

Fracture of the Costal Cartilage: Presentation, Diagnosis, and Management



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A 52-year-old woman sustained a fracture of the left 7th costal cartilage after a ski injury. She presented complaining of painful clicking over the area. Initial imaging studies were negative for fracture; however, 3-dimensional reconstruction of a chest computed tomography scan, formatted to costal cartilage, revealed the fracture. She was offered and underwent surgical fixation of the fracture with a plate and 4 screws using a biaxial, convergent construct. Postoperatively, her symptoms resolved. In this case report, we review the rationale for fixation of costal cartilage, including a summary of previous literature pertaining to this relatively rare thoracic injury.

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Data on the natural history of costal cartilage injury remains limited, and whether these fractures truly heal to form a stable union is unknown. Recent interest in the operative management of rib fractures in general has prompted curiosity in attempting this technique in cartilage fractures as well. The long-term outcomes of patients managed surgically with fixation remain unknown, however, and several technical issues related to the unique location of such fractures in the chest wall make this endeavor more challenging.

A 52-year-old woman was skiing when a snowboarder struck her from behind. As he fell, he reached his arm around her left side to brace himself and forcefully pulled in her left chest. She presented to a local emergency department complaining of left lower, anterior chest wall pain and left shoulder pain with the inability to abduct or flex her left shoulder. She specifically described painful “clicking” of a rib in and out of place with any motion over an area which corresponded to a palpable, painful instability on physical exam with chest muscle activation or rectus muscle activation. Chest and shoulder plain films were unremarkable, as was a noncontrast computed tomography (CT) chest and abdomen. However, reformatting the 3-dimensional reconstruction to expose costal



Fig 1. Computed tomography chest reconstructions formatted to costal cartilages and demonstrating an acute fracture of the left 7th costal cartilage (circled area).

cartilage revealed a subtle fracture of the left 7th costal cartilage, just lateral to the 6th to 7th interchondral joint (Fig 1, Supplemental Fig 1). She was transferred to our Level 1 trauma center and, after the history and physical exam findings were confirmed, underwent surgical exploration through a 6-cm transverse incision centered over the palpable depression the day after the ski injury (Supplemental Fig 2). After incising the anterior rectus sheath and splitting the muscle fibers longitudinally, a bruised perichondrium was visualized and incised. This revealed a complete transection of the costal cartilage with marked instability (Video). The cartilage depth was measured at 9 mm, and a 55-mm plate was used to bridge the fracture, with four 2.3-mm diameter, 9-mm screws on each side (DePuy Synthes, Inc, West Chester, PA) (Fig 2). The 5th to 8th intercostal nerves were infiltrated with liposomal bupivacaine (Pacira Pharmaceuticals, Inc, Parsippany, NJ), and the wound was closed in layers. Postoperative chest x-ray film confirmed plate position and the absence of pneumothorax (Fig 3). In the recovery room, the patient relayed resolution of the painful clicking sensation and left shoulder pain. One month postoperatively, the patient has recovered well with no residual pain or instability, and an additional chest roentgenogram confirmed adequate plate placement.

Comment

Fractures of the costal cartilage have been described sporadically in the literature, mostly in the setting of

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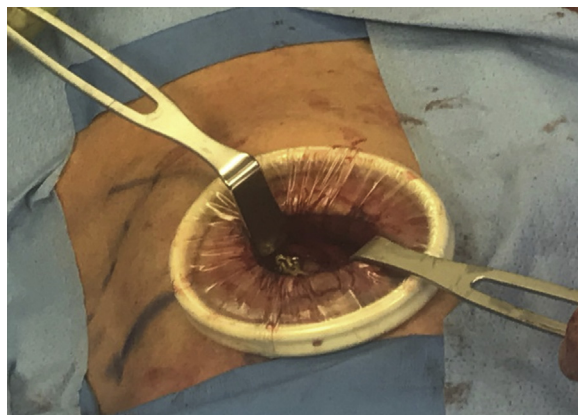


Fig 2. Intraoperative photograph of the plate in situ.

professional sports [1, 2]. A common theme is either delayed or missed diagnosis secondary to normal imaging studies [3, 4]. Although both 3-dimensional reconstruction specific to cartilage and ultrasound may be useful, the history and physical exam remain the mainstay of diagnosis.

Management recommendations have consisted primarily of pain control and rest. Data on the natural history of costal cartilage injury remain limited, and whether these fractures truly heal to form a stable union is unknown [5, 6]. Enthusiasm for operative management of rib fractures in general [7] has raised interest in the possibility of fixation of chondral fractures. Nevertheless, there are several technical challenges unique to this location on the chest wall, and the long-term efficacy of fixation of cartilage fractures remains unknown. Specifically, the anatomic relationships of costal cartilage to the sternum, ribs, and each other (eg, costochondral joints) can make identification of the precise location of the fracture, as well as selection of the best structure into which to affix hardware, challenging. Although it appears advisable to affix plates to bone as opposed to cartilage (eg, spanning the fracture by securing to the sternum medially and the rib laterally), certain fracture locations, such as this one, may render this option impractical or impossible. For this reason, fixation to cartilage on each side of the fracture was selected in this case. Although there is no evidence to support any one fixation platform over another, we selected a biaxial, convergent plating platform to maximize purchase into the cartilage. Further investigation is warranted to confirm ideal plate configuration and screw styles to maximize solid purchase of the reconstructive construct to cartilage. Additional prospective studies are necessary for determining outcomes of patients with chondral fractures who are managed operatively versus nonoperatively.

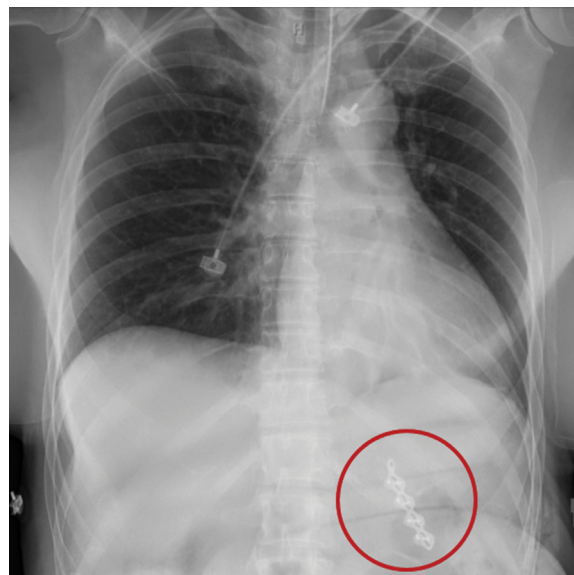


Fig 3. Postoperative chest X-ray demonstrating location and direction of plate (circled area).

Fractures of the costal cartilage represent a challenging and likely underappreciated entity. Surgical management of costal chondral fractures, and specifically fixation to cartilage on each side of the fracture, was successful in this instance. Further research into long-term outcomes is needed prior to recommending surgical fixation to all patients with such fractures.

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