

Crossed Kirschner's wires for the treatment of anterior flail chest: an extracortical rib fixation

Felice Mucilli, Pierpaolo Camplese, Giuseppe Cipollone, Decio Di Nuzzo, Luigi Guetti, Marco Prioletta, Mirko Barone*

Department of General and Thoracic Surgery, University Hospital "SS. Annunziata", Chieti, Italy

Received: 2 May 2016
Accepted: 5 June 2016
Published online: 23 July 2016

*Corresponding author: Mirko Barone, Department of General and Thoracic Surgery, University Hospital "SS. Annunziata", Via dei Vestini, 1,66100 Chieti (CH), Italy. Tell: +390871358289; Fax: +390871358220; Email: mir87mb@libero.it

Competing interests: None.

Funding information: None.

Citation: Mucilli F, Camplese P, Cipollone G, Di Nuzzo D, Guetti L, Prioletta M, et al. Crossed Kirschner's wires for the treatment of anterior flail chest: an extracortical rib fixation. *Journal of Emergency Practice and Trauma* 2016; 2(1): x-x. doi: 10.15171/jept.2016.11

Abstract

Objective: Thoracic trauma may be a life-threatening condition. Flail chest is a severe chest injury with high mortality rates. Surgery is not frequently performed and, in Literature, data are controversial. The authors report their experience in the treatment of flail chest by an extracortical internal-external stabilization technique with Kirshner's wires (K-wires).

Methods: From 2010 to 2015, 137 trauma patients (109 males and 28 females) with an average age of 58.89 ± 19.74 years were observed. Seventeen (12.41%) patients presented a flail chest and of these, 13 (9.49%) with an anterior one. All flail chest patients underwent early chest wall surgical stabilization (within 48 hours from the injury).

Results: In the general population, an overall morbidity of 21.9% (n=30 of 137) and a 30-day mortality rate of 5.1% (n=7 of 137) were observed. By clustering the population according to the treatment (medical or interventional vs surgical), significant statistically differences between the two cohorts were found in morbidity (12.65% vs. 34.48%, $P=0.002$) and mortality rates (1.28% vs. 10.34%, $P=0.017$). In patients undergoing chest wall surgical stabilization, with an average Injury Severity Score of 28.3 ± 5.2 and Abbreviated Injury Score (AIS) of 8.4 ± 1.7 , an overall morbidity rate of 52.9% (n=9) and a mortality rate of 17.6% (n=3) were found. Post-surgical device removal, in local anesthesia or mild sedation, was performed 42.8 ± 2.9 days after chest wall stabilization and no cases of wound infection, dislodgment of the wires or osteosynthesis failure were reported. Moreover, in these patients, an early postoperative improvement in pulmonary ventilation (ΔPaO_2 and ΔpCO_2 ; +9.49 and -5.05, respectively) was reported.

Conclusion: Surgical indication for the treatment of flail chest remains controversial and debated both due to an inadequate training and the absence of comparative prospective studies between various strategies. Our technique for the surgical treatment of the anterior flail chest seems to be anachronistic, but the aspects described, both in terms of technical features and of outcome and benefits (health, economic), allow to evaluate the effectiveness of this approach.

Keywords: Flail chest, Chest trauma, Kirschner's wire, Injury Severity Score, Abbreviated Injury Score.

Introduction

Thoracic trauma may be a life-threatening condition. In the United States and Europe, mortality rates in chest trauma patients amount up to 60%. In addition, about a quarter of deaths in polytrauma patients can be attributed to thoracic injury (1). An operative treatment of blunt thoracic injury is required in less than 10% of cases; while in the majority of cases, medical therapy or interventional procedures (such as the placement of a chest drainage) are needed.

Flail chest is a severe chest injury with high mortality rates. In recent reports, it accounts for 9.1% (2) of thoracic traumas with a mortality rate of 20%-33% (3,4). Patients with severe chest injury can develop not only early dramatic

consequences, but also long-term effects and disability. In addition, flail chest also presents local (respiratory impairment, shunt effect) and systemic (increased terminal complement components) pathophysiological effects causing catastrophic results (5). The use of positive pressure ventilation (PPV) has been described in these patients (6). However, this technique requires a prolonged mechanical ventilation which may arise in pulmonary complications (pulmonary infections, distress syndromes) with mortality rates up to 36% (7). Moreover, a conservative strategy does not always allow a stabilization of the bony stumps, resulting in osteosynthesis failures, debilitating chronic pain, secondary chest wall deformities up to 64% of cases (8).

