

## Case Report

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# Conservative management of bilateral massive flail chest: A case report

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### Abstract

**Background:** Massive flail chest is an ultra-rare condition and occurs when a remarkable number of adjacent ribs break in at least two points. This entity is highly associated with underlying pulmonary contusion, which may lead to catastrophic pulmonary complications. Considering the importance of this condition, there are controversial data about definitive management of massive flail chest.

**Case presentation:** We reported a 47-year-old woman brought to our hospital after an auto-pedestrian accident. Due to pneumothorax, we inserted a tube thoracostomy in the right hemithorax. She became gradually unstable, and due to positive findings in imaging studies, the patient underwent splenectomy. She had bilateral multiple rib fractures in several points causing bilateral flail chest.

**Conclusion:** Massive flail chest could be treated both surgically or conservatively. However, most clinical data show the cost-effectiveness of operative management, but in some selected cases, it is better to treat the patient in a supportive manner.

**Keywords:** massive flail chest; Rib fracture; conservative management; chest trauma.

### Introduction

Although flail chest is defined as a fracture of 3 or more contiguous ribs in at least two points, the term "Massive Flail Chest" is not clearly described yet. But many sequential ribs must have broken so that the whole underlying lung parenchyma becomes contused. However, conventional flail chest is a common entity among trauma patients. However, a massive flail chest with complete lung contusion is still a rare condition, and there is an intense controversy about its management. Several potential treatments have been described so far [1,2]. Given that underlying pulmonary contusion is a potentially fatal problem, the trauma managers must select the best treatment choice for respective patients.

In the present report, we introduce a case of massive flail chest due to an auto-pedestrian accident managed conservatively.

### Case presentation

A 47-year-old woman was brought to our emergency department by emergency medical services with a history of an auto-pedestrian accident 8 hours earlier. She was slightly confused, stable in vital signs, and had a chief complaint of severe back pain. On primary resuscitation, she had bilateral decreased pulmonary sounds, positive chest compression test, and abdominal tenderness in the left upper quadrant was detected. Pulse oxymetry showed reduced oxygen saturation, and Focused Assessment with Sonography in Trauma (FAST) showed moder-

ate free liquid inside the abdomen. Therefore, two 28-Fr tube thoracostomies were inserted bilaterally drained air and blood. Also, a fast-track CT was done in the emergency department showing moderate liquids in the pelvic cavity and multiple lacerations at the posterior surface of the spleen as well as active bleeding (Figure 1a,1b).

On the other hand, the right clavicle, numerous rib fractures, and pulmonary contusion were found on both sides. On the left side, the ribs 1 to 12 were broken. Also, the ribs 6 to 11 were broken at two points. In addition, on the right side, the ribs 1 to 10 were broken at two points and the 11th rib in only one point, altogether causing a massive flail chest (Figure 1c).

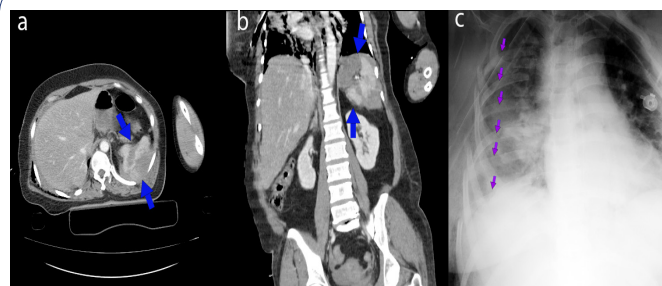
The patient was admitted to the intensive care unit (ICU), and resuscitation continued. After two hours, her blood pressure decreased to 70 cmHg, and she was taken to the operating room to perform an emergent laparotomy. After a midline incision and suction of clots and gore, a severely lacerated spleen was found, and a complete splenectomy was performed. There were no other pathologic findings inside the abdomen, and the diaphragm was intact on both sides. Because of severe pulmonary contusion, the patient returned to ICU intubated.

The oral regimen was started for her on day two via a nasogastric tube. Figure 2 shows a portable chest x-ray on day two.

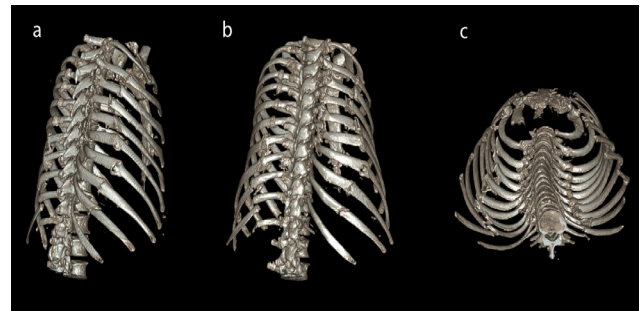
On the fifth day of the postoperative period, she could tolerate the weaning process and was extubated successfully. Due to her massive flail chest, conservative therapy was started. Potent analgesic medicines, incentive spirometry, and early ambulation were performed repeatedly. On day 8, the patient was breathless, and CXR showed collapsed lung and remained hemothorax in the right pleural cavity. Thoracostomy tube was changed and re-inserted at another place but couldn't drain remained hemothorax successfully. Thus, on day 10, a video-assisted thoracoscopic surgery (VATS) was performed, and multiple large clots were extracted from the right-side pleural space. The left clavicle was fixed with plate and screws via an anterior approach. After 36 days of admission, the patient was discharged and showed no complications (Figure 2).

### Discussion

As mentioned above, a flail chest is clinically defined as fracture of three or more adjacent ribs in at least two points. However, these fractures alone may not cause any specific clinical



**Figure 1:** Initial imaging studies of the patient: (a,b). Axial and coronal views of CT show lacerated spleen with perisplenic hematoma (blue arrows). (c). multiple contiguous floating ribs (purple arrows) in a portable antero-posterior chest x-ray.



**Figure 2:** Three-dimensional reconstructed CT of ribs after 2 months. a,b and c depict multiple callus formation at fracture sites on both sides.

problem other than bleeding and pain, but associated pulmonary contusion usually remains problematic. Today, there is a consensus that these patients' main cause of respiratory insufficiency is related to underlying pulmonary contusion. Therefore, respective treatments are being focused on this problem [1].

Diagnosis is based on clinical and radiological findings. Tachycardia, tachypnea, multiple rib clicking, paradoxical movement, and shortness of breath are more common findings [3]. On the other hand, axial CT has a high diagnostic capability in order to find fractured ribs [4] and even can predict pulmonary insufficiency [5].

Pulmonary contusion is highly associated with further lung impairments like huge atelectasis and acute respiratory distress syndrome (ARDS). This condition starts with parenchymal destruction and alveolar hemorrhage and finally causes lung insufficiency within hours. It is approximated that contusion may resolve after seven days [5]. The risk of ARDS is related to underlying pulmonary contusion so that more than 20% of lung involvement, is highly predictive for ARDS development [6].

Logically, there are two options for treatment of flail chest: Conservative management and surgical treatment [1,5,7]. However latest literature emphasizes several advantages of surgical therapies, but in some selected cases, conservative management is the best choice. Surgical approaches have better outcomes and in some cases even are cost-effective, especially in patients with multiple rib fractures [8]. On the other hand, non-operative management is associated with more admission days, decreased pulmonary function, increased risk of pneumonia, and need for tracheostomy [9,10]. Also, the surgical method has its respective disadvantages. Operative management may develop surgical complications or need for other operations. Known surgical complications are wound infection, fracture-related infection, nonunion and malunion, bleeding, and the need for blood transfusion [11]. Therefore, it seems that a definitive decision on treatment method entirely depends on the patient's condition. In some cases, who we can extubate them earlier, conservative management could be a good choice despite global consensus over operative management.

### Conclusion

Massive flail chest could be treated both surgically or conservatively. However, most clinical data show the cost-effectiveness of operative management, but in some selected cases, it is better to treat the patient in a supportive manner.

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## Declarations

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