Acute Traumatic Sternal Fracture in a Female College Hockey Player

Brian Culp; Jason G. Hurbanek, MD; Jennifer Novak, MS, ATC; Kendra L. McCamey, MD; David C. Flanigan, MD

Despite the lower forces to the chest incurred during a sports injury compared to a motor vehicle accident, it is prudent to perform the standard of care chest radiographs and electrocardiogram to rule out any potentially severe complications.

Trauma literature contains documentation of sternal fractures, and the management principles continue to evolve. However, little has been reported about sternal fractures in athletes. The sports literature is limited to case reports of sternal stress fractures in sports such as baseball, diving, golf, gymnastics, weight lifting, and wrestling, as well as 1 report of a nondisplaced sternal fracture of a rugby player. The pathomechanics of sternal fractures in an athlete differ significantly from the classic steering wheel syndrome and the more recently described safety-belt syndrome. The large forces associated with a motor vehicle accident can cause a number of injuries presenting as chest pain, including pathology of the heart, lungs, vasculature, and bones. These are rarely associated with sporting injuries due to the dramatically lower forces. Other conditions in the differential of chest pain in athletes are more likely, and include stress fractures, dislocations, soft tissue injuries, and nonmusculoskeletal-related issues. Because the physis of the sternum or medial clavicle do not completely ossify before age 18, physeal injury must be suspected with chest pain in a young athlete. Traumatic sternal fractures often have other associated injuries, the most frequent of which are rib fractures (22% to 32% when an associated injury has occurred). The injury pattern describing stress fractures of the sternum consistent with repetitive microtrauma has far fewer comorbidities than some of the mentioned etiologies.

To our knowledge, there has been only 1 previous report of a sports-related, isolated sternal fracture, which occurred in a rugby match. That player’s injury was missed on routine radiographs, but was eventually diagnosed by bone scan. Upper body training and activity was restricted for 6 weeks, and the rugby player made a full recovery.

This article describes a rare fracture to the distal one-third of the sternum sustained by a female hockey player after a checking collision.

CASE REPORT

An 18-year-old female college hockey player sustained a chest-to-chest check from another player during a game. She was able to skate off the ice but reported immediate chest pain. The patient was transported to the local emergency department. Her history revealed no pertinent medical issues. She was found to be medically stable, with negative radiographs and a normal electrocardiogram (EKG), and was discharged.

Follow-up 2 days later revealed persistent anterior chest pain worsened with breathing. The patient had normal vitals, and a review of systems was otherwise negative. Physical examination demonstrated pain on palpation of the inferior third of the sternum, but no crepitus or obvious defect was noted. The follow-up radiograph showed a fracture within the distal body of the sternum, with...
posterior displacement of 3 to 4 mm (Figure 1). Cardiothoracic surgery was consulted, and it was decided that the fracture was not displaced enough to merit surgical intervention. Furthermore, since it was >48 hours postinjury and the patient had previously had a normal EKG, no further monitoring was needed.

The patient was instructed to refrain from all sports and training until she could breathe pain free without analgesia. By 6 weeks, the patient was able to train and only had pain with extreme exertion. Physical examination was normal at 12-week follow-up, and 3-month follow-up radiographs revealed a stable and healing sternal fracture (Figure 2). The patient was cleared to return to sports with no restrictions, and she had no residual pain or issues.

**DISCUSSION**

This article presents a case of an isolated traumatic sternal fracture in a college hockey player. This type of injury lies somewhere on the severity spectrum between a motor vehicle accident-type sternal fracture with several comorbidities that must be ruled out, and a sternal stress fracture that lacks a single inciting event or associated sequelae. The appropriate management for the team physician can be gleaned from the trauma literature.

Historically, sternal fractures were described as occurring with blunt impact on an automobile steering wheel, but now the described mechanism involves flexion forces over the shoulder strap of a seat belt, which acts as a fulcrum. This change in mechanism of injury has decreased severity of injury and led numerous authors to recommend a less aggressive management plan to rule out associated pathology.

Associated injuries with motor vehicle accident-related sternal fractures include concomitant fracture (53.5%) and pulmonary (24.4%), head (14.2%), and cardiac injuries (3.1%). Authors have recommended that after normal advanced trauma life support protocol, a negative EKG sufficiently rules out any injury to myocardium.

Therefore, patients do not require serial cardiac enzyme levels, continuous telemetry, or echocardiography as was the previous standard of care. Similarly, if routine chest radiographs indicate that there is no severe displacement of the fractured sternum, no potential for hemopneumothorax, and no additional fractures, then no operative intervention is indicated. Patients can then be given appropriate analgesia and discharged without a hospital admission.

The incidence of sporting-related sternal injuries is approximately 5%, with no reported serious complications or deaths. Sternal stress fractures are more common in the athletic population than traumatic fractures. After a traumatic injury to the chest, one should have a high index of suspicion of sternal pathology when an athlete presents with symptoms of chest pain and examination findings of tenderness over the midline of the anterior chest.

We believe that a thorough physical examination is key to a good diagnosis, proper evaluation, and outcome. The key elements of the initial onsite physical examination include assessing for stability of the patient, palpation of the chest wall and surrounding structures, and auscultation of the heart and lungs. Regardless, any chest pain that is persistent in an athletic environment usually requires removal of the athlete from competition and evaluation. For a stable patient, an EKG and chest radiograph should be done to evaluate for cardiac, pulmonary, and sternal pathology. Sternal radiographs may also be needed if the chest radiograph does not show a fracture and there is suspicion for a sternal fracture. With a stable patient, these can be done on an outpatient basis when resources are immediately available. With an unstable patient or if outpatient resources are not available, emergency department consultation is often needed to evaluate the cause of chest pain and rule out potential life-threatening injuries.

The notably lower energy of forces in a sports injury contrasts with that seen in a motor vehicle accident; however, ruling out cardiac injury and obtaining chest and sternal radiographs should be the standard of care for sports trauma as it...
is in motor vehicle accidents. These types of pathology should always be considered when a blow to the chest has occurred, even if no obvious bony changes are seen, as they can be associated with severe conditions if missed. If diagnosis is not made with conventional radiology, yet the patient remains clinically symptomatic, the patient should be assessed with computed tomography to confirm diagnosis and to assess adjacent structures for injury. It may also be useful to obtain an ultrasound or bone scan to rule out an occult fracture.

When considering return to play guidelines for the athlete, the approach can be similar to that taken for stress fractures. Time frames for return to play have varied from a minimum of 6 weeks to >6 months. Although time frames are not agreed on and healing for each patient is unique, clinical resolution of symptoms and radiographic stability remain the guiding principles for return to play. While we acknowledge that not every patient will need a full 12 weeks to recover, our patient took that course due to a surgery for an unrelated shoulder injury that occurred after the fracture.

REFERENCES