

# Intrathoracic Displacement of the Humeral Head with Polytrauma: Case Report

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**Abstract.** Intrathoracic displacement of the humeral head is rarely documented due to high mortality of the trauma. As a result, there is no clear consensus about how such case should be approached. In this report we reviewed our successful case, and reviewed the literature. The patient arrived after car accident with a broken humerus and upon taking X-ray found to have the humeral head lodged in the chest cavity. After humeral head removal and arthroplasty, patient was discharged without complications. In literature several cases were found in which a patient usually suffers because of high energy trauma with arm typically in abducted position. In all cases treatment involves removing humeral fragment from chest and prosthetic arthroplasty of the glenohumeral joint. Although some authors suggest leaving humeral fragment in some cases while others suggest to always remove. Exact indications of such decision are unclear. Cases like this pose a high risk of neurological and circulatory complications, although no complications were observed in this case. Nevertheless, there have been too few similar cases described to establish a proper methodology.

**Keywords:** dislocation, humerus, arthroplasty, shoulder.

## Intratorakalinis žastikaulio galvos išnirimas, esant politraumai: klinikinio atvejo aprašymas

**Santrauka.** Intratorakalinis žastikaulio galvos išnirimas – trauma, kuri retai aprašoma dėl didelio mirštamumo, todėl nėra aiškiai sutariama, kaip šią traumą patyrusį pacientą reikėtų gydyti. Straipsnyje aptariamas sėkmingo gydymo atvejis, apžvelgiama mokslinė literatūra. Į gydymo įstaigą dėl lūžusio žastikaulio pristatytas avariją patyręs pacientas. Atlikus rentgeną, nustatyta krūtinės ląstoje įstrigusi žastikaulio galva. Žastikaulio galvą pašalinus iš krūtinės ląstos ir protezavus, pacientas išrašytas gydytis ambulatoriškai, nesant komplikacijų.

Mokslinėje literatūroje aprašyta keletas atvejų, kai pacientai, dažniausiai patyrę didelės jėgos sukeltą traumą, pristatyti į gydymo įstaigą rankai esant abdukciniėje pozicijoje. Visais atvejais trauma gydyta šalinant žastikaulio fragmentą iš krūtinės ląstos ir protezuojant glenohumeralinį sąnarį. Kai kurie tyrėjai siūlo tam tikrais atvejais palikti žastikaulio fragmentą krūtinės ląstoje, kiti rekomenduoja žastikaulio fragmentą visada pašalinti. Minėtų sprendimų aiškių indikacijų nėra.

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Straipsnyje pristatomu atveju komplikacijų nenustatyta, tačiau tokios traumos kelia didelį pavojų kraujotakai ir nervinei sistemai. Vis dėlto kol kas aprašytų klinikinį atvejų nepakanka, kad būtų galima nustatyti tinkamą metodologiją šiai traumai gydyti.

**Reikšminiai žodžiai:** išnirimas, žastikaulis, protezavimas, petys.

## Introduction

Dislocations of the shoulder joint with bone fracture are relatively rare injuries only 20 were documented up to year 2009 [1]. In extremely rare cases, a part or fragment of the bone becomes trapped intrathoracically. These cases are typically caused by high-energy traumas and are accompanied by polytrauma, often involving respiratory, nervous, and circulatory system injuries, making them particularly life-threatening. This article describes one such case following a car accident and reviews similar documented cases and potential complications.

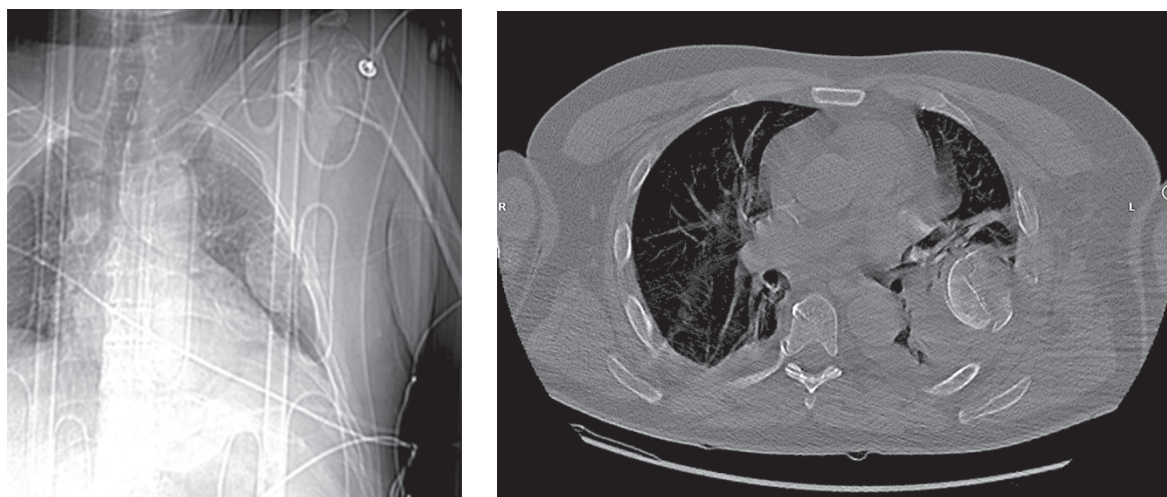
## Methods

Analysis of a clinical case (images, examination, treatment) was performed, and a literature review was conducted using the PubMed database. Keywords that were used: *shoulder, humeral, dislocation, intrathoracic*. Out of 21 publications 10 were reviewed.

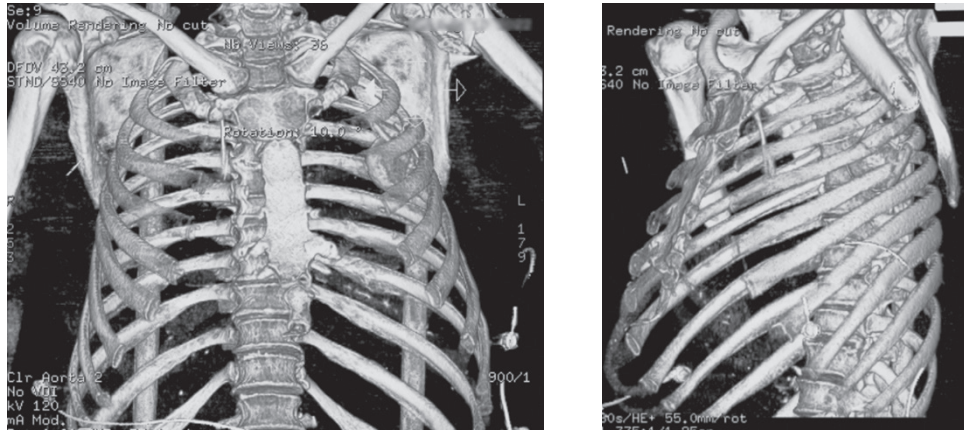
## Case description

A 58-year-old patient was admitted to the Emergency Department of level I Trauma Center in August 2022 due to polytrauma sustained in a car accident. On arrival, the patient's condition was severe, with decreased consciousness (GCS score of 12), unstable hemodynamic, subcompensated peripheral circulation, blood pressure of 62/32, and heart rate of 78 beats per minute. There was reduced breathing on the left side with a respiratory rate of 18 breaths per minute and an oxygen saturation (SpO<sub>2</sub>) of 85.0%. Palpation revealed pain in the left posterior chest. X-rays and CT scans were performed, which revealed a traumatic hemothorax on the left side, humeral head within the pleural cavity, three rib fractures, lung contusion, and hematoma.

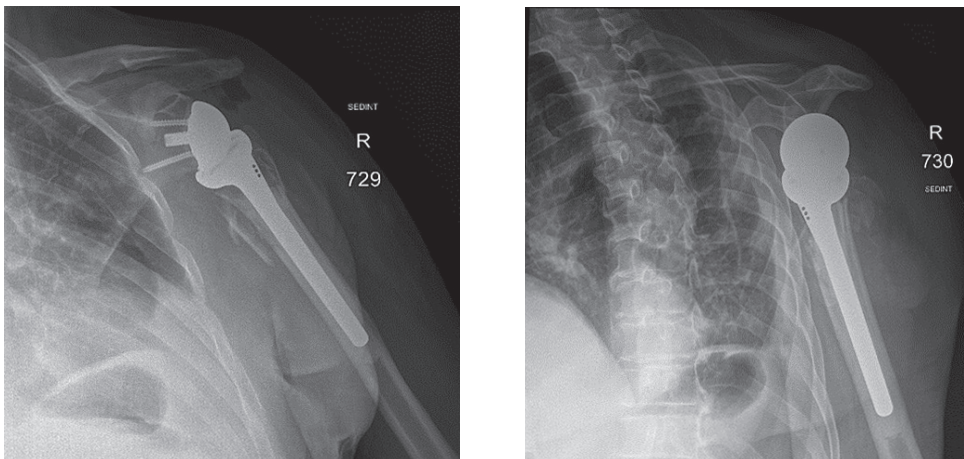
Neurovascular status of the left hand was intact. The patient's condition was stabilized in the intensive care unit and after 5 days transferred to the Thoracic Surgery Department, where 4 days later a resection of the fifth rib, thoroscopic removal of the humeral head, and lung decortication were performed.



**Figure 1.** First X-ray and computer tomography upon admission (with humeral head shown)



**Figure 2.** Subsequent 3D reconstruction



**Figure 3.** X-ray after shoulder arthroplasty

In a subsequent consultation, it was decided to perform shoulder arthroplasty 11 days later using reverse prosthesis (*Delta Xtend, DePuy Synthes*) with tuberosity fixation.

Postoperative course was uneventful in the chest or shoulder. The patient was discharged after 23 days from admission.

## Discussion

Several similar injuries were found in the literature, but such cases are not common. Therefore, there is no precise consensus on the appropriate actions and timing to achieve better treatment outcomes and reduce the risk of complications. Injuries of this nature are usually caused by high-energy trauma, such as motor vehicle accidents, falls from stairs, or falls from heights [2–6]. In these and similar cases, the impact not only fractures the proximal part of the humerus but also forces the humeral head through all the tissues and ribs into the chest cavity. Even in more common cases such as anterior dislocations, injury to the brachial plexus occurs quite frequently (0.4%) [6], especially in older age groups which have increased risk for tissue damage [7]. Other example would be open anterior dislocations which often result in septic arthritis or necrosis due to impaired blood supply [8]. Compared to these cases, intrathoracic dislocation is way more dangerous as the fragment or part of the humerus can damage blood vessels and nerves while traveling into

the chest cavity, resulting in a high risk of neuropathic and circulatory complications. Therefore, it can be considered a “miracle” that there were no neurological complications in this case. Other cases described in the literature include injuries to the subclavian artery, costocervical trunk, or even bone fragments near the aorta [5]. Some cases with neurological complications were found, such as axillary neuropathy, median and ulnar nerve neuropraxia, and secondary brachial plexus injuries. Despite the fact that many of the described patients regained normal blood circulation and nerve function, some experienced incomplete recovery [2–6]. The following treatment principles were similar as they adhere to basic guidelines for these type of traumas. First stabilization of the patient’s condition and respiratory system, extraction of the humeral head, and endoprosthetic replacement of the damaged joint. However, the exact methods of performing these procedures are not clearly defined. Some authors suggest leaving the humeral fragment in the chest cavity if it does not help improving the patient’s condition in the long run, while some suggest that it must always be removed [5]. The precise circumstances and size of the fragment that can be left in the thoracic cavity, as well as the potential consequences of such a decision, remain unclear. Therefore, it is important to document and evaluate the most common complications and treatment methods in order to ensure treatment success.

## Conclusions

This clinical case highlights the importance of assessing and treating significant and complex traumas. The treatment priority should be stabilization of the patient’s condition, along with appropriate diagnostic procedures to accurately diagnose and determine the appropriate treatment. Documentation and analysis of such cases are crucial for better understanding these injuries and identifying more effective treatment methods, particularly considering the potential complications. Since this type of trauma is rare, further research and case documentation are necessary to improve their diagnosis and treatment.

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