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Case Report

Isolated bilateral first rib fracture associated with congenital cervical block vertebra – A case report

Raju Karuppal^{a,*}, Chathoth Meethal Kumaran^b, Anwar Marthya^c, Rajendran V. Raman^d, Sandhya Somasundaran^d^aDept of Orthopaedics, Govt. Medical College, Kozhikode 673008, Kerala, India^bDept of Orthopedics, MES Medical College, Perinthalmanna 679338, Kerala, India^cDept of Orthopaedics, KMCT Medical College, Kozhikode 673008, Kerala, India^dDept of Ophthalmology, Govt. Medical College, Kozhikode 673008, Kerala, India

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1. Introduction

Fracture ribs, more frequently the lower ribs, are commonly associated with Chest trauma.¹ First rib fracture is uncommon due to its peculiar anatomical location.² It was first described by Lane (1885). Bilateral fractures of the first ribs are still rarer.² They are usually associated with severe blunt trauma; although other mechanisms like indirect trauma, sudden contraction of the neck muscles, and stress or fatigue fractures are also been attributed.^{2–4}

In indirect trauma, first rib fractures due to violent contraction of scalene and sternomastoid muscles.^{4,5} The

articular processes of the neural arch have been implicated in weight transmission through the cervical spine. The exact relationship of the cervical block vertebra to the fracture ribs is not clear-cut on account of the alteration in the biomechanics.

First rib fracture may be associated with early or late complications, though they are very rare.^{3,6,7} Treatment for isolated first rib fractures is mild analgesia and rest.² If complications are present, each must be treated accordingly.⁶ To the best of our knowledge, bilateral fracture of the first rib associated with congenital cervical block vertebra has not been reported previously.

* Corresponding author. Karuppal House, Post Mukkam 673602, Calicut, Kerala, India. Tel.: +91 9447330002.

E-mail address: drkaruppal@rediffmail.com (R. Karuppal).

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2. Case report

A 63-year-old male presented following a fall on outstretched hand, complaining of stabbing pain at the base of the neck and both shoulders. There was no history of direct injury to the neck and shoulders.

On examination there was abraded wound in the middle of the forehead. He had tenderness over the scapular region and at the base of neck. There was no obvious deformity or swelling. There were no abnormal neurological or vascular signs or any evidence of head or chest injury. The neck movements were grossly restricted. Radiographs showed congenital cervical block vertebra type 1 (Fig. 1) and bilateral first rib fracture at the anterolateral aspect (Fig. 2). Computed tomography scan confirmed the fracture. We managed our patient with mild oral analgesics and rest for a period of two weeks. Although symptoms gradually improved over a period of four weeks, mild discomfort remained for four months.

3. Discussion

First rib fractures may be isolated or occur in association with other rib fractures^{3,5,6,8,9} and are usually located in the area of anatomical weakness (a shallow depression for the subclavian artery).¹⁰

All the other ribs are different from the first rib as it is deeply placed and protected on all sides by the shoulder

Fig. 1 – Radiographs of cervical spine showing congenital cervical block vertebra type 1.

Fig. 2 – Radiographs of root of neck with upper chest showing bilateral first rib fracture at the anterolateral aspect.

girdle and by the regional musculature. Hence isolated first rib fracture is rare in direct external violence. If this is the cause, there are often other associated fractures (clavicle, scapula) and great concern that there may be associated injury to the subclavian vessels, brachial plexus, or the pleura.¹¹

In indirect trauma, the mechanism of first rib fractures is due to violent contraction of scalene and sternomastoid muscle.⁵ It has been suggested that sudden powerful contraction of the scalene muscle may fracture the rib at its thinnest segment.⁸ This may occur when the head is thrown backwards or sideways. Our patient had abraded wound over the forehead sustained during his fall which indicates hyperextension moment at neck.

The exact relationship of the cervical block vertebra to the fracture ribs is not clear-cut on account of the alteration in the biomechanics.⁵ In patients with congenital cervical block vertebra, weight transmission of the impact force may be more vertically directed and dissipated through the nearest transverse bone (first rib). This impulsive force on the first rib leads to a bending moment distribution with maximum values at the indicated positions shown in Fig. 3. This bending moment distribution is well known.¹⁸

And this may be the probable contributory mechanism of bilateral first rib fracture associated with cervical block vertebra.

Most patients with first rib fracture present with pain. According to the literature, as in our case, the pain is usually located in the region of the scapula and shoulder or behind the clavicle.^{8,10,12} This symptom may be clinically misleading raising concern about shoulder pathology. The pain may also

Fig. 3 – The impact force on the forehead being transmitted to the first rib and the points of maximum bending moment.

be located in the upper chest or the base of the neck. Weakness of the upper extremity and occasionally pain or paraesthesia radiating down the arm have also been described.^{8,13,14} This was not seen in our case.

First rib fracture is normally visualized with chest radiographs as a simple linear crack. The fracture may resemble non-union or pseudoarthrosis if it has been present for some time or as callus formation.¹²

Early complications from first rib fractures are rupture of the apex of the lung, pneumothorax, emphysema, pleurisy, aortic arch aneurysm, tracheo-oesophageal fistula, brachial plexus injury, Horner's syndrome, ruptured subclavian artery, and abscess formation above or below the clavicle, have been reported.^{3,5,6,8,15,16} None of these were seen in our case. Angiography is justified in many patients when there are specific indication like first rib fracture after trauma include widened mediastinum on chest radiography, pulse deficit in the arm, posteriorly displaced first rib fracture, subclavian groove fracture anteriorly, brachial plexus injury, and expanding haematoma.^{15,17} Late complications include thoracic outlet syndrome and non-union, but they are very rare.^{3,5,7}

Treatment for isolated first rib fractures, without any complications is mild analgesia and rest until symptoms resolve.^{10,14} If complications are present, each must be treated accordingly. Non-union of first rib fractures has been reported as asymptomatic, with no further treatment necessary.^{10,12}

4. Conclusion

No reported case of bilateral first rib fracture with congenital cervical vertebra has hitherto been available. This paper describes such a case and the probable biomechanics we postulated.

Statement of patient consent

The authors have obtained the patient's informed written consent for print and electronic publication of the case report.

Conflicts of interest

All authors have none to declare.

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