

# Emergency Case

David Konkin, Harold Schubert, MD, MSC, CCFP

## Clavicle fracture

### QUESTIONS

**A hockey player presents with progressive swelling of his entire left arm. He was recently treated with a figure-of-8 bandage for a fractured left clavicle. What life- or limb-threatening complications can accompany or follow clavicle fractures? Are all clavicle fractures treated the same? What treatments are recommended?**

Clavicle fractures account for approximately 5% of fractures seen in emergency departments. The clavicle is the most commonly fractured bone at birth, and half of all clavicle fractures occur before age 7.<sup>1</sup>

Clavicle fracture can be an isolated injury or part of multiple trauma. In either case, careful examination of adjacent anatomy is required to assess for complications that can threaten life

or limb. Classification of clavicle fractures is based on fracture location (**Figure 1**). Each classification implies a unique mechanism of injury and raises concern for specific associated injuries and complications.

Imaging for suspected clavicle fracture is typically a single anteroposterior (AP) x-ray film that provides little information over clinical examination. When

displacement of fragments is of concern, obtaining a 30° to 40° lordotic view of the clavicle is helpful. Some clinicians routinely obtain an AP chest x-ray film alone. This film shows the entire clavicle and helps assess for some worrisome potential complications, such as upper rib fractures and hemothorax or pneumothorax.

### Class A clavicle fractures

Class A fractures (middle third, proximal to the coracoclavicular ligaments) are the most common,

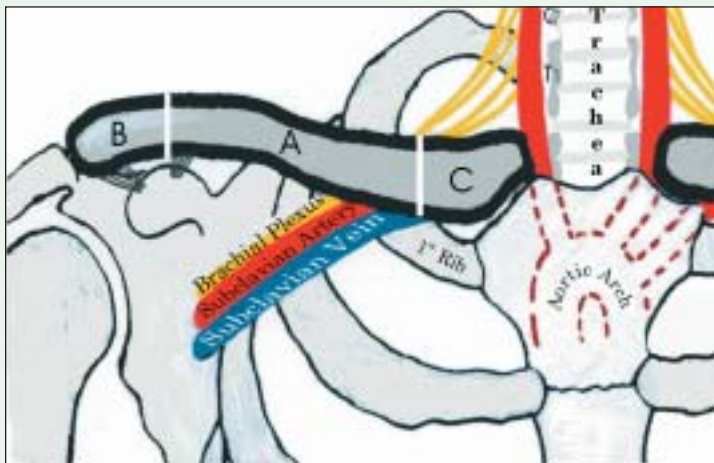


Figure 1. Classification of clavicle fractures and structures at risk

accounting for about 80% of all clavicle fractures.<sup>1</sup> The mechanism of injury is usually a blow to the lateral shoulder directed medially.<sup>2</sup> The force of the blow compresses the clavicle against the sternum causing the S-shaped clavicle to fracture in the area of maximum curvature.

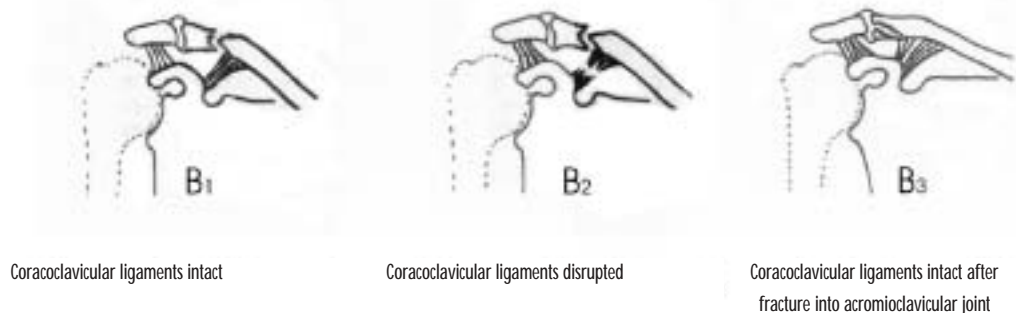
Class A fractures can also result from direct pressure to the anterior clavicle,

a common seat belt injury.

Class A fractures are often displaced, the medial fragment being pulled upward by unopposed action of the sternoclavicular muscle. Clinically significant shortening is often seen.

Class A fractures are so commonplace that potential for serious complications is easily overlooked. The

**Mr Konkin** is a medical student at the University of British Columbia in Vancouver. **Dr Schubert** practises emergency medicine at the University of British Columbia Hospital in Vancouver.

Figure 2. Subtypes<sup>6</sup> of class B clavicle fracture

subclavian vessels and brachial plexus traverse the small space between the mid-clavicle and first rib. Vessels can be lacerated or simply compressed, resulting in hemorrhage, loss of distal circulation, arteriovenous fistula, subclavian artery aneurysm, or subclavian vein thrombosis. Brachial plexus injuries can include contusion, compression, laceration, or root avulsion. Any signs of such complications should be investigated with angiographic or electromyographic studies. Rib fractures and hemothorax or pneumothorax can also occur.

Class A clavicle fractures are also subject to delayed neurovascular complications months or years after fracture.<sup>1</sup> In young patients, these fractures are particularly prone to exuberant callus formation, which can compress neurovascular structures against the first rib and cause thoracic outlet syndrome.

Treatment for class A fractures has, for many years, involved a figure-of-8 clavicle bandage. Several orthopedic texts continue to advise this treatment, although it is not supported in the literature. The device was intended to pull the clavicle out to its natural length and effect some degree of fracture reduction. In fact, numerous studies have shown that figure-of-8 bandages do not reduce fractures or improve functional or cosmetic outcome.<sup>3-5</sup> Furthermore, use of figure-of-8 bandages is associated with notable incidence of skin and neurovascular complications, including axillary vein thrombosis.

Current treatment for class A fractures is a simple sling, ice, and analgesics. Immobilization of the shoulder for more than a few days often leads to shoulder stiffness and elbow flexion contracture. Circumduction exercises, in the sling, should be

started within days, and full range-of-motion exercises, out of the sling, as soon as possible.

### Class B clavicle fractures

Class B fractures occur distal to the coracoclavicular ligaments and account for about 15% of all clavicle fractures.<sup>1</sup> Class B fractures have been subtyped (Figure 2<sup>6</sup>) in an effort to aid treatment decisions.<sup>6</sup> These fractures usually result from impact to the shoulder directed medially and downward.

Class B1 fractures are stable. Class B3 fractures are similar to acromioclavicular joint injury, and treatment is as for acromioclavicular sprain or separation. Class B1 and B3 fractures are treated symptomatically, in a sling, with early mobilization.<sup>7</sup>

Class B2 fractures, which have been the subject of numerous studies evaluating surgical and non-surgical treatments, are inherently unstable and have a 20% to 30% rate of nonunion.<sup>7</sup> Surgical treatment has traditionally been recommended. Recent studies assessing functional results from open or closed treatment have reported that outcomes are satisfactory without surgery.<sup>7</sup> It is advisable to get an orthopedic opinion for B2 fractures. Many now treat B2 fractures symptomatically, in a sling, with early mobilization.

### Class C clavicle fractures

Class C fractures, about 5% of clavicle fractures,<sup>1</sup> involve the medial third of the clavicle. Mechanism of injury might be a blow to the shoulder but is more often a direct blow to the anterior medial clavicle. The medial end of the clavicle is the sturdiest part of the bone, and fracture or dislocation in this area involves a strong force.

Although isolated class C fractures are usually stable and require only symptomatic treatment, there is high risk of serious associated injuries, including injuries to the cervical spine, trachea, esophagus, ribs, and great vessels. Careful physical and chest x-ray examinations are essential. Fracture of the first rib should raise suspicion for possible great vessel injury. Displacement of medial clavicle fragments is difficult to detect due to swelling over the medial clavicle; a lordotic view can be helpful.

Posterior dislocation of the medial clavicle, with or without fracture, is a life-threatening orthopedic emergency<sup>8</sup> because the trachea and major vessels are at risk. Immediate threat to the airway should be addressed by immediate reduction of

the dislocation. Emergency physicians should be familiar with rapid analgesia and sedation methods and techniques for reduction. In addition to emergency airway management, this injury might also require urgent angiography and treatment for great vessel injury.

### ANSWERS

Clavicle fractures can be accompanied by injuries to airways, great vessels, cervical spine, ribs, lungs, and neurovascular structures of the upper limb. Delayed vascular and brachial plexus problems can result from callous formation or from treatment with a figure-of-8 clavicle bandage. All clavicle fractures are best treated in a sling with early mobilization, with the possible exception of unstable distal clavicle fractures

(class B2). These have traditionally been treated surgically, but the benefit of surgery is in question. Treatment in a sling might be satisfactory. ❖

### References

1. Simon RR, Koenigsknecht SJ. *Emergency orthopedics—the extremities*. 3rd ed. Stamford, Conn: Appleton and Lange; 1996.
2. Stanley D, Trowbridge EA, Norris SH. The mechanism of clavicular fracture: a clinical and biomechanical analysis. *J Bone Joint Surg Br* 1988;70-B(3):461-4.
3. Andersen K, Jensen PO, Lauritzen J. Treatment of Clavicular fractures: figure-of-eight bandage versus a simple sling. *Acta Orthop Scand* 1987;57:71-4.
4. Nordqvist A, Redlund-Johnell I, von Scheele A, Petersson CJ. Shortening of clavicle after fracture. *Acta Orthop Scand* 1997;68:349-51.
5. McCandless DN, Mowbray MAS. Treatment of displaced fractures of the clavicle. *Practitioner* 1979;223:266-7.
6. Neer CS. Fracture of the distal third of the clavicle. *Clin Orthop* 1968;58:43-50.
7. Nordqvist A, Petersson C, Redlund-Johnell I. The natural course of lateral clavicle fracture: 15 (11-21) year follow up of 110 cases. *Acta Orthop Scand* 1993;64:87-91.
8. Buckerfield CT, Castle ME. Acute traumatic retrosternal dislocation of the clavicle. *J Bone Joint Surg Am* 1984;66-A(3):379-85.