

# Intrathoracic displacement of the humeral head in a trauma patient

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## ABSTRACT

Fracture and intrathoracic displacement of the humeral head is the result of severe high energy trauma and are extremely rare. Because of the exceedingly limited number of cases, appropriate treatment modality remains unclear. Hitherto, we describe a unique case of thoracic aorta injury caused by fragmented humeral head. Purposeful medical examination and fast locating of the humeral head fragment are crucial for the selection of appropriate treatment modality. Early aggressive intervention, e.g., emergency thoracoscopy exploring, can be performed to treat potential thoracic complications.

**Key words:** Shoulder dislocation, humeral head fracture, thoracic cavity

## INTRODUCTION

Intrathoracic displacement of the humeral head is an extremely rare complication of severely high energy trauma.<sup>1</sup> High-energy trauma associated with abduction and external rotation leads to humeral head fracture and its confinement in the thorax. Another possible mechanism is the posttraumatic transmission of the force along the humeral shaft, causing the dislocation of the humerus within the thorax.<sup>2</sup> A previous study reported that accompanying pneumothorax or hemothorax occurred.<sup>3</sup> However, unlike those reports, we present a remarkably critical case intrathoracic displacement of the humeral head with hemodynamic instability. This case had considerably active hemothorax, and compressed and contused thoracic aorta.

## CASE REPORT

A 50 year old woman was admitted to emergency

department with severe multiple injuries due to a fall from 3m height. According to “CRASHPLAN” from advanced trauma life support (ATLS) guideline, we sequentially assessed the function and condition of airway breathing, circulation, etc., and the results of fast physical examination and routine analysis of blood revealed hemorrhagic shock with a blood pressure of 76/48 mm Hg and hemoglobin of 7.9 g/L. The patient had difficulty in left thoracic breathing and had migration of trachea to the right side. There was swelling, numbness, and tenderness of left shoulder, and limitation of abduction and rotation, while the thorax wall was intact. During the course of emergency management, blood transfusion and vasoactive agent were used. Further results of bedside radiography and sonography indicated fracture dislocation of the proximal humerus, fracture of the first, second, and third ribs [Figure 1], and hemothorax. However, absence of humeral head in pleural cavity did not support the initial suspicion of diagnosis of intrathoracic displacement. Under the condition of decreased radiation dose in chest radiography, free humeral head adhering thoracic aorta was shown by second assessment of radiography [Figure 2]. The chest tube was inserted into thoracic cavity. Chest tube aggravated symptoms, there was dirty drainage of bloody hydrothorax more than 1000 mL, and decrease in hemoglobin level (5–6 g/L). The auscultation revealed abnormal arterial murmur, and patient had severe pain complaint in upper thorax during the 3 days of posttrauma. On day 4, computerized tomography (CT) revealed striking findings of severely compressed thoracic aorta caused by fragmented humeral head. Moreover, sharpened fragment inserting into external coat of thoracic aorta resulted in active bleeding [Figure 3]. As a result, humeral head fragments were removed through emergency thoracoscopy. In addition, torn external coat of aorta and pleura was repaired. The thoracoscope port was

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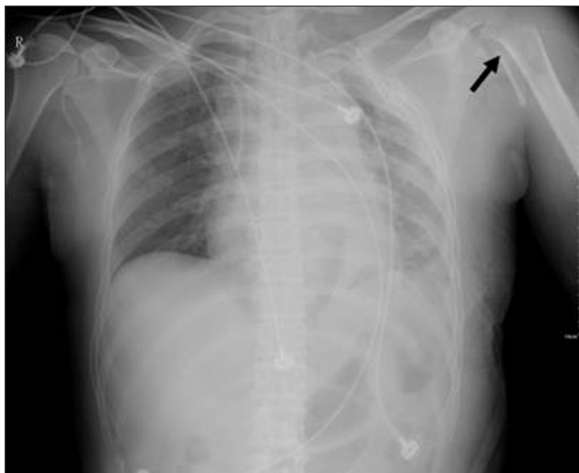
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placed in the sixth intercostal space and midaxillary line, then thoracoscope tube and light source with automatic brightness control attached to a couple-charged device camera were inserted. An additional 3 cm incision in the same intercostal was made and working instruments were inserted to take out the fragmented humeral head and repair external coat of thoracic aorta. Effective control of refractory thorax hemorrhage resulted in hemodynamic stability. Twenty seven days later, the patient underwent hemiarthroplasty in order to reconstruct the shoulder joint [Figure 4]. The deltopectoral approach was adopted. Restoration of medial “gothic arch” and implantation of the head facing glenoid cavity with 20° retroversion / forearm in neutral rotation were completed. Meanwhile, we used prosthesis with long stem in order to decrease stress concentration and future complications, e.g., fracture and pain (Bigliani/Flatow® shoulder system, Zimmer Co., Warsaw, IN, USA). The patient was discharged on day 15 after the operation and accepted reassessment 15 months

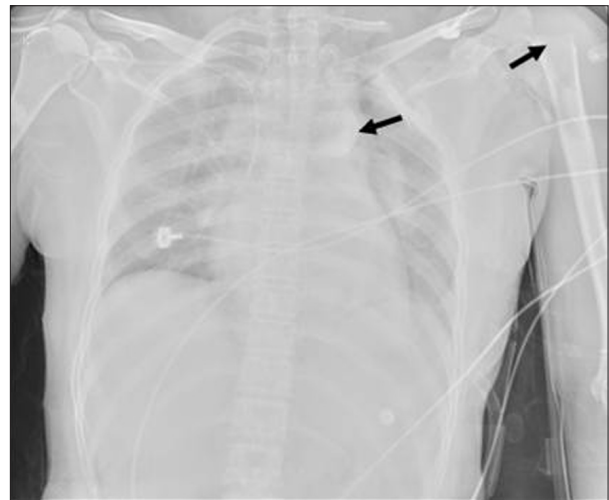
later. Despite mild loss of shoulder mobility (abduction, reduction, rotation, flexion, and extension of 70°, 0°, 70°, 80°, and 50°, respectively), her activities of daily living were not affected and she had no intrathoracic complications.

## DISCUSSION

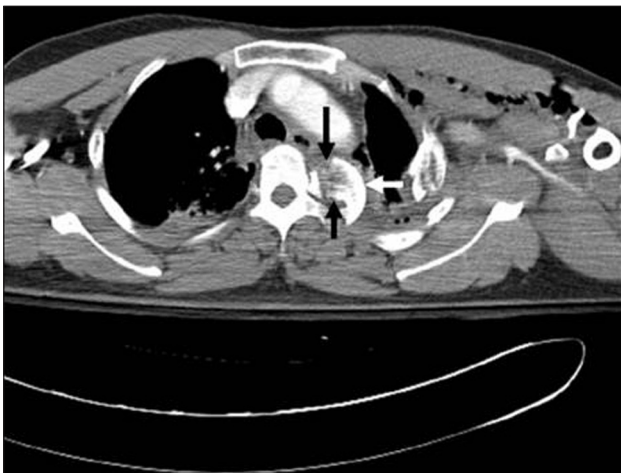
Intrathoracic displacement of the humeral head was not initially recognized in our patient until the second assessment of radiography with modified radiation dose. Thus, early and rapid CT scan is necessary because X-ray imaging may not be the optimal examination method,<sup>4</sup> especially when the presentation of auscultation with abnormally arterial murmur was suggestive of insidiously intrathoracic injury. However, due to the intact thorax wall, early misdiagnosis can hardly be avoided. This critical case of thoracic humeral head accompanied by hemodynamic instability resulting from arterial injury was not described in previous reports.<sup>5-7</sup> Traditional guideline for the treatment of hemothorax



**Figure 1:** An anteroposterior X-ray of the chest and shoulder showing fracture of the proximal humerus (black arrow) and haemothorax



**Figure 2:** Fragmented humeral head stepping over thoracic aorta (black arrow)



**Figure 3:** CT showing compressed and contused thoracic aorta (black arrow) and fragmental humeral head (white arrow)



**Figure 4:** Hemiarthroplasty was performed to reconstruct shoulder joint

indicated that emergency thoracotomy is not needed if the daily drainage through chest tube is less than 2000 mL.<sup>8</sup> However, this principle does not apply the signs of abnormal arterial murmur and severe pains in upper thorax although the daily drainage was beyond 1000 mL in our report. Mini invasive thoracotomy, e.g., emergency thoracoscopy, may explore active thoracic bleeding. Nevertheless, the removal of fragmented humeral head is still controversial. One study suggested that removal of the humeral head from the pleural cavity may not be performed unless cardiovascular complications arise.<sup>9</sup> We suggest that the humeral head fragment must be removed if respiratory complications occur or if the fragment impacts the airway patency or causes damage to neurovascular or other structures.

This case highlights the early diagnostic challenge accompanied by continued hemodynamics instability inspite of adequate measures due to insidious arterial injury in pleural cavity. Good medical examination and imaging to locate the humeral head fragment are crucial for making decisions on the treatment modality. Early aggressive intervention, e.g., emergency thoracoscopy exploration, can be performed to treat potential thoracic complications.

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