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Case Report

Ideberg type III glenoid fractures are caused by indirect force: A report of four cases

Matsugaki Toru*, Shibata Hideaki, Matsubara Tsunemasa

Department of Orthopaedic Surgery, Saiseikai Fukuoka General Hospital, 1-3-46 Tenjin, Chuo-Ku, Fukuoka City, Japan

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ABSTRACT

Ideberg type III glenoid fractures are relatively rare, and the mechanisms of injury and treatment strategies remain controversial. We reviewed the fracture patterns and final radiological findings in four cases. All fractures were wider on the medial side than on the side of the articular surface. All patients had multiple ipsilateral rib fractures; three out of four patients had a concomitant acromion fracture. Therefore, the mechanism of injury for the fracture is assumed to be external force applied in the caudal direction to the medial side of the body of the scapula. The superior shoulder suspensory complex was disrupted in most cases. A good clinical outcome was obtained in two patients with percutaneous screw fixation for the glenoid fracture and rigid plate fixation for the acromion fracture and in one patient who did not have an acromion fracture. However, one patient who did not undergo fixation of the acromion fracture developed osteoarthrosis of the shoulder joint. In this type of fracture, it is important to stabilize the acromion fracture at the same time as fixation of the glenoid fracture.

Case reports

Case 1

A 71-year-old male had a history of left clavicle fracture. He was injured in a traffic accident. Computed tomography (CT) revealed subdural hemorrhage, left Ideberg type III glenoid fracture, left acromion fracture (Fig. 1A), and fractures of the left third, fourth, and ninth ribs (Fig. 1B). The acromion fracture was fixed with a plate and wiring. Percutaneous screw fixation was used to treat the glenoid fracture. After 43 months, the patient developed dementia secondary to brain injury. However, he did not complain of any symptoms and there was no difference in the range of motion between the left and right shoulder joints. Radiography demonstrated no degenerative changes in the left shoulder joint (Fig. 1C). CT demonstrated bone union (Fig. 1D).

Case 2

An 83-year-old male fell from a ladder while pruning tree branches. CT revealed subarachnoid hemorrhage, right Ideberg type III glenoid fracture, right acromion fracture (Fig. 2A), and fractures of the right second through ninth ribs (Fig. 2B). The acromion fracture was fixed with a plate. Percutaneous screw fixation was performed to treat the glenoid fracture. Three years later, he had dementia secondary to brain injury. However, he did not complain of any symptoms. Radiography demonstrated no degenerative

* Corresponding author at: Department of Orthopaedic Surgery, Saiseikai Fukuoka General Hospital, 1-3-46 Tenjin, Chuo-Ku, Fukuoka City, Japan.
E-mail address: matsugaki_tohru@kurume-u.ac.jp (M. Toru).

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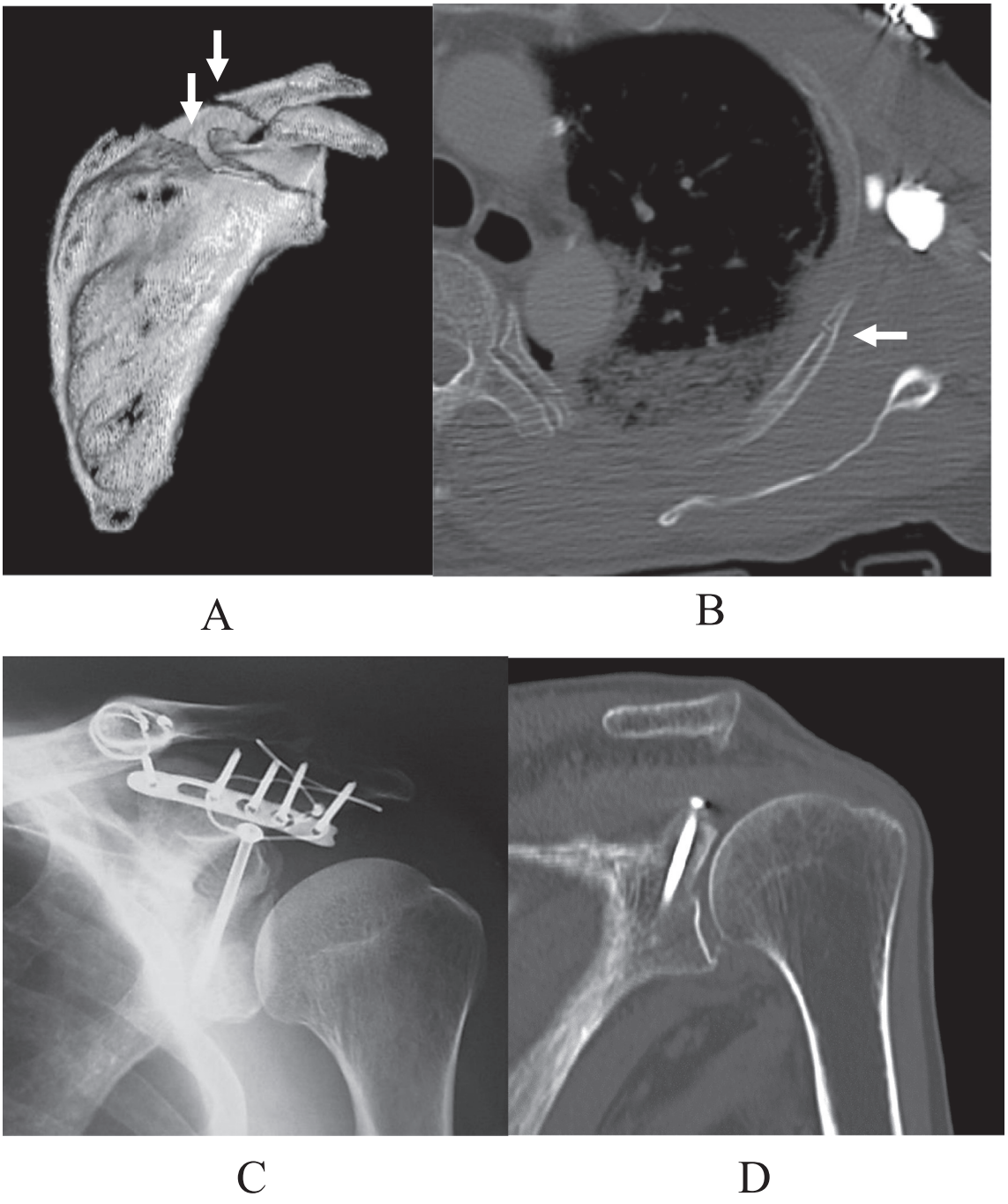

Fig. 1. A 71-year-old male. A) Three-dimensional CT demonstrating left Ideberg type III glenoid fracture and acromion fracture. B) Axial CT demonstrating fracture in the left fourth rib. The left third and ninth ribs were also fractured. C) Anteroposterior radiograph 43 months after surgery demonstrating no degenerative changes in the left shoulder joint. D) Coronal CT demonstrated bone union.

changes in the right shoulder joint (Fig. 2C).

Case 3

A 24-year-old female fell from the second floor of an apartment building. She had subdural hemorrhage, subarachnoid hemorrhage, right Ideberg type III glenoid fracture (Fig. 3A), and fractures of the right fifth through ninth ribs (Fig. 3B). She was treated conservatively because her acromion was not fractured. One year later, she had no symptoms and full range of motion in the right

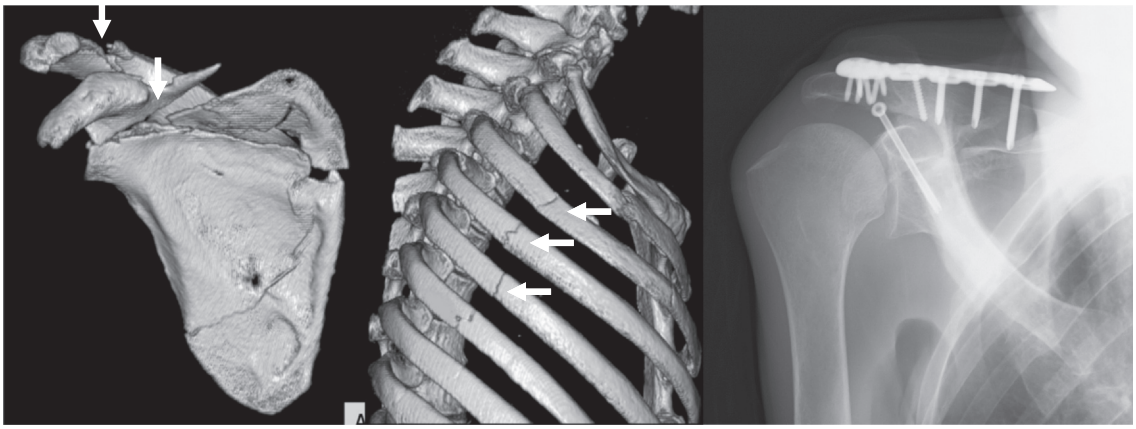

Fig. 2. An 83-year-old male. A) Three-dimensional CT demonstrating right Ideberg type III glenoid fracture and acromion fracture. B) Three-dimensional CT demonstrating fractures in the right third to fifth ribs. The right second and sixth through ninth ribs were also fractured. C) Anteroposterior radiograph 3 years after surgery demonstrating no degenerative changes in the right shoulder joint.

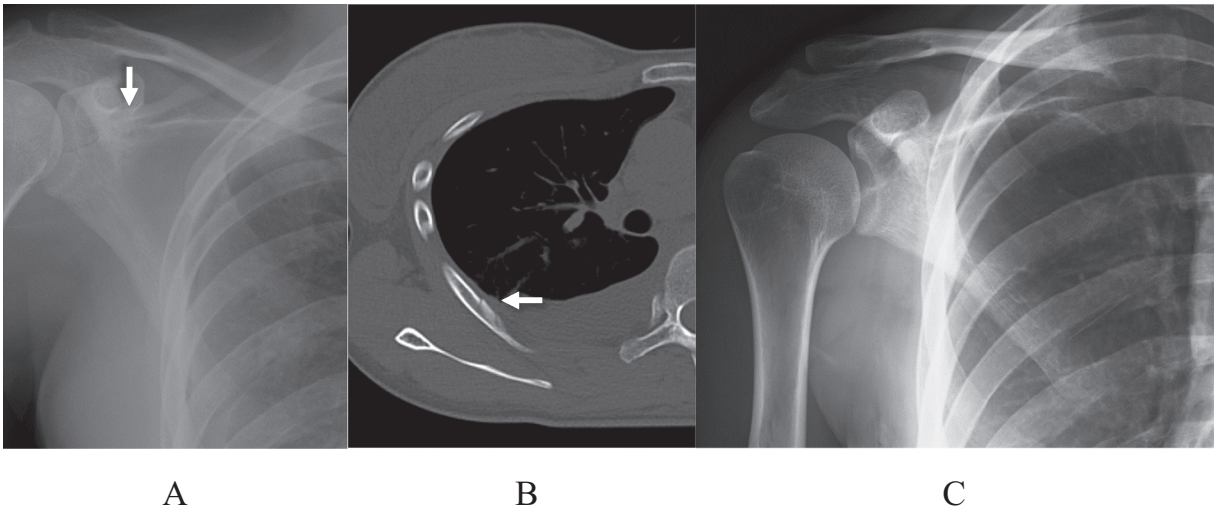

Fig. 3. A 24-year-old female. A) Anteroposterior radiograph demonstrating right Ideberg type III glenoid fracture. B) Axial CT demonstrating right sixth rib fracture. The right fifth through ninth ribs were fractured. C) Anteroposterior radiograph 1 year after the injury demonstrating bone union of the fracture and no degenerative changes in the right shoulder joint.

shoulder joint. Radiography demonstrated bone union at the fracture site and no degenerative changes in the right shoulder joint (Fig. 3C).

Case 4

A 62-year-old male was hit on the left shoulder by a falling tree. He had a left Ideberg type III glenoid fracture, left acromion fracture, and fractures of the left third through tenth ribs (Fig. 4A–C). Since the distal fragment was severely dislocated in the caudal direction, the left arm was pushed up to move the distal fragment more proximally. Next, the fragments were reduced with bone forceps and fixed with two screws (Fig. 4D). However, the acromion was not fixed because the surrounding soft tissue was destroyed. The patient developed osteoarthrosis in the left shoulder joint 20 months later (Fig. 4E, F).

Discussion

Ideberg Type III fractures are superior glenoid fractures extending through the base of the coracoid process [1]. The fracture line extends from the glenoid fossa to the superior margin of the scapula. Some authors argue that this type of fracture results from a force

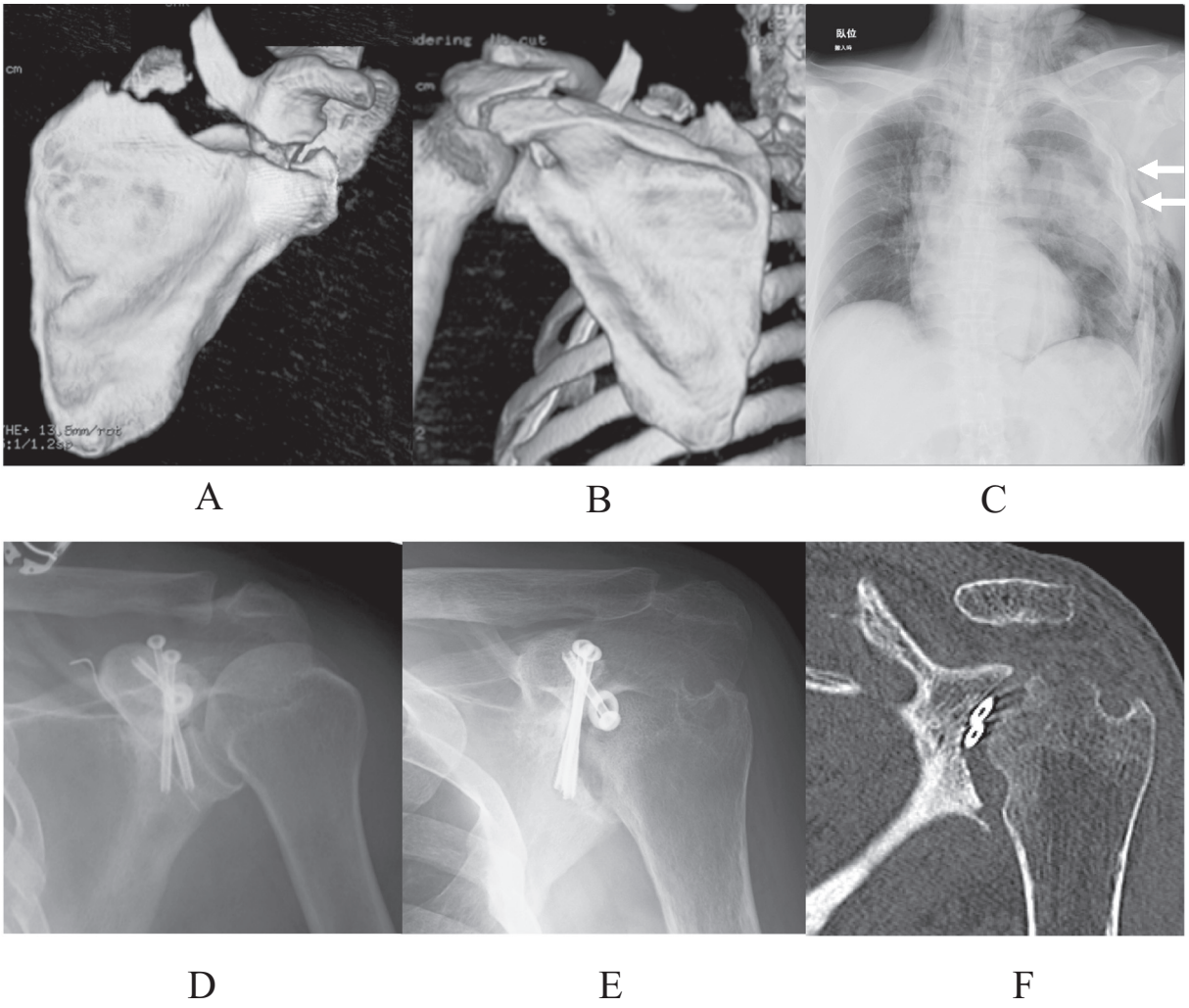

Fig. 4. A 62-year-old male. A) Three-dimensional CT demonstrating right Ideberg type III glenoid fracture B) and acromion fracture. C) Anteroposterior radiograph demonstrating multiple right rib fractures. D) Postoperative anteroposterior radiograph. E) Anteroposterior radiograph 20 months after surgery demonstrating degenerative changes in the right shoulder joint. F) Coronal CT 20 months after surgery demonstrating that the two screws were in the shoulder joint.

applied to the humeral head that is directed somewhat superiorly [2–4]. However, the body of the scapula is just suspended by the clavicle; it is not fixed directly to the thoracic bones. When a force is applied to the upper part of the glenoid superiorly, the body of the scapula also moves in the same direction, so it is difficult to create a shearing force in the glenoid cavity via this mechanism. Ideberg Type III fractures are known to sometimes be accompanied by multiple rib fractures and head injury [5], as observed in these cases. However, a superiorly dislocated humeral head would not cause these injuries. In all of these cases, the medial side of the fracture was more displaced than the articular side (Figs. 1A, 2A, 3A, 4A) and three of four patients had an acromion fracture. Therefore, the mechanism of injury leading to the fracture is assumed to be an external force applied in the caudal direction to the medial side of the body of the scapula. The body of the scapula rotates around the humeroscapular joint, leading to a fracture from the medial side of the body of the scapula to the glenoid cavity (Fig. 5A). In most cases, the superior shoulder suspensory complex (SSSC) was disrupted and the displaced body of the scapula breaks the ribs beneath it (Fig. 5B). In Case 4, this mechanism of injury is obvious, because the falling tree pushed his left scapula in a caudal direction.

Several techniques to treat this type of fracture have been described. In some reports, if reduction is difficult, a joystick was inserted into the coracoid process for reduction [4,6,7]. However, the body of the scapula is displaced caudally and the coracoid process is connected to the thoracic bones via the clavicle. Therefore, we should manipulate the body of the scapula toward the coracoid process. Especially in the severely displaced cases like Case 4, the coracoid process would never reach the body of the scapula without moving the body of the scapula.

Ideberg type III fractures are sometimes associated with SSSC injury [3,4,8,9]. Most authors recommend surgical treatment for concomitant injuries of the posterior segment (i.e., acromion fracture, acromioclavicular dislocations, or fractures of the distal

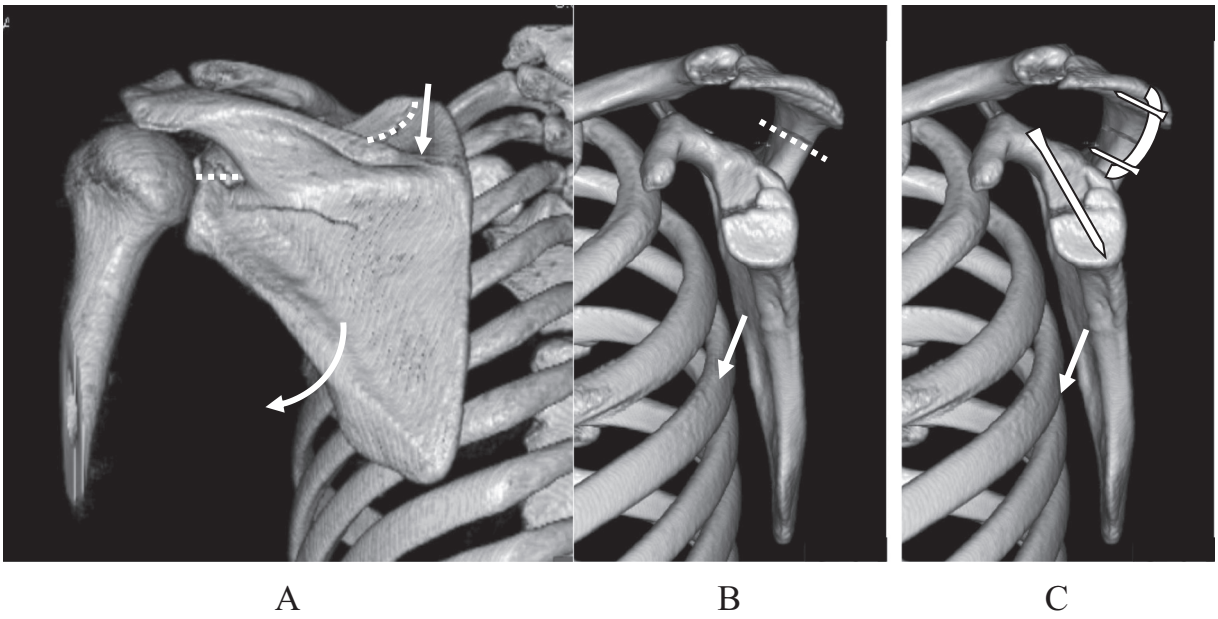

Fig. 5. A) Mechanism of Ideberg type III glenoid fracture. An external force is applied to the medial side of the body of the scapula (straight arrow). The body of the scapula rotates around the humeroscapular joint (curved arrow). The fracture line starts at the superior margin of the body of the scapula and ends at the glenoid fossa (dashed line). B) When the body of the scapula moves caudally (arrow), the acromion can fracture easily (dashed line), and the ribs below the body of the scapula are affected. C) Screw fixation is insufficient for stabilizing the body of the scapula from moving caudally. Plate fixation is required to treat the acromion fracture.

clavicle) [4,9]. In Case 4, the two screws migrated into the shoulder joint and led to osteoarthrosis. In this case, the acromion fracture was not fixed due to soft tissue injury. Therefore, SSSC instability persisted. Since the body of the scapula is pulled by the muscles around the shoulder, screw fixation is not sufficient to treat glenoid fractures unless the posterior segment is stabilized. If the posterior segment is destroyed, it should be repaired surgically. On the other hand, in Case 3, the acromion was not fractured and the glenoid fracture healed uneventfully with conservative treatment.

Although the number of cases in this series was limited, it is important to note that most cases were caused by an external force applied in the caudal direction to the medial side of the body of the scapula and the acromion fracture should be fixed at the same time as fixation of the glenoid fracture.

Declaration of competing interest

The authors declare that they have no conflicts of interest in connection with this paper. All authors confirm that they have no financial or personal relationships with other people or organizations that could inappropriately influence this work.

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