CASE REPORT

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Surgical Plate Fixation of Simple Rib Fractures: A Case Report

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ABSTRACT

Introduction: Rib fractures can cause patient morbidity that causes long hospitalization if conservative treatment is carried out. Current international guidelines recommend a minimally incisional surgical-based treatment approach to reduce pain and provide optimal clinical benefit. Numerous studies have demonstrated that surgical fixation in conjunction with multidisciplinary integrated care pathways offers the highest therapeutic benefit for developing countries, which are typically more accountable for a higher share of unfavorable global outcomes. This case report describes the selection of appropriate decision-making in the management of multiple rib fractures.

Case description: We report that a 51-year-old, still actively working young female came to our emergency department after a motorcycle accident, left chest hitting the road boundary, 2 days earlier. He presented with severe upper chest pain, chest deformity, mild dyspnea, tachycardia, subcutaneous emphysema, and hematoma. The chest radiograph shows a hypo ventilated lung field and a minor pleural effusion. A computed tomography scan showed right lateral rib fractures 3–4 posterior and 5–6 posterolateral, with areas of hyperdensity of simple bone fragments, and pulmonary contusion. Treatment consists of minimal incision with surgical fixation of the 5th and 6th posterolateral ribs which causes pain. For rib fractures 3-4, because it is stable and protected by the scapula, we only perform conservative measures. Rib fixation uses titanium reconstruction plates and cortical fixing screws. The patient's clinical condition improved rapidly postoperatively with a length of stay of 2 days after surgery. Follow-up at 6 weeks, the patient confirmed a full return to preoperative daily activities with the return to normal work activities as well as high quality of life.

Conclusion: In this case report, reported that in rib fractures in a developing country, thoracic trauma can be treated through medical treatment with minimal incisions which allows rapids recovery of the patient.

Keywords: Simple Rib Fracture, Rib Internal Fixation, Reduce Pain.
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INTRODUCTION

Despite poor medical infrastructure and a shortage of staff with specialized training in thoracic surgery, clinical management recommendations for developing nations attempt to follow worldwide guidelines. Thoracic trauma injuries continue to have a high rate of morbidity and death since the management system for these injuries is still highly inadequate in developing nations like the Republic of Indonesia.[1,2] Because the patient is in so much pain, thoracic trauma with rib fractures frequently results in substantial long-term hospital morbidity. Rib fractures are frequently brought on by automobile accidents. Twenty to forty percent of trauma cases in emergency rooms involve rib fractures. Prompting numerous researchers to consider proper therapy to lower pain morbidity.[3] Over time, there have been varying recommendations for treating rib fractures, ranging from internal surgical rib fixation to conservative treatments centered on external stabilization, analgesia, and respiratory support. Some evidence shows that surgical fixation with minimal incisions can reduce pain significantly because the patient can mobilize quickly and perform work activities. However, many lines of research suggest that surgical fixation along with a multidisciplinary bundled care pathway provides the most therapeutic benefit.[4-6] This case report describes the selection of appropriate decision-making in the management of multiple rib fractures. This case report shows that minimal incisional rib fracture plate placement can reduce postoperative pain.

CASE DESCRIPTION

We received a case in the emergency department, a 51-year-old female with mild dyspnea but complaining of severe upper chest pain who was involved in a traffic accident hitting a road divider 2 days earlier. The patient tried to take care of himself by taking him to a massage therapist, but the complaints of extreme pain still did not go away, even though the patient only moved a little. This situation causes the patient to be unable to work, even though the patient was a field worker, who needs active mobilization. After done the radiology examination, by the chest x-ray shows several rib fractures. Initial conservative treatment has failed to relieve the symptoms. She had repeated episodes of shortness of breath in the days before her admission to our clinic due to

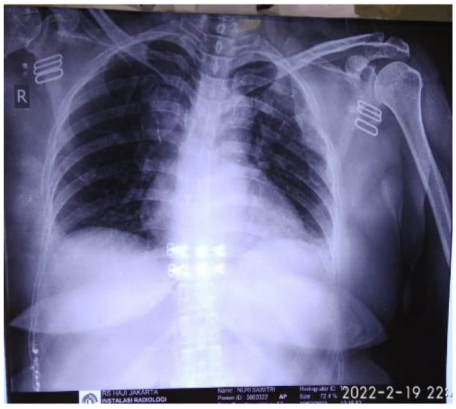

Figure 1. Chest X-ray in Emergency Room. The fracture line was not clear, although in physical examination there was crepitation and local pain in the left hemi thorax

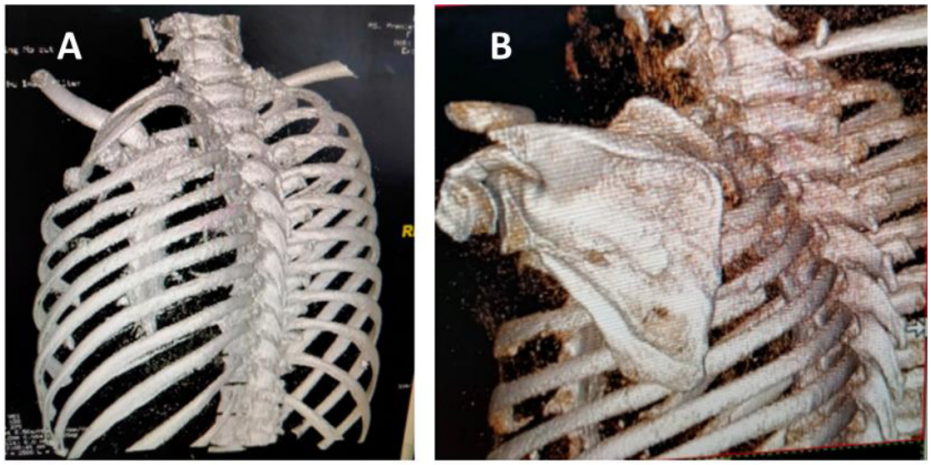

Figure 2. Preoperative three-dimensional reconstruction of the injuries from computed tomographic imaging. Three-dimensional chest computed tomography (a) Posterior (b) posterior reconstructions in a 51-year-old female who sustained fractures to ribs 3–6 on the left posterior side as a result of a traffic accident.

fear of breathing. It happened due to the excruciating pain. If the Visual Analog Pain Scale (VAS) (1-10, with a maximum pain of 10), the patient said the pain was 9-10. The patient's medical history reports that he was an active smoker, although alcohol beverage was denied. The patient also got menopause last year.

Our examination showed an increase in blood pressure of 160/90 mmHg, mild tachycardia (100-105 beats/min), chest deformity, subcutaneous emphysema on the left side, and hematoma in the left hemi thorax. Patients try to reduce pain by taking paracetamol first. While in the emergency ward, the patient received intravenous tramadol analgesia but the patient still complained of pain, especially when changing positions.

All of the laboratory parameters were within normal limits, only the white blood cell count was slightly increased ($12.8.10^3$ cells/µl).

Initial examination in the ER found no neurological abnormalities. The chest X-ray showed a possible left lateral rib fracture with minimal pleural effusion and pulmonary contusion (**Figure 1**).

Because the chest X-ray was not clear, a chest ct scan showed 3-4 posterior and 5-6 posterolateral rib fractures (**Figure 2**)

We chose general anesthesia followed by C-Arm imaging to determine the incision site. A minimal anterolateral (8 cm) left anterolateral incision was made above the fracture line. By cauterizing

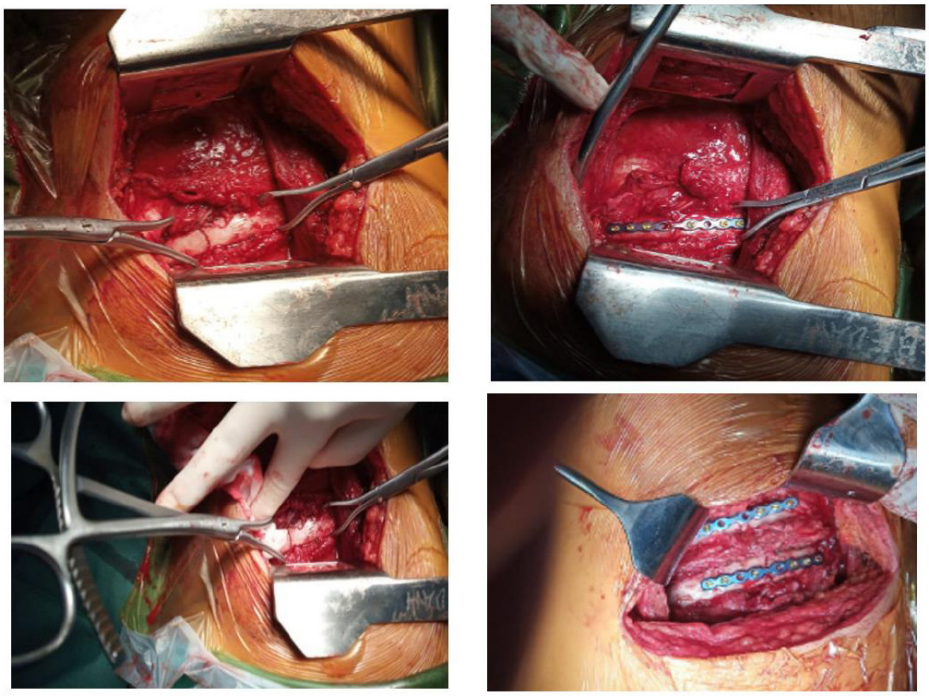

Figure 3. Operation technique with minimal incision internal fixation rib fracture

the pectoralis, serratus, and intercostal muscles, the transaction is carried out below the chest, and above the coastal edge. A titanium reconstruction plate and cortical locking screws were used to stabilize two ribs (small notch titanium reconstruction plate, 3.5 mm thick, 8 mm wide DePuy Synthes, West Chester, PA, USA) (**Figure 3**).

Before closing, the thoracic cavity was drained using a Nasogastric Tube (NGT) no 16. With the help of anesthesia, the Endotracheal Tube (ETT) was given positive pressure and the NGT tube in the lung cavity was removed, and the wound was sutured layer by layer without leaving a drain. The patient was extubated and observed in the recovery room for 2 hours. The patient was transferred to the usual room after hemodynamic stability. In the first 12 hours, patients reported low VAS pain scores (<2); but the patient was able to sleep soundly. The next day, an early mobilization rehabilitative physical

therapy program was carried out. On day 2 the patient was discharged with active mobilization and dry wounds.

DISCUSSION

Multiple rib fracture cases are frequently handled conservatively in developing nations due to a lack of thoracic surgery geographical resources, which leads to protracted hospital stays and long-term morbidity.[7,8] The number of multiple rib fractures, which are linked to pulmonary morbidity and mortality, will rise along with the vehicle's increased mobility. The most frequent complication is excruciating pain that prevents the patient from working. Therefore, the preferred method of treatment for uncomplicated multiple rib fractures is currently surgical fixation. Since it can greatly lessen the pain when the patient moves, more than one rib bone.[5]

The patient just fell from the motorcycle after hitting the road divider, but the patient suffered a broken bone because the patient was a postmenopausal woman with a history of smoking. Compared to postmenopausal women who do not smoke, smokers have reduced bone mineral density and a higher risk of fracture. Age causes a rise in these variations.[9]

In this case, the indication for surgery is because of pain than not relieved with medical medication. The patient also needs as soon as possible for work, because the patient has active mobilization during work. Severe rib fractures are usually caused by a car or motorcycle accident, fall, assault, or another blunt injury. If left untreated, the short-term consequences of a rib fracture include severe pain when breathing, pneumonia, and, possibly, death. Flail chest, pain, and moveable rib fractures that are resistant to traditional pain relief are potential indicators for internal fixation of rib fractures. Within the first 7 days following trauma, ideally within the first 3 days, surgical stabilization of rib fractures is advised. For the care of rib fractures, several consensus guidelines have been produced, such as the Sheffield rib fracture guideline, which was modified from Bemelman (**Figure 4**).[10]

In this case, before the skin incision, we performed C-Arm imaging to determine the fracture site. Our goal is to perform C-Arm to make minimal incisions because wide incisions will cause postoperative pain. Minimally invasive techniques to reduce and fix ribs are on the horizon. The optimum surgical access for locating a rib fracture is provided through a posterolateral thoracotomy incision. However, it necessitates one of the most painful surgical incisions since it divides the latissimus dorsi and, occasionally, the serratus anterior and trapezius muscles. More than 50% of patients who have undergone an incision thoracotomy may experience chronic pain.[11]

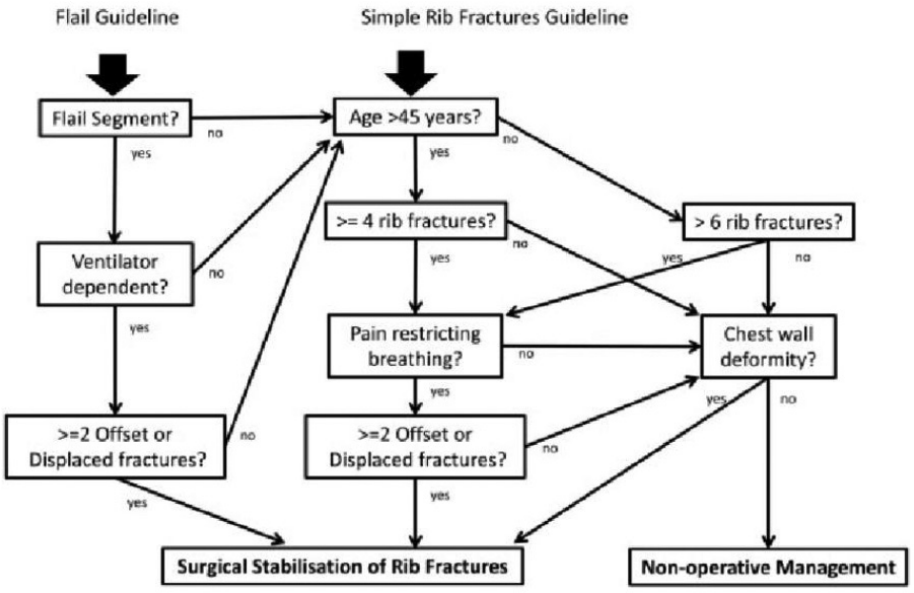

Figure 4. The Sheffield rib fracture guideline, modified from Bemelman et al.[10]

In this case, we only chose internal fixation for 5-6 posterolateral fractures. We did not perform internal fixation for posterior rib 3-4 fractures, in addition to the location of the fracture behind the scapula bone, so that the rib 3-4 fracture will be stable because it is fixed by the anterior and posterior scapula muscles. trapezius. We used a minimal incision to reduce postoperative pain, so we only performed posterolateral rib fractures which were very painful when the patient moved. We also do not use drain after surgery to reduce pain.

The neuropathic and nociceptive mechanisms that cause pain following a thoracotomy incision may be caused by somatic and visceral afferents. Pain is another word for a pain experience. After rib fractures are moved, muscles are severed, skin is incised, chest drains are inserted into the ipsilateral dorsal horn of the spinal cord, and nociceptive somatic afferents are conveyed by the intercostal nerves (T4-T10). With wound infection occurring in 2.2 percent of patients and fracture-related infection in 1.3 percent, the overall risk of complications from surgery and implants was 10.3 percent. After rib fixation, symptomatic nonunion was a rather rare consequence (1.3 percent).[12,13]

Rib fractures can be treated either as an outpatient condition or as an inpatient condition, depending on the severity of the trauma and the level of pain. Simple, numerous, displaced, or related rib fractures that can necessitate hospitalization for respiratory failure or surgical repair. Due to their higher mortality risk than younger patients with rib fractures, older patients may need more frequent monitoring.[14]

The limitations of this study are that it does not explain the patient's follow-up and the outcomes obtained and does not explain the patient's condition related to the risk of complications from this surgical management.

CONCLUSION

In this case report, a simple rib fracture is reported with complaints of severe pain. In developing countries, the management of thoracic trauma is still not optimal, due to human resources and financial problems. Thoracic trauma can be treated through medical care through minimal incisions and without leaving a post-drain. surgery, thus enabling rapid recovery of the patient and shortening the length of hospital stay.

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AUTHOR CONTRIBUTION

All authors contributed to this study's conception, data collection, and interpretation, article drafting, critical revision, and the final approval of the article.

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CONFLICT OF INTEREST

There is no conflict of interest in this manuscript.

ETHICAL CONSIDERATION

Not applicable. Meanwhile the patient has been approved to publish her case.

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