuff tears.

#### **MANAGEMENT**

Generally, frozen shoulder is a self-limiting condition. However, about 10% of patients experience long-term problems.<sup>(12)</sup> Considerable research has been conducted with regard to the most effective approach to treatment. A broad overview of some of the well-recognised methods today is provided below.

#### **CONSERVATIVE METHODS**

##### **Patient education**

This is most important as it encourages compliance. Informing the patient about the phases, course and duration of the condition usually aids in alleviating frustration. It is also imperative to emphasise that while the range of motion would improve, it may never be complete.

##### **Physiotherapy**

Conventionally, this encompasses the use of weighted pendulum stretching followed by passive stretching exercises, which aims to stretch the lining of the glenohumeral joint. A study published in 2008 indicates the promising use of continuous passive motion as compared to that of conventional practice.<sup>(13)</sup> Dierks and Stevens described a prospective study of 77 patients that compared exercise within the limits of pain with intensive physiotherapy in patients with idiopathic frozen shoulder. In this study, they found that exercise performed within the limits of pain (64% reached near normal, painless shoulder movements at 12 months and 89% at 24 months) yielded better results than that with intensive physiotherapy (63% achieved a similar result at 24 months).<sup>(14)</sup> Improvement in daily activities, pain relief and range of motion is more significant with deep heating combined with stretching exercises than with superficial heating alone.<sup>(15)</sup>

##### **Nonsteroidal anti-inflammatory drugs (NSAIDs)**

As the pathology behind this condition is inflammatory, it would make sense to reduce the symptoms by administering anti-inflammatory drugs. This, together

with physiotherapy, is the mainstay of treatment for frozen shoulder. Its effectiveness has been proven through various prospective studies.<sup>(16)</sup>

### **Corticosteroids**

Studies have shown that adding steroids to the usual NSAID and physiotherapy regime results in an improvement in pain relief; however, the relief generally does not extend beyond six weeks.<sup>(17,18)</sup> Corticosteroids can be administered orally or via injection. A study conducted by Widiastuti-Samekto and Sianturi revealed that intra-articular corticosteroid injection provides faster improvement compared to the oral route.<sup>(19)</sup>

### **Electrical stimulation**

Either electroacupuncture or interferential electrotherapy, in combination with shoulder exercises, is effective in treating patients with frozen shoulder. However, no significant difference has been found between these two types of treatment.<sup>(20)</sup>

## **SURGICAL METHODS**

### **Shoulder manipulation**

In some patients, if severe stiffness persists, gentle manipulation of the shoulder while administering a general anaesthetic may improve shoulder motion and function for a mean period of 15 years following treatment.<sup>(21)</sup> However, studies have shown that this does not increase the benefit to an exercise program carried out by the patient under instructions by the clinician.<sup>(22)</sup> Furthermore, Loew et al have observed iatrogenic intra-articular lesions following this procedure, which included bleeding, capsule rupture, tendon and ligament tears, and osteochondral defects.<sup>(23)</sup>

### **Hydrodilatation**

Quraishi et al compared the results of manipulation under anaesthesia with hydrodilatation in 36 patients who were followed up for six months. At the final follow-up, 94% of the patients were either adequately satisfied or highly satisfied with the results after hydrodilatation, as compared with 81% of those who received a manipulation. Although most of the patients were successfully treated, those who underwent hydrodilatation reported better results.<sup>(24)</sup> A systematic review conducted by Buchbinder et al concluded that short-term benefits with regard to pain, range of movement and function can be achieved with arthrographic distension using saline and steroids.<sup>(25)</sup>

### **Arthroscopic selective capsular release**

This is considered an effective treatment for resistant

cases, especially in diabetics.<sup>(26,27)</sup> Ogilvie-Harris et al conducted a study on 17 diabetic patients with frozen shoulder who failed to respond to conservative management, for which arthroscopic release was performed. At the 1–5 year follow-up, the patients showed significant improvement in pain, external rotation, abduction and function.<sup>(26)</sup> Pearsall et al reviewed and treated 43 patients with a diagnosis of primary or secondary frozen shoulder who had symptoms for an average of 12 months and who failed conservative treatment of at least 12 weeks of physical therapy. Following arthroscopic capsular release, all the patients showed a significant reduction in shoulder pain and improvement in shoulder range of motion.<sup>(28)</sup> Holloway et al compared the results of arthroscopic capsular release in three different groups of patients (idiopathic frozen shoulder, shoulder stiffness after surgery and shoulder stiffness after fracture) with shoulder contracture refractory to those of conservative management and manipulation under anaesthesia. The results revealed that surgery provided benefits, in terms of range of motion, to patients with postoperative contracture of the shoulder and to those with idiopathic and post-fracture contractures. However, those in the postoperative group showed less improvement in the subjective scores for pain, function and patient satisfaction.<sup>(29)</sup> Another study by Gerber et al concluded that the success of arthroscopic capsular release was largely impacted by the severity of stiffness regardless of the cause.<sup>(30)</sup>

The current indication for open surgical release includes cases that cannot be managed by arthroscopic means. However, open surgery has significant disadvantages and risks. It can be technically difficult to achieve a complete posterior capsule release via open release. Moreover, it is associated with increased postoperative pain, a limited range of motion and extended hospital stay.<sup>(31)</sup> On the other hand, arthroscopy is contraindicated in patients who cannot tolerate fluid challenges (cardiac, renal insufficiency).

The treatment of choice for frozen shoulder is similar to other conditions, which is conservative initially, but may eventually require more invasive methods depending on the expectations, functional demands and comorbidities of the patient. The indication for surgical treatment should be genuine failure of conservative treatment and not non-compliance. In this day and age of easy access to information, clinicians must equip themselves with sufficient knowledge so as to be able to filter and discuss treatment options with patients. Patients themselves may come up with their “ideal” treatment, but ultimately, the choice of treatment rests on both the doctor’s clinical judgement and the patient’s preference.

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