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Case Report

# ISOLATED SCAPULA FRACTURE WITH INTRATHORACIC DISLOCATION: A CASE REPORT AND LITERATURE REVIEW

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SUMMARY – Scapula fractures are very rare, resulting from high-energy trauma and are mostly associated with other fractures of the locomotor system and injuries to the head, chest or abdominal organs. Most often, they are treated conservatively and the indications for surgical treatment are not yet clearly agreed. One of the conditions requiring surgical treatment is a scapula fracture with fragment migration into the thoracic cavity. In this paper, we are presenting an extremely rare, isolated scapula fracture, without injury to other parts of the locomotor system, with an intrathoracic fragment migration that was treated conservatively with an excellent functional outcome.

Key words: *scapula, bone fractures, thoracic cavity, closed fracture reduction, case reports*

## INTRODUCTION

Scapula fractures are very rare, with a total incidence of up to 1% of all fractures, i.e., 3-5% of shoulder girdle fractures[1]. Most often they are caused by a high-energy trauma such as traffic or sports accidents or falls from heights. Given the mechanism of the trauma, scapula fractures are often associated with other bone fractures of the shoulder girdle and long bones, rib fractures, and injury to the lung parenchyma, as well as head or abdominal organ injuries.

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Most of the scapula fractures are treated nonoperatively, by immobilisation with an arm sling and gradual physical rehabilitation with good functional results. Indications for surgical treatment are not clearly agreed upon and are still the subject of discussion[2].

Intrathoracic dislocation of the fracture fragment of the scapula body is a rare condition that most often requires surgical treatment[3,4,5,6,7,8,9]. In this paper, we present an adult patient with an isolated, multifragmentary scapula fracture with intrathoracic displacement of the fracture fragments treated conservatively with an excellent functional outcome.

## CASE REPORT

A 56-year-old forest worker was brought to the emergency department (ER) after getting hit in the

right shoulder by a branch falling from a tree. When he arrived, his blood pressure was 140/70 mmHg, Sp02 98%, he was respiratory compensated and without other problems.

The initial examination revealed a contusion imprint and pain in the upper third and the lateral edge of the right scapula. He did not perform abduction in the shoulder joint and other movements in the shoulder joint were feasible in a reduced range. The movements in the elbow and distal to the elbow were normal. Peripheral arterial pulsations on the arm were present and no neurological disorders were found. Subcutaneous emphysema was present on the chest, and there was a decreased breath sound at the base of the right lung.

Initial x-ray scans of the right shoulder, hemithorax, and lungs showed a multifragmentary transverse fracture of the right scapula in the subscapular fossa, as well as a right-sided pneumothorax. In addition, a CT scan was performed that verified the multifragmentary fracture of the scapula body, whose proximal lateral fragment passed between rib III and IV in the midaxillary line and penetrated the pleura and lung parenchyma. The described fragment penetrated the thoracic cavity by about 15 mm, and in addition to its ventral part, a free bone fragment measuring about 17x6 mm was visible within the pleural cavity (Figure 1, Figure 2). A pulmonary contusion measuring 18x13 mm was observed at the site of the lung parenchyma lesion with a bone fragment. Pleural effusion and subcutaneous emphysema around the right scapula and a right-sided pneumothorax about 9.5 cm

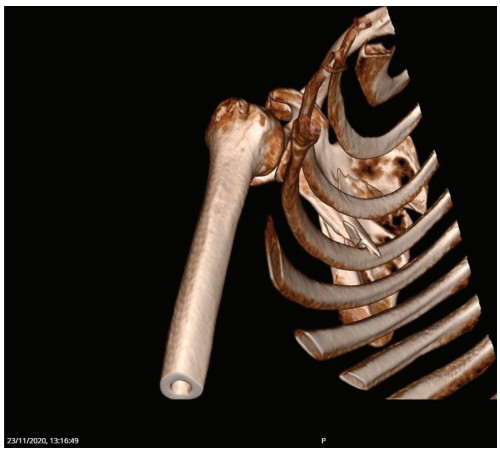


*Figure 1. 3D-computed tomographic reconstruction showing intrathoracic dislocation of scapula fragments*

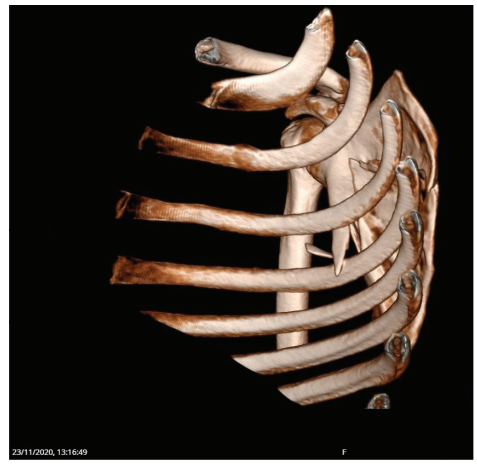


*Figure 2. 3D-computed tomographic reconstruction showing intrathoracic dislocation of scapula fragments*

thick in the base area and 3.5 cm in the pulmonary apex area were also verified. There were no signs of rib fractures.

During analgosedation, an indirect method was used to perform a closed reposition of the scapula's bone fragment, thus restoring the range of motion and later immobilisation with a sling. The follow-up CT scan after the reposition showed an extrathoracic position of the fractured fragment of the scapula and the third bone fragment (Figure 3). After a follow-up CT scan a thoracic tube was placed in the right side of the chest, which was removed after 5 days, and the x-ray verification of the pneumothorax and hae-


*Figure 3. 3D CT reconstruction after closed reduction with extrathoracic location of scapula fragments*

mothorax regression. The patient was discharged the next day. At the follow-up visit after seven weeks, the abduction of the shoulder was feasible up to 100°, without scapulothoracic crepitus. Five cycles of physical therapy were recommended after which the patient returned to work. At the follow-up examination 20 months after the initial injury, the patient reported only occasional difficulties when working with a machete in the form of occasional pain at the fracture site. A full range of motion was achieved as on the other arm – anteflexion 160°, elevation 160°, external rotation 45°, internal rotation to the level of the Th 8. The functional status of the arm as measured by the DASH (Disabilities of the Arm, Shoulder, and Hand) test was 12.1, and the pain score on the VAS scale is 3.

## DISCUSSION

Fractures of the scapula are very rare due to the anatomical specificities of the scapula, which is enclosed by a thick muscular sheath. Most often they are mainly caused by high-energy trauma such as sports or traffic accidents, as well as falls from heights. An increase in the incidence of fractures caused by a w-energy trauma was observed due to the ageing of the population and more frequent implantation of shoulder endoprostheses[9]. The tendency of increased fracture incidence can also be explained by the more frequent use of CT devices in diagnosing trauma patients[11].

Given the localization of fractures, the scapula body (52%) and glenoid (29%) are the most affected[12]. Scapula fractures are often associated with other injuries to the shoulder girdle, ribs, long bones, or thoracic and abdominal organs, and in the light of trauma mechanisms, they can also be an indicator of other injuries. Although the expected mortality is higher in polytrauma patients, some authors think that the flat structure of the scapula along the thick muscular sheath partially absorbs the energy of trauma, thus the mortality in polytrauma patients with scapula fractures is about 10% lower than in patients with a similar ISS (injury severity score)[13].

Most scapula fractures are treated conservatively with a good or very good functional outcome[14]. On a larger sample of 520 scapula fractures, good or excellent functional results were achieved in 99% of patients with an isolated scapula body fracture and 83% in patients with a glenoid fracture[16]. Indications for surgical treatment are still vaguely and inconsistently determined and mostly depend on the experience and personal decision of the surgeon. The most commonly mentioned relative indications are medio/lateral displacement greater than 20 mm, shortening greater than 25 mm, angular deformation greater than 40-45°, intra-articular displacement greater than 4 mm or involvement of more than 20-25% of the joint surface, glenopolar angle less than 22° or double suspension injury of the shoulder[17]. A rare condition that most often requires surgical treatment is a scapula fracture with an intrathoracic dislocation and impaction of fracture fragments.

By reviewing the references, we have found eight cases of scapula fractures with an intrathoracic dislocation, three of which were described in children and adolescents (Table 1). All patients were initially treated surgically or underwent surgery due to failure of conservative treatment. One patient was treated conservatively due to her older age.

The first case described was that of a 13-year-old cyclist who was hit by a truck. He suffered a left scapula fracture with an intrathoracic dislocation and impaction of the caudal fragment, a bilateral hemopneumothorax, and a bilateral rib fracture. An open reposition without a fragment fixation was performed and the end functional result was a normal range of motion[9].

The second case involved a 72-year-old female pedestrian who was injured in a car crash and suffered a left scapula fracture with an intrathoracic impaction of the caudal fragment, bilateral rib fractures, and a tibia fracture. The open reposition of the scapula and the fixation of the fragments with plates and screws were performed. After rehabilitation, the patient developed a full range of motion[8].

The third case described is a 30-year-old female motorist with a left scapula fracture and an intrathoracic dislocation of the inferior fragment with bilateral rib fractures, left-sided hemopneumothorax, and subcutaneous emphysema. Initially, the patient was treated conservatively, but due to a reduction in the range of motion and neuropathic pain above the left scapula, a CT scan was taken after which surgical treatment was initiated with an open reposition. Since the range of motion was again reduced, a control CT was done where a residual impacted fragment between the ribs was verified. The scapula body was surgically separated from the fragment that ossified with the ribs and which was left in situ. To prevent the re-ossification between fragments, a mesh was placed. After

*Table 1. Scapula fracture with intrathoracic fragment dislocation. A literature review*

| Author | Age and gender | Mechanism of trauma | Fracture pattern | Concomitant injuries | Treatment method | Functional outcome |
|---|---|---|---|---|---|---|
| Blue et al., 1997 | 13, ♂ | Cyclist struck by a truck | Left scapula, intrathoracic dislocation of inferior fragment | Bilateral rib fractures, hemopneumothorax, pelvic fractures, splenic laceration | Open reduction | Full ROM |
| Schwartzbach et al., 2006 | 72, ♁ | Pedestrian hit by a car | Left scapula, intrathoracic dislocation of inferior fragment | Multiple left sided rib fractures, right tibial fracture | Open reduction, internal fixation (ORIF) | Full ROM |
| N'Gai Porte et al., 2009 | 30, ♁ | All-terrain vehicle crash | Left scapula, intrathoracic displacement of inferior fragment | Bilateral rib fractures, left hemopneumothorax, subcutaneous emphysema | Conservative initially open reduction, impacted fragment left in situ open reduction + Mesh | Good ROM Neuropathic pain |
| Van Shie van der Weert et al., 2012 | 43, ♂ | Fall from height | Right scapula, intrathoracic dislocation of inferior fragment | 3rd rib fracture | Open reduction | No data |
| Shin et al., 2015 | 6, ♂ | Pedestrian hit by a truck | Left scapula, intrathoracic dislocation of inferior fragment | Rib fractures, pneumothorax, pulmonary contusion | Open reduction | Full ROM |
| Park et al., 2017 | 10, ♂ | Cyclist hit by a motor vehicle | Left scapula, intrathoracic dislocation of inferior fragment | Liver laceration, spleen rupture, left kidney infarction, rib fractures, hemopneumothorax | Open reduction | Full ROM |
| Auñón-Martín et al., 2019 | 32, ♂ | Snowboard accident | Left scapula, intrathoracic dislocation of proximal fragment | AC dislocation grade III | Conservative initially open reduction and intrathoracic fragment resection | Full ROM |
| Franco et al, 2021 | 83, ♁ | Fall from stairs | Right scapula, intrathoracic dislocation of inferior fragment | Rib fractures, hemopneumothorax, | Conservative | Good ROM |

22 months of physical therapy, the patient developed an excellent range of motion and the persistent neuropathic pain was well regulated under the control of an algologist[7].

Van Shie et al. described the case of a 43-year-old male who had fallen from a height and had suffered a right scapula fracture with impaction of an inferior fragment between the fractured ribs. An open reposition of fracture fragments was performed and a thoracic drainage was placed. There is no information on the functional status of the arm[6].

Shin et al. presented the case of a 6-year-old boy with a scapula fracture and an intrathoracic impaction of the caudal fragment, rib fracture, pneumothorax, and lung contusion. A surgical reposition of the fracture was performed[5].

In 2017, Park et al. described the case of a 10-year-old boy who had been injured in a motorcycle accident

with injuries to his liver, spleen, left kidney, first to third rib on the left side, and left scapula with an intrathoracic migration of an inferior fragment, which caused a hemopneumothorax. The full range of motion without pain was restored postoperatively after two years. The possibility of intrathoracic dislocation of scapula fragments without comminution of the scapula in children is explained by the plasticity of the bones[3,5].

Auñón-Martín et al. presented the case of a 32-year-old snowboarder who, in addition to the left scapula fracture and intrathoracic dislocation of a cranial fragment, also had a 3rd degree AC joint luxation. Due to the progression of the pain, after initial conservative treatment and a chest CT, an open reposition and resection of the impacted fragment were performed. The patient returned to sports activities and the range of motion was comparable to the other arm[4].

The last case described in the literature is an 83-year-old woman who had fallen down the stairs and suffered a right scapula fracture with an intrathoracic migration of a caudal fragment, with a serial rib fracture and a haemothorax. The patient was treated conservatively with a good functional result and the ability to perform daily life activities[18].

According to the available literature, this is the sixth described case of a scapula fracture with an intrathoracic migration in adults. Given that the shoulder blade is a wide and flat bone, enclosed by muscles and leaning on the ribs at the front, the case is interesting because it happened because of a relatively low energy that led to an isolated scapula fracture with a displacement of fragments into the thoracic cavity, without fractures of the ribs or other parts of the shoulder girdle. To our knowledge, this is the first case of an isolated scapula fracture with a dislocation into the thoracic cavity described in literature.

Since the repositioning was not possible, all presented cases in adults and children were initially treated surgically or after a failed attempt at conservative treatment, except for the last, the 83-year-old woman who was treated conservatively and managed to achieve a good functional result. In our case, as in the paper of Auñón-Martín et al., it was a less frequent variant when a cranial fragment was dislocated in the chest cavity.

In our case, we managed to remove the cranial impacted fragment and the third wedge fragment from the thoracic cavity without surgery by indirect methods, i.e., manipulation of the shoulder blade and the injured arm, which was confirmed by a follow-up CT scan. With targeted physical therapy, the patient returned to daily life and work activities with full range of motion and a very good DASH score.

## CONFLICT OF INTEREST

The authors have no conflict of interest to disclose. The authors received no funding from private or public institutions for the preparation of this manuscript. All authors have read the final version of the paper and agreed with it.

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Sažetak

## IZOLIRANI PRIJELOM LOPATICE S MIGRACIJOM FRAGMENATA U PRSNU ŠUPLJINU: PRIKAZ SLUČAJA S PREGLEDOM LITERATURE

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Prijelomi lopatice su vrlo rijetki prijelomi nastali kao posljedica visokoenergetske traume i najčešće su povezani s drugim prijelomima lokomotornog sustava te ozljedama glave, prsišta ili trbušnih organa. Najčešće se liječe konzervativno, a indikacije za operacijsko liječenje još uvijek nisu jasno usuglašene. Jedno od stanja koje zahtijeva operacijsko liječenje je prijelom lopatice s migracijom fragmenata u prsnu šupljinu. U ovom radu prikazujemo izrazito rijedak izolirani prijelom lopatice, bez ozljeda drugih dijelova lokomotornog sustava, s intratorakalnom migracijom ulomka koji je liječen konzervativno s izvrsnim funkcijskim ishodom.

Ključne riječi: *lopatica, prijelom kosti, prsna šupljina, zatvorena repozicija prijeloma, prikaz slučaja*