Case report

Intrathoracic fracture—Dislocation of the shoulder

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ABSTRACT

Intrathoracic dislocation of the shoulder is a rare condition that usually occurs after high-energy trauma. Etiology, mechanism of injury and associated lesions are diverse. We present the case of a patient who suffered a great height fall, treated with removal of the humeral head and implantation of a shoulder hemiarthroplasty. One year after the surgery, the patient was pain free and the Constant score was 70 points.

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1. Introduction

Intrathoracic fracture-dislocation of the humeral head is a very rare entity. The early description belongs to Watson-Jones,¹ who referred to some cases published in the German literature in 1865. West² in 1949, and Glessner³ in 1961, would be who reported the first international articles of this injury. Henceforward, only about twenty cases have been described in the literature.

The aim of this paper is to review the published cases to determine etiology, mechanism of production, associated injuries and treatment of this serious injury.

Below, we present the case of a 60 years old woman who suffered an intrathoracic fracture-dislocation of the humeral head after a great height fall.

2. Case presentation

We present the case of a 60 years old woman who suffered an accidental six meters fall in the countryside. She injured her left shoulder presenting local tenderness and loss of function. Also blunt chest trauma occurred with respiratory distress. She did not address any prior medical history.

On arrival at our hospital the patient was awake and oriented, hemodynamically stable, with an oxygen saturation of 89%, without oxygen therapy. Furthermore, subcutaneous emphysema was detected on the left costal grill and pain increased concomitantly with breathing movements.

In the nerve examination of the extremity no alteration was found. Radial and ulnar pulses were present.

Laboratory studies showed mild leukocytosis with neutrophilia and hemoglobin level of 11 g per deciliter, as only significant findings.

In a standard radiographic study of the left shoulder, a four-part fracture-dislocation of the proximal humerus was observed, being the humeral head displaced intrathoracically (Fig. 1). Here, a CT scan was performed showing a marked medial displacement of the humeral head besides the second rib fracture and a left lung hemopneumothorax (Fig. 2).

Following forty-eight hours in the intensive care unit where the patient was stabilized, we proceeded to the surgery. Firstly, through axillary thoracotomy, the humeral head was removed and a chest tube was left in collaboration with a thoracic surgeon. No rib fixation was performed. Afterwards, through deltopectoral approach, a cemented hemiarthroplasty (Global-FX. DePuy®) was implanted and tuberosities were anatomically reduced and fixed (Figs. 3 and 4). Forty-eight hours after the surgery, the patient was allowed to perform passive rehabilitation exercises. Five days after the surgery, she was discharged from our hospital remaining respiratory stable and continuing rehabilitation treatment on an outpatient basis.

One year after the surgery, the patient was pain free. Her shoulder range of movement (ROM) consisted of: flexion 120°, abduction 100°, internal rotation 30° and external rotation 50° (Fig. 5). These values in ROM made her independent in activities of daily living. The postoperative Constant score of the patient was 70 points.

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Fig. 1. Radiographic study showing the intrathoracic fracture dislocation.

3. Discussion

Fig. 2. CT-scan showing the intrathoracic localization of the humeral head.

The early description belongs to Watson-Jones,¹ who referred to some cases published in the German literature in 1865. West² in 1949, and Glessner³ in 1961, would be who reported the first international articles of this injury. Henceforward, only about twenty cases have been described in the literature.

Fig. 4. Radiographic study showing the hemiarthroplasty. Note the second rib fracture.

Intrathoracic fracture-dislocation of the humeral head is a rare injury that requires the conjunction of a high energy trauma, combined with a specific mechanism.

Enumerating the mechanism of injury, we can review 16 falls from height (same mechanism of our case),^{2,4–11,13–19} one fall of a bicycle,¹² five motor vehicle accidents,^{20–24} and two were knocked down by a motor vehicle.^{25,26} Two exceptions can be made regarding the mechanism of high energy: the cases published by Griffin et al. and Salhiyyah et al. in which the injury was a fall from standing height.^{28,28}

The fracture mechanism was raised by Hardcastle et al. in 1981, who suggested two stages for the injury to occur.²⁹ First a drop in forced abduction with external rotation causing dislocation and moves the humeral head toward the chest. Subsequently, a sharp adduction causes fracture of the humeral head. Glessner and Patel, previously (1961 and 1963), had suggested a similar mechanism, in which a forced abduction dislocated the shoulder into the chest cavity, and in the process of impact against the ribs would be when the fracture took place.^{3,4}

Karr et al., suggested another possible mechanism of injury. It is a fall on the hand with the elbow extended that causes the fracture and dislocation of the humeral head, followed by a lateral impact on the shoulder resulting in fracture of the ribs and the entry of the head fragment into the chest.⁶

Fig. 3. Intraoperative images showing the humeral head and the hemiarthroplasty replacement.

Fig. 5. Range of motion of the patient at one year after surgery.

There are others even more exceptional cases, with intraperitoneal displacement of the humeral head,³⁰ or two cases in which the cephalic fragment moved to the contralateral hemithorax.^{8,9}

This mechanism produces a four fragments fracture dislocation of the proximal humerus. As an exception, two examples with an isolated greater tuberosity fracture and intrathoracic displacement of the complex shaft – head – lesser tuberosity (two parts fracture – dislocation) have been reported.^{2,25} Additionally, a three parts fracture dislocation case has been published²⁹ and one epiphyseolysis fracture of the proximal end of the humerus.¹²

As for injuries associated with proximal humerus fracture-dislocation, there is a wide variety, mainly determined by the mechanism of trauma. The pneumo or hemothorax and other pulmonary lesions are virtually constant. Also in the literature, tibial plateau, humeral shaft, elbow, scapula, wrist and pelvis fractures are described.^{10,19,20,22,24–26} Regarding vascular complications, cases of an aortic compressing fragment of the humeral head, injuries to the subclavian artery and the costocervical trunk are described.^{15,17,28}

Several neurological complications have been identified. There are many reports of axillary nerve palsy, median and ulnar nerves neuroapraxia and secondary trunks of the brachial plexus lesions. In the majority of the cases described, they made a spontaneous recovery without needing surgery, although others ended with incomplete recovery.^{7,9,10,18,26}

Regarding the management of this injury, there is no consensus in the literature. In the early publications and some subsequent ones, conservative treatment was performed.^{2,4–6,16,27} There is no consensus about the need of removal the humeral head in the three or four parts fractures. Of the twenty eight reported cases, it was decided to extract it in twenty three, and just in one patient treated with an hemiarthroplasty, the head was not removed.²⁶ In arguing

for removing the head is the likelihood of associated complications such as infection or foreign body reaction.

Du Plessis et al. considered in his paper whether to remove the humeral head was really necessary.¹⁶ Supported by imaging techniques to discard the commitment of some noble structure and in the absence of clinical symptoms caused by the fragment he concluded that the removal may not be compulsory.

One author has chosen fixing rib fractures advocating a more rapid recovery of lung function.¹⁸ Extraction can be performed by thoracotomy or thoracoscopy. Another point of discussion although is more consensual, is the type of surgery being performed. In the articles reviewed, eighteen authors opted for a shoulder arthroplasty and one of them used a reversed prosthesis.^{7–11,14,15,17–22,24,26,28} The reverse shoulder was used due to the high-energy comminution, stripping of the remaining tuberosity fragments, and extensive proximal bone loss.¹⁴ There are four cases in the literature where the open reduction and internal fixation were chosen, including the instance of a two fragments fracture dislocation.^{12,23,25,29} In all three cases the patients were younger which determined the therapeutic decision making. None of them reported aseptic necrosis of the humeral head in the short term. Nevertheless, the extraction of the dislocated humeral head involves devitalization of the cephalic fragment and, consequently, the risk of necrosis is extremely high. Glessner in 1961 opted for the removal of the head and reinsertion of the remaining rotator cuff to the humeral shaft.³

4. Conclusion

The treatment of the intrathoracic fracture dislocation of the shoulder requires the participation of a multidisciplinary team. The impact of thoracic trauma and severity of the associated injuries must be treated individually. Because of the rarity of this injury, a lack of understanding exists to choose the optimal treatment. However, given our experience with the case described and the literature review, we advocate shoulder hemiarthroplasty as a better treatment due to the high risk of osteonecrosis, except for very young patients. Doubts about the need for removal of the humeral head still remain, although the majority of authors choose the extraction.

Conflicts of interest statement

None.

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