Fracture, Clavicle

Indexing Metadata/Description

› **Title/condition:** Fracture, Clavicle
› **Synonyms:** Clavicular fracture; collarbone fracture; fracture, collarbone; fracture, clavicular; broken collarbone
› **Anatomical location/body part affected**
  • The clavicle is an S-shaped bone located between the scapula and the sternum of the rib cage. It serves as the only bony/rigid connection between the upper extremity and the axial skeleton
  • The clavicle articulates at the sternoclavicular (SC) joint and the acromioclavicular (AC) joint. The clavicle provides the shoulder girdle with rigid stability while allowing full shoulder movement. The clavicle also protects a network of neurovascular structures located near it\(^{(2)}\)
› **Area(s) of specialty:** Orthopedic Rehabilitation, Pediatric Rehabilitation, Sports Rehabilitation, Hand Therapy
› **Description**
  • The clavicle is one of the most commonly fractured bones, accounting for 5% to 10% of all fractures. Clavicle fractures occur mainly in the middle third (midshaft) of the diaphysis with some degree of displacement that may require surgical fixation. Fractures of the distal (lateral) end account for about 15% of clavicle fractures and may also require surgical fixation if unstable. Medial clavicle fractures are the least common and usually remain stable without surgery\(^{(1,2)}\)
  – Distal clavicle fractures can be further subclassified by the location of the coracoclavicular (CC) ligaments relative to the fracture fragments\(^{(15)}\)
  – Type II distal clavicle fractures, in which the CC ligaments are detached from the medial segment, are more unstable and more likely to result in nonunion and require surgical fixation\(^{(15)}\)
  • In children, the clavicle is the most commonly fractured long bone, accounting for about 10% of all pediatric fractures, with midshaft fractures being the most common\(^{(27)}\)
  • In addition to cosmetic deformity, an unstable clavicle fracture can also impair upper extremity and rib cage movement. Other complications of clavicle fractures are the development of sternoclavicular joint instability later in life and the possibility of damage to neurovascular structures, the trachea, or the esophagus. Retrosternal displacement of the medial clavicular metaphysis may also occur after medial shaft fracture\(^{(16)}\)
  • The majority of acute clavicle fractures can be treated nonoperatively. Surgical intervention is typically based on radiographic findings that show bony displacement and instability\(^{(2)}\)
  • Midshaft clavicle fractures are often associated with acromioclavicular (AC) joint dislocation, sometimes called a shoulder separation, due to displacement of the distal shaft causing a visible bump\(^{(17,24)}\)
› **ICD-10 codes**
  • S42.0 Fracture of clavicle
  • S42.01 Fracture of sternal end of clavicle
• S42.02 Fracture of shaft of clavicle
• S42.03 Fracture of lateral end of clavicle

(ICD codes are provided for reader’s reference only, not for billing purposes)

› Reimbursement: No specific issues or information regarding reimbursement has been identified

› Presentation/signs and symptoms
  • Patients usually present wearing a sling for relative immobilization, support, and pain management
  • Major signs and symptoms are ecchymosis, point tenderness, swelling, deformity, and pain-restricted ROM. Numbness and tingling in the affected upper extremity might be reported
  • In a sports medicine or emergency room setting, the patient may present with a guarded posture. The contralateral arm might support the affected arm, or the affected arm might be held to the patient’s side
  • Pulling from the sternocleidomastoid muscle might cause the patient’s head to tilt toward and rotate away from the side of injury

Causes, Pathogenesis, & Risk Factors

› Causes
  • Clavicle fractures most often occur from a fall directly onto the shoulder. This mechanism of injury accounts for 90% of all clavicle fractures. Falling onto an outstretched hand (FOOSH) is another cause of clavicle fractures, although it accounts for only 2% to 5% of cases
  • Motor vehicle accidents have also been known to cause clavicle fractures. It has been reported that 29% of clavicle fractures are related to motor vehicle accidents, whereas sports-related injuries account for 26%
  • The clavicle is also a common site of fractures during obstetrical procedures, occurring in 1% to 7% of all births (see Risk factors)
  • Stress fractures of the clavicle, although extremely rare, have also been reported
  • Insufficiency fracture of the clavicle can occur after neck dissection and radiation therapy in patients treated for neck cancer

› Pathogenesis
  • Clavicle fractures are classified into 3 types based on the location of the fracture. Fractures in each of these groups can be open or closed
    – Group I (middle third or midshaft) (the most common type)
      - Accounts for 4 out of 5 clavicle fractures
      - Shortening and overriding of fragments is common in group I and requires careful management
    – Group II (distal third)
      - Accounts for 15% to 30% of all clavicle fractures
      - Cosmetic deformity is also common in group II because the medial fragment can displace upwards and backwards due to pulling from the sternocleidomastoid and upper trapezius muscles, while the weight of the arm pulls the lateral fragment downward and forward
      - Open reduction with internal fixation is often the choice of treatment for open fractures and displaced group II fractures. However, the great majority of clavicle fractures heal with nonoperative management
    – Group III (medial third)
      - Accounts for 2% to 10% of all clavicle fractures

› Risk factors
  • Age: Clavicle fractures are most likely to occur in persons in their early twenties and younger, specifically young males
  • Sex: Between the ages of 15 and 30 years, males are more likely to sustain a clavicle fracture than females, but after age 65 females have more clavicle fractures than males
  • Sports: Clavicle fractures are common in field hockey, lacrosse, and other contact sports played without protective shoulder padding, as well as in sports with a high risk of falls, such as horseback riding and bicycling. Neurovascular injuries associated with clavicle fractures are rare in sports
• Obstetric risks
  – Fetal macrosomia (birth weight > 4,500 g)
  – Shoulder dystocia (inability of a child’s shoulder to pass the mother’s pubic symphysis during delivery)
  – Delivery complications requiring specialized obstetric maneuvers or special equipment

**Overall Contraindications/Precautions**

› Carefully follow physician’s pre- and postoperative protocol
› Inform the patient that a permanently raised area often develops at the site of callus formation, especially in adults, regardless of the intervention used. However, the callus will lessen as the bone remodels during the 6- to 12-month period after the injury(2)
› A complication of clavicle fractures is malunion at the fracture site, which is a shortening, angulation, or displaced position on radiographs resulting in cosmetic or functional patient complaints.(9) Although rare, serious aesthetic ramifications and long-term functional loss can ensue.(1) Authors of a study designed to assess the risk for developing a clavicle fracture nonunion found a nonunion rate of 7.5% in a cohort of 729 clavicle fractures. In this group, the risk factors for developing nonunion included location (midshaft), fracture pattern (complex), female sex, and smoking.(10) Nonunion events are more common with distal clavicle fractures(14)
› Other complications associated with a clavicle fracture are brachial plexus irritation, subclavian artery transection, pneumothorax of the lungs,(1) and DVT(19)
› Clavicle fractures resulting from high-energy injury are prone to displacement, even when initial radiographs show non-displacement(20)
› See specific Contraindications/precautions to examination and Contraindications/precautions under Assessment/Plan of Care

**Examination**

› Contraindications/precautions to examination
  • Avoid activities that produce crepitus or movement at the fracture site
  • Distal clavicle fractures can be mistaken for acromioclavicular dislocations(14)
  • The ulnar nerve dermatome should be assessed and monitored after a clavicle fracture because the medial branch of the brachial plexus can also be injured(1)
  • Healthcare practitioners, including therapists and therapy assistants, are required by law to immediately report to the appropriate legal authorities a patient who exhibits any signs of abuse. Reporting procedures vary from state to state, so clinicians need to educate themselves on proper protocols
  • Rib injuries should be ruled out, as they may occur with clavicle fractures especially when injury occurs in a motorcycle or motor vehicle accident.(4) See Clinical Review...Fracture, Rib; CINAHL Topic ID Number: T708487
› History
  • History of present illness
    – Mechanism of injury or etiology of illness
      - Document the date and mechanism of injury and progression of recovery since onset
      - Fall (on tip of shoulder or from FOOSH)?
      - Blunt direct trauma to clavicle?
      - Motor vehicle accident?
    – Course of treatment
      - Medical management: Ask about patient’s past and current medical management. How quickly did the patient receive medical intervention? How has the pain responded to treatments?
      - Surgical management: Did patient undergo surgery? Document date and type of fixation (e.g., tension band or suture anchor)(15)
      - Authors of a meta-analysis of high-quality studies, 8 RCTs and 12 observational studies including 1,760 patients, found that surgical treatment of midshaft clavicle fractures resulted in significantly fewer nonunions, fewer malunions, and earlier return to work compared with nonsurgical treatment(26)
- **Medications for current illness/injury**: Determine what medications clinician has prescribed; are they being taken? Are they effectively controlling symptoms?

- **Diagnostic tests performed**: The initial diagnosis is based on the history and clinical findings; however, radiographs confirm the diagnosis and provide information to help determine appropriate medical management and may be helpful to assess callus formation during healing.

- **Aggravating/easing factors**: Functional impairment of the arm varies significantly based on the location, displacement, and fracture stability as well as associated injuries. Movement of the arm is usually painful, thus the use of a sling or figure-of-eight immobilization to restrict overhead activity and decrease symptoms may be appropriate.

- **Body chart**: Use body chart to document location of symptoms.

- **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.

- **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 awakenings/night. Patient will usually report inability to sleep on the injured side and will require pillows for support.

- **Other symptoms**: Document other symptoms patient might be experiencing that could exacerbate the condition and/or symptoms that could be indicative of a need to refer to physician (e.g., neurovascular symptoms, difficulty breathing, appearance of skin puncture from the fracture ends).

- **Barriers to learning**: Are there any barriers to learning? Yes ___ No ___

- **If Yes, describe ____________________________

- **Medical history**: Past medical history

- **Previous history of same/similar diagnosis**: History of previous fractures? History of neck, shoulder, or thoracic spine pathology?

- **Comorbid diagnoses**: Ask patient about other problems, including diabetes, cancer, cardiovascular disease, complications of pregnancy, psychiatric disorders, and osteoporosis and other relevant orthopedic disorders.

- **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/she might be 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 participate in recreational or competitive sports? What does the patient’s occupation require? Is the patient a student? Which is the dominant arm? Functional limitations/assistance with ADLs/adaptive equipment: Might have limited function especially if dominant arm is affected. Living environment: Identify if there are barriers to independence in the home.

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

- **Assistive and adaptive devices**: Evaluate for proper placement and fit of sling or figure-of-eight splint. Are the elbow, wrist, and hand free to use while wearing sling?

- **Balance/gait**: Perform balance and gait assessment for patients at increased fall risk (e.g., Berg Balance Scale or Dynamic Gait Index).

- **Circulation**: Examine supraclavicular fossa for possible damage to subclavian artery. Assess brachial and radial pulses for bilateral symmetry.

- **Cranial/peripheral nerve integrity**: Upper limb tension testing is contraindicated in the acute stages of the injury.

- **Joint integrity and mobility**: Assessment of shoulder joint integrity and mobility might need to be delayed until fracture union is verified.

- **Muscle strength**: Assess elbow, wrist, and handgrip isometric strength, as tolerated by the patient. Defer testing shoulder strength until fracture union. At that time, assess isometric shoulder strength in flexion and abduction at 20° with elbow
straight and in internal/external rotation with elbow at 45˚. Consider any onset of exertional pain as the patient’s functional strength.

- **Neuromotor development:** Infants with a clavicle fracture will frequently have an asymmetric Moro reflex. Assess development using a scale such as the Peabody Developmental Motor Scales (PDMS-2) as indicated.

- **Observation/palpation**
  - Assess for crepitus and tenderness (using VAS) at the fracture site with gentle palpation, as tolerated by the patient.
  - Swelling and ecchymosis are common in the acute stage. “Tenting” of skin over the fracture site is also common.
  - Examine for other clavicular deformities. The proximal fractured segment might be elevated due to the pull of the sternocleidomastoid. Assess integrity of skin, especially important for patients wearing a figure-of-eight splint.
  - Examine upper extremity for associated injuries to hand, wrist, or elbow. For example, a Colles’ fracture might occur concomitantly with a FOOSH-related clavicle fracture.
  - In a patient with chest trauma, observe for respiratory distress, hoarseness, or difficulty with swallowing (dysphagia) to help rule out lung or other thorax injuries.
  - A newborn with clavicle fracture might demonstrate lack of active movement in the upper extremity.
  - Assess for signs and symptoms of DVT (e.g., swelling or redness) or complex regional pain syndrome (CRPS) (e.g., trophic changes).

- **Posture**
  - Assess unsupported position of shoulder, scapula, and neck in sitting and standing.
  - Does the shoulder droop?
  - Is scapular winging/anterior tilt apparent?
  - The injured shoulder might be slumped inferomedially or anteroinferiorly due to the weight of the shoulder pulling on the fractured clavicle.
  - Scapulohumeral kinematics in patients with a healed, nonoperatively treated clavicle fracture differ from the uninjured side but do not result in clinically relevant changes in functional outcomes.

- **Range of motion:** Assess active ROM at the wrist and elbow joints using goniometric measurements. Identify pain-free shoulder ROM that does not cause crepitus at the fracture site, but defer active full ROM testing at shoulder and scapulothoracic joints until fracture union.

- **Reflex testing:** Assess biceps, brachioradialis, and triceps deep tendon reflexes as appropriate.

- **Sensory testing:** Assess sensation in dermatomes C4–T1 and sensitivity at surgical scar, if applicable. Assess light touch (e.g., Semmes-Weinstein monofilaments, Weinstein Enhanced Sensibility Test [WEST]), static and moving two-point discrimination as appropriate based on patient presentation.

- **Self-care/activities of daily living:** Assess ability to perform tasks such as washing hair, brushing teeth, toileting, etc.

- **Special tests:**
  - Disabilities of the Arm, Shoulder, and Hand (DASH) Outcome Measure.

- **Assessment/Plan of Care**

  > **Contraindications/precautions**
  - Carefully follow physician’s orders/protocol.
  - Avoid activities that reproduce crepitus because it implies movement at the fracture site. To allow time for union of the fracture and reduce the risk of complications (nonunion/malunion, persistent pain, joint dysfunction), strengthening exercises should be postponed until radiographic evidence of union is obtained.
  - Review contraindications and precautions for use of modalities.

- **Cryotherapy** contraindications
  - Raynaud’s syndrome
  - Cryoglobulinemia
  - Cold urticaria
  - Paroxysmal cold hemoglobinuria
  - Impaired sensation over area of nerve regrowth.
– Impaired circulation or slow-healing wounds
– Cold intolerance

**Cryotherapy** precautions
– Hypertension – cold can lead to an increase in blood pressure
– Thermoregulatory disorders
– Over an open wound
– Very young or very old
– Personal aversion to cold
– Area of poor sensation

**Thermotherapy** contraindications
– Decreased sensation
– Vascular insufficiency
– Recent or potential hemorrhage
– Malignancy/tumor
– Acute/subacute traumatic and inflammatory conditions
– Skin infection
– Where heat rubs or liniments have recently been used
– In patients with cognitive deficits or if a language barrier exists

**Aquatic therapy** contraindications
– Open wounds without occlusive dressings
– Urinary or bowel incontinence
– Surface infections
– Menstruation without internal protection
– Uncontrolled seizures over the past 12 months
– Severe cardiac dysfunction
– Acute fever
– Upper respiratory infection
– Severe mental disorders that might place the patient or clinician at risk
– Severe pulmonary conditions with a vital capacity less than 1,000 mL
– Halo vests
– Infectious diseases

**Aquatic therapy** precautions
– Compromised cardiovascular system
– Multiple sclerosis
– G-tubes
– Ostomies
– Intravenous lines
– Catheters
– Suprapubic appliances
– Autonomic dysreflexia
– Orthostatic hypotension
– Fear of water
– Fear of sinking or losing balance
– Medically controlled seizure disorder
– History of aspiration

**Diagnosis/need for treatment:** Clavicle fracture/therapy is indicated for pain management, restoration of upper-extremity function, guiding daily activities, and for planning safe return to vigorous activities, sport, or occupation; patient and family/caregiver education is indicated to protect the healing fracture

**Rule out**
• Humeral fracture
• Scapular fracture
• Acromioclavicular separation¹
• Rotator cuff injury
• Labral tear
• Sternoclavicular dislocation
• Rib fracture
• Shoulder contusion
• Pneumothorax

In newborn infants:
– Brachial plexus palsy
– Congenital pseudarthrosis
– Congenital muscular torticollis

**Prognosis**

A high percentage of patients return to their normal activities without limitations. For example, authors of critical reviews of adults with group I clavicle fractures treated conservatively in the United States found good functional outcomes in:

- 98% with nondisplaced fractures
- 83% with displaced fractures
- 73% with comminuted fractures

In contrast, authors of a retrospective study in Canada found that only 57% of patients had regained full shoulder strength after nonoperative treatment of a displaced group I fracture, but authors of a more recent study found no functional deficits in a group of patients with shortening after nonoperative treatment of displaced midshaft clavicle fractures.

Clavicle fractures with a displacement greater than 1.5 cm are associated with more pain, a higher incidence of malunion, and greater loss of motion and strength.

Authors of a prospective follow-up study (102 patients with displaced midshaft clavicular fractures: 37 received conservative treatment, 41 plate osteosynthesis, and 24 intramedullary stabilization) in Germany found that all treatments led to good or excellent clinical outcomes at 1-year post intervention.

A young athlete who participates in noncontact sports might be allowed to resume training after clinical union of the fracture and strength and ROM are restored. However, return to contact sports should be delayed until radiographs show complete healing. This might take 6 to 12 weeks, which is dependent on the age of the patient and the degree of fracture displacement. Fortunately, padding or special bracing is usually not necessary for athletes upon returning to athletic activities.

Authors of a case series of 54 athletes in Argentina found that plate fixation of displaced midshaft clavicular fractures resulted in excellent functional outcomes, with 98% returning to their sport and 94% at the same level as prior to injury. The mean time to return to sport was 68 days (range, 5–180 days).

Authors of a case series of 10 professional and 15 recreational cyclists with displaced midshaft clavicle fracture in the Netherlands found that anteroinferior plate fixation allowed 25/25 to resume outside training 1 week after surgery. Subsequently, 3 cyclists had complications: 1 nonunion, 1 wound infection, and 1 refracture.

**Referrals to other disciplines**

- Older adult patients and patients whose dominant arm is severely affected might require referral to occupational therapy for assistance with personal care and daily activities
- Patients with gait impairment may be referred to physical therapy
- Social worker
- Refer any patients who are not progressing or are demonstrating signs/symptoms of complications and/or mal-/non-union back to physician

**Other considerations**

- Recent reviews on significantly displaced and/or shortened midshaft clavicle fractures in adults favor open reduction and plate fixation for optimal outcomes in comparison to nonoperative treatment.

**Treatment summary**

Although a conservative approach is the standard of care for uncomplicated, stable clavicle fractures, surgical intervention is recommended for cases involving an open or highly unstable clavicle fracture.
stiffness, compared to nonoperative treatment there is no improvement in function, pain, or quality of life. In addition, surgical intervention has risk for adverse events such as infection, wound healing issues, and hardware irritation. 

- Evidence is lacking to support the use of electrotherapeutic modalities for treating patients with clavicle fracture
- Medical guidelines are lacking for rehabilitation after clavicle fracture. Therapists should follow specific physician instructions for patient management on a case basis and use their clinical judgement for treating fractures when orders/protocols are not provided.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Goal</th>
<th>Intervention</th>
<th>Expected Progression</th>
<th>Home Program</th>
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</thead>
</table>
| Pain and tenderness at fracture site | Minimal tenderness/crepitis at fracture site | **Physical agents and mechanical modalities**  
  Use of cryotherapy for pain management \(^ {11}\) | Discharge sling or splint when there is no discomfort (usually during the first weeks post injury) or crepitis with unsupported use of the arm \(^ {4,29}\) | Instruct patient in use of cold, sling. Educate patient on purpose of sling (i.e., not only for pain management but also to assist in union of the fracture site) |
| Sleep disturbance              | Normal sleep quality                | **Patient education**  
  Educate patient to place a small pillow or roll between the scapulæ to help reduce discomfort experienced in the supine position \(^ {8}\); some patients might reduce symptoms sleeping semi-reclined or in a recliner chair | N/A                                                                                  | Provide written instructions and diagrams to assist patient in positioning |
<p>| Decreased shoulder ROM with pain | Full pain-free shoulder ROM | <strong>Physical agents and mechanical modalities</strong>&lt;br&gt;Moist heat over the shoulder girdle to assist in increasing the extensibility of the surrounding tissue prior to treatment&lt;sup&gt;(11)&lt;/sup&gt; | After radiographic evidence of callus formation, provide glenohumeral, scapulothoracic, acromioclavicular, and sternoclavicular joint mobilizations as needed. &lt;br&gt;<strong>Manual therapy</strong>&lt;br&gt;Provide pain-free passive ROM to the shoulder to prevent contractures, but avoid end of range, pain, and crepitus. Also, follow physician protocols as some restrict any motion until the fracture has healed. However, sling immobilization is often discontinued after 3 to 4 weeks of use&lt;sup&gt;(14)&lt;/sup&gt; | After radiographic evidence of callus formation, progress ROM exercises for shoulder while avoiding pain and end of range abduction, adduction, and rotation.&lt;sup&gt;(6)&lt;/sup&gt; Begin with active-assisted ROM exercises (e.g., cane, pulleys, Codman’s pendulum) and progress to active ROM exercises. Scapular movements should also be encouraged | Prescribe home exercises that promote improvement in patient shoulder ROM |</p>
<table>
<thead>
<tr>
<th>Reduced functional strength of the shoulder and shoulder girdle musculature</th>
<th>Normalization of shoulder/shoulder girdle strength</th>
<th>Manual therapy</th>
<th>As ROM has progressed, begin active full ROM strengthening of the shoulder girdle.¹ Progress to more aggressive strengthening techniques as appropriate, while taking into account varying resistance, joint angles, and speed. Also involve strengthening the contralateral upper extremity, as well as the trunk/core.</th>
<th>Provide home exercises that promote strengthening of the shoulder and entire upper extremity</th>
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<tbody>
<tr>
<td><strong>Therapeutic exercise</strong></td>
<td>Begin isometric and limited ROM strengthening of all shoulder girdle musculature after fracture healing has been confirmed.</td>
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<tr>
<td>Deficits in posture and scapular stability</td>
<td>Improved posture and scapular stability</td>
<td>Therapeutic exercise</td>
<td>Progress scapular stability exercises as indicated and appropriate (e.g., upper extremity weight-bearing on unstable surface)</td>
<td>Provide home exercises that promote good posture and scapular stability</td>
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<tr>
<td><strong>Therapeutic exercise</strong></td>
<td>Posture retraining (including education and exercise), scapular stability exercises</td>
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<tr>
<td>Deficits in daily activities, work, or sport such as opening door, carrying objects, or overhead motions with involved upper extremity</td>
<td>Independent in daily activities, with return to work/sport</td>
<td>Therapeutic exercise</td>
<td>Add upper-body stationary cycling, swimming, elliptical trainer, and aquatic therapy, as tolerated.</td>
<td>Continue prescribed exercises at home</td>
</tr>
<tr>
<td><strong>Therapeutic exercise</strong></td>
<td>Roll gym ball up and down wall, at first with 2 hands, to point of pain onset; ball catch and ball throw against wall (at first high on wall)</td>
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<td><strong>Functional training</strong></td>
<td>Simulate functional activities in the environment to which the patient will need to return (i.e., home, work, sport)</td>
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**Desired Outcomes/Outcome Measures**

- Desired outcomes with associated outcome measures
- Minimal tenderness/crepitus at fracture site
  - VAS
  - Palpation

¹ Return to noncontact sports might be considered at 6 weeks. Return to contact sports might occur at 8 to 12 weeks.
• Normal sleep quality
• Full pain-free shoulder ROM
  – Goniometric measurements
• Normalization of shoulder/shoulder girdle strength
  – Manual muscle testing
  – Isokinetic testing
• Improved balance and safety with ambulation
  – Berg Balance Scale
  – Dynamic Gait Index
• Patient satisfaction
  – UCLA shoulder rating scale
  – DASH
• Independent in daily activities, with return to work/sport

**Maintenance or Prevention**

› Continue with home exercise program of increasing ROM and strengthening of the upper extremity
› Follow fall-prevention recommendations and home modifications, especially in populations most at risk for falls (i.e., children and older adults)

**Patient Education**


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**Coding Matrix**

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

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