

Costal Cartilage Fractures and Disruptions in a Rugby Football Player

Victor Lopez, Jr, DO, MA, Richard Ma, MD,*† Xinning Li, MD,† John Steele, BS,† and Answorth A. Allen, MD†*

CASE REPORT

Abstract: Costal cartilage fracture of the rib cage, or costochondral, is a rare sporting injury. For contact athletes, the instability of the rib cage may lead to potential serious complications, similar to rib fractures or thorax disruption. Most authors recommend initial conservative treatment with surgery reserved for only recalcitrant cases. We report a case of an amateur American male rugby football player who sustained a costal cartilage fracture and disruption involving the anterior left fifth and sixth rib costal cartilages. The case highlights the difficulty in establishing the diagnosis based on clinical examination and standard radiographs alone. Computed tomography was used to assist in diagnosing this destabilizing injury to the rib cage. Costal cartilage fractures and disruptions in athletes are rarely reported in literature and can have serious implications for the athlete's ability to return to play if the rib cage is destabilized.

Key Words: costal cartilage disruption, costochondral fracture, rib injury, athletic chest wall injury

(*Clin J Sport Med* 2012;0:1-3)

INTRODUCTION

Fractures or disruptions involving the costal cartilage are typically high-energy injuries and occur after blunt trauma.¹⁻³ The potential for sustaining this type of injury while participating in sports, however, is likely underrecognized and underreported in literature. In this case report, we present an amateur rugby football player who sustained costal cartilage fractures and disruptions involving his left fifth and sixth ribs. The case highlights the difficulty in establishing the diagnosis based on clinical examination and standard radiographs alone. Costal cartilage fractures and disruptions in athletes can have serious implications for the athlete's ability to return to play if the rib cage is destabilized. Due to the precarious location of the injury, it was recommended that the player not return to collision sports after he recovered due to the potential of injury to underlying cardiac structures.

Submitted for publication February 17, 2012; accepted April 4, 2012.

From the *Rugby Research and Injury Prevention Group, New York, New York, and †Shoulder Surgery and Sports Medicine Service, Hospital for Special Surgery, New York, New York.

The authors report no conflicts of interest.

Corresponding Author: Victor Lopez, Jr, DO, MA, Rugby Research and Injury Prevention Group, 118-17 Union Turnpike, Suite 3B, New York, NY 11375 (victor_lopezjr@hotmail.com).

Copyright © 2012 by Lippincott Williams & Wilkins

A 27-year-old amateur American Division II male rugby football player was injured during an alumni match while attempting to pass the ball over a defender. The injured player was tackled at his chest level with both his arms up and above his shoulders. The defending player made contact with a shoulder tackle into the injured player's left upper anterior thorax. The injured ball carrier had to leave the game and was unable to return to play because of severe left-sided thoracic pain and difficulty breathing. The player was sent to the emergency department (ED), where his clinical examination was notable for significant tenderness to palpation over the left anterior rib cage. Plain radiographs of the chest and shoulder were inconclusive. The patient was diagnosed with a noncomplex rib sprain and subsequently discharged home.

After his ED visit, the injured player was evaluated by his home physician. His clinical examination demonstrated a notable prominence over his left anterior chest wall. Based on the asymmetry that was present, there was a concern that the player had a structural injury to his chest wall and a referral was arranged with an orthopedist. Repeat plain radiographs obtained in clinic failed to reveal any obvious injuries. A CT scan revealed a mid-substance costal cartilage fracture of the fifth and sixth ribs directly anterior to the patient's cardiac structures (Figure 1).

Due to the patient's overall improving clinical course, the orthopedist recommended conservative management with rest and removal from competition. The player was pain free by 8 weeks. A CT scan at 10 weeks after his injury showed evidence of healing at the costal cartilage fracture sites (Figure 2). One year after the injury, the player was able to exercise without significant pain in his costal cartilage injuries; however, he reports occasional clicking at his left chest wall with certain activities. Due to the precarious location of the player's costal cartilage fractures combined with his amateur competition level, it was recommended that the player refrain from further contact sports including rugby, where a repeat injury to that area could occur and place the underlying cardiac structure at risk for injury.

DISCUSSION

The literature on costal cartilage injuries is sparse, and its true incidence is unknown.²⁻⁵ Most costal cartilage injuries reported in the literature are in the young male population and a result of blunt trauma.^{2,3} Sports that involve twisting maneuvers may predispose athletes to sustain costochondral separations, which often occur in the relative immobile first and second ribs.^{5,6} These separations are in contrast with fractures of the costal cartilage, which occur in the lower ribs and typically result from the direct impact seen in collision sports, such as hockey and rugby.⁵ Rugby may be at increase risk, given the collisions and lack of protective equipment to absorb the energy of the impact. Brooks et al⁷ reported that



FIGURE 1. CT scan of the fracture and disruption to the fifth (above right) and sixth costal cartilages (below right). Both costal cartilage fractures are displaced 100%. The injured area is located just anterior to the underlying cardiac structures.

the incidence of costochondral/sternal injuries was 2.4 per 1000 player-hours in English professional rugby union match play.

Current imaging modalities used to diagnose costochondral injuries include ultrasound, CT, and magnetic resonance imaging (MRI).^{2,3,5} Unlike rib fractures, costal

cartilage fractures are not visible on radiographs unless it is strongly calcified.² In a retrospective study by Malghem et al,² the authors were able to reliably identify all 15 cases of costal cartilage fractures in their patient series using CT scan. Most of the fractures in their series were mid-substance in location, similar to our patient's fracture. A CT scan also reliably

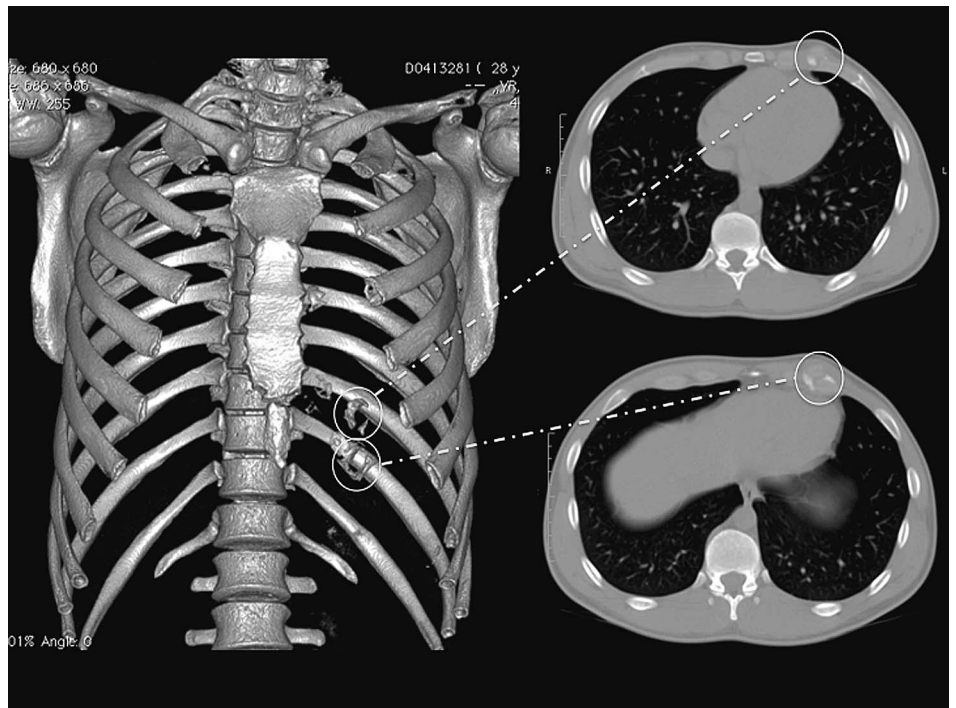


FIGURE 2. Follow-up CT scan approximately 10 weeks after injury. New bone formation can be seen at the site of the fifth (above right image) and sixth (below right image) costal cartilage fracture sites, which represents a healing response.

identifies concomitant injuries such as rib fractures and organ injuries, which have been reported to occur with sports-related costal cartilage injuries.^{1,4} Ultrasound and MRI have also been shown to reliably diagnose costal cartilage injuries.⁵ The advantage of these modalities over CT is the lack of additional radiation exposure, which is valuable in the pediatric population and for follow-up imaging.

The literature on outcome and treatment guidance after costochondral fracture is sparse. Although many of the costal cartilage fractures presented in the literature are reported to “heal,” what is unclear from these case series is the healing rates and quality of healing with this type of injuries. Questions exist regarding whether cartilage fracture healing would be as robust as the bony healing that occurs in rib fractures.^{8,9} Based on recent experimental animal studies on costal cartilage injury, there are questions whether costal cartilages have the capacity to fully heal.⁹ Unlike our case report, we are not aware of any case series where follow-up imaging is presented for these injuries.

With regards to return to sport, most athletes with costal cartilage fractures return once the pain subsides, which may range from 3 to 12 weeks.^{1,5,8,10} The use of protective padding is encouraged for an additional period for protection until the injury is fully healed. There is no literature that provides guidance on withholding an athlete from further contact sport participation based on this type of injury. Our rationale for recommending the athlete in this case report to no longer participate in contact rugby was based on consideration of his amateur competition level and the unique location of his costal cartilage fractures. The fractures involved the fifth and sixth

costochondral cartilages, which are intimately associated with the underlying cardiac structure. Our athlete’s complaint of occasional clicking along his chest wall with certain activities may suggest some residual motion at these costal cartilage fracture sites despite the bony callus that was seen at the 10-week repeat CT scan. A repeat collision may therefore place this injured area, and underlying cardiac structure, at risk.

REFERENCES

1. Willis-Owen C, Kemp SP, Thomas RD. Hepatic injury after costochondral separation in a rugby football player. *Clin J Sport Med*. 2009; 19:70–71.
2. Malghem J, Vande Berg B, Lecouvet F, et al. Costal cartilage fractures as revealed on CT and sonography. *AJR Am J Roentgenol*. 2001;176: 429–432.
3. Torreggiani W, Lyburn I, Thornton F, et al. Fracture of the costal cartilage: computed tomography assists diagnosis. *J Hong Kong Coll Radiol*. 2001;4:272–276.
4. Ng CS, Hall CM. Costochondral junction fractures and intra-abdominal trauma in non-accidental injury (child abuse). *Pediatr Radiol*. 1998;28: 671–676.
5. Subhas N, Kline MJ, Moskal MJ, et al. MRI evaluation of costal cartilage injuries. *AJR Am J Roentgenol*. 2008;191:129–232.
6. Miles JW, Barrett GR. Rib fractures in athletes. *Sports Med*. 1991;12: 66–69.
7. Brooks JH, Fuller CW, Kemp SP, et al. Epidemiology of injuries in English professional rugby union: part 1 match injuries. *Br J Sports Med*. 2005;39:757–766.
8. Gregory PL, Biswas AC, Batt ME. Musculoskeletal problems of the chest wall in athletes. *Sports Med*. 2002;32:235–250.
9. Piao Z, Takahara M, Harada M, et al. The response of costal cartilage to mechanical injury in mice. *Plast Reconstr Surg*. 2007;119:830–836.
10. Kemp SP, Targett SG. Injury to the first rib synchondrosis in a rugby footballer. *Br J Sports Med*. 1999;33:131–132.