Case Report

Bilateral first rib and associated lower cervical spine fractures

Volume 7 Issue 5 - 2017

Ireena Ismail,[1] Collin SK Looi,[2] Ashraf Bin Hakim,[3] Roohi SA[4]
[1]Master Student in Anatomy, Universiti Putra Malaysia, Malaysia
[2]Resident, Department of Orthopaedics, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, Malaysia
[3]Lecturer, Department of Orthopaedics, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, Malaysia
[4]Professor & Consultant Hand & Microsurgeon, Department of Orthopaedics, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, Malaysia

Correspondence: Ashraf Bin Hakim, Lecturer, Department of Orthopaedics, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, Email acap76@yahoo.com

Received: December 15, 2016 | **Published:** March 24, 2017

Introduction

First rib fractures are uncommon, bilateral first rib fractures (BFRFs) being a rarer entity.1,2 Due to their deep seated position and protection from surrounding musculature, violent trauma such as that involving motor vehicle accidents (MVA) are a frequent cause of these fractures. Important to note are the circumstances in which patients survive this polytrauma, including the fact that it is possible other serious head and neck injuries may be missed, necessitating extra vigilance in the initial assessment.

Objectives

To report prior cases, thereby increasing awareness of this rare condition. To highlight the significant correlation between radiographic findings of bilateral rib fractures and vertebral fractures, more specifically, C7 vertebrae fractures.

Case reports

Here we present two interesting cases involving bilateral first rib and C7 vertebrae fractures.

Case 1

A 20 year-old male motorcyclist crashed and fell backwards hitting his head first (with his helmet on) near the occipital area. At the emergency department, he complained of pain over his lower neck and was found to have tenderness at the lower cervical region and was unable to fully abduct both his upper limbs. No other neurovascular abnormalities or chest injuries were detected.

Radiological examination indicated bilateral first rib and C7 transverse process fractures. Both clavicles were intact. A CT scan of the chest showed a small left haemothorax with adjacent lung contusion. No pneumothorax was seen and the right lung field was clear. The heart was of normal size with no pericardial effusion and the main vessels are of normal caliber.

The hemothorax was treated conservatively with patient on Philadelphia collar with thoracic extension for two months. At 18 months follow-up, complete healing occurred with no complications noted.

Case 2

A 46-year old man was involved in a motor vehicle accident (MVA) and sustained fractures of the skull, mandible, and maxilla, both first ribs, left 2nd and 3rd ribs, left clavicle and left scapula.

A CT scan of the head revealed multiple facial bone fractures and a left temporal extradural hemorrhage while CT scan of the chest showed a left hemothorax and subcutaneous emphysema. A CT scan of the cervical spine confirmed fractures of both first ribs and the left C7 transverse process. MRI of the cervical and brachial plexus area noted a presence of haematoma on the left paraspinal region compressing the upper left brachial plexus, which was not properly visualized.

Clinically, the patient had Horner's syndrome and was thus diagnosed with a pre-ganglionic upper brachial plexus lesion (C5, C6, C7).

Approximately two months post-trauma, the patient recovered from his injuries but the brachial plexus injury remained.

Figure 1 Bilateral first rib and C7 transverse process fractures seen on the AP view of the cervical spine radiograph.

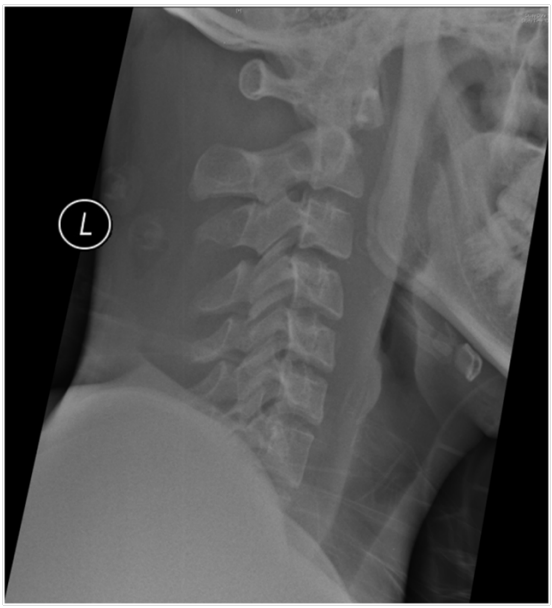

Figure 2 Lateral radiograph depicting the C7 transverse process fracture.

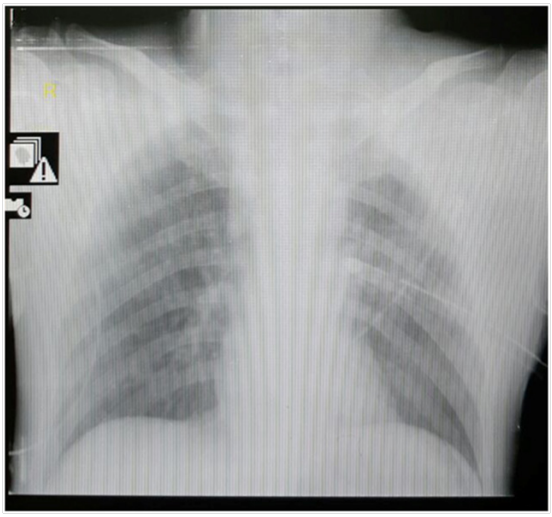

Figure 3 PA view chest radiograph showing fracture of both first ribs. The left 2nd and 3rd ribs including the left clavicle and left scapula are also fractured.

Figure 4 Axial CT image showing a left C7 transverse process fracture.

Discussion

First rib fractures are uncommon, bilateral first rib fractures being a rarer entity.[1,2] This is attributed to the unique anatomical characteristic of the first rib. The first rib is a deeply seated structure shielded by the shoulder girdle and its surrounding muscles.[3] Thus first rib fractures (unilateral) are classically caused by high energy trauma resulting in serious damage to mediastinal structures, rupture of the subclavian vessels and trauma to the brachial plexus and minor damage to the clavicle and scapula (as illustrated by the second patient).[2,4]

The proposed mechanisms that result in these fractures may be due to direct or indirect causes. Direct causes typically involve high-energy trauma to the chest wall; while indirect causes, which have been previously described, include excessive neck extension movements or excessive use of accessory muscles of respiration, resulting in 'traction-type' injuries.[2]

Indirect injuries have been attributed to violent contractions of juxtacostal muscles such as the scalene and sternocleidomastoid muscles which result in severe bending strain at a relative point of weakness at the first rib such as the subclavian groove.[3]

Another described pathology which exemplifies one of our cases is a Horner's lesion due to the trajectory of force going through the stellate ganglion.[5] Hassan et al mention that interestingly enough all reported cases were on the left![6] They postulate that the presence of the sensitive Ansa Subclavius nervous ring is more common on the left and thus if there is any traction injury to the subclavian artery it may be transmitted to this structure resulting in a paresis or paralysis.[6]

In cases involving direct trauma, theoretically, a considerable amount of force must be transmitted through the surrounding structures to result in these fractures. Considering the fact that transmission of a high magnitude of force occurs in both direct and indirect causes of fractures at the first rib (and usually the clavicles and scapulae as well), these injuries should be considered as major injuries.[2] Therefore, these fractures should serve as an indicator to arouse suspicion of other injuries associated with high-energy trauma. It has been said that traumatic first rib fractures are often associated with serious intra-thoracic, head, neurological and cervical spine injuries or more succinctly, life threatening injuries.[7,8] Recognition of these associated injuries is of equal importance as their identification might affect the patient's survival.

The authors report 2 cases of patients with bilateral first rib fractures with associated C7 vertebrae fractures. Current literature regarding these associated injuries is limited with only *Logan* reporting a potential association between cervical spine injury and first and second rib fractures. Based on his findings, almost a third of patients with traumatic cervical spine injuries have an associated upper-rib fracture with the strongest association between the C7 vertebrae and first rib fracture.[9] This strong association led us to suggest that in patients with first rib fractures, cervical spine imaging (radiographs/CT scans) should be highly considered. This is all the more significant when it has been reported that 90% of first rib fractures are detected on chest radiographs.[5] In both of the reported patients, either standard radiographs or CT scans of the chest (PA view), cervical spine (AP/Lateral views) managed to detect bilateral rib fractures with concurrent C7 vertebral fractures.

Conclusion

Thus, in patients with radiographically detected bilateral rib fractures, it would be prudent to proceed with imaging of the cervical spine or vice versa to detect these fractures, in regard to

Citation: Ismail I, Looi CSK, Hakim AB, et al. Bilateral first rib and associated lower cervical spine fractures. *MOJ Orthop Rheumatol.* 2017;7(5):11–12. DOI: 10.15406/mojor.2017.07.00287

their high degree of association. The investigative process should then be completed with further investigations to detect potential life threatening conditions, which are closely associated with the abovementioned fractures. Early detection of brachial plexus lesions may also afford a better outcome.

Acknowledgments

None.

Conflicts of interest

None.

References

1. Agrawal A, Pratap A, Kumar A, et al. Multiple fractures upper body fractures associated with extradural hematomas. *Pak J Neurol Sci*. 2007;2(1):11–13.
2. Chatterjee S, Dey R, Guha P, et al. Isolated traumatic bilateral first rib fracture: a rare entity. *Tanaffos*. 2011;10:60–63.
3. Joshi SG, Panday SR, Parulkar GB, et al. Bilateral fracture of the first rib; report of two cases. *J Bone Joint Surg Br*. 196547:283–285.
4. Moodley MS, Singh B, Tallapaneni V. Bilateral first rib fractures – case report and review. *SAJS.* 2007;45(3):104.
5. Maria José Denis, Andreia Teles, Idsabel Carvalho. Horner Syndrome Due to First Rib Fracture. *Arch Bronconeumol*. 2013;46(3):151–155.
6. Hassan ANA, Ballester J, Slater N. Bilateral first rib fractures associated with Horner's Syndrome. *Injury*. 2000;31(2000):273–274.
7. Lee SJ, Chu SJ, Tsai SH. Isolated bilateral first–rib fractures. *J Emerg Med*. 2010;39(2):204–205.
8. Qureshi T, Mander BJ, Wishart GC. Isolated bilateral first rib fractures – an unusual sequel of whiplash injury. *Injury*. 1998;5:397–398.
9. Logan M. Is there an association between fractures of the cervical spine and first– and second– rib fractures? *Canadian Association of Radiologists Journal*. 1999;50(1):41–43.