Fracture of the Costal Cartilage: Computed Tomography Assists Diagnosis

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ABSTRACT
Rib fractures are common and almost always involve the osseous component of a rib. They are typically diagnosed on plain film. Fractures of the costal cartilage are rare and are invisible on plain film. We describe a case in which computed tomography aided in the visualisation of a displaced cartilaginous fracture. To our knowledge, computed tomography-assisted diagnosis of a displaced costal fracture has not previously been described.

Key words: Computed tomography, Costal cartilage, Fracture

INTRODUCTION
Traumatic fracture of the osseous component of a rib is a common injury. Conversely, fracture of the costal cartilage of the rib is rare and poorly described in the literature. While plain thoracic radiographs often identify osseous rib fractures, the diagnosis of a cartilaginous fracture is extremely difficult to make. The non-calcified costal cartilage is minimally perceptible on a plain radiograph making fracture detection almost impossible. Establishing the diagnosis of such a fracture is important, however, as identifying the cause of the patient’s pain allows the provision of appropriate symptomatic relief and the avoidance of further unnecessary investigations.

We report the case of a patient with normal plain radiographs following chest trauma, who had unexplained persistent severe localised chest pain. This was shown on computed tomography (CT) of the thorax to be due to fracture of the costal cartilage of a rib. To our knowledge such a case, in which CT established the diagnosis, has not been reported previously in the English language literature.

CASE REPORT
A 35-year-old male was admitted to hospital following a motorcycle accident in which he collided with the pavement, sustaining trauma to his left chest. On arrival at the emergency department, the patient complained of severe left-sided chest pain and painful respiration. Physical examination demonstrated tachycardia (110 beats/second), normal blood pressure, and shallow chest wall movement limited by pain. There was marked left-sided localised parasternal tenderness on palpation.

Clinical examination was otherwise normal with air entry present throughout both lungs. A plain radiograph of the chest was performed to assess for rib fractures and to rule out any underlying lung complications. This showed no abnormality, apart from some minor atelectasis in the left lower lobe of the lung (Figure 1). In view of the negative chest radiograph and persistent severe localised unexplained pain, a CT scan of the thorax was arranged. This indicated a fracture of the fifth costal cartilage with posterior displacement (Figure 2), which correlated clinically with the site of maximal chest tenderness. No parenchymal lung injury was seen.

On review, the chest radiograph did not show any abnormality in this area. The patient was commenced on appropriate analgesic therapy and admitted for observation. He subsequently made an uneventful recovery.
DISCUSSION

Blunt chest trauma is a common phenomenon. No clear guidelines exist in the literature regarding appropriate investigation and treatment in a haemodynamically stable patient with no clinical evidence of pneumothorax. Clinicians’ practice patterns are largely based on anecdotal evidence, clinical experience, and the theoretical risk of complications. Rib fractures are common and the diagnosis is usually made on clinical grounds. Routine radiography to diagnose rib fractures is considered of little benefit, given that it does not generally alter patient management, and arguably should be reserved for patients in whom underlying lung complications are suspected. Ultrasound may have a role in diagnosing rib fractures, being a potentially more sensitive tool than plain chest radiography.

Although CT is not used to routinely detect rib fractures, it is not uncommon to identify rib fractures when scanning a patient for underlying complications. There is a higher risk of associated internal complications with certain rib fracture locations. Fractures of the first rib are associated with aortic injury, for example, while sternal and adjacent anterior rib fractures are associated with internal thoracic artery injury due to the close proximity of this vessel. In its proximal portion, the internal thoracic artery is located immediately posterior to the costal cartilage, placing the vessel at risk when a fracture through the cartilaginous component of an upper rib occurs.

Rib fractures are usually related to the osseous rib component, with cartilage fractures being very rare. As cartilage is generally not visible on plain radiographs, fractures involving the costal cartilage are imperceptible. Due to its inherent higher spatial and contrast resolution, CT on the other hand, results in good visualisation of the costal cartilage. This allows for the accurate detection of a fracture through the cartilaginous component of a rib.

In the case reported, no associated underlying injury was identified on CT scanning of the thorax. Identification of the fracture involving the costal cartilage assisted management, however, as it determined the cause of unexplained pain and resulted in appropriate analgesic intervention. Establishing the definitive diagnosis offered reassurance to both the referring clinician and the patient concerning the adequacy of intervention.

It is important for clinicians to be aware of the possibility of a cartilaginous rib fracture, though it is a rare entity. While the authors do not advocate CT scanning of the thorax for all stable patients with blunt chest trauma, there appears to be a role for CT in selected patients, such as the case presented, where there is persistent severe localised chest tenderness in the context of normal chest radiograph films. The ability to reach the correct diagnosis, afforded by CT scanning, significantly aided patient management. Appropriate analgesia treatment could be administered with confidence and further investigation was not required.

REFERENCES