

## Iatrogenic Delayed Aortic Injury Following a Surgical Stabilization of Flail Chest

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Most of aortic injuries after blunt chest trauma usually occur at the aortic isthmus and are identified in the emergency department soon after arrival. Delayed aortic injuries by fractured posterior ribs, however, are relatively rare and have been reported only a few times. We recently experienced an iatrogenic descending aortic injury sustained as a result of a direct puncture by a sharp rib end after surgical stabilization of rib fractures.

**Keywords:** Aortic injury; Rib fracture; Surgical fixation; Postoperative complication

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## INTRODUCTION

Traumatic injury of the aorta is a life-threatening condition in which survival depends on early diagnosis and treatment. It usually occurs at the aortic isthmus just distal to the left subclavian artery by rapid deceleration [1,2], but other sites can be affected. Direct damage to the aorta by fractured ribs on scene which requires emergent operation is identified in the emergency department soon after arrival to the hospital [3,4]. Delayed aortic injuries after blunt trauma, however, have been reported only a few times [5-11]. We describe the case of an iatrogenic aortic injury sustained as a result of a direct puncture by a sharp rib end after surgical stabilization of rib fractures (SSRF).

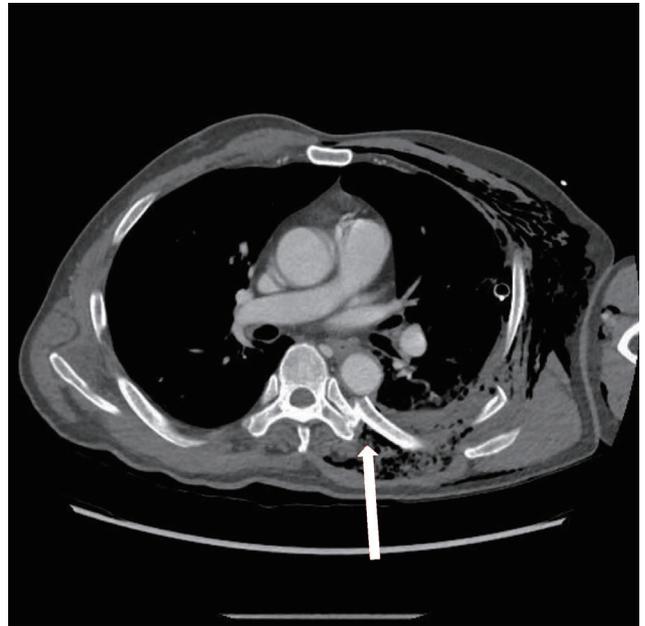
## CASE REPORT

A 61 years old male admitted to the emergency department with respiratory failure and left arm amputation after an accident. Chest computed tomography (CT) re-

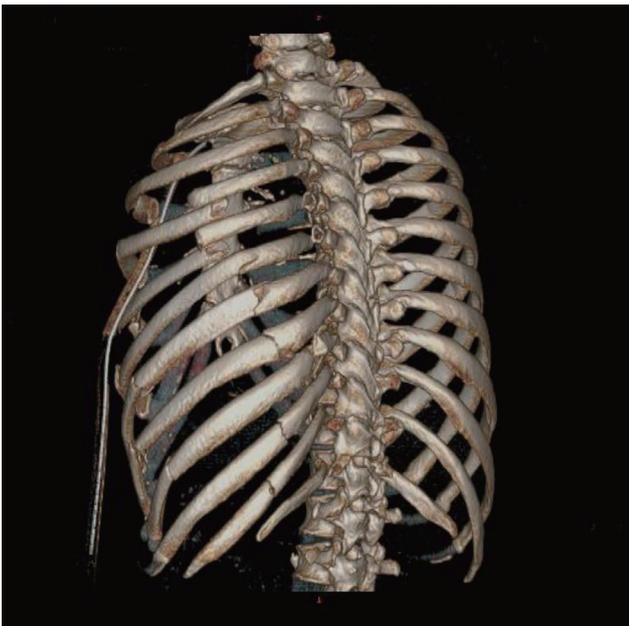
vealed multiple rib fractures with traumatic hemothorax on the left thorax. Segmental fractures of the 4th to 9th ribs were identified, especially posterior ends of the 5th and 6th rib fractures were dislocated into the thoracic cavity, adjacent to the descending thoracic aorta (Figs. 1, 2). The patient was intubated because of respiratory failure by flail chest, and a drainage thoracic catheter was placed. Only 200 mL of blood was drained initially through the drainage thoracic catheter. The patient underwent emergent operation for the left arm anastomosis.

On the hospital day 3, the patient underwent SSRF for the flail chest. On the operation field, lateral ends of the 4th to 8th rib fractures were fixed with plates and screws. Posterior ends of rib fractures were not stabilized because they were too closely located to the thoracic vertebrae (Fig. 2). After the operation, the patient was hemodynamically stable and transferred to the surgical intensive care unit. Soon after, the patient became hypotensive and suddenly fell into deep shock after taking a postoperative chest X-ray (Fig. 3). More than 2,000 mL of massive blood poured out through the drainage thoracic catheter. We promptly reopened the operation wound on the bed. After evacuating large amount of hematoma, we found that the posterior end of the 6th rib fracture penetrated the descending aorta. Finger tamponade was performed,

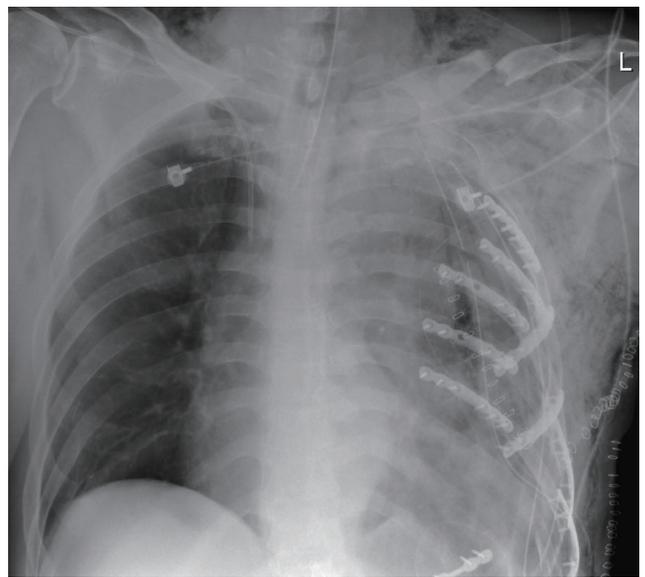
and then injured aortic wall was repaired with a pledgeted suture of 4-0 prolene in a U fashion. After emergent bedside procedure, the patient was transferred to the operating room again. The posterior ends of the 5th and 6th rib fractures were rongeured off and smoothed. The patient was discharged 4 months later.



**Fig. 2.** Posterior fracture of the 6th rib (arrow) and the descending thoracic aorta.



**Fig. 1.** Three dimensional chest computed tomography of the patient.



**Fig. 3.** Postoperative chest radiography after surgical stabilization of rib fracture.

## DISCUSSION

Delayed aortic injuries due to fractured ribs have been reported infrequently. Park et al. [7] suggested two possible mechanisms which are able to worsen this situation, temporary clot formation of the penetrated aortic wall and physical movements of the patient after initial trauma. Marco and Gregory [9] reported a case of the delayed aortic injury on the 3rd hospital day, they suggested that the injured aortic wall initially formed a pseudoaneurysm at scene without active bleeding. Kigawa et al. [5] also reported a delayed aortic injury after changing the body position of a patient with flail chest on the 10th hospital day. In our case, the patient initially did not show the clinical manifestations of aortic injury. Although several posterior ends of rib fractures were dislocated toward the descending thoracic aorta (Fig. 2), only subclinical amount of hemorrhage was identified through the drainage thoracic catheter, and the patient became hemodynamically stable after being intubated. Right after the SSRF for the flail chest on the 3rd hospital day, however, the descending thoracic aorta was penetrated by posterior ends of rib fractures. We only stabilized lateral ends of rib fractures at that time, and this procedure moved the posterior end of the 6th rib fracture closer to the descending aorta, and finally the aorta was penetrated.

Based on the result, this patient already had been exposed to high risk of delayed aortic injury by rib fractures regardless of the SSRF, although the SSRF definitely caused disastrous consequences. When we decided to stabilize rib fractures, we should have considered how to manage posterior ends of rib fractures during the operation. This case suggests that if posterior rib fractures are severely dislocated into the thoracic cavity and closely located to the descending thoracic aorta on the initial chest

CT, care should be taken to prevent adverse outcome.

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