Cirugía y Cirujanos. 2015; 83(1): 23-28

CIRUGÍA y CIRUJANOS

Órgano de difusión científica de la Academia Mexicana de Cirugía

Fundada en 1933

www.amc.org.mx www.elsevier.es/circir

ORIGINAL ARTICLE

Unstable thorax fixation with bioabsorbable plates and screws. Presentation of some cases☆

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Received 10 February 2014; accepted 1 September 2014

KEYWORDS
Flail chest;
Bio-absorbable screws and plates

Abstract

Background: Flail chest is managed with mechanical ventilation or inhalation therapy, and analgesia. Mechanical ventilations carry risks by themselves, and disengage with the external fixators, so they must be operated to improve lung ventilatory mechanics and cleaning. Little has been published on the use of bio-absorbable material and its evolution in the setting of flail chest.

Material and methods: A study was made on a material that did not have to be removed, that had the malleability of steel, its inflammatory reaction was minimal, and could be handled in both adults and children. A descriptive study is presented of patients with flail chest under rib fixation with plates and bio-absorbable screws.

Results: A series of 18 cases are presented, with ages from 33-74 years, three with bilateral flail chest. Fixation was performed between days 1-21 of the accident. In cases that showed no fractures of pelvic limbs, walking was restarted the day after fixing. In all cases mechanical ventilation improved and pain decreased. So far there has been no reaction to the material.

Conclusions: Flail chest has a high (16.3%) mortality when the pathophysiology of the condition (pain, poor mechanical ventilation, alveolar oedema-pulmonary contusion) is not treated. The use of bio-absorbable material has no side effects attributable to material, making it another option for rib fixation.

☆Please cite this article as: Nolasco-de la Rosa A. L. et al. Fijación de tórax inestable con placas y tornillos bioabsorbibles. Presentación de serie de casos. Cirugía y Cirujanos. 2015; 83: 23-28.

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PALABRAS CLAVE
Tórax inestable;
Placas y tornillos bioabsorbibles

Fijación de tórax inestable con placas y tornillos bioabsorbibles. Presentación de serie de casos

Resumen
Antecedentes: El tórax inestable se maneja con ventilación mecánica o inhaloterapia y analgesia. Los pacientes ventilados mecánicamente tienen los riesgos de la ventilación misma y se desacoplan con fijadores externos, se debe operar para mejorar la mecánica ventilatoria y la limpieza pulmonar. Poco se ha publicado del uso de material bioabsorbible y su evolución en la fijación de tórax inestable.
Material y métodos: Se investigó un material que no tuviese que retirarse, que presentará la maleabilidad del acero y que su reacción inflamatoria fuera mínima, que además pudiese ocuparse tanto en adultos como niños. Se presenta un estudio descriptivo de pacientes con tórax inestable sometidos a fijación costal con placas y tornillos bioabsorbibles.
Resultados: Se presentan 18 casos, con edades entre los 33 y los 74 años, 3 con tórax inestable bilateral; la fijación se realizó entre los días 1 y 21 del accidente. En aquellos casos en que no se presentaban fracturas de extremidades pélvicas, se reinició la deambulación al día siguiente de la fijación, en todos los casos mejoró la mecánica ventilatoria, el dolor disminuyó y ninguno hasta el momento ha presentado reacción al material.
Conclusiones: El tórax inestable tiene una mortalidad alta (16.3%) cuando no se brinda manejo a la fisiopatología del cuadro (dolor, mala mecánica ventilatoria, contusión pulmonar-edema alveolar). El uso de material bioabsorbible no tiene efectos secundarios atribuibles al material, por lo cual es una opción más para la fijación costal.

Background

Thoracic trauma, according to Wilson et al.[1] is responsible for 25% of the 50 to 60,000 deaths that annually occur due to car accidents, 25% of which correspond to unstable thorax, or flail chest (FC)[2-4], which presents paradoxical respiration. When accompanied by other injuries, FC considerably raises the mortality rate[5,6]. It was believed that the main lesion was loss of the rib cage architecture, which in turn produced respiratory insufficiency, but it has been demonstrated that other factors cause respiratory insufficiency, such as pulmonary contusion, pain, and shock, among others[7,8]. The capillary lesion produces an intra-alveolar and interstitial haemorrhage with oedema, which develop an intrapulmonary shunt, with the subsequent reduction of the functional residual capacity and pulmonary compliance, which in turn increases respiratory effort and leads to quick muscle fatigue, mainly if associated with pain and shock. In the absence of shock, this condition develops in an average of 6 to 12 hours after trauma[9-12]. Treatment for unstable thorax has been conditioned by the accepted physiopathology in every stage; that is to say, when the problem was considered to be caused by the instability of the chest wall, treatment was oriented in that sense[13-15]. In 1956, Avery[16] used internal pneumatic stabilization as a treatment for flail chest, with the aim of correcting the wall defect by applying positive pressure ventilation. This favoured bone consolidation[16-18], but also respiratory infections from the prolonged ventilation, with subsequent tracheostenosis and death of the patient[18]. The methods of ventilation used are: positive end expiratory pressure (PEEP), continuous positive pressure ventilation alone, or combined with the intermittent mandatory ventilation. Recently, authors such as Hormaechea[19] and Lardinois et al.[10] recommended the use of high-frequency positive pressure ventilation combined with low-rate conventional mechanical ventilation, reporting peak pressures and lower PEEP, which minimize barotrauma. They observed less damage to pulmonary tissues from oxygen exposure at a lower concentration of oxygen and better consolidation of the fracture by minimum and strictly necessary movement, as the cycles are adjusted from 130 to 169 cycles/min. In 1975, Trinkle et al.[17] supported the conservative management for efficient pulmonary hygiene. Irrespective of the management therapy, we must remember that patients with this lesion frequently present multiple injuries and can present head injury, lesions in the internal abdominal organs, long bone fractures, haemopneumothorax, etc., which worsen prognosis and increase morbidity and mortality. Currently, it is known that when there is flail chest with sternal fracture, external fixation of the sternal fracture or osteosynthesis must be performed as part of the treatment. Rib fixation must be performed when flail chest is diagnosed or when, without being unstable in the strict sense of the definition, there are more than seven ribs fractured in the same hemithorax, which may or may not include the sternum. Whenever fractured, the sternum must be fixed, as it may lead to mechanical instability[19].

The bioabsorbable LactoSorb®[20] material is the only material proven to be absorbed or to disappear in a year or less. Since its introduction in 1996, it has been particularly used in craniofacial surgery. This material is comparable to titanium plates regarding malleability. The initial strength decreases to 70% after eight weeks of implantation, the time needed for bone consolidation. The minimal inflammatory reaction, the absence of migration, and its high effectiveness have been proven in both children and adults[20]. The