

# Frozen Shoulder

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## Frozen Shoulder – A Review of the Literature Paul Monaro – Sports & Musculoskeletal Physiotherapist

### Definition

*Adhesive capsulitis*, better known as frozen shoulder (FS) is characterised by the spontaneous onset of shoulder pain, and progressive reduction in both active and passive range of motion in at least two directions<sup>3,5,11</sup>. The most significant loss of movement is in external rotation<sup>9,11</sup>. While this is the accepted definition, some experts also describe ‘global restriction’, with loss of range in every direction. In reality, patients with true FS usually have global restriction. The condition is often over-diagnosed. A 1991 arthroscopic study found that of 150 patients referred with a diagnosis of FS, only 37 had ‘true’ adhesive capsulitis<sup>16</sup>. Under-diagnosis is also common, particularly in the early stages when pain is a greater feature than stiffness, and the condition appears more like “subacromial impingement” or “rotator cuff tendinitis”. The pain in the early periods is often severe and disturbs sleep<sup>3</sup>. FS typically affects people between the ages of 40 and 65 years<sup>1,8,9,10,11,16</sup>, with younger cases reported but quite rare. In a systematic review covering 476 patients in four separate studies, the maximum age of FS sufferers was 56 years, and the minimum age was 47 years<sup>11</sup>. In a 1991 arthroscopic study of 37 patients, the age ranges were between 40 & 70<sup>16</sup>. In a 2003 study with 106 subjects, the average age was 53 years<sup>1</sup>.

The natural time course of the condition is recovery in one to three years<sup>2</sup>, but it is not unknown for people to have ongoing restriction beyond this time-frame. Up to 40% to 50% of sufferers will have persistent symptoms past three years<sup>8,9</sup>, and 15% persistent long-term disability<sup>2,3,13</sup>. FS has three

distinct phases (some authors describe four). Phase I is the inflammatory or ‘freezing’ stage, characterised by pain and progressive stiffness. This can last between two to nine months<sup>3,7,11</sup>. Pain that disturbs sleep is common. Phase II is the frozen stage, with pain easing, but the patient being left with generalised restriction of movement in all directions. Pain is usually present at end of available range. This phase can last from four to twenty months<sup>3,7</sup>. Phase III is the ‘thawing’ phase, with gradual recovery of movement. This can last from five to 26 months<sup>3,7,11</sup>.

### Incidence

The literature consistently reports the incidence of FS as being between 2% to 5% in the general population<sup>2,3,7,8,9,10,11,12,13</sup>. The incidence of people presenting to general practitioners in Holland was 2.4 per 1000 per year<sup>3</sup> and similarly around one in every 400 patients attending a GP in England<sup>11</sup>. In patients with insulin dependent diabetes mellitus the prevalence increases to between 10% and 38%<sup>7,8,9,12,13</sup>. Whether the side of the body affected is related to handedness is unclear. In a study involving 106 patients, there were almost exactly equal numbers of left and right shoulders affected<sup>1</sup>. However, in a separate study involving 56 patients, Watson et al felt that the non-dominant shoulder was more likely to be affected<sup>15</sup>. Neviasser et al agreed<sup>10</sup>. Up to 34%<sup>8,10,12</sup>, and even as many as 50%<sup>9</sup> of patients will experience FS in their opposite shoulder. Simultaneous involvement of both shoulders at the same time occurs in up to 14% of sufferers<sup>8</sup>.

## Associated Factors

The cause of FS is still unclear; however, it is known to be more common in certain individuals. While trauma has been suggested as a common precipitating event <sup>7,10,16</sup>, most FS is the 'primary' type, where there is no identifiable cause. Females are said to be affected slightly more than males <sup>3,7,10</sup>, although across several reviewed studies, the incidence of female FS sufferers ranged from 38 to 70% <sup>9,11</sup>. There is a strong association with diabetes, particularly type I (insulin dependent diabetes). Delayed and less satisfactory recovery has also been reported in patients with diabetes <sup>1,8,9</sup>. Other factors which have been implicated in contributing to FS include prolonged immobilisation <sup>7,12</sup>, those being treated for breast cancer <sup>10</sup>, those with thyroid disease <sup>7,8,9,10,12</sup>, autoimmune diseases <sup>7,9,10</sup>, scleroderma <sup>12</sup>, Dupuytren's contracture <sup>9,12</sup>, and after myocardial infarction (heart attack) <sup>7,8,9,10</sup> and stroke <sup>7,9,10</sup>.

## Pathology

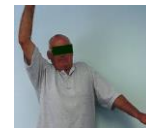
The theory behind the onset of FS is that inflammation occurs <sup>2,3</sup>, particularly in the axillary fold (the capsule of the 'arm-pit') <sup>3,9</sup>, and in the synovial membrane <sup>5,9,16</sup> – the inner-lining of the joint, followed by adhesions & fibrosis (scarring) of the synovial lining and capsular ligaments <sup>2,9</sup>. Patients with FS have been found to have both inflammatory cells and fibroblast cells (fibrosis = scarring) indicating both an inflammatory process and scarring <sup>8</sup>. The term adhesive capsulitis was coined in 1945 because of the suggestion of adhesions forming between the capsule and bone of the humeral head. However, this is not generally found on arthroscopic investigation (keyhole surgery) <sup>5,16</sup>. "Patchy vascular synovial collections" and fibrosis were noted particularly around the subscapularis and biceps tendons <sup>9,16</sup> (in the front of the shoulder), which may help to explain why external rotation range tends to be affected most <sup>8</sup>. As a result of capsular fibrosis, the joint capsule contracts <sup>8,10</sup> (somewhat like 'shrink-wrap'), and fluid is squeezed out of the joint.

## Examination

The diagnosis of FS is a clinical one, and imaging is not usually required <sup>9</sup>. Plain X-ray and ultrasound are of limited to no use for the diagnosis of FS. Arthrography or MR arthrogram are the tests

ordered when the diagnosis is unclear. This is rarely necessary. When the patient is examined, the findings will depend on the stage of the condition. In the early stages, there may be pain with certain movements, but movement may not be significantly restricted. As the disease becomes established, stiffness becomes the key feature, with pain present at end of available range. Typically, there is no weakness on muscle testing <sup>10</sup>. If weakness is detected, this may be unrelated to the FS, and indicate the presence of a pre-existing rotator cuff injury.

The examiner will assess a few key movements. In true FS, external rotation range will be affected more than other movements. The normal



70° to 90° range may be restricted to between 10° to 30°. Forward elevation may be restricted to between 90° to 120°. Hand-behind-back range will also



be moderately to severely affected. To confirm 'global restriction', I also test horizontal adduction (arm across the body) and external and internal rotation at 90° abduction. Other conditions, including osteoarthritis, can cause restrictions similar to FS, so the expert clinician needs to differentiate the true cause of the stiffness.

## Management

Many different treatments have been described for FS, and there is still no clear consensus regarding the effectiveness of many of these treatments. Complicating the picture is that the various stages of the disease may respond differently to the chosen treatment. In many of the studies reviewed, it was not always clear at what stage of FS the treatment was given.

## Physiotherapy

Physiotherapy as a stand-alone treatment is not generally effective during phase I or II of the disease <sup>9,10</sup>. A gentle home exercise programme can be effective in relieving symptoms <sup>8</sup>, and a physiotherapist can help with prescription of these exercises. In comparison with steroid injection alone, physiotherapy was found to be less effective <sup>2,5,8</sup>. In my experience, exercise provides no better than limited short-term relief during stage 1 and 2 of

the condition.

There is evidence that physiotherapy, when performed after intra-articular corticosteroid injection, is more effective than either intervention alone in improving pain and range of motion <sup>2,5,10,15</sup>. The fact that range of motion improved more in the combination group suggests that physiotherapy may be effective for FS when performed after steroid injection. However, in clinical terms, it is more likely that the patient will experience symptomatic relief, and little or no improvement in range of motion during stage 1 or 2. This was supported by a recent systematic review <sup>9</sup>. However, physiotherapy is much more likely to be effective during late stage 2, and during stage 3 of the condition.

Physiotherapy management approaches described in the literature include transcutaneous electrical nerve stimulation <sup>5,8</sup>, joint mobilisation techniques <sup>5,6,8,9</sup>, active and assisted range of motion exercises <sup>5</sup>, gentle stretching <sup>8</sup>, ice <sup>5</sup>, scapular muscle control exercises <sup>6</sup>, and isometric strengthening <sup>5</sup>.

### Cortisone Injection

*Intra-articular* injection of corticosteroid (through the joint capsule and into the joint space) has been claimed to provide quick pain reduction and to help restore movement. In an effort to settle symptoms quickly, some clinicians recommend this as the first-line treatment for FS<sup>2,6</sup>. Corticosteroids are a powerful anti-inflammatory agent, and are also known to be effective in reducing pain. Considering the anti-inflammatory effect, it is possible that the injections will be most effective if performed in the early, inflammatory stage of the condition <sup>2,10</sup>. Recent reviews of the literature confirmed that improved pain and range of motion could be demonstrated in the short-term, but not the medium to long-term after corticosteroid injection <sup>5,7,9</sup>. This has been a fairly consistent finding, and is not surprising considering that FS usually improves over time, even with no treatment. It is the short-term improvement in pain which provides an attractive treatment option, particularly in the early stages when pain is a significant factor. In the short-term, it has been consistently shown to be effective in reducing pain <sup>5,7</sup>, and some studies have found an improvement in range of motion compared to control groups <sup>5,7</sup>. There is evidence that the combination of injection and physiotherapy is more effective than injection alone <sup>2,5,6,10,15</sup>, although this

has been disputed in a recent review <sup>9</sup>. In a systematic review covering 476 patients over four studies, the consensus was that steroid injection had a positive effect on the symptoms of FS in the short-term <sup>11</sup>. Short-term was defined as 6 to 16 weeks. As the most painful phase of FS generally lasts less than 9 months, this may offer important symptomatic relief during a significant proportion of this period. It was suggested that up to three injections may be beneficial, and there was limited evidence that any more than this would provide additional benefit <sup>11</sup>. In the long-term (6-12 months) physiotherapy was more beneficial than multiple injections <sup>11</sup>.

There is evidence that injections carried out under imaging (usually fluoroscopic control) are more effective, and that up to 60% of 'blind' injections are inaccurate <sup>2,5,11</sup>.

### Hydrodilatation

This technique involves a volume of fluid being injected into the shoulder joint space, with the aim to stretch or even rupture the capsule. This is performed under local anaesthetic, takes approximately 15 minutes, and the person goes home immediately afterwards. There is often transient pain during the procedure, and sometimes for a short time afterwards, but otherwise hydrodilatation is considered to be a safe procedure <sup>1,3</sup>. Rest is advocated for two days, followed by return to normal activities <sup>1</sup>. A home exercise programme &/or physiotherapy is often recommended as well.

There is potential overlap between steroid injection and hydrodilatation that makes it difficult to compare the two procedures. On the one hand, it has been argued that the benefits of hydrodilatation may be largely due to the anti-inflammatory effect of the steroid, which is generally injected at the same time as the local anaesthetic and normal saline solution <sup>2,14,15</sup>. On the other hand, it has been shown that a contracted capsule in a person with FS can rupture with only small volumes of injected fluid <sup>14</sup>. The normal volume of the shoulder joint may be reduced to less than 10ml in FS <sup>11</sup>, meaning that there may often be a combination effect of distension and anti-inflammatory. Interestingly, in a review of the literature into corticosteroid injection, it was found that the more effective outcomes may have been in studies where greater volumes were injected, even

up to 40ml<sup>2</sup>. In one study, the injected volume of intra-articular steroid was 50ml<sup>11</sup>. It is possible that even small doses may lead to capsular distension & / or rupture.

Possible benefits of the procedure include disrupting adhesions (scar tissue) within the joint<sup>3</sup>, and an improvement in pain by reducing the stretch on pain receptors within the capsule<sup>15</sup>. Repeat procedures are advocated when results are less than ideal<sup>13</sup>. Good results have been reported, particularly for reducing pain. However, there are few quality studies of hydrodilatation for FS, and in most studies a control group was not used<sup>1,13,14,15</sup>. Therefore, while encouraging results have been reported, it is impossible to determine if the results were due to the procedure, or due to time and natural recovery. There is no good evidence at this time that hydrodilatation offers superior results to other available treatments, particularly for helping with earlier return of range of motion<sup>6,10</sup>. Studies which compared hydrodilatation to cortisone injection alone found no significant differences between the two groups<sup>9,14</sup>. In one study the authors reported that they did not refer their subjects for physiotherapy post-intervention, and speculated that had they done so, this may have provided further benefit<sup>14</sup>. In recalcitrant cases, where recovery is slow, or full movement is not regained in the longer-term, hydrodilatation may be an effective procedure to promote further recovery<sup>6</sup>.

### Oral Steroids

According to an extensive literature review, there is moderate evidence for the benefit of oral steroids to help with the pain of FS, however there was no evidence that the benefit lasted beyond 6 weeks<sup>4</sup>. Oral steroids were as effective as steroid injection in improving range, pain and subjective feelings of dysfunction<sup>7</sup>. However oral steroids are known to have several potential systemic side effects. For this reason, most practitioners opt for steroid injection rather than medication.

### Oral non-steroidal anti-inflammatory medication

These medications, commonly known as *anti-inflammatories* or *NSAIDs*, are frequently prescribed for FS. However, there have been few studies analyzing their effectiveness<sup>9</sup>. To date there is no good evidence that they provide any benefit other than temporary pain relief<sup>6,10</sup>. And of concern is the

finding that up to 76% of patients taking NSAIDs for FS reported side-effects<sup>9</sup>.

### Manipulation under Anaesthesia

This procedure involves placing the patient under a general anaesthetic so that all muscles around the shoulder are relaxed. The joint is forcefully manipulated into the stiff range, in order to break adhesions within and around the joint. It is usually reserved for those cases where the shoulder remains restricted even after the expected recovery time.

This procedure has been compared to intra-articular steroid injection, and both were found to be equally effective<sup>7</sup>. In a comparison with hydrodilatation, it was found to be less effective<sup>7</sup>. As manipulation is an involved procedure with potential risks, and there are alternative procedures available, it is rarely used as a first line procedure. It's effectiveness in recalcitrant cases also remains controversial<sup>9</sup>.

### Arthroscopic release of the joint capsule

Until recently, there were no good quality studies examining the effectiveness of this technique<sup>6</sup>. However, a recent review found it to be a safe and effective technique, with evidence for benefit in the short and longer-term<sup>9</sup>. It involves 'keyhole' release of the joint capsule. As with other operative techniques, it is a recommended procedure for recalcitrant cases, and not as a first line treatment<sup>10</sup>.

### Summary of Treatments for Frozen Shoulder

While numerous treatments have been advocated for this condition, most interventions had small to no effect in the short to medium term. Expert consensus during stage 1 to 2 is for a "wait-and-see" approach, and for an intra-capsular cortisone injection where pain is a significant factor. Physiotherapy may provide additional benefit in some cases, and is more likely to be effective when pain is no longer a significant feature of the disease. If physiotherapy techniques increase pain, with no measurable improvement in range or function, they should be delayed or discontinued. When recovery goes beyond the expected healing time, or restoration of movement is incomplete in the longer-term, treatments aimed at restoring range may be considered. On current evidence, the favored treatments for recalcitrant FS are intra-articular corticosteroid injection, hydrodilatation, or arthroscopic capsular release, followed by physiotherapy.

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