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CLINICAL CASE

Rib cage ostheosynthesis. Literature review and case reports☆

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Rib fractures;
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Abstract
Background: Fractures of the chest wall include sternum and rib fractures. Traditionally they are managed conservatively due to the anatomy of the rib cage that allows most of them to remain stable and to form a callus that unites the fractured segments. In spite of this management, some patients present with chronic pain or instability of the wall which makes them require some type of fixation. The present article performs a literature review based on 4 cases.
Clinical cases: The *first case* was a 61 year-old man with blunt chest trauma, with a great deformity of the chest wall associated with subcutaneous emphysema, and pneumothorax. The *second case* was a 51 year-old man with blunt chest trauma, initially managed at another institution, who despite treatment, had persistent pain and dyspnoea. The *third case* was a 30 year-old man that suffered a motor vehicle accident, with resulting pain and crepitation of the rib cage and with diagnostic images showing multiple rib fractures. The *last case* is a 62 year-old man that fell down the stairs, with blunt chest trauma with high intensity pain, dyspnoea and basal ipsilateral hypoventilation.
Conclusion: Rib fracture fixation offers a good alternative in selected patients to decrease associated morbidity, leading to a patient's fast return to his or her working life.

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PALABRAS CLAVE
Fracturas costales;
Reducción abierta;
Osteosíntesis

Osteosintesis de reja costal. Revisión de la bibliografía y reporte de casos

Resumen
Antecedentes: Las fracturas de la pared torácica, comprenden fracturas costales y del esternón. Tradicionalmente se manejan de manera expectante, debido a la anatomía de la reja costal, que permite que la mayoría permanezcan estables y formen callos óseos que unan los segmentos fracturados. A pesar de este manejo, algunos pacientes cursan con dolor crónico o inestabilidad de la pared, por lo que requieren algún tipo de fijación. El presente artículo hace una revisión del tema respecto a una serie de 4 casos.
Casos clínicos: El *primer caso* es un hombre de 61 años con trauma cerrado de tórax, con gran deformidad de la pared torácica, asociada a enfisema subcutáneo y neumotórax. El *segundo caso* es un hombre de 51 años con trauma cerrado de tórax, con manejo inicial en otra institución; pero en quien a pesar de esto persiste el dolor, y la sensación de disnea. El *tercer caso* es un hombre de 30 años quien sufre accidente de tránsito, con dolor, y crepitación de la reja costal, y con imágenes diagnósticas que muestran fracturas costales múltiples. El *último caso* es un hombre de 62 años que presenta caída por escaleras, con trauma cerrado de tórax con dolor de alta intensidad, y disnea; en quien se evidencia movimiento paradójico del tórax izquierdo e hipoventilación basal ipsilateral.
Conclusiones: La fijación de fracturas costales, ofrece en pacientes seleccionados una buena alternativa para disminuir la morbilidad asociada, y permitir al paciente su pronto retorno a su vida laboral.

Background

The first open fracture reduction report belongs to the 1st century 1 AD and was performed by Soranus, according to Hurt.[1] Later on, Paré described a method of handling rib fractures in which there was an attempt at closed reduction and then an open reduction if the first attempt failed[2]; that procedure became obsolete because it was not very effective. During the Second World War, doctors chose to remove rib fragments inside the lung,[3] and today, open reductions and external fixation of ribs and sternal fractures are increasingly practised[4] in selected cases, even implementing minimally invasive approaches.[5]

External traction has been initially described for handling sternal fractures,[6,7] then wire and Russian internal thread fastenings were implemented in 1956.[8] Later on, positive pressure with mechanical ventilation was implemented. This technique is still used, since it provides better handling and avoids respiratory failure, which is frequent in complex fractures.[9]

Clinical cases

Case 1

61-Year-old male patient with a history of chest blunt trauma caused by being run over by a bull. He was transferred to an emergency department where he went into respiratory failure; he was intubated and needed mechanical ventilation. During the initial assessment, a large deformity was identified in his left anterior thoracic wall with unstable thorax associated with subcutaneous emphysema. The chest X-ray registered a left-sided pneumothorax, so a left-sided closed thoracotomy was performed and the patient was transferred to the intensive care unit. At this point, a chest computerised axial tomography scan was ordered, which evidenced multiple displaced left rib fractures and pneumothorax (Fig. 1). With these findings, a cross-consultation with thoracic surgeons was made, who considered that the patient was a candidate for rib osteosynthesis with an 8-hole, one-third tubular osteosynthesis plate with bicortical screws. This procedure was carried out without complications, and watertight closure was used after surgery (Fig. 2).

The patient was extubated six days after surgery and discharged 14 days after surgery, without complications. He returned to work 30 days after the trauma. There was no pulmonary function follow-up since the patient was lost.

Case 2

51-Year-old patient who underwent a closed trauma in his left hemithorax after being hit by a bull. He received initial treatment at a rural hospital, but since the pain in his left hemithorax and a sensation of dyspnoea persisted, he was referred to our institution. During physical examination there was no evidence of paradoxical respiration or subcutaneous emphysema, or hypoventilation or abnormal lung sounds. A computerised chest tomography scan was conducted, which showed displaced fracture of three left ribs with haemothorax. Based on the clinical and tomographic findings, he underwent rib osteosynthesis using the STRACOS system® and watertight closure after surgery without complications. He returned to work 20 days after the