Turk J Anaesth Reanim 2014; 42: 277-9 DOI: 10.5152/TJAR.2014.67044

Case Report

The Decrease of the Duration of Stay in the ICU with Rib Fixation in a Case of Multiple Rib Fracture

Aykut Sarıtaş[1], Gökhan Güneren[2], Pelin Uzun Sarıtaş[1], Seyit Ali Kızılkaya[3], Cengiz Ugış[1]
[1]*Clinic of Anaesthesiology and Reanimation, Prof. Dr. A. İlhan Özdemir State Hospital, Giresun, Turkey*
[2]*Clinic of Chest Surgery, Milas State Hospital, Muğla, Turkey*
[3]*Clinic of Plastic Surgery, Suhospital, İzmir, Turkey*

Abstract

Severe breathing problems arise in multiple rib fractures. As a result, many advantages of the surgical stabilization of the chest wall have been reported. Especially, shortening mechanical ventilation, along with a decrease in the duration of intensive care unit stay, is important for the prevention of possible infection complications. In this study, the dramatic improvement of the breathing pattern, as well as the reduction in ventilator duration after rib fixation time, of a 36-year-old patient with severe respiratory distress who had multiple rib fractures due to a road traffic accident was discussed. Due to this fact, it is concluded that patients could be discharged from the hospital earlier and uncomplicated as a result of fixation of the rib with the right indications.

Key Words: Intensive care, rib fracture, rib fixation

Introduction

Blunt trauma to the chest cause rib fractures at a rate of 35-40% (1). This is in fact, a substantially high rate. Multiple rib fractures often result in severe respiratory problems. Due to intense pain, dyspnoea and insufficient inspiration, the rate of pulmonary complications, and particularly the rate of atelectasis increase. This situation leads to longer length of hospital and intensive care stay, increased morbidity, and consequently to high patient cost (2). Effective pulmonary ventilation is tried to be provided with early intubation, aggressive pain control and mechanical ventilation in cases with flail chest; and this approach results in prolonged intensive care and hospital stay, sepsis and barotrauma (3-7).

Surgical stabilization of the chest wall has been reported to have multiple advantages, which include shortening of the duration of mechanical ventilation, hospitalization and intensive care stay, and reduction of the degree of respiratory dysfunction and decreased frequency of postural deformities (8-10). This paper is intended to present the success of early rib fixation in decreasing pulmonary complications in a case with severe chest deformity and multiple rib fractures and its effects on decreasing the length of intensive care stay.

Case Presentation

A 36-year-old male patient was brought to the emergency department of Giresun Prof. Dr. A. İlhan Özdemir State Hospital because of a traffic accident. Computed tomography (CT) of the brain and abdomen revealed no pathological findings. Thoracic CT demonstrated haemopneumothorax on the left side, contusions in the left lower lobe and posterior and lateral multiple rib fractures at the mid thoracic level. A chest tube was inserted due to haemopneumothorax. There was considerable paradoxical motion "flail chest" of the left hemithorax. Although brain CT was normal, arterial blood gas analysis revealed hypoxemia (PaO_2: 52 mmHg, $PaCO_{2:}$ 41.3 mmHg SaO_2: 83%), and the patient with mental confusion was intubated, and mechanical ventilation was initiated. During mechanical ventilation, midazolam and fentanyl infusion was started in the patient with a need of sedation and analgesia because of paradoxical motion due to fractured ribs. While analgesic treatment for pain was continued, sedation was discontinued. In the follow-up, when the patient recovered consciousness, pain complaints increased along with the increased paradoxical motion. Intercostal blockade, narcotics and nonsteroidal anti-inflammatory analgesics were given in order to control pain, and it was decided to wean the patient from mechanical ventilation; however, weaning attempts were unsuccessful because of pain and paradoxical breathing. As there was continuous air leak

Address for Correspondence: Dr. Aykut Sarıtaş, Clinic of Anaesthesiology and Reanimation, Prof. Dr. A. İlhan Özdemir State Hospital, Giresun, Turkey Phone: +90 454 310 20 00-1918 E-mail: aykut26tr@hotmail.com

Received: 05.09.2013
Accepted: 25.11.2013
Available Online Date: 09.07.2014

from the chest tube, the patient was consulted with thoracic surgeons, and they suggested that early rib fixation would be beneficial in the case. Indication of surgery was based on pain that could not be relieved by intercostal blockade, narcotics and nonsteroidal anti-inflammatory analgesics, continuous air leak from the chest tube, intrathoracic haematoma and flail chest deformity.

After written informed consent for surgery was obtained from the relatives of the patient, the patient was taken to surgery by the thoracic surgeons at 4 days of hospitalization. Double lumen intubation was performed under general anaesthesia in lateral decubitus position. A thoracotomy incision was made at the midline of fractured ribs, and the skin and subcutaneous tissues were retracted. From the upper border of the fractured ribs, the involved lung was deflated and the thoracic cavity was accessed. Reduction was accomplished by placing the broken edges of the ribs in appropriate anatomical position (Figure 1). Titanium mini plate and clamps were used for fixation. All displaced fractures were reducted and fixation was established (Figure 2). The patient, whose analgesic requirement was decreased and posture was improved, was extubated 1 day after the surgery. The patient then was transferred from the intensive care to the ward 2 days after extubation. The patient who had no problems in the postoperative follow-up period was discharged with full recovery.

Discussion

Rib fractures generally heal without treatment and these patients usually receive conservative treatment. However, in cases with multiple rib fractures, reduction may become necessary. These cases are those having prolonged pain despite adequate medical treatment, parenchymal injury, hematoma, postural deformity and flail chest.

Various treatments are used in the conservative approach for patients with rib fractures including nonsteroidal anti-inflammatory drugs, intravenous narcotics and sedative agents, and transdermal narcotics. Adequate pain control cannot be achieved with these treatment options in our case. Kerr-Valentic and colleagues (11) reported that neither pain control nor returning to daily activities is eased by non-surgical treatment.

Flail chest injuries are the second most frequent type of thoracic trauma. As hypoxia develops in patients with flail chest, these cases are hospitalized in intensive care unit, and are ventilated with mechanical ventilator after endotracheal intubation. It has been reported that rib stabilization by open reduction decrease morbidity and ventilator requirement, and minimize the risk of pulmonary infections in these cases (2, 12). Granetzny et al. (13) in their study comparing operative and non-operative treatment in flail chest patients reported that rib stabilization decrease the need for mechanical ventilation, and shorten the length of intensive care stay. In another study, Bille et al (14) stated that rib fixation using titanium plates is an effective, reliable treatment with good long-term outcomes. In the present case, the patients' posture recovered and his need for analgesics decreased after stabilization and he was weaned from mechanical ventilation on the first postoperative day.

There are different opinions on the treatment of rib fractures. Slobogean et al (15) indicated that surgical fixation in intensive care unit has advantages in flail chest cases; however, these data are based on retrospective studies and there is a need for prospective randomized trials. Likewise, although there are different opinions among physicians with regard to clinical and surgical approach to rib fractures in our country, we are in the opinion that new studies on this subject will be beneficial.

Conclusion

Open reduction and rib fixation is a beneficial method in improving the quality of life, decreasing the possible complications, the length of intensive care stay and the need for analgesics, and preventing ventilator associated pneumonia by early weaning from the ventilator, and shortening the time to return to work. We, as anaesthesia and thoracic surgery teams, aimed to provide a multidisciplinary approach during surgery

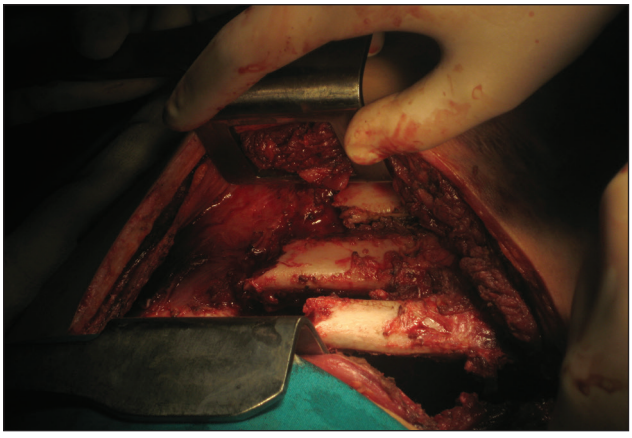

Figure 1. Before rib fixation

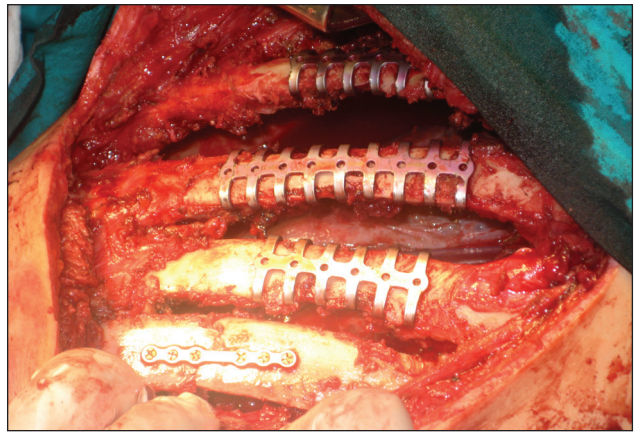

Figure 2. After rib fixation

and intensive care follow-up. We suggest that patients who undergo rib fixation with correct indication are discharged from the hospital early without any complications.

Informed Consent: Written informed consent was obtained from the parents of the patient who participated in this case report.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - A.S.; Design - A.S., G.G., P.U.S.; Supervision - A.S., G.G., C.U.; Funding - A.S., P.U.S.; Materials - A.S., G.G., S.K.; Data Collection and/or Processing - A.S., P.U.S., C.U.; Analysis and/or Interpretation - A.S., G.G., P.U.S., S.K., C.U.; Literature Review - A.S., S.K., G.G.; Writer - A.S., G.G.; Critical Review - A.S., G.G., P.U.S., S.A., C.U.; Other - A.S., G.G., P.U.S., S.A., C.U.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Balcı A, Ayan E, Özalp K, Duran M, Vuraloglu S. Operative fixation for posterolateral rib fractures: evaluation of titanium material and radiological accordance. Turkish J Thorac Cardiovasc Surg 2005; 13: 37-40.
2. Beal S, Oreskovitch M. Long term disabililty associatedwith flail chest injury. Am J Surg 1985; 150: 324-6. [CrossRef]
3. Lardinois D, Krueger T, Dusmet M, Ghisleta N, Gugger M, Ris H. Pulmonary function testing after operative stabilisation of the chest wall for flail chest. Eur J Cardiothorac Surg 2001; 20: 496-501. [CrossRef]
4. Labitzke R, Schmit-Neuerburg K, Schramm G. Indikation zur Thoracotomie und Rippenstabilisierung beim Thoraxtrauma im hohen Lebensalter. Chirurg 1980; 51: 576-80.
5. Meier P, Schuepbach P. Zur Therapie des instabilen Thorax. Schweiz Med Wschr 1978; 108: 608-13.
6. Friedrich B, Redeker H, Kljucar S. Die instabile Thoraxwand: Behandlungsmoeglichkeiten. Helv Chir Acta 1991; 58: 77-82.
7. Ahmed Z, Mohyuddin Z. Management of flail chest injury: internal fixation versus endotracheal intubation and ventilation. J Thorac Cardiovasc Surg 1995; 110: 1676-80. [CrossRef]
8. Tanaka H, Yukioka T, Yamaguti Y, Shimizu S, Goto H, Matsuda H, et al. Surgical stabilization of internal pneumatic stabilization? A prospective randomized study of management of severe flail chest patients. J Trauma 2002; 52: 727-32. [CrossRef]
9. Tscharner C, Schuepbach P, Meier P, Nachbur B. Zur operativen Behandlung des instabilen Thorax bei respiratorischer Insuffizienz. Helv Chir Acta 1988; 55: 711-7.
10. Haasler GB. Open fixation of flail chest after blunt trauma. Ann Thorac Surg 1990; 49: 993-5. [CrossRef]
11. Kerr-Valentic MA, Arthur M, Mullins RJ, Pearson TE, Mayberry JC. Rib fracture pain and disability: Can we do better? J Trauma 2003; 54: 1058-64. [CrossRef]
12. Middleton C, Edwards M, Lang N, Elkins J. Management and treatment of patients with fractured ribs. Nurs Times 2003; 99: 30-2.
13. Granetzny A, Abd El-Aal M, Emam E, Shalaby A, Boseila A. Surgical versus conservative treatment of flail chest. Evaluation of the pulmonary status. Interact Cardiovasc Thorac Surg 2005; 4: 583-7. [CrossRef]
14. Billè A , Okiror L, Karenovics W, Routledge T. Experience with titanium devices for rib fixation and coverage of chest wall defects. Interactive CardioVascular and Thoracic Surgery 2012; 15: 588-95. [CrossRef]
15. Slobogean GP, MacPherson CA, Sun T, Pelletier ME, Hameed SM. Surgical fixation vs nonoperative management of flail chest: a meta-analysis. J Am Coll Surg 2013; 216: 302-11. [CrossRef]