

# Frozen Shoulder

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## Overview

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- Frozen shoulder management guidelines provide evidence-based guidance and identify key areas for future research [2].
- Magnetic resonance imaging findings in frozen shoulder should not replace clinical judgments regarding prognosis and treatment decisions [7].
- Clinicians should monitor frozen shoulder patients with diabetes more closely and offer further treatment if pain or lack of function persist long-term [8].
- Different treatment strategies for frozen shoulder may be appropriate depending on the location [9].
- A strict definition of recalcitrant idiopathic frozen shoulder is needed to prevent unnecessary interventions, as current data should not be interpreted as a plea for surgery in patients with a mean symptom duration of 4 months [10].
- The variety of participants, methods, interventions, and outcomes across trials provides limited new evidence to inform the non-surgical management and treatment of frozen shoulder [14].
- Patients with a poor outcome or recurrent symptoms after manipulation under anaesthetic (MUA) should be offered a further MUA, with an expectation of a good outcome and a low complication rate [17].
- Early surgical intervention might shorten the overall duration of symptoms in frozen shoulder and is not associated with inferior clinical outcomes compared with late surgical intervention [19].
- There is insufficient evidence to reliably recommend a single treatment approach for frozen shoulder [32].
- Further treatment was indicated in 41% of patients who could not tolerate more than 20 mL of injection during hydrodilatation [34].
- Recurrence of frozen shoulder was more common in primary (33%) versus secondary (16%) cases [34].
- Arthroscopic capsular release is a suitable option for refractory primary frozen shoulder syndrome, leading to faster and long-lasting recovery [35].
- Manipulation under anaesthetic (MUA) and arthroscopic capsular release (ACR) are both good treatment options for primary frozen shoulder [70].
- MUA is simpler but carries risks of serious complications, whereas ACR may be safer if performed by experienced surgeons and is convenient for patients with combined rotator cuff tears [70].

## Anatomy & Pathophysiology

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- Primary (idiopathic) frozen shoulder consists of three phases: pain, stiffness, and thawing [3].
- Secondary frozen shoulders may not exhibit all three phases and may not follow the exact chronology of primary frozen shoulder [3].
- The pain phase of primary frozen shoulder involves a gradual onset of diffuse shoulder pain that is progressive over weeks to months [3].
- Pain in the initial phase is usually worse at night and exacerbated by lying on the affected side [3].

- Reduced arm use due to pain leads to stiffness [3].
- The stiffness phase begins when patients restrict movement to seek pain relief and usually lasts 4 to 12 months [3].
- During the stiffness phase, patients experience difficulty with activities of daily living, such as men accessing back pockets or women fastening brassieres [3].
- A dull ache is present nearly all time during the stiffness phase, especially at night, often accompanied by sharp pain during range of motion at or near new endpoints [3].
- The thawing phase lasts for weeks or months, during which motion increases and pain diminishes [3].
- Without treatment, motion return in the thawing phase is gradual and may never objectively return to normal, although most patients subjectively feel near normal [3].
- Frozen shoulder is characterized by progressive pain and stiffness that usually resolves spontaneously after about 18 months [4].
- Histological features of frozen shoulder are reminiscent of Dupuytren's disease, with active fibroblastic and myofibroblastic proliferation in the rotator interval, anterior capsule, and coracohumeral ligament [4].
- Conditions particularly associated with frozen shoulder include diabetes, Dupuytren's disease, hyperlipidaemia, hyperthyroidism, cardiac disease, and hemiplegia [4].
- The etiology of frozen shoulder is still not known and understanding of the pathogenesis is limited [15].
- Frozen shoulder is a poorly understood condition that typically involves substantial pain, movement restriction, and considerable morbidity [12].
- The pathophysiology of frozen shoulder is complex, involving various pathophysiologic mechanisms [62].
- A systematic review summarizes the tissue pathophysiology of primary frozen shoulder [25].
- Primary frozen shoulder is defined by total elevation restricted to 135° or less [20].
- In primary frozen shoulder, motion restriction is localized to the humero-scapular joint [20].
- Primary frozen shoulder excludes cases with post-traumatic conditions, rheumatoid arthritis, osteoarthritis, hemiplegia, or other obvious changes explaining the range of motion decrease [20].
- Secondary frozen shoulder involves decreased range of motion following a traumatic lesion, including soft tissue injury, intra- and juxtaarticular fractures, and other upper limb fractures [20].
- Symptomatic subjects with frozen shoulder demonstrate substantial kinematic deficits during humeral range of motion [44].
- Patients with frozen shoulder present with altered shoulder muscle activity and kinematics [78].
- Pathomechanics of frozen shoulder are characterized by glenohumeral motion limitations, high tension in the anteroinferior glenohumeral capsule, and altered scapular motion [75].
- The scapulohumeral rhythm (SHR) of the affected shoulder is inversely related to the severity of limitation of shoulder range of motion, suggesting a compensatory pattern [80].
- The anatomical structure of passive shoulder restraints has no impact on the difference in passive joint position sense values between external and internal rotation in frozen shoulder [59].

- The thickness of the inferior glenohumeral joint capsule in the 80° scapular plane elevated arm position is a highly reliable and valid method for assessment [79].
- Imaging is an essential tool for evaluation of patients with shoulder pain to understand the extent of injury [37].
- X-rays in frozen shoulder are normal, and their main role is to exclude other causes of pain and stiffness [4].
- Post-traumatic stiffness may persist for some months after severe shoulder injury but is maximal at the start and gradually lessens, unlike the pattern of frozen shoulder [4].
- Disuse stiffness can occur if the arm is nursed overcautiously, such as following a wrist fracture, but lacks the characteristic pain pattern of frozen shoulder [4].
- Complex regional pain syndrome may follow acute trauma or be seen in patients with myocardial infarction or stroke, presenting features similar to frozen shoulder [4].
- Rheumatoid arthritis and osteoarthritis can affect the shoulder and develop bilaterally, with diagnosis usually obvious on X-ray [4].
- Shoulder stiffness is a typical outcome after bone or soft tissue injuries around the shoulder, including contusions, subluxations, dislocations, acromioclavicular joint injuries, clavicle and scapula fractures, and proximal humerus fractures in the elderly [61].
- Repetitive, low-level trauma can cause localized contractures leading to motion loss in specific patterns [61].
- Isolated posterior capsular contracture is the most commonly described localized contracture causing motion loss [61].
- Surgical procedures such as anterior or posterior capsulorrhaphy, inferior capsular shift, and rotator cuff surgery can result in limitation of motion [61].

## Classification

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- Frozen shoulder is a specific, painful, and debilitating condition affecting patients mainly in middle age [6].
- Frozen shoulder is a poorly understood condition that typically involves substantial pain, movement restriction, and considerable morbidity [12].
- Most patients clinically diagnosed with primary frozen shoulder had undiagnosed systemic abnormalities and/or intra-articular pathologies [5].
- Different treatment strategies for frozen shoulder may be appropriate depending on the location [9].
- 18F-FDG PET/CT is clinically relevant in diagnostically challenging cases, such as distinguishing the first phase of frozen shoulder from subacromial impingement [11].
- Health professionals manage frozen shoulders differently for different phases of the condition [16].
- Primary frozen shoulders are defined by total elevation restricted to 135° or less [20].
- In primary frozen shoulder, the restriction of motion is localized to the humero-scapular joint [20].
- Primary frozen shoulder is diagnosed when no findings in case history, clinical examination, or radiological examination explain the decrease in range of motion [20].

- Cases with post-traumatic conditions, rheumatoid arthritis, osteoarthritis, hemiplegia, and other obvious changes are excluded from primary frozen shoulder classification [20].
- Secondary frozen shoulder is characterized by decreased range of motion following a traumatic lesion [20].
- Associated injuries in secondary frozen shoulder include soft tissue injury to the shoulder region, intra- and juxtaarticular fractures, and other fractures of the upper limb [20].
- Frozen shoulder is classified into three consecutive stages according to Reeves [20].
- Stage 1 of frozen shoulder is characterized by pain [20].
- Stage 1 of frozen shoulder has a duration of 10 to 36 weeks [20].
- In Stage 1 of frozen shoulder, there is no difference between men and women, no difference between affected dominant and nondominant shoulders, and no correlation with age [20].
- In the early stages of frozen shoulder, there is a full range of movement under anesthesia [20].
- Classification of frozen shoulder was found to be controversial [38].
- There are lower rates of agreement among Japan Shoulder Society (JSS) members than American Shoulder and Elbow Surgeons (ASES) members for the definition of primary frozen shoulder [43].
- There are lower rates of agreement among JSS members than ASES members for the classification of primary and secondary frozen shoulder [43].
- There are lower rates of agreement among JSS members than ASES members for the divisions of secondary frozen shoulder [43].
- There is disagreement among shoulder specialists regarding terminology for frozen shoulder [57].

## Clinical Presentation

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- Frozen shoulder is a specific, painful, and debilitating condition that primarily affects patients in middle age [6].
- Frozen shoulder is a common disease that causes significant morbidity [21].
- Frozen shoulder is characterized by severe shoulder pain and functional restriction [24].
- Frozen shoulder has considerable economic impact [28].
- Frozen shoulder typically involves substantial pain, movement restriction, and considerable morbidity [12].
- Frozen shoulder affects approximately 4% of the general population [24].
- Frozen shoulder affects up to 59% of patients with diabetes mellitus [24].
- The disease duration of frozen shoulder varies between 1 and 3 years [24].
- The clinical course of primary (idiopathic) frozen shoulder consists of three phases: pain, stiffness, and thawing [3].
- Secondary frozen shoulders may not exhibit all three phases and may not follow the exact chronology of primary frozen shoulder [3].

- Primary frozen shoulder is characterized by progressive pain and stiffness which usually resolves spontaneously after about 18 months [4].
- In Phase I (Pain), patients experience a gradual onset of diffuse shoulder pain that is progressive over weeks to months [3].
- The pain in Phase I is usually worse at night and exacerbated by lying on the affected side [3].
- In Phase II (Stiffness), patients restrict movement to seek pain relief, leading to stiffness that usually lasts 4 to 12 months [3].
- During Phase II, patients have difficulty with activities of daily living, such as men reaching back pockets or women fastening brassieres [3].
- In Phase II, a dull ache is present nearly all the time, especially at night, often accompanied by sharp pain during range of motion at or near new endpoints [3].
- In Phase III (Thawing), motion increases and pain diminishes over weeks or months [3].
- Without treatment, motion return in Phase III is gradual and may never objectively return to normal, though patients often subjectively feel near normal [3].
- The natural history of frozen shoulder involves pain that increases in severity, prevents sleeping on the affected side, and subsides after several months [4].
- As pain subsides in frozen shoulder, stiffness becomes more prominent and persists for another 6–12 months if untreated [4].
- Movement is gradually regained in frozen shoulder but may not return to normal [4].
- Patients with frozen shoulder are typically aged 40–60 years [4].
- Patients with frozen shoulder may give a history of trauma, often trivial, followed by pain [4].
- Physical examination of frozen shoulder usually reveals slight muscle wasting and tenderness [4].
- Movements in frozen shoulder are always limited, and the shoulder may be extremely stiff in severe cases [4].
- X-rays in frozen shoulder are normal; their main role is to exclude other causes of pain and stiffness [4].
- Post-traumatic stiffness is characterized by stiffness without much pain that is maximal at the start and gradually lessens, unlike the pattern of frozen shoulder [4].
- Disuse stiffness occurs if the arm is nursed overcautiously and lacks the characteristic pain pattern of frozen shoulder [4].
- Complex regional pain syndrome may follow acute trauma or occur in patients with myocardial infarction or stroke, presenting features similar to frozen shoulder [4].
- Rheumatoid arthritis and osteoarthritis can affect the shoulder bilaterally and are usually obvious on X-ray [4].
- Primary frozen shoulder is defined by total elevation restricted to 135° or less [20].
- In primary frozen shoulder, motion restriction is localized to the humero-scapular joint [20].
- Primary frozen shoulder excludes cases with post-traumatic conditions, rheumatoid arthritis, osteoarthritis, hemiplegia, or other obvious changes in history or examination [20].

- Secondary frozen shoulder involves decreased range of motion following a traumatic lesion, such as soft tissue injury or fractures of the upper limb [20].
- Stage 1 (pain) of frozen shoulder lasts 10 to 36 weeks [20].
- In Stage 1 of frozen shoulder, there is no difference in presentation between men and women, affected dominant and nondominant shoulders, or correlation with age [20].
- In the early stages of frozen shoulder, there is a full range of movement under anesthesia [20].
- Frozen shoulder following COVID-19 vaccination may present with clinical features similar to idiopathic frozen shoulder [39].
- Frozen shoulder can occur after COVID-19 vaccination [41].
- Frozen shoulder is particularly associated with diabetes, Dupuytren's disease, hyperlipidaemia, hyperthyroidism, cardiac disease, and hemiplegia [4].
- Most patients clinically diagnosed with primary frozen shoulder had undiagnosed systemic abnormalities and/or intra-articular pathologies [5].
- MR findings in frozen shoulder should not replace clinical judgments regarding further prognosis and treatment decisions [7].
- 18F-FDG PET/CT is clinically relevant in diagnostically challenging cases, such as distinguishing the first phase of frozen shoulder from subacromial impingement [11].
- Unusual stiffness and pain in the shoulder of a young female patient suggests a wide range of disease entities, including infection [23].
- Misdiagnosing shoulder tumors as frozen shoulder syndrome is likely to cause a significant delay in making a correct diagnosis [40].
- A detailed clinical history and examination is critical in the assessment of a painful, stiff shoulder to avoid misdiagnosis of conditions like malignant shoulder girdle tumours [1].

## Investigations

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- A detailed clinical history and examination is critical in the assessment of a painful, stiff shoulder [1].
- Frozen shoulder is a specific, painful and debilitating condition affecting patients mainly in middle age [6].
- The term frozen shoulder should be reserved for a well-defined disorder characterized by progressive pain and stiffness which usually resolves spontaneously after about 18 months [4].
- The histological features of frozen shoulder are reminiscent of Dupuytren's disease, with active fibroblastic and myofibroblastic proliferation in the rotator interval, anterior capsule and coracohumeral ligament [4].
- Conditions particularly associated with frozen shoulder include diabetes, Dupuytren's disease, hyperlipidaemia, hyperthyroidism, cardiac disease, and hemiplegia [4].
- Patients with frozen shoulder are typically aged 40–60 years [4].
- Patients may give a history of trauma, often trivial, followed by pain that gradually increases in severity and often prevents sleeping on the affected side [4].

- Pain begins to subside after several months, but stiffness becomes more problematic; untreated stiffness persists for another 6–12 months before movement is gradually regained, which may not return to normal [4].
- Clinical examination usually reveals slight muscle wasting and tenderness, with always limited movements and extreme stiffness in severe cases [4].
- X-rays are normal in frozen shoulder, and their main role is to exclude other causes of pain and stiffness [4].
- Post-traumatic stiffness may persist for some months after severe shoulder injury but is maximal at the start and gradually lessens, unlike the pattern of frozen shoulder [4].
- Disuse stiffness may occur if the arm is nursed overcautiously, such as following a wrist fracture, and lacks the characteristic pain pattern of frozen shoulder [4].
- Complex regional pain syndrome may follow acute trauma or be seen in patients with myocardial infarction or stroke, and its features can be similar to those of frozen shoulder [4].
- Both rheumatoid arthritis and osteoarthritis can affect the shoulder, with diagnosis usually obvious on X-ray, and rheumatoid arthritis may present with characteristic generalized symptoms and signs [4].
- Most patients clinically diagnosed with primary frozen shoulder had undiagnosed systemic abnormalities and/or intra-articular pathologies [5].
- MR findings in frozen shoulder should not replace clinical judgments regarding further prognosis and treatment decisions [7].
- 18F-FDG PET/CT is clinically relevant in diagnostically challenging cases, such as distinguishing the first phase of frozen shoulder from subacromial impingement [11].
- Unusual stiffness and pain in the shoulder of a young female patient suggests a wide range of disease entities, from simple frozen shoulder to infection [23].
- Routine use of shoulder MRI scans in patients with frozen shoulder but without suspicion of additional pathology may not be indicated [31].
- Imaging is an essential tool for evaluation of patients with shoulder pain, and understanding the extent of an injury with imaging is key to successful management [37].
- Physicians should re-examine frozen shoulder patients with repeated plain radiographs and further imaging, especially MRI, if conservative therapy fails [56].
- MR arthrography reveals characteristic findings in patients with frozen shoulder [58].
- T2 signal hyperintensity and axillary capsule thickening are characteristic of the early stages of frozen shoulder, although MRI alone cannot completely define the disease stage [71].
- The burning sign is an abnormal finding that appears in dynamic MRI of severe frozen shoulder [73].
- Dynamic MRI semiquantitatively demonstrated a reduction in abnormal blood flow and improvement in clinical results after manipulation under cervical nerve root block (MUC) in patients with frozen shoulder [77].
- Clinical improvement in patients with frozen shoulder was associated with a decrease in the coefficient of enhancement (CE) in the glenohumeral synovium following intraarticular injections of hyaluronate [81].
- There may be a causal relationship between hypothyroidism and frozen shoulder [85].

- Patients who underwent image-guided (ultrasound) injections had statistically significant greater improvement in shoulder pain and function at 6 weeks after injection compared to blind injections [86].
- MR imaging of patients with severe frozen shoulder after MUC showed 29 capsule tears, 4 labrum tears, and 15 bone bruises of the humeral head [87].

## Treatment

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### NON-OPERATIVE MANAGEMENT

- Treatment for frozen shoulder aims to improve pain and function through a shared decision-making process, utilizing a step-up approach from conservative measures to invasive treatments if symptoms persist [28].
- Health professionals manage frozen shoulders differently depending on the phase of the condition [16].
- There is insufficient evidence to reliably recommend a single treatment approach for frozen shoulder [32].
- There is limited evidence of the effectiveness of different forms of treatment used for frozen shoulder, with many studies carrying a moderate to high risk of bias and omitting details of symptom duration or condition phase [74].
- The variety of participants, methods, interventions, and outcomes across trials provides limited new evidence to inform non-surgical management [14].
- Conservative treatment is effective for the treatment of frozen shoulder regardless of the severity of symptoms [45].
- Intra-articular steroid injection is effective and safe for frozen shoulder, relieving pain, improving functional performance, and increasing range of motion [48].
- Multisite corticosteroid injection therapy is more effective than single intra-articular injection in terms of pain relief, restoration of motion, and functional status for primary frozen shoulder [46].
- Both multisite and single glenohumeral injections of corticosteroid are effective in patients with primary frozen shoulder [49].
- Ultrasound-guided administration of corticosteroid injections into the glenohumeral joint increases the likelihood of successful injection but does not improve clinical outcomes at 12 weeks compared with blind administration [52].
- Ultrasound-guided multisite injection is a nonsurgical treatment technique for frozen shoulder that emphasizes correct injection sites [72].
- Hydrodilatation has emerged as a potential nonsurgical option in the management of frozen shoulder, but its role has yet to be fully clarified [60].
- Management of frozen shoulder stage II to III using hydrodistension and a guided exercise programme by physiotherapists in primary care is an effective non-operative treatment strategy [66].
- Further treatment was indicated in 41% of patients who could not tolerate more than 20 mL of injection during hydrodilatation [34].

- Recurrence of frozen shoulder after hydrodilatation was more common in primary (33%) versus secondary (16%) frozen shoulder [34].
- A central nervous system-focused treatment approach is being evaluated in a randomized clinical trial to compare effectiveness against standard medical and physical therapy care [42].
- The comparative effectiveness of low-level laser therapy versus muscle energy technique is being evaluated in a randomized controlled trial to determine the optimal treatment approach for frozen shoulder related to diabetes [47].

## OPERATIVE AND PROCEDURAL MANAGEMENT

- Secondary frozen shoulder may be more recalcitrant to conventional conservative treatment [64].
- The study on arthroscopic capsular release timing adds information for shared decision-making but should not be a plea for surgery for patients with a mean duration of symptoms of 4 months; a strict definition of recalcitrant idiopathic frozen shoulder is needed to prevent unnecessary interventions [10].
- The arthroscopic 360° release is an effective and safe treatment modality for severe or recalcitrant frozen shoulder [53].
- A combination of limited capsular release and manipulation under anaesthesia (MUA) for primary frozen shoulder is a safe and effective procedure resulting in marked improvement in pain, function, and range of motion [55].
- The mid-term outcomes of transcatheter arterial micro embolization (TAME) for frozen shoulders resistant to conservative treatments are encouraging and warrant further evaluation [50].
- Manipulation under anesthesia versus physiotherapy treatment in stage two of a frozen shoulder is being evaluated in a randomized controlled trial to provide evidence on the best treatment strategy [51].
- Different treatment strategies for frozen shoulder may be appropriate depending on the location of pathology [9].

## Complications

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- Frozen shoulder is a painful and debilitating condition [6].
- Frozen shoulder causes significant morbidity [21].
- The natural history of primary frozen shoulder consists of three phases: pain, stiffness, and thawing [3].
- Primary frozen shoulder usually resolves spontaneously after about 18 months [4].
- Without treatment, motion return in primary frozen shoulder is gradual and may never objectively return to normal [3].
- In the long term, 41% of patients with frozen shoulder report some ongoing symptoms [30].
- Postoperative frozen shoulder is a serious complication after shoulder surgery with an incidence of 11% [54].
- Preoperative frozen shoulder negatively affects functional outcomes, including range of motion, at 6 months and 1 year postoperatively following arthroscopic rotator cuff repair [33].

- Preoperative frozen shoulder positively affects rotator cuff healing [33].
- Patients with diabetes should be monitored more closely for frozen shoulder, as they may experience persistent pain or lack of function long-term [8].
- An age between 46 and 60 years is a statistically significant risk factor for developing frozen shoulder after simple arthroscopic shoulder procedures [29].
- A previous history of contralateral frozen shoulder is a statistically significant risk factor for developing frozen shoulder after simple arthroscopic shoulder procedures [29].
- Most patients clinically diagnosed with primary frozen shoulder have undiagnosed systemic abnormalities and/or intra-articular pathologies [5].
- Recurrence of frozen shoulder after manipulation under anaesthetic (MUA) can occur, but late recurrence is uncommon [22].
- Patients with poor outcomes or recurrent symptoms after MUA can be offered a further MUA with an expectation of good outcome and low complication rate [17].

## Recovery

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- Primary (idiopathic) frozen shoulder consists of three phases: Pain, Stiffness, and Thawing [3].
- Secondary frozen shoulders may not exhibit all three phases and may not follow the exact chronology of primary frozen shoulder [3].
- Phase I (Pain) involves a gradual onset of diffuse shoulder pain that is progressive over weeks to months [3].
- Pain in Phase I is usually worse at night and exacerbated by lying on the affected side [3].
- Phase II (Stiffness) usually lasts 4 to 12 months [3].
- During Phase II, patients restrict movement to seek pain relief, leading to difficulty with activities of daily living such as reaching back pockets or fastening brassieres [3].
- Phase II is accompanied by a dull ache present nearly all the time, especially at night, and sharp pain during range of motion at or near new endpoints [3].
- Phase III (Thawing) lasts for weeks or months, during which motion increases and pain diminishes [3].
- Without treatment, motion return in Phase III is gradual in most patients [3].
- Objective motion may never return to normal, although most patients subjectively feel near normal due to compensation or adjustment in activities of daily living [3].
- Frozen shoulder affects approximately 4% of the general population and up to 59% in patients with diabetes mellitus [24].
- The disease duration of frozen shoulder varies between 1 and 3 years [24].
- In the long term, 59% of patients with frozen shoulder have normal or near normal shoulders [30].
- In the long term, 41% of patients with frozen shoulder report some ongoing symptoms [30].
- 94% of patients with spontaneous frozen shoulder recover to normal levels of function and motion without treatment [69].

- Idiopathic frozen shoulder is a self-limiting condition in which symptoms subside and full shoulder movement returns within a maximum of two years from the onset of symptoms [88].
- Idiopathic frozen shoulder is a self-limiting condition in which symptoms subside and full shoulder movement returns within a maximum of two years from the onset of symptoms [89].
- Long-term outcome after manipulation under anaesthetic (MUA) for frozen shoulder is favourable with late recurrence being uncommon [22].
- Patients with poor outcome or recurrent symptoms after MUA should be offered a further MUA with the expectation of a good outcome and a low complication rate [17].
- Arthroscopic capsular release leads to a faster and long-lasting recovery in patients with refractory primary frozen shoulder syndrome [35].
- The long-term results of arthroscopic capsular release in frozen shoulder were confirmed in 255 patients [36].
- MUA in stage 2 frozen shoulder results in a faster recovery of range of motion and improved functional outcome compared to physiotherapy alone in the short term [68].
- MUA in stage 2 frozen shoulder can be considered safe compared to physiotherapy alone in the short term [68].
- Early surgical intervention might shorten the overall duration of symptoms in frozen shoulder [19].
- Early surgical intervention is not associated with inferior clinical outcomes when compared with late surgical intervention [19].
- Timing has a significant influence on the outcome of manipulation for frozen shoulders [90].
- Diabetes is a poor prognostic factor for the conservative treatment of frozen shoulder [82].
- Male sex is a poor prognostic factor for the conservative treatment of frozen shoulder [82].
- Simultaneous bilateral involvement is a poor prognostic factor for the conservative treatment of frozen shoulder [82].
- Subsequent bilateral involvement is a poor prognostic factor for the conservative treatment of frozen shoulder [82].
- A longer duration of symptoms recorded at the first visit is a poor prognostic factor for the conservative treatment of frozen shoulder [82].
- Clinicians should monitor frozen shoulder patients with diabetes more closely and offer further treatment if pain or lack of function persist long-term [8].
- Preoperative frozen shoulder negatively affected most functional outcomes, including range of motion, at 6 months and 1 year postoperatively after arthroscopic rotator cuff repair [33].
- Preoperative frozen shoulder positively affected rotator cuff healing after arthroscopic rotator cuff repair [33].

# Key Evidence

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- [L4] A detailed clinical history and examination is critical in the assessment of a painful, stiff shoulder. ([10.1186/1477-7800-2-2](#))
- [L1] This updated guideline provides evidence-based guidance for managing frozen shoulder and identifies key areas for future research. ([10.1177/17585732251335955](#))
- [L4] Most patients clinically diagnosed with primary frozen shoulder had undiagnosed systemic abnormalities and/or intra-articular pathologies. ([10.5397/cise.2018.21.2.82](#))
- [Paper] Frozen shoulder is a specific, painful and debilitating condition effecting patients mainly in middle age. ([10.1016/j.maturitas.2014.02.009](#))
- [L4] MR findings in frozen shoulder should not replace clinical judgments regarding further prognosis and treatment decisions. ([10.1007/s00167-015-3887-y](#))
- [L2] If high-quality studies can confirm the findings of this review, then clinicians should monitor frozen shoulder patients with diabetes more closely and offer further treatment if pain or lack of function persist long-term. ([10.1016/j.arrct.2021.100141](#))
- [L5] Different treatment strategies for frozen shoulder may be appropriate, depending on the location. ([10.1016/j.jse.2018.03.010](#))
- [L5] The study adds information for shared decision-making but should not be a plea for surgery for patients with a mean duration of symptoms of 4 months; a strict definition of recalcitrant idiopathic frozen shoulder is needed to prevent unnecessary interventions. ([10.1177/2325967120903710](#))
- [L2] This is clinically relevant in diagnostically challenging cases, for instance in the first phase of frozen shoulder, which can be difficult to distinguish from subacromial impingement. ([10.1007/s00167-020-05937-2](#))
- [L5] Frozen shoulder is a poorly understood condition that typically involves substantial pain, movement restriction, and considerable morbidity. ([10.1016/j.math.2014.07.006](#))
- [L1] The variety of participants included/excluded in trials and the variety of methods, interventions and outcomes used across the trials provided limited new evidence to inform the non-surgical management and treatment of people with frozen shoulder. ([10.2340/16501977-2578](#))
- [L4] The etiology of frozen shoulder is still not known and our understanding of the pathogenesis is limited. ([10.3109/03009749009096786](#))
- [L4] Health professionals manage frozen shoulders differently for different phases of the condition. ([10.1111/j.1758-5740.2010.00073.x](#))
- [L4] Patients with a poor outcome or recurrent symptoms of a frozen shoulder after a MUA should be offered a further MUA with the expectation of a good outcome and a low complication rate. ([10.1302/0301-620x.99b6.bjj-2016-1133.r1](#))
- [L3] Early surgical intervention might shorten the overall duration of symptoms in frozen shoulder and is not associated with inferior clinical outcomes when compared with late surgical intervention. ([10.1016/j.jse.2020.07.023](#))

- [L4] Frozen shoulder is a common disease which causes significant morbidity. ([10.5312/wjo.v6.i2.263](#))
- [L3] Long-term outcome after MUA for frozen shoulder is favourable with late recurrence being uncommon. ([10.1177/17585732211070007](#))
- [L5] Unusual stiffness and pain in the shoulder of a young female patients suggests a wide range of disease entities, from simple frozen shoulder to (albeit rarely) infection. ([10.1016/j.radcr.2020.08.006](#))
- [L1] This systematic review presents a summary of what is currently known about the tissue pathophysiology of primary frozen shoulder. ([10.1186/s12891-016-1190-9](#))
- [L4] Frozen shoulder is a painful and debilitating condition with considerable economic impact; treatment aims to improve pain and function through a shared decision-making process, with a step-up approach from conservative measures to invasive treatments if symptoms persist. ([10.1177/1758573215601779](#))
- [L3] An age of between 46 and 60 years and a previous history of contralateral frozen shoulder were statistically significant risk factors. ([10.1302/0301-620x.97b7.35387](#))
- [L3] In the long term, 59% of patients had normal or near normal shoulders and 41% reported some ongoing symptoms. ([10.1016/j.jse.2007.05.009](#))
- [L4] Therefore, routine use of shoulder MRI scans in patients with FS but without suspicion of an additional pathology may not be indicated. ([10.1016/j.jseint.2022.05.009](#))
- [L1] There is insufficient evidence to reliably recommend a treatment approach for frozen shoulder. ([10.1136/bmj.i4162](#))
- [L3] Preoperative frozen shoulder positively affected rotator cuff healing but negatively affected most functional outcomes, including ROM, at 6 months and 1 year postoperatively. ([10.1177/2325967120934449](#))
- [L4] Further treatment was indicated in 41% of patients who could not tolerate more than 20 mL of injection, and recurrence was more common in primary (33%) versus secondary (16%) frozen shoulder. ([10.1177/17585732221124914](#))
- [Paper] In patients with refractory primary frozen shoulder syndrome, arthroscopic capsular release emerges as a suitable option that leads to a faster and long-lasting recovery. ([10.1016/j.eats.2015.06.004](#))
- [L4] The long-term results of arthroscopic capsular release in frozen shoulder were confirmed in 255 patients. ([10.1186/s13018-018-0758-5](#))
- [L4] Imaging is an essential tool for evaluation of patients with shoulder pain; understanding the extent of an injury with imaging is key to successful management. ([10.1016/j.csm.2013.03.009](#))
- [L4] However, classification of frozen shoulder was found to be controversial. ([10.4055/cios.2020.12.1.60](#))
- [L4] Frozen shoulder following COVID-19 vaccination may present with clinical features similar to those of idiopathic frozen shoulder. ([10.1016/j.xrrt.2023.09.013](#))
- [L2] Misdiagnosing shoulder tumors as frozen shoulder syndrome is likely to cause a significant delay in making a correct diagnosis. ([10.1016/j.jse.2009.05.010](#))
- [L4] Frozen shoulder can occur after COVID-19 vaccination, and musculoskeletal specialists should be aware of this diagnosis to identify and treat such patients early. ([10.1016/j.jseint.2022.02.013](#))

- [Paper] The trial aims to compare the effectiveness of a CNS-directed treatment program versus standard medical and physical therapy care on outcomes in participants with frozen shoulder. ([10.1186/s13063-019-3585-z](#))
- [L4] The survey shows lower rates of agreement among the JSS members than the ASES members for the definition of primary frozen shoulder, the classification of primary and secondary frozen shoulder, and the divisions of secondary frozen shoulder. ([10.1016/j.jos.2018.12.012](#))
- [L4] Symptomatic subjects demonstrated substantial kinematic deficits during humeral range of motion. ([10.1016/s0003-9993\(03\)00359-9](#))
- [L3] Conservative treatment is effective for the treatment of frozen shoulder. ([10.1016/j.asmr.2025.101149](#))
- [Commentary] Multisite corticosteroid injection therapy is more effective in terms of pain relief, restoration of motion, and functional status than single intra-articular injection for the treatment of primary frozen shoulder. ([10.1016/j.arthro.2021.02.028](#))
- [L2] The findings of the study may provide evidence on the efficacy of these interventions and most likely, the optimal treatment approach for frozen shoulder related to diabetes, which may guide clinical practice. ([10.1186/s13018-024-04735-7](#))
- [L1] Intra-articular steroid injection is effective and safe for frozen shoulder, relieving pain, improving functional performance, and increasing range of motion. ([10.1177/0363546516669944](#))
- [L1] Both treatments were effective in patients with primary frozen shoulder. ([10.1016/j.arthro.2021.01.069](#))
- [Abstract] The mid-term outcomes of TAME for frozen shoulders that were resistant to conservative treatments are encouraging and warrant further evaluation. ([10.1016/j.jse.2016.11.031](#))
- [L2] Successful completion of this trial will provide evidence on the best treatment strategy for patients with a stage two frozen shoulder. ([10.1186/s12891-017-1763-2](#))
- [L1] In patients with frozen shoulder, US-guided administration of corticosteroid injections into the glenohumeral joint increased the likelihood of successful injection but did not improve clinical outcomes at 12 weeks compared with blind administration. ([10.2106/jbjs.21.01007](#))
- [L4] The arthroscopic 360° release is an effective and safe treatment modality for severe or recalcitrant frozen shoulder. ([10.1016/j.jseint.2024.07.006](#))
- [L2] Postoperative frozen shoulder is a serious complication after shoulder surgery, with an incidence of 11%. ([10.1007/s00402-016-2589-3](#))
- [L4] A combination of limited capsular release and MUA for the treatment of primary frozen shoulder is a safe and effective procedure resulting in marked improvement in pain, function and range of motion. ([10.1177/1758573215578590](#))
- [L4] Physicians should re-examine frozen shoulder patients with repeated plain radiographs and further imaging, especially MRI, if conservative therapy fails. ([10.1016/j.jse.2011.07.026](#))
- [L4] This survey summarized the trend in prevalent practices regarding frozen shoulder among shoulder specialists and senior shoulder surgeons of SESI, revealing strong consensus on imaging and nonoperative

management but disagreement on terminology and specific surgical complications.

([10.1177/23259671221118834](#))

- [L4] MR arthrography reveals characteristic findings in patients with frozen shoulder. ([10.1148/radiol.2332031219](#))
- [L3] The anatomical structure of passive shoulder restraints has no impact on the difference in passive joint position sense values between external and internal rotation. ([10.1186/s12891-016-0971-5](#))
- [L5] Hydrodilatation has emerged as a potential nonsurgical option in the management of frozen shoulder, but its role has yet to be fully clarified. ([10.1302/2058-5241.2.160061](#))
- [L5] This scoping review outlines the complexity of the pathophysiology of frozen shoulder and provides a comprehensive overview of pathophysiologic mechanisms. ([10.1186/s40634-020-00307-w](#))
- [L4] Secondary frozen shoulder may be more recalcitrant to conventional conservative treatment. ([10.1016/j.jor.2015.01.030](#))
- [L4] This service evaluation demonstrates that management of frozen shoulder stage II to III, as conducted by physiotherapists in a primary care setting utilizing hydrodistension and a guided exercise programme, represents an effective non-operative treatment strategy. ([10.1177/1758573217701063](#))
- [L1] MUA in stage 2 frozen shoulder can be considered safe and results in a faster recovery of range of motion and improved functional outcome compared to physiotherapy alone in the short term. ([10.1016/j.jseint.2023.11.004](#))
- [L4] We found 94% of patients with spontaneous frozen shoulder recovered to normal levels of function and motion without treatment. ([10.1007/s11999-011-2176-4](#))
- [L5] MUA and ACR are good treatment options for primary frozen shoulder; MUA is simpler but carries risks of serious complications, while ACR may be safer if performed by experienced surgeons and is convenient for patients with combined rotator cuff tears. ([10.5397/cise.2020.00311](#))
- [L5] T2 signal hyperintensity and axillary capsule thickening are characteristic of the early stages of frozen shoulder, although MRI alone cannot completely define the disease stage. ([10.1016/j.xrrt.2024.05.002](#))
- [L5] This technique is presented for the nonsurgical treatment of frozen shoulder, emphasizing correct injection sites. ([10.1016/j.eats.2022.06.020](#))
- [L4] The burning sign is an abnormal finding that appears in dynamic MRI of severe frozen shoulder. ([10.1016/j.jse.2016.06.003](#))
- [L2] There is limited evidence of the effectiveness of different forms of treatment used for frozen shoulder, with many studies evaluating treatment effects carrying a moderate to high risk of bias and omitting details of the duration of symptoms or the phase of the condition. ([10.1111/j.1758-5740.2010.00067.x](#))
- [L5] Pathomechanics of the frozen shoulder characterised by glenohumeral motion limitations should be considered complicated, as confirmed by high tension in the anteroinferior glenohumeral capsule and altered scapular motion. ([10.1016/j.jseint.2025.04.003](#))
- [L4] Dynamic MRI semiquantitatively demonstrated a reduction in abnormal blood flow and improvement in clinical results after MUC in patients with frozen shoulder. ([10.1016/j.jseint.2021.12.007](#))

- [L4] Patients with frozen shoulder presented with altered shoulder muscle activity and kinematics, and one-session of heat and manual muscle release showed beneficial effects on shoulder muscle performance, kinematics, mobility, and pain. ([10.1186/s12891-017-1867-8](#))
- [L3] The thickness of the inferior glenohumeral joint capsule in the 80° scapular plane elevated arm position was shown to be a highly reliable and valid method. ([10.1016/j.jseint.2024.06.004](#))
- [L4] SHR of the affected shoulder is inversely related to severity of limitation of shoulder range of motion, which suggests a compensatory pattern. ([10.1016/j.jbiomech.2007.09.004](#))
- [L4] Clinical improvement in patients with frozen shoulder was associated with a decrease in the coefficient of enhancement (CE) in the glenohumeral synovium. ([10.1007/s00776-004-0766-7](#))
- [L2] Diabetes, male sex, simultaneous bilateral involvement, subsequent bilateral involvement, and a longer duration of symptoms recorded at the first visit were identified as poor prognostic factors for the conservative treatment of frozen shoulder. ([10.1016/j.jos.2019.03.011](#))
- [L2] Our MR analysis suggests that there may be a causal relationship between hypothyroidism and frozen shoulder. ([10.1186/s12891-024-07826-y](#))
- [L1] Patients who underwent image-guided (ultrasound) injections had statistically significant greater improvement in shoulder pain and function at 6 weeks after injection compared to blind injections. ([10.1186/1471-2474-12-137](#))
- [L4] MR imaging of patients with severe frozen shoulder after MUC showed 29 capsule tears, 4 labrum tears, and 15 bone bruises of the humeral head. ([10.1016/j.jse.2015.06.019](#))
- [L4] In the great majority of patients idiopathic frozen shoulder is a self-limiting condition, in which symptoms subside and full shoulder movement returns within a maximum of two years from the onset of symptoms. ([10.2106/00004623-197860040-00030](#))
- [L4] In the great majority of patients idiopathic frozen shoulder is a self-limiting condition, in which symptoms subside and full shoulder movement returns within a maximum of two years from the onset of symptoms. ([10.2106/00004623-197860040-00029](#))
- [L4] Timing has a significant influence on the outcome of manipulation for frozen shoulders. ([10.1016/j.jos.2020.11.002](#))

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