A novel method of rib plating in a flail chest

G. Ekanayake, L. Jayathilake, D. Wijesinghe, J. Parakramasinghe, U. Dharmapala, S. Alagiyawanna, N. Manawadu

Plastics and Reconstructive Unit, Teaching Hospital Kurunegala, Sri Lanka

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Case Report

A 30 year old male patient was transferred following a motor bike accident with the primary impact onto his chest and lower limbs. On admission his GCS scored 15 and he was experiencing severe chest pain. He was dyspnoeic with tachypnoea and reduced chest movements. His clinical diagnosis was a bilateral haemothorax. Chest X-ray showed multiple rib fractures with bilateral haemopneumothorax predominantly on the left side. Bilateral intercostal tubes were inserted immediately and the patient was given 100% O₂ via a face mask. However, his condition was not improving. He had to be on oxygen via a face mask to maintain his saturation. A CT chest with 3D reconstruction was done 3 hours after bilateral chest tubes failed to improve saturation, and it confirmed multiple rib fractures anteriorly as well as posteriorly on his left chest wall (Figure 1 & 2).

Figure 1. Pre-operative CT scan..

The CT report did not reveal any significant lung contusion that would have contributed to his desaturation. Therefore it was confirmed that the desaturation is mainly due to a large

flail segment on the left hemithorax.

Figure 2. Pre-operative CT scan showing fracture on the right side.

The decision was then made to proceed with fixation of the fractured ribs via an antero-lateral thoracotomy type incision. On deep dissection, the Latissimus was retracted posteriorly to expose the Serratus Anterior and the Serratus muscle fibres were split in line to expose the fractured ribs. Anteriorly, the second to ninth ribs were fractured and displaced. Posteriorly, the second to ninth ribs were fractured. Out of these, the seventh to ninth fractures were displaced. Titanium mesh plates which are used for cranial vault reconstruction was used for fixation of the fractured ribs since the usual rib plates were not available at that time (Figure 3). This is the same method we use for harvesting intercostal nerves routinely for extraplexural neurotization of the brachial plexus. The Titanium mesh was cut into the appropriate length and width and used to fix the ribs by using self-drilling screws. The intra-pleural line was placed for administering intra-pleural anaesthesia. Chest tubes were replaced. Closure of overlying muscle and subcutaneous tissue was done and the patient was observed closely at the post-operative surgical ward. He was extubated on the table by the anaesthetist and was observed with intrapleural bupivacaine and local infiltration of bupivacaine.

Chest physiotherapy was started from following day onwards. Breathing pattern of the patient improved remarkably following the surgery and he was weaned off

Correspondence: G. Ekanayake
E-mail: gayanse2003@yahoo.com
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oxygen after few days. Bilateral intercostal tubes were removed on the tenth postoperative day. A chest X-ray was taken after removal of the intercostal tubes and it showed fully expanded lung fields bilaterally. Thus the patient was discharged from the hospital on the twelfth day following surgery.

Outcome and follow-up

The patient was seen as an out-patient after two weeks. He was clinically well with clinically normal lung functions.

Figure 3. Posterior plate fixation.

Discussion

Flail chest is one of the major life threatening condition following severe blunt injuries to the chest. Flail chest is usually described as the paradoxical movement of a segment of chest wall caused by the fracture of three or more ribs anteriorly and posteriorly.

Treatment of flail chest can be either surgical or non-surgical depending on the severity. There are several surgical options for hardware available for fixation of rib fractures: metal plates (Judet plate, U-plate, pre-contoured locking plates), absorbable plates and intramedullary fixation (Kirschner

wire, Rehbein plates and rib splint). However, several newer options of stabilizing the flail segment is in evolution and are currently not available locally in our setting. Therefore, titanium mesh plates with screws which is used for cranial vault reconstruction were used instead of them.

The titanium plates can be fixed in different directions and in various places, thereby facilitating it to maintain the contour of the fractured rib. Since the rigidity of the titanium plate is more it will help to distribute the pressure evenly through the bone and the plate. These advantages allow a stable fixation. Self-drilling screws were used to fix the titanium plates to bones. It will avoid thermal injury to bone compared to other methods. Apart from that, this method is economically advantageous and the equipment is locally available. This method can hence be established as a successful treatment for flail chest resulting from multiple rib fractures.

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Key Points:

- Fixation of multiple rib fractures with titanium mesh plates and self-drilling screws is a successful method of treating patients with severe flail chest in local settings with low resources.