Adhesive Capsulitis

Indexing Metadata/Description

› **Title/condition:** Adhesive Capsulitis
› **Synonyms:** Capsulitis, adhesive; frozen shoulder; frozen shoulder syndrome; pericapsulitis; periarthritis; scapulohumeral periarthritis; periarthritis humeroscapularis; capsular syndrome
› **Anatomical location/body part affected:** Shoulder joint/capsuloligamentous tissue, coracohumeral ligament
› **Area(s) of specialty:** Orthopedic Rehabilitation
› **Description**

- As its name implies, adhesive capsulitis (AC) ("frozen shoulder") is characterized by capsular stiffness that limits movement of the glenohumeral joint
- There is painful, gradual loss of both active and passive ROM\(^{(15)}\)
- In most cases, AC progresses in loosely defined stages\(^{(7,15-23)}\)
  - Painful/acute ("freezing") stage (Stage 1): Duration of symptoms is 3 to 9 months. Pain-restricted mobility. Pain is at night and at rest. 50% (or more than 30°) loss in passive external rotation
  - Adhesive/chronic ("frozen") stage (Stage 2): Duration of symptoms is 4 to 12 months. Painful only at end-range movements. Fibrosis develops, pain decreases (compared to stage 1), increasing stiffness and restricted movements
  - Recovery ("thawing") stage (Stage 3): Duration of symptoms is 15 to 24 months. Minimal pain. ROM progressively improves
- Conservative management involves analgesics and intraarticular corticosteroid injections for pain in the initial stage, with greater emphasis on physical therapy and manual therapy in later stages\(^{(15)}\)
› **Incidence and prevalence of AC\(^{(7,15)}\)**
- 2% to 5% of the general population
- 10% to 20% of patients with diabetes mellitus (DM)\(^{(23)}\)
- Mostly aged 40–60
- More common in women than men
- 20% to 30% of patients also develop AC in the contralateral shoulder
› **ICD-10 codes**
- M75.00 Adhesive capsulitis of unspecified shoulder
- M75.01 Adhesive capsulitis of right shoulder
- M75.02 Adhesive capsulitis of left shoulder

(ICD codes are provided for the reader’s reference, not for billing purposes)
› **Reimbursement:** Reimbursement for therapy will depend on insurance contract coverage. No special agencies are applicable for this condition. No specific issues or information regarding reimbursement has been identified
› **Presentation/signs and symptoms**\(^{(7)}\)
- Consensus opinion on clinical features of the initial stage
  - Onset of the disorder is typically > 35 years of age
  - A strong component of night pain in most cases
- Increased pain with rapid or unguarded movement
- Discomfort lying on the affected shoulder
- Pain easily aggravated by movement
- Pain at the end range in all directions
- Global loss of AROM and PROM of glenohumeral joint

• Restricted mobility in shoulder forward flexion, abduction, internal rotation, external rotation
• Low to high level of chronic pain
• Mild to severe disability (depending on amount of restriction and pain and whether dominant arm is affected)
• In patients with DM, 10–20% will have AC. Compared to the general population the mean age of onset is lower, duration is longer, and response to treatment is lower. Bilateral shoulder involvement is seen more among the diabetic population\(^{(23)}\)
• In a meta-analysis performed in the United Kingdom, 18 articles were identified on the prevalence of AC in the diabetic population\(^{(26)}\)
  – Patients with DM were 5 times more likely than controls to have AC
  – Overall prevalence of AC in DM patients is estimated at 13.4%
  – Overall prevalence of DM in AC is estimated at 30%
  – Authors concluded that screening for DM should be considered for patients presenting with AC

### Causes, Pathogenesis, & Risk Factors

#### Causes
- Two main forms of AC\(^{(22)}\)
  – Primary/idiopathic/etiology unknown
  – Secondary to associated precipitating factors
    - Prior injury (e.g., proximal humerus fracture, labral tear)
    - Surgery (e.g., breast cancer surgery with lymph node resection)
    - Disuse or prolonged immobilization
    - Metabolic disorders (e.g., diabetes, thyroid disease)

#### Pathogenesis
- The exact etiology is unknown in primary, idiopathic AC and usually is unclear in secondary AC. In secondary AC there is an unknown stimulus that produces histological capsular changes. Secondary AC may develop after a variety of antecedent episodes, including trauma to arm, upper extremity immobilization, myocardial infarction, pulmonary cancer or infection, rheumatoid arthritis, or diabetes\(^{(27)}\)
- Abnormal histological findings in the capsular tissue include hypertrophy, hypervascular synovitis, angiogenesis, perivascular and subsynovial scarring, and fibroplasia\(^{(2)}\)
- Elevated serum cytokines and other growth factors such as TGF-beta are involved in the pathogenesis. The stimulation of synovitis leads to fibrosis and capsular thickening\(^{(22)}\)
- Shoulder stiffness and pain restrict arm function in a capsular pattern (greater limitation of external rotation than abduction, and lesser for internal rotation). Thickening of the rotator cuff tendons is common and the GH joint space is greatly diminished. Progression of AC includes contracture of the coracohumeral ligament. Greater than 50% reduction in passive external rotation compared to uninvolved side is common in AC\(^{(2)}\)

#### Risk factors
- Conditions associated with secondary AC\(^{(27)}\)
  – Diabetes mellitus\(^{(23,26)}\)
  – Thyroid disease
  – Shoulder trauma
  – Inflammatory arthritis
  – Myocardial infarction
  – Lung cancer
  – Tuberculosis
  – Chronic lung disease
  – Stroke with hemiplegia
  – Scleroderma
- Breast cancer, post mastectomy
- Cervical radiculitis
- Atherosclerotic disease
- Pulmonary tuberculosis

- Age > 40 years
- Often involves the nondominant shoulder
- History of recent shoulder injury
- History of adhesive capsulitis

- 20–30% will have reoccurrence in opposite shoulder
- Female sex; 2–4 times more prevalent

**Overall Contraindications/Precautions**
- Modify treatment to accommodate any underlying conditions and diseases associated with secondary AC (diabetes mellitus, thyroid disease, trauma, inflammatory arthritis, myocardial infarction, lung cancer, tuberculosis, chronic lung disease, stroke with hemiplegia, scleroderma, post mastectomy, cervical radiculitis)
- Avoid aggressive stretching, manual therapy, or exercise that increases pain. Respect the patient’s self-reported level of pain at all times
- Clinicians should follow the guidelines of their clinic/hospital and what the patient’s physician orders in regard to the evaluation and treatment intervention. Obtain a written informed consent from the patient or legal caretaker
- Follow physician’s protocol and orders following manipulation or arthrolysis
- See specific **Contraindications/precautions to examination** and **Contraindications/precautions** under Assessment/Plan of Care

**Examination**
- **Contraindications/precautions to examination**
  - In patients who are examined during the first stage of AC, rotator cuff impingement often is mistakenly diagnosed because they may exhibit only mild end-range pain
- **History**
  - **History of present illness/injury**
    - **Mechanism of injury or etiology of illness:** Document onset of pain, any history of trauma, any history of upper-extremity immobilization, or any neurological symptoms concurrent with onset and course of symptoms
  - **Course of treatment**
    - **Medical management:** Inquire about any previous medical services that have been provided. This may include a history of corticosteroid and anesthetic injections. Corticosteroid injections in addition to conservative treatment (i.e., exercise, pain control, patient education, and monitoring) increase shoulder ROM and decrease pain in patients with AC. Capsular release interventions include manipulation/mobilization under anesthesia (MUA) or arthroscopic techniques such as distension of the joint capsule or lysis of capsuloligamentous adhesions
    - For detailed information on capsular release interventions, please see Clinical Review...Adhesive Capsulitis: Capsular Release Interventions; Item Number: T708719
    - **Medications for current illness/injury:** NSAIDs, steroids, and corticosteroids are often prescribed
    - Intra-articular steroid injections have been found to improve ROM, pain, and function of the shoulder in patients with AC
    - For detailed information on intra-articular steroid injections, please see Clinical Review...Adhesive Capsulitis: Intra-Articular Steroid Injections; Item Number: T708715
    - **Diagnostic tests completed:** Imaging studies to rule out other conditions
      - X-ray to rule out glenohumeral or acromioclavicular arthritis, calcific tendonitis, and subacromial spur
      - Routine bloodwork is often obtained to rule out causes of secondary AC (e.g., neoplastic, A1c for DM)
      - MRI will show thickening of axillary pouch in secondary AC
    - **Home remedies/alternative therapies:** Document any use of home remedies (e.g., ice or heating pack) or alternative therapies (e.g., acupuncture) and whether they help
      - Authors of a systematic review and meta-analysis that included 19 RCTs (all conducted in China) on acupuncture at the acupoint tiaokou for AC found that current evidence shows improved shoulder ROM and reduced pain. Authors noted that the current research is not of the highest quality and might not be sufficient to support clinical use
Previous therapy: Document whether patient has had occupational or physical therapy for this or other conditions and what specific treatments were helpful or not helpful.

Aggravating/easing factors (and length of time each item is performed before the symptoms come on or are eased): During the frozen stage, patients commonly report pain only with end-range movement. Does lying on the shoulder disturb sleep?

Body chart: Use body chart to document location and nature of symptoms. Is the dominant arm affected?

Nature of symptoms: Document nature of symptoms (constant vs intermittent, sharp, dull, aching, burning, numbness, tingling)

Rating of symptoms: Use a visual analog scale (VAS) or 0–10 scale to assess symptoms at their best, at their worst, and at the moment (specifically address if pain is present now and how much). Pain is likely to be increased soon after closed manipulation or surgery.

Pattern of symptoms: Document changes in symptoms throughout the day and night, if any (a.m., mid-day, p.m., night); also document changes in symptoms due to weather or other external variables.

Sleep disturbance: Document number of wakings/night.

Other symptoms: Document other symptoms the patient is experiencing that could exacerbate the condition and/or symptoms that could be indicative of a need to refer to physician (e.g., dizziness, sweating, high heart rate).

Barriers to learning

- Are there any barriers to learning? Yes ___ No ___
- If Yes, describe _______________________

Medical history

- Past medical history
  - Previous history: Inquire about previous shoulder problems and any periods of prolonged immobilization. Inquire about any previous shoulder surgery. Any history of contralateral shoulder AC?
  - Comorbid diagnoses: Question regarding cancer, diabetes, and thyroid and other autoimmune diseases
  - Medications previously prescribed: Obtain a comprehensive list of medications prescribed and/or being taken (including OTC drugs)
  - Other symptoms: Ask patient about other symptoms he or she is experiencing

Social/occupational history

- Patient’s goals: Document what the patient hopes to accomplish with therapy and in general
- Vocation/avocation and associated repetitive behaviors, if any: Does the patient work? Is so, does the shoulder pain or stiffness interfere with work-related activities? Does the patient participate in recreational or competitive sports?
- Functional limitations/assistance with ADLs/adaptive equipment: Is the patient having difficulty with ADLs and specific work or leisure activities?
- Living environment: Document information about the living environment including stairs, number of floors in home, and with whom patient lives (e.g., caregivers, family members). Identify if there are barriers to independence in the home; any modifications necessary?

Relevant tests and measures: (While tests and measures are listed in alphabetical order, sequencing should be appropriate to patient medical condition, functional status, and setting)

- Assistive and adaptive devices: Evaluate need for and proper fit of arm sling. Does patient require devices to assist with ADLs?
- Circulation: Assess upper extremity pulses (should not be affected)
- Cranial/peripheral nerve integrity: Full upper-quarter exam to rule out cervical spine and neurological deficits, including assessment of sensation in the involved arm. Axillary nerve damage can be a complication of capsular release surgery, resulting in decreased strength in the deltoid and teres minor and impaired sensation over the lateral shoulder.
- Ergonomics/body mechanics: Observe body mechanics for compensatory mechanisms and scapular substitution during course of evaluation. Ergonomic assessment of workstation setup may be indicated
- Functional mobility (including transfers, etc.): Assess general mobility of affected arm in routine activities. Use a validated functional outcome instrument such as the Disabilities of the Arm, Shoulder, and Hand (DASH) Outcome Measure, the Shoulder Pain and Disability Index (SPADI), or the American Shoulder and Elbow Surgeons (ASES) shoulder scale to assess self-reported functional ability.
- Gait/locomotion: Assess arm swing (often decreased on affected side)
- Joint integrity and mobility: Expect pain at end-range and limited glenohumeral joint mobility. Assess glenohumeral capsular restrictions with joint mobilization. Assess scapular mobility position at rest and mobility
Glenohumeral (GH), acromioclavicular, sternoclavicular, spinal, upper ribs, and full kinetic chain (i.e., elbow) joints should be assessed for ROM, accessory glide, and end-range play, feel, or accessory motions.

**Muscle strength**
- Modify testing according to stage of healing if capsular release is performed
- Shoulder strength might be slightly reduced and is painless with AC
- Assess strength in the upper extremities and compare sides. Note any pain present during testing

**Observation/inspection/palpation** (including skin assessment): Is there any sign of trauma to the shoulder or of trophic changes consistent with complex regional pain syndrome (CRPS)?

**Pain:** Monitor worst pain during strength and ROM assessment using VAS. Note when pain is reported during the ROM assessment (i.e., prior to the end of range or at the end of range)

**Palpation:** Assess for tenderness, warmth, and soft tissue edema
- Diffuse tenderness over the anterior and posterior shoulder is common, but there typically is no pinpoint tenderness
- Assess for tenderness possibly related to concurrent shoulder pathology
  - Rotator cuff tendinopathy/subacromial impingement – there might be tenderness at subacromial point (beneath anterolateral corner of acromion), pain on passive elevation, and possibly other motions
  - Biceps tendinopathy – felt anteriorly but compare with uninvolved side since anterior shoulder is often tender; best felt with shoulder externally rotated; confirm by producing pain by resisting attempt to supinate forearm with elbow bent 90º and against side (Yergason’s test) or resisted forward flexion of shoulder with elbow extended (Speed’s test)
  - Acromioclavicular joint arthritis – tenderness at joint and top of shoulder; extreme elevation and cross-arm adduction usually are painful

**Posture:** Assess for postural dysfunction: forward head, “rounded shoulders” (shoulders internally rotated, scapulae abducted and rotated upward), scoliosis, increased thoracic kyphosis, arm position (patient might hold the involved arm in adduction and internal rotation), and other protective changes

**Range of motion**
- Loss of AROM and PROM in all planes
- Loss of PROM, especially in external rotation and abduction
- Pain intensity at end range similar with AROM and PROM
- Capsular pattern of limitation
- Assess glenohumeral AROM and PROM, including end-feel, with the patient in supine and scapula stabilized. Any detection of crepitus may be indicative of osteoarthritis
- Assess for muscle guarding
- PROM should be improved after joint manipulation or surgery
- Assess scapulothoracic motion
- Gross exam of cervical and thoracic spine and bilateral shoulders
- A patient with AC will generally will present with PROM loss in a capsular pattern; most significant restriction is in external rotation, there is a fair amount of limitation in abduction, and flexion/internal rotation is less limited

**Reflex testing:** Deep tendon reflexes typically are normal in patients with AC

**Self-care/activities of daily living:** (objective testing): Assess limitations in occupational and leisure activities secondary to shoulder pain/stiffness; also assess limitations in performing self-care (e.g., washing hair, tucking in back of shirt)

**Special tests specific to diagnosis**
- Severely restricted external rotation ROM with pain is the principal diagnostic test
- Does scapula move with humerus when arm is abducted to 90º?
- AC unlikely if PROM is full in abduction
- Limitation due to pain only in forward elevation and cross-arm adduction is consistent with rotator cuff tendonitis or acromioclavicular joint arthritis and is not specific for AC
- Shoulder-complex muscle imbalances lead to altered shoulder motion
  - The upper trapezius tends to be more activated than the lower trapezius, causing an imbalance in scapula stabilizers
  - This leads to increased elevation and upward rotation of the scapula during arm elevation in the frontal and sagittal plane
  - “Shrug sign” is characteristic of AC
- During GH joint abduction the scapula migrates upward prior to 60º abduction
- Indicates compensation for lack of capsular extensibility and CNS changes in motor patterns secondary to maladaptive movement

**Assessment/Plan of Care**

› **Contraindications and precautions**
  
  • Only those contraindications/precautions applicable to this diagnosis are mentioned below, including with regard to modalities. Rehabilitation professionals should always use their professional judgment in their assessment and treatment decisions.
  
  • Physical therapy interventions can cause severe pain and can damage subacromial structures when PROM into elevation is used.
    
    – Forcing the shoulder into elevation may increase inflammation, resulting in the formation of more scar tissue.
    
    – Low-load prolonged stretches within the patient’s tolerance are recommended instead.
  
  • Clinicians should follow the guidelines of their clinic/hospital and what is ordered by the patient’s physician. The summary below is meant to serve as a guide, not to replace orders from a physician or the specific protocols of the treatment clinic.
  
  • Contraindications/precautions to use of modalities
    
    – **Cryotherapy** contraindications
      
      - Raynaud’s syndrome
      - Cryoglobulinemia
      - Cold urticaria
      - Paroxysmal cold hemoglobinuria
      - Impaired circulation
      - Over area of nerve regrowth
    
    – **Cryotherapy** precautions
      
      - Hypertension
      - Hypersensitivity to cold
      - Over an acute wound
      - Over superficial nerves
    
    – **Thermotherapy** contraindications
      
      - Decreased circulation
      - Decreased sensation
      - Acute/subacute traumatic and inflammatory conditions
      - Skin infections
      - Impaired cognition or language barrier
      - Malignancy
      - Liniments or heat rubs
      - Presence of or tendency for hemorrhage or edema
    
    – **Electrotherapy** contraindications/precautions
      
      - Do not place electrodes near:
        - Carotid bodies, cardiac pacemakers or implantable cardioverter defibrillators, phrenic nerve or urinary bladder stimulators, phrenic nerve, eyes, gonads
        - Osteomyelitis
        - Hemorrhage
        - Impaired sensation, mental status, communication
        - Cardiovascular disease
        - Malignancy
        - Dermatological conditions
        - Proximity of electromagnetic radiation
        - In pregnant women, near the pelvis, lumbar spine, hips, abdomen
        - In patients with stroke or seizures, near the neck
        - History of spontaneous abortion in pregnant women
    
    – **Therapeutic ultrasound** contraindications; do not use.
- Over the region of a cardiac pacemaker
- Over the pelvis, abdominal, and lumbar regions during pregnancy
- Over the eyes or testes
- In an area with infection or bleeding
- If a tumor or malignancy is present in the area
- In the area of a deep vein thrombosis (DVT) or thrombophlebitis
- Over the heart, stellate, or cervical ganglia
- Over epiphyseal plates

**Therapeutic ultrasound precautions**
- Sensory deficits
- Ineffective communication skills in a patient (e.g., impaired cognition, language barrier)
- Circulatory impairments
- Plastic or metal implants
- Peripheral vascular disease
- Note: Always decrease ultrasound intensity if the patient complains of discomfort

**Low-level laser therapy (LLLT) contraindications**
- Pregnancy
- Over the open fontanelles of children
- Over cancerous lesions
- Over the cornea
- Over endocrine glands
- Over hemorrhaging lesions
- Anatomically, gonads, epiphyseal plates of children, sympathetic ganglia, vagus nerve, and mediastinum should be avoided

**Low-level laser therapy (LLLT) precautions**
- Epilepsy
- Fever
- Malignancy
- Areas of decreased sensation
- Infected tissue

› **Diagnosis/need for treatment:** AC/physical therapy for pain management, functional rehabilitation to improve flexibility and strength, and patient education

› **Rule out**
  - Shoulder fracture
  - Rotator cuff contracture
  - Polymyalgia rheumatica
  - Cervical myelopathy or radiculopathy (C5, C6)
  - CRPS
  - Thoracic outlet syndrome
  - Peripheral nerve entrapment (suprascapular)
  - Other common shoulder conditions
    - Rotator cuff tendinopathy
    - Subacromial impingement
    - Biceps tendinopathy/tenosynovitis
    - Acromioclavicular joint pathology
    - Glenohumeral osteoarthritis
    - Dislocation

› **Prognosis**
  - 60% to 80% of patients respond favorably to conservative treatment
  - Patients are often left with some deficits in GH motion even after “recovery,” although rarely enough to result in functional limitation
  - A 15-year follow-up reported slight limitations in elevation and external rotation
• Reported success rates for patients treated with MUA range from 75% to 100%, with short-term and long-term improvements in pain and mobility\(^{(2)}\)

• Persons with diabetes who have frozen shoulder have worse functional outcomes as measured by disability and quality of life questionnaires than do persons without diabetes with frozen shoulder\(^{(23)}\)

Referral to other disciplines: Orthopedic surgeon as indicated; occupational therapist for deficits in ADLs; pain management

Other considerations
• Patients not responding to physical therapy intervention may be treated with MUA, in which adhesions within the capsule are broken by forceful movement of the shoulder through full range\(^{(4)}\)
  – Risks include complications from anesthesia, labral and tendon tears, and fractures
  – Steroid injections with distension arthrography have been shown to be as effective as MUA and are therefore preferred\(^{(4)}\)

• In China, researchers performed a meta-analysis of RCTs on the effects of intra-articular steroid injection for patients with AC. They concluded that it is a safe and effective treatment option to reduce pain, increase ROM, and improve functional performance\(^{(24)}\)
  – Eight RCTs with 416 patients were included that compared intra-articular steroid injection with no injection or sham
  – Three time intervals were analyzed: 4–6 weeks, 12–16 weeks, and 24–26 weeks post intervention
  – SPADI, passive external rotation, abduction, and flexion ROM all improved at all 3 intervals with the steroid injection group. Internal rotation ROM improved at 12–16 weeks and 24–26 weeks

• Extracorporeal shock wave therapy (ESWT) can be an effective intervention for improving pain and function in patients with AC\(^{(14,18)}\)

  – Researchers from South Korea compared the effects of ESWT versus conservative physical therapy in 30 patients (n = 15 for conservative physical therapy and n = 15 for ESWT) with AC. Treatment was 2 times a week for 6 weeks
    - Outcome measures for this study included pain (measured by VAS) and the Patient-Specific Functional Scale (PSFS)
    - For ESWT, the Vitera device was used. Patients received 1,000 shock waves at 2.5 Hz with energy adjustment varying from 0.01 to 0.16 mJ/mm\(^2\) depending on the patient’s pain tolerance
    - Participants in the conservative physical therapy group were treated with hot packs for 20 minutes, ultrasound therapy for 5 minutes, and IFC (100 bps, 15 minutes)
    - The results show that ESWT can be an effective intervention for mitigating pain and improving shoulder function; however, further research is warranted

  – Researchers in the United Arab Emirates conducted a study on the effectiveness of ESWT for participants with diabetic AC\(^{(22)}\)
    - 20 participants were divided into an experimental group of 10 and a control group of 10
    - The experimental group received ESWT, mobilization, and exercise. The control group received ultrasound, mobilization, and exercise
    - Clinical outcomes improved in both groups; pain reduction, AROM, and DASH were measured weekly for 4 weeks. The experimental group experienced significant pain reduction with a decreased number of therapy sessions and treatment costs when compared to the control group

  – In a study conducted in China with 34 patients who received treatment for AC in the hospital between January 2015 and July 2017, researchers compared the effects of ESWT modeled after the fascial manipulation theory (ESWT-FM) and local extracorporeal shockwave treatment (L-ESWT)\(^{(18)}\)
    - Sessions occurred once weekly and all patients went to 5 sessions
    - Researchers found that pain relief was faster and more significant with the ESWT-FM group

Treatment summary
• There is no consensus as to what treatment is the most effective for AC\(^{(9)}\)

• Physical therapy treatment strategies for AC include joint mobilization, continuous passive motion (CPM), soft tissue mobilization (STM), modalities, therapeutic exercise, and postural education

• Preferred interventions vary depending on the phase in the natural history of the condition. Interventions for the pain-predominant phase tend to differ from interventions for the stiffness-predominant phase\(^{(7,34)}\)

• According to an RCT conducted in Germany, physical therapy focusing on functional movements and performing activities reduces pain and improves ADL performance\(^{(16)}\)
  – N = 33, Mean age: 47 years
- “Activity” group received physical therapy while performing activities
- Conventional therapy consisted of manual therapy and proprioceptive neuromuscular facilitation (PNF)
- Both groups had 30 minutes of therapy for 10 days

• Authors of a systematic review of physiotherapeutic interventions for AC found 12 studies out of 39 reviewed that could be considered high quality (9)
- Results indicate that therapeutic exercises and mobilization can be strongly recommended for reducing pain and improving ROM and function in patients with stages 2 and 3 AC
- High-grade posterior mobilization along with self-exercise is recommended to improve external rotation and abduction PROM
- High-grade mobilization and mobilization with movement (MWM) along with self-exercise is recommended to improve function
- LLLT is suggested for pain relief but not for improving ROM
- Acupuncture along with physical therapy exercises is moderately recommended for pain relief and for improving ROM and function
- Future studies are needed to investigate what specific physiotherapeutic protocols are beneficial

• Joint mobilization
- Scapular mobilization combined with glenohumeral joint mobilization as compared to glenohumeral joint mobilization alone has grade-B evidence for improvement of scapulohumeral mechanics as well as glenohumeral mobility in patients with AC (32)
- Researchers from Turkey compared stretching alone to adding mobilization with stretches in treatment of persons with AC (30)
  - Thirty patients were randomized into the two groups
  - Both groups performed a home exercise program and were treated for 6 weeks (18 sessions)
  - The group that performed stretching exercises and joint mobilization had improved abduction and external rotation ROM and function scores at 1-year follow-up compared to the stretching exercise alone group
- Researchers in India concluded from a study that the effects of Mulligan’s MWM in conjunction with supervised exercises improve ROM, pain, and functional ability in patients with type-2 DM (28)
  - Sixty-six patients with type 2 DM were randomized into 2 groups: the control group received supervised exercises alone and the experimental group received exercises and MWM
  - Participants in both groups received treatment sessions 2x per week for 12 weeks. Participants in the exercise-alone group were directed to do the same exercises at home at least 2x per day
  - The majority of improvements occurred during weeks 6–12
  - Internal rotation and abduction AROM in the MWM group was 20.4 and 23.4 degrees greater, respectively, than in the control group
- MWM may be more effective in increasing scapulohumeral rhythm compared to end-range mobilization (ERM). In a study, MWM was more effective than ERM as indicated by improvements in SPADI and ROM scores (29)
- Researchers from South Korea compared mobilization techniques of Maitland and Kaltenborn and concluded that both techniques are effective in improving pain and ROM in patients with AC (12)
  - Twenty patients with frozen shoulder were randomized into either the Kaltenborn group or Maitland group for 12 therapy sessions, 3 times a week for 4 weeks
  - Outcome measures for this study were pain using the VAS and assessment of internal rotation and external rotation ROM
  - Prior to treatment, both groups received hot packs to the affected shoulder for 20 minutes followed by interferential current (IFC) for 15 minutes. Joint mobilization of their respective groups was later performed
  - Kaltenborn grade III is defined as sustained stretching at an intensity upon which the joint capsule is stretched. Patients are positioned in supine with the scapula fixated with a wedge. Physiotherapist places the humerus in maximal abduction while maintaining 90° of elbow flexion with forearm rotated toward the head. A posterior translation is applied to the humeral head. Translation is applied for 30 seconds for 15 sets over a 10-minute period
  - Maitland grade III anterior-posterior oscillation was performed. Grade III is defined as an intensity that slightly exceeds restriction points of the ROM to provoke tissue resistance, while providing an oscillating movement with a slow and large amplitude. Patients are positioned in supine with the scapula fixated with a wedge. Physiotherapist places the
humerus in maximal abduction while maintaining 90° of elbow flexion with forearm rotated toward the head. An anterior-posterior oscillation is applied for 30 seconds for 10 minutes.

- After 4 weeks, there was a significant decrease in pain and improvements in ROM. There was no significant difference between Maitland and Kaltenborn group in pain or ROM improvements.

- Researchers in Turkey concluded from a one-week study that participants with AC who received cold packs and posterior capsule stretching had improved shoulder flexion and active internal rotation as well as decreased pain severity during activity. The group that received posterior and anterior capsule stretching exercises had decreased pain at rest at night and increased abduction and total elevation movement^{[31]}

• Therapeutic exercise
  - The addition of rotator cuff strengthening exercises to the treatment of AC results in superior outcomes^{[21]}
    - Based on a prospective, parallel-group RCT conducted in India with 42 patients with AC
    - The experimental group received TENS and joint mobilization as well as exercises to strengthen the rotator cuff muscles; control group received only TENS and joint mobilization
    - Treatment program was delivered in 12 sessions over the course of 4 weeks
    - Significantly greater improvements in pain level, shoulder ROM, and shoulder function were seen in the experimental group compared to the control group
    - A hospital-based exercise class might be more effective than individual physiotherapy or a home exercise program to improve AC^{[10]}
      - Based on an RCT conducted in the United Kingdom
      - Seventy-five patients with primary idiopathic AC were randomly assigned to 1 of 3 groups: group exercise class supervised by physiotherapist, individual physiotherapy, or home exercises
      - Outcome measures included ROM, Constant Shoulder Score, Oxford Shoulder Score, SF-36, and Hospital Anxiety and Disability Scale
      - The exercise class group had greater improvement in shoulder symptoms than either the individual therapy group or home exercise group. Improvement in ROM was greater in both physiotherapy groups than in the home exercise group

• Continuous passive motion (CPM)
  - CPM is more effective in reducing pain and improving function in individuals with AC and DM than conventional physical therapy^{[22]}
    - Based on an RCT in Turkey of 41 DM patients with AC
    - The patients were randomized to one of two groups
      - Group 1 – used CPM device; 1 hour/day, 5 days/week, 4 weeks duration
      - Group 2 – conventional physical therapy including ROM, pendulum exercises, and active stretching; 1 hour/day, 5 days/week, 4 weeks duration
      - All patients had hot packs, ultrasound, and TENS regardless of their therapy group
      - After 4 weeks of physical therapy, patients were instructed to continue a home exercise program of pendulum and passive ROM exercises for an additional 8 weeks
      - Outcomes assessed at baseline, 4 weeks, and 12 weeks were VAS for pain at rest, night, and with activity; Constant Shoulder Score; and SPADI
      - Group 1 had greater total improvements in function, flexion and abduction ROM, disability, and pain

• Soft tissue mobilization (STM)
  - STM to the shoulder girdle structures (i.e., infraspinatus, teres minor, supraspinatus, and pectoralis minor muscles) increases shoulder AROM^{[6]}
    - Based on a case study series of 8 patients with AC in the United Kingdom
    - The patients received STM to the shoulder girdle structures and performed progressive stretching and strengthening home exercises

• Regional interdependence: a model for physical therapy treatment based on the concept that physical impairments might be related to remote anatomical locations in the musculoskeletal system. Therapy involves treatment in locations other than the region of the primary complaint^{[12]}
  - In a case series conducted in the United States, 5 consecutive patients with AC received between 11 and 21 sessions over 5 to 10 weeks. Treatment was individualized based on impairments and was modeled on regional interdependence targeting the shoulder, shoulder girdle, and spine. Interventions included joint and soft tissue mobilization, muscle...
stretching and strengthening, patient education, and modalities. All of the patients improved in the DASH as well as shoulder ROM\(^{(15)}\)

- **Modalities**
  - Authors of a Cochrane systematic review of studies of electrotherapy modalities for AC published up to May 2014 found 19 trials, including a total of 1,249 participants, that were RCTs or quasi-randomized controlled clinical trials comparing an electrotherapy modality to placebo, no treatment, a different modality, or another intervention\(^{(11)}\)
    - Only LLLT and pulsed electromagnetic field therapy have been compared to placebo
    - No trials have compared an electrotherapy modality plus manual therapy and exercise to manual therapy and exercise alone
    - There was moderate-quality evidence that LLLT plus exercise may be more effective than exercise alone for reducing pain and improving function and low-quality evidence that LLLT may be more effective than placebo for global treatment success
    - It is unclear whether pulsed electromagnetic field therapy is more or less effective than placebo
    - It is unclear whether other electrotherapy modalities are an effective adjunct to exercise
    - The authors concluded that further high-quality RCTs are needed to determine whether electrotherapy modalities are beneficial for AC compared to interventions with evidence of benefit, such as glucocorticoid injections and arthrographic joint distension
  - Ultrasound, massage, iontophoresis, and phonophoresis have not been shown to be effective in the treatment of AC\(^{(20,25)}\)

- **Muscle energy techniques (MET)** can provide improvements in external ROM and decrease pain in patients with AC\(^{(13)}\)
  - In a crossover research design from Thailand involving 24 patients (ages 40–65), individuals were randomly assigned to be treated with MET and then mobilization or mobilization then MET during the first week, and then treated with another MET pattern at another visit. All participants were given MET, MET preceding mobilization, mobilization, and mobilization preceding MET
  - Outcome measures for this study included active external rotation ROM, pain assessment (VAS), shoulder function assessment, and patient satisfaction assessment
  - The therapist positioned the shoulder into external rotation until resistance was felt. The patient was asked to perform an isometric contraction at 25% of maximum voluntary contraction in internal rotation for 5 seconds followed by active external rotation to the patient’s end range for 30-second holds, followed by complete relaxation of the muscle. The therapist would passively place the patient into external rotation again until a new end range was found
  - The therapist would perform mobilization technique in 4 directions, with a goal to improve external ROM: anterior-posterior mobilization, posteroanterior combined with cephalocaudal, external rotation mobilization, and posteroanterior combined with cephalocaudal direction in prone
  - Results of this study show that all treatments (mobilization and/or MET) were beneficial to improving AC, but patients who had MET had more beneficial outcomes as compared to mobilization techniques in regards to improving active external rotation and pain levels

<table>
<thead>
<tr>
<th>Problem</th>
<th>Goal</th>
<th>Intervention</th>
<th>Expected Progression</th>
<th>Home Program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>Shoulder pain</td>
<td>Resolve pain</td>
<td><strong>Modalities</strong></td>
<td>Pain management should be the primary nonoperative intervention in the “freezing” stage</td>
<td>Patient education on pain-relieving strategies</td>
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<tr>
<td></td>
<td></td>
<td>Various strategies may be helpful:</td>
<td>Pain management should be the primary nonoperative intervention in the “freezing” stage</td>
<td>Patient education on pain-relieving strategies</td>
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<tr>
<td></td>
<td></td>
<td>Cryotherapy</td>
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<td></td>
<td></td>
<td>Moderate moist heat</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Gentle stretching</td>
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<td></td>
<td></td>
<td>TENS, especially at night or during therapy if needed</td>
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<td></td>
<td></td>
<td>NSAIDs 20 minutes before exercises</td>
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<tr>
<td><strong>Activity modification</strong></td>
<td></td>
<td>Avoid aggravating activities, including sleep positions that aggravate the shoulder</td>
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<tr>
<td>Poor posture/alignment</td>
<td>Improve posture/alignment</td>
<td><strong>Patient education</strong></td>
<td>N/A</td>
<td>Provide patient with diagrams and written instructions</td>
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<td></td>
<td></td>
<td>Postural education</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Gentle posture exercises</td>
<td></td>
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</tr>
</tbody>
</table>
| Decreased shoulder ROM due to muscular stiffness and impaired joint mobility | Improve ROM | **CPM**  
See *Treatment summary*, above | Use PROM initially, then active-assisted ROM, as tolerated. Progress flexibility and muscle stretching exercises gradually to avoid pain | Patient education and exercise prescription for safe flexibility exercises, as indicated |
|---|---|---|---|---|
| **Joint mobilization**  
See *Treatment summary*, above | **Manual therapy**  
PNF to improve ROM and neuromuscular control and to decrease pain | **Therapeutic exercise**  
Initiate stretch-and-hold (short duration) exercises in patients with low irritability  
Pendulum exercises  
Wall climbing – face wall and walk fingertips up wall, repeat with side toward wall  
Stretches – can use body positioning to force shoulder into flexion, abduction, and rotation |
<table>
<thead>
<tr>
<th>Decreased ability in ADLs</th>
<th>Normal physical functioning</th>
<th><strong>Functional training</strong></th>
<th>Progress as appropriate</th>
<th>Functional activities as indicated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Purposeful and occupation-based activities that focus on ADLs as well as return to work, education, and leisure activities, monitoring patient for use of proper alignment and mechanics</td>
<td>Referral to occupational therapist as indicated</td>
<td></td>
</tr>
<tr>
<td>Muscle weakness</td>
<td>Increase strength</td>
<td><strong>Therapeutic exercise</strong></td>
<td>Move from isometrics during the acute stage to isotonic strengthening as pain and symptoms allow</td>
<td>Recommend a home program that includes strengthening activities as indicated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Typically includes scapular stabilizers and rotator cuff. Incorporating scapular stabilization exercises in a conventional AC treatment program has been shown to improve ROM and functional ability in patients with AC during the frozen stage when compared to patients who received conventional treatment only (i.e., modalities, joint mobilization, stretching, home exercises program)</td>
<td>Therapist should facilitate normal movement patterns rather than allowing maladaptive patterns such as the “shrug sign” during exercise</td>
<td></td>
</tr>
</tbody>
</table>

**Desired Outcomes/Outcome Measures**

- Pain relief
  - VAS
- Increased ROM
  - Goniometric ROM measurements
- Increased strength
  - MMT
  - Dynamometer
- Recovery of normal shoulder function
  - DASH outcome measure
- Improved posture/alignment
  - Posture assessment
- Improved shoulder mechanics
  - DASH outcome measure
Maintenance or Prevention
› There is no current evidence regarding prevention
› Avoid prolonged disuse or immobilization
› Home exercise program for ROM and strength to maintain function

Patient Information
› See “Adhesive Capsulitis” from the American Family Physician at https://www.aafp.org/afp/2003/0315/p1323.html
› See “Frozen Shoulder” from the Mayo Clinic at https://www.mayoclinic.org/diseases-conditions/frozen-shoulder/symptoms-causes/syc-20372684

Coding Matrix
References are rated using the following codes, listed in order of strength:

<table>
<thead>
<tr>
<th>M</th>
<th>Published meta-analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR</td>
<td>Published systematic or integrative literature review</td>
</tr>
<tr>
<td>RCT</td>
<td>Published research (randomized controlled trial)</td>
</tr>
<tr>
<td>R</td>
<td>Published research (not randomized controlled trial)</td>
</tr>
<tr>
<td>C</td>
<td>Case histories, case studies</td>
</tr>
<tr>
<td>G</td>
<td>Published guidelines</td>
</tr>
<tr>
<td>RV</td>
<td>Published review of the literature</td>
</tr>
<tr>
<td>RU</td>
<td>Published research utilization report</td>
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<tr>
<td>QI</td>
<td>Published quality improvement report</td>
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<tr>
<td>L</td>
<td>Legislation</td>
</tr>
<tr>
<td>PGR</td>
<td>Published government report</td>
</tr>
<tr>
<td>PFR</td>
<td>Published funded report</td>
</tr>
<tr>
<td>PP</td>
<td>Policies, procedures, protocols</td>
</tr>
<tr>
<td>X</td>
<td>Practice exemplars, stories, opinions</td>
</tr>
<tr>
<td>GI</td>
<td>General or background information/texts/reports</td>
</tr>
<tr>
<td>U</td>
<td>Unpublished research, reviews, poster presentations or other such materials</td>
</tr>
<tr>
<td>CP</td>
<td>Conference proceedings, abstracts, presentation</td>
</tr>
</tbody>
</table>

References
2. Walmsey S, Rivotet DA, Osmonthery PG. Adhesive capsulitis: establishing consensus on clinical identifiers for stage 1 using the DELPHI technique. Phys Ther. 2009;89(9):906-917. (R)


