CASE REPORT

ONLINE EXCLUSIVE

THE PATIENT

14-year-old boy

SIGNS & SYMPTOMS

– Aching midsternal pain following a basketball injury

– Worsening pain with direct pressure and when the patient sneezed

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THE CASE

A 14-year-old boy sought care at our clinic for persistent chest pain after being hit in the chest with a teammate's shoulder during a basketball game 3 weeks earlier. He had aching midsternal chest pain that worsened with direct pressure and when he sneezed, twisted, or bent forward. There was no bruising or swelling.

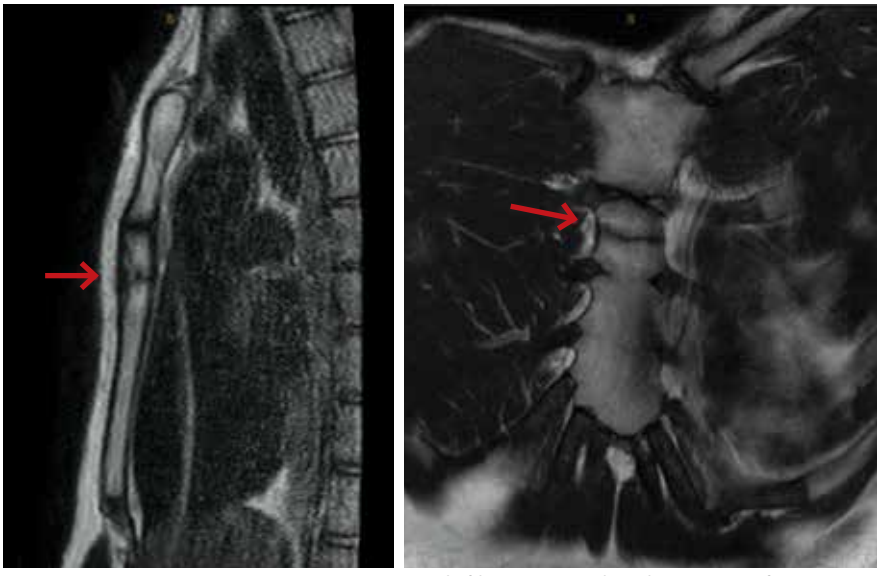
On examination, the patient demonstrated normal perfusion and normal work of breathing. He had focal tenderness with palpation at the manubrium with no noticeable step-off, and mild tenderness at the adjacent costochondral junctions and over his pectoral muscles. His sternal pain along the proximal sternum was reproducible with a weighted wall push-up. Although the patient maintained full range of motion in his upper extremities, he did have sternal pain with flexion, abduction, and external rotation of the bilateral upper extremities against resistance. Anteroposterior (AP) and lateral chest radiographs were unremarkable.

THE DIAGNOSIS

The unremarkable chest radiographs prompted further investigation with a diagnostic ultrasound, which revealed a small cortical defect with overlying anechoic fluid collection in the area of focal tenderness. T2-weighted magnetic resonance imaging (MRI) of the chest was performed; it revealed a transverse, nondisplaced fracture of the superior body of the sternum with surrounding bone marrow edema (**FIGURE**).

FIGURE

MRI reveals nondisplaced fracture



IMAGES COURTESY OF EAST CAROLINA UNIVERSITY DEPARTMENT OF FAMILY MEDICINE, DIVISION OF SPORTS MEDICINE, GREENVILLE, NC

T2-weighted magnetic resonance imaging sagittal (left) and coronal (right) views identified a transverse, nondisplaced fracture along the superior sternum with surrounding bone marrow edema.

DISCUSSION

Fractures of the sternum comprise < 1% of traumatic fractures and have a low mortality rate (0.7%).[1,2] The rarity of these fractures is attributed to the ribs' elastic recoil, which protects

the chest wall from anterior forces.[1,3] These fractures are even more unusual in children due to the increased elasticity of their chest walls.[4-6] Thus, it takes a significant amount of force for a child's sternum to fracture.

While isolated sternum fractures can occur, two-thirds of sternum fractures are nonisolated and are associated with injuries to surrounding structures (including the heart, lungs, and vasculature) or fractures of the ribs and spine.[2,3] Most often, these injuries are caused by significant blunt trauma to the anterior chest, rapid deceleration, or flexion-compression injury.[2,3] They are typically transverse and localized, with 70% of fractures occurring in the mid-body and 17.6% at the manubriosternal joint.[1,3,6]

Athletes with a sternal fracture typically present as our patient did, with a history of blunt force trauma to the chest and with pain and tenderness over the anterior midline of the chest that increases with respiration or movement.[1] A physical examination that includes chest palpation and auscultation of the heart and lungs must be performed to rule out damage to intrathoracic structures and assess the patient's cardiac and pulmonary stability. An electrocardiogram should be performed to confirm that there are no cardiovascular complications.[3,4]

Initial imaging should include AP and lateral chest radiographs because any displacement will occur in the sagittal plane.[1,2,4-6] If the radiograph shows no clear pathology, follow up with computed tomography, ultrasound, MRI, or technetium bone scans to gain additional information.[1] Diagnosis of sternal fractures is especially difficult in children due to the presence of ossification centers for bone growth, which may be misinterpreted as a sternal fracture in the absence of a proper understanding of sternal development.[5,6] On ultrasound, sternal fractures appear as a sharp step-off in the cortex, whereas in the absence of fracture, there is no cortical step-off and the cartilaginous plate between ossification centers appears in line with the cortex.[7]

A self-limiting injury that requires proper pain control

Isolated sternal fractures are typically self-limiting with a good prognosis.[2] These injuries are managed supportively with rest, ice, and analgesics[1]; proper pain control is crucial to prevent respiratory compromise.[8]

Complete recovery for most patients occurs in 10 to 12 weeks.[9] Recovery periods longer than 12 weeks are associated with nonisolated sternal fractures that are complicated by soft-tissue injury, injuries to the chest wall (such as sternoclavicular joint dislocation, usually from a fall on the shoulder), or fracture nonunion.[1,2,5]

Anterior sternoclavicular joint dislocations and stable posterior dislocations are managed with closed reduction and immobilization in a figure-of-eight brace.[1] Operative management is reserved for patients with displaced fractures, sternal deformity, chest wall instability, respiratory insufficiency, uncontrolled pain, or fracture nonunion.[1,3,8]

A return-to-play protocol can begin once the patient is asymptomatic.[1] The timeframe for a full return to play can vary from 6 weeks to 6 months, depending on the severity of the fracture.[1] This process is guided by how quickly the symptoms resolve and by radiographic stability.[9]

Our patient was followed every 3 to 4 weeks and started physical therapy 6 weeks after his injury occurred. He was held from play for 10 weeks and gradually returned to play; he returned to full-contact activity after tolerating a practice without pain.

THE TAKEAWAY

Children typically have greater chest wall elasticity, and thus, it is unusual for them to sustain a sternal fracture. Diagnosis in children is complicated by the presence of ossification centers for bone growth on imaging. In this case, the fracture was first noticed on ultrasound and confirmed with MRI. Since these fractures can be associated with damage to surrounding structures, additional injuries should be considered when evaluating a patient with a sternum fracture. JFP

Although sternum fractures are rare in pediatric patients, two-thirds of these fractures are associated with injuries to surrounding structures.

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