

Showa Univ J Med Sci 31(3), 293~298, September 2019

Case Report

A Case of Olecranon Stress Fracture Caused by Throwing Motion

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Abstract: A 28-year-old man had right elbow pain just as he was throwing his usual fastball from the pitcher's mound while playing a recreational baseball game. He had tenderness and swelling at the site of the olecranon without a history of trauma, previous elbow pain, instability or degenerative change in his elbow. An olecranon stress fracture was diagnosed caused by an impaction force during the throwing motion. Open reduction and internal fixation using tension band wiring was performed. Bone union was achieved and he returned to playing baseball as a pitcher. We report our case along with some discussion of the literature.

Key words: olecranon stress fracture, throwing injury, surgical treatment

Introduction

Patient: A 28-year-old man, recreation level baseball player.

Chief complaint: Right elbow intense pain.

Onset and course: The patient had severe pain in the right elbow just as he was throwing a baseball from the pitcher's mound while playing a recreational baseball game. At that time he threw a fastball as usual and he felt intense pain with a crack of his elbow. He visited our hospital the following day with a splint which the local clinic had given him.

Physical examination: There was swelling mainly on the posterior part of his elbow joint and pain with tenderness in the olecranon area. There was no pain or tenderness on the medial or lateral sides of his elbow, and no elbow instability. He had no trauma history, or previous pain in his right elbow while playing baseball.

Radiological findings: X-ray findings showed a simple oblique fracture line on the olecranon (Fig. 1). Computed tomography findings showed sclerotic change on both sides of the fracture (Fig. 2).

Diagnosis: Olecranon stress fracture associated with the throwing motion.

Treatment options: ① conservative treatment with cast; ② surgical treatment with tension band wiring, screws or a plate, with or without a bone graft.

Clinical Course: In consultation with the patient, we decided on a treatment plan ②, considering his age, level of baseball, fracture type, medical history and minimally invasive treatment. Three days after the injury, open reduction and internal fixation was performed using tension band wiring without a bone graft (Figs. 3 and 4). His elbow was splinted for two weeks, after

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which he started rehabilitation. Bone union was achieved at 3 months after the operation (Fig. 5). He had a full range-of-motion and no pain during his throwing motion. Finally, he could return to playing baseball as a pitcher without pain, at 12 months after the operation (Fig. 6).

Discussion

According to Orava and Hulkko¹⁾, olecranon stress fractures occur rarely and constitute 1.4% of all stress fractures. However, Iwamoto and Takeda²⁾ reported that for baseball players, olecranon stress fractures make up 58.3% of all stress fractures. Thus, it is necessary to consider the olecranon stress fracture as a major throwing injury of the elbow.

Olecranon stress fractures associated with the throwing motion mostly occur in the interval

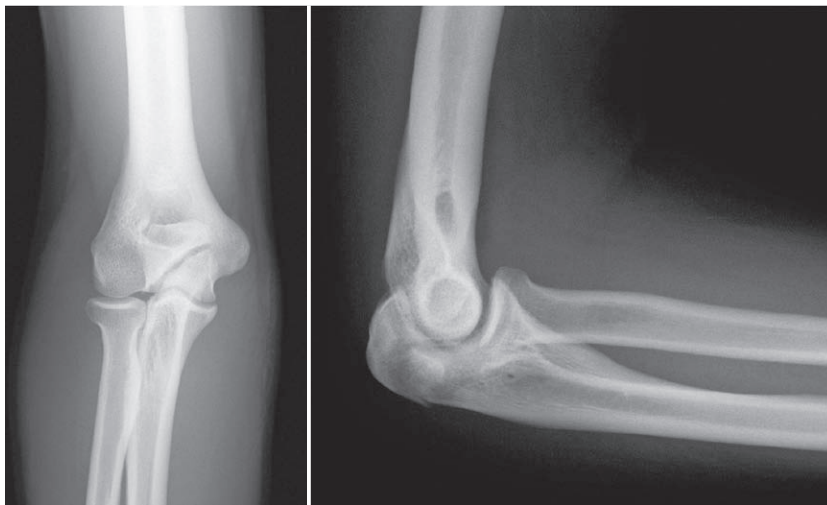


Fig. 1. X-ray of the elbow at the time of injury. A simple oblique fracture line on the olecranon can be seen.

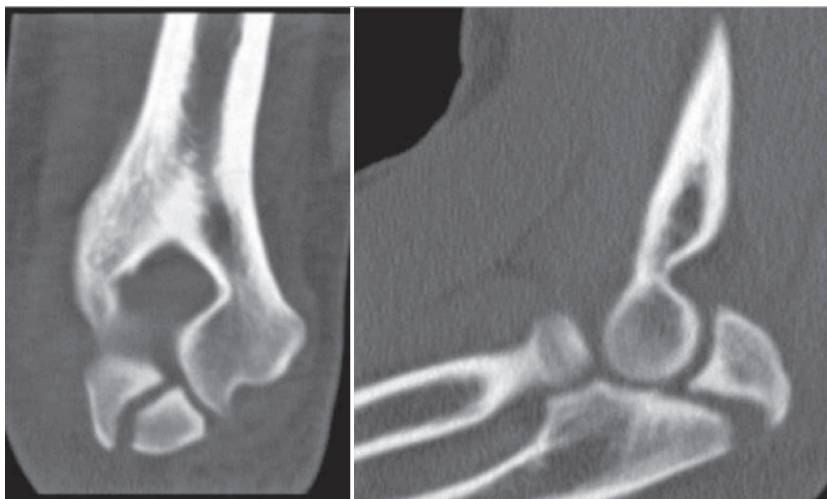


Fig. 2. Coronal and sagittal computed tomography (CT) scans at the time of injury. CT images show sclerotic change on both sides of the fracture.

from the late cocking phase to the acceleration or follow-through phase³⁾. Slocum⁴⁾ reported that the traction force generated by the triceps brachii muscle in the acceleration phase causes the olecranon stress fracture. Ito *et al*⁵⁾ theorized that the impaction force generated by impingement of the olecranon and olecranon fossa with overstretching of the elbow joint in the follow-through phase was the biomechanical cause of the injury. Ohno *et al*⁶⁾ also suggested that posterior impingement and valgus stress may be involved in the cause, while Ahmad *et al*⁷⁾ reported that the valgus extension overload generated by the stress of valgus and overstretching of the elbow joint in the follow-through phase was responsible for the stress fracture.

Furushima *et al*⁸⁾ classified types of olecranon stress fractures based on the shape of the fracture line and status of the epiphyseal line as seen on X-ray images (Fig 7). A transverse

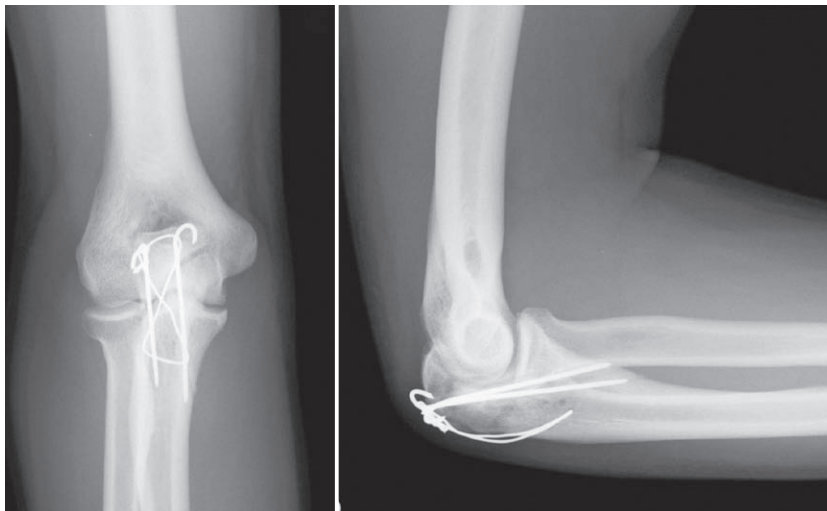


Fig. 3. Postoperative X-ray of the elbow.

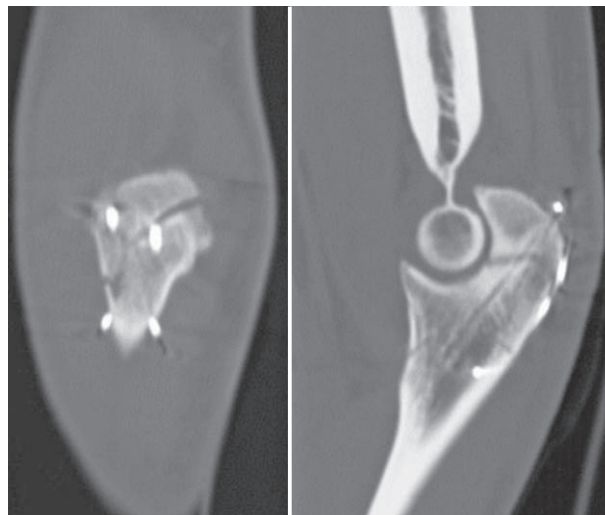


Fig. 4. Postoperative coronal and sagittal computed tomography scans of the elbow.

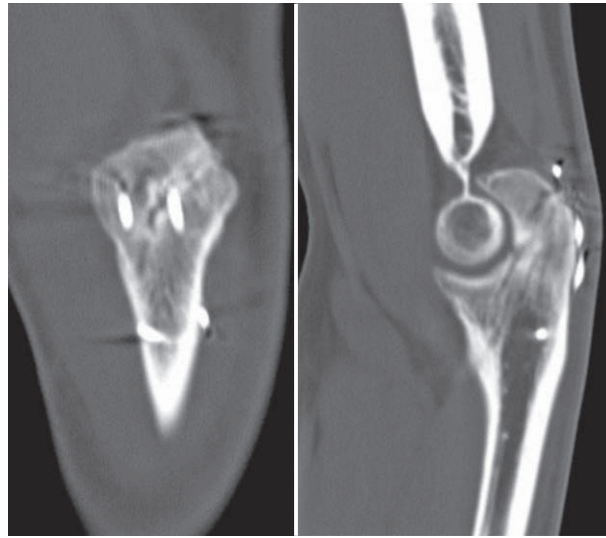


Fig. 5. Three months after the operation. Coronal and sagittal computed tomography scans. Bone union was achieved.

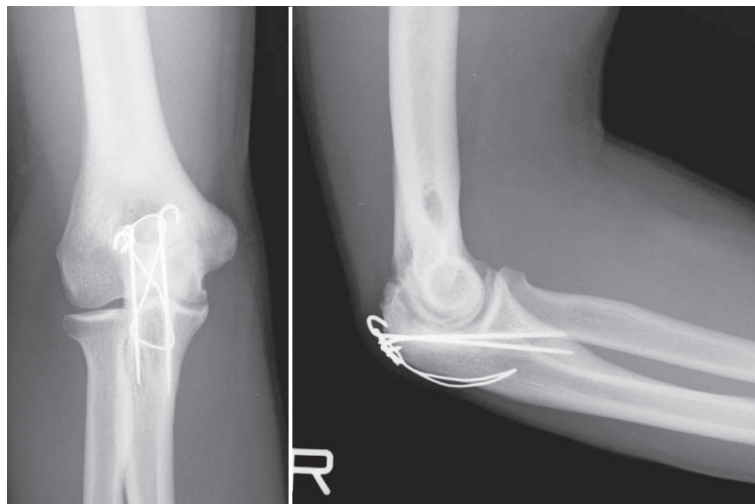


Fig. 6. 12 months after the operation

fracture occurs if it is caused by a traction force, while an oblique fracture occurs if it caused by an impaction force. Furushima *et al* reported that 62.9% of transverse olecranon stress fractures and 80.7% of oblique olecranon stress fractures are accompanied by injury to the medial elbow joint itself. Injury of the medial collateral ligament accompanies 42.9% of transverse fractures and 76.9% of oblique fractures. They also described a strong association between olecranon stress fractures and injury to the medial collateral ligament of the elbow. Therefore, it is necessary to consider both medial collateral ligament injuries and olecranon stress fractures when treating throwing injuries of the elbow.

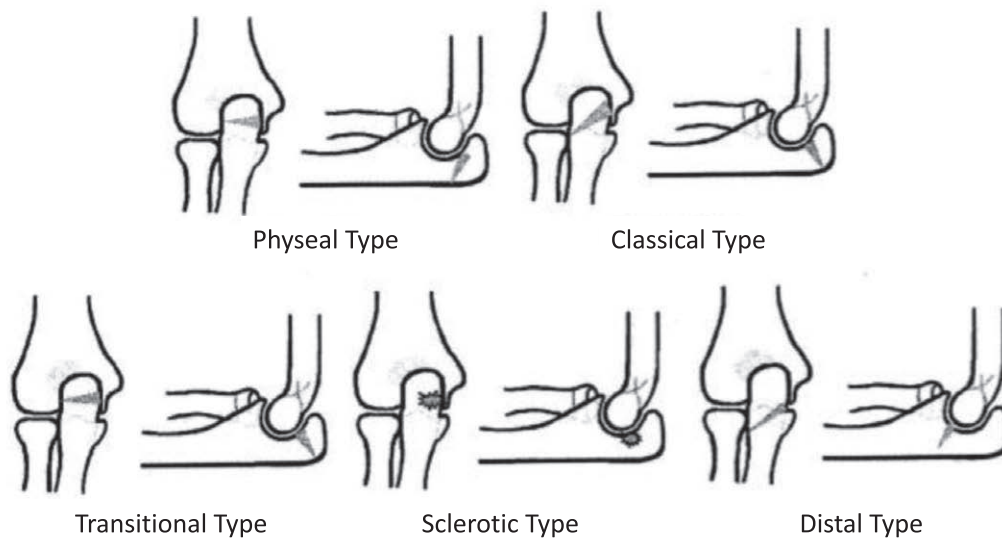


Fig. 7. Classification of olecranon stress fractures
 Taken from Furushima K *et al. J Joint Surg.* 2008;**27**:58–68.⁸⁾

Conservative treatment can be considered for olecranon stress fractures. However, this treatment has the risk of nonunion or recurrence, and requires a prolonged rest interval with no throwing, which is not ideal for athletes. Thus, surgical treatment is commonly recommended for adult athletes. Open reduction and internal fixation are achieved with the use of cancellous screws or tension band wiring. Some reports have recommended a bone graft at the initial surgery^{9, 10)}, in order to avoid nonunion and recurrent fractures after removal of the screws.

In the case of an olecranon stress fracture with instability of the elbow joint, a recurrence is possible if only the fracture itself is treated. Therefore, proactive reconstruction of the medial collateral ligament should be considered. In addition, in the case of a stress fracture with impingement of the olecranon and olecranon fossa, preventive surgery, such as osteophyte resection should be considered⁶⁾.

To prevent recurrence or re-injury, postoperative rehabilitation should focus on improvement of the throwing style, according to the mechanism of the injury. In the current case, the cause was revealed to be an impaction force as there was a typical oblique fracture on X-ray imaging and no findings of medial collateral ligament injury. A treatment plan was decided based on the following: his healing potential as he was young, no complications with medial collateral ligament injury or elbow arthritis, it was his first injury, and his baseball level. After open reduction and internal fixation using tension band wiring, he had two weeks of immobilization, followed by rehabilitation of his throwing style. Finally, bone union was achieved three months later.

Although requiring careful examination, open reduction and internal fixation using tension band wiring results in firm fixation and it is easy to remove after bone union and is minimally invasive; thus it is considered to be one of the alternative surgical methods.

Postoperative rehabilitation is important for the prevention of recurrence of olecranon stress

fractures. In particular, it is necessary to teach a throwing form that prevents valgus stress.

However, in this case, long-term follow-up with improvement of his throwing style and body condition, and further X-ray imaging may be needed.

Acknowledgments

We thank the patient for allowing us to publish this case.

Conflict of interest

We declare that there are no conflicts of interest.

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[Received February 26, 2019 : Accepted March 25, 2019]