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Devising Osteosynthesis for the Reverse Oblique Olecranon Fracture: A Case Report

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Learning Point of the Article:

The combination of tension band wiring and plates should be actively consideration reverse oblique olecranon fractures.

Abstract

Introduction: We encountered a patient with a reverse oblique olecranon fracture in whom redisplacement occurred after osteosynthesis using routine tension band wiring (TBW). In this case report, methods for stable fixation used during reoperation are reported with a review of the literature.

Case Report: A 60-year-old male got the left olecranon fracture (Colton classification, type 2A) visited our hospital. However, osteosynthesis using TBW was performed, soft wire breakage, K-wire distortion, and olecranon bone fragment displacement at 2 weeks after surgery. Reoperation was performed. TBW was performed using K-wires as intramedullary nails so that compression force could be applied as vertically as possible to the bone fragments. Furthermore, for further control of distal bone fragment instability, olecranon locking plate fixation was performed using a posterior approach. 12 months after the operation, the visual analog scale score was 2/10, Quick Disabilities of the Arm, Shoulder, and Hand score were 2.27/100, and the Mayo Elbow Performance score was 85/100 (good). Plain X-ray examination showed favorable bone union.

Conclusion: In reverse oblique fractures, the compression force applied to the fracture site is weak because it is not vertical to the fracture line. Therefore, stable osteosynthesis cannot be performed, and post-operative redisplacement occurs. The combination of TBW and plates should be actively considered in reverse oblique olecranon fractures for which adequate fixation cannot be provided by TBW alone.

Keywords: Reverse oblique olecranon fracture, Colton classification, tension band wiring, olecranon plate.

Introduction

As surgery for olecranon fractures, tension band wiring (TBW) or locking plate fixation is selected. Favorable post-operative results can be obtained using either technique for general fractures [1]. In TBW, insertion of Kirschner wires (K-wires) as vertically as possible to the fracture line allows favorable compression force applied to the fracture site (Fig. 1). However, in reverse oblique fractures, the compression force applied to the fracture site is weak because it is not vertical to the fracture line. Therefore, stable osteosynthesis cannot be performed, and post-operative redisplacement occurs [2]. Therefore, we consider that reverse oblique olecranon fractures appear to be simple fractures but are one of the injuries challenging to treat. We encountered a patient with a reverse oblique olecranon fracture in whom redisplacement occurred after osteosynthesis using routine TBW. In this case report, methods for stable fixation used during reoperation are reported with a review of the literature.

Case Report

A 60-year-old male with nothing of note in his medical history visited our hospital due to pain in the elbow joint resulting from a motorcycle accident. Based on plain X-ray findings, a diagnosis of a left olecranon fracture was made (Colton

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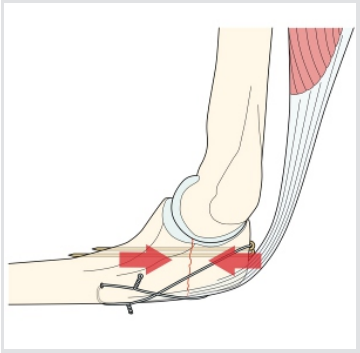

Figure 1: Tension band wiring for normal cases. When tension band wiring is performed for general olecranon fractures, insertion of Kirschner wires as vertically as possible to the fracture line allows favorable compression force application.

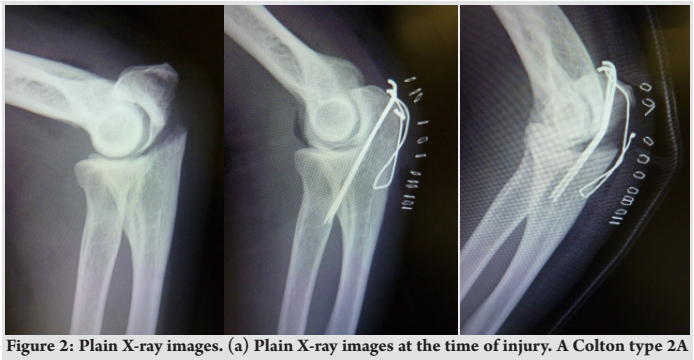

Figure 2: Plain X-ray images. (a) Plain X-ray images at the time of injury. A Colton type 2A reverse oblique olecranon fracture was observed. (b) Plain X-ray images after the first operation. Osteosynthesis using tension band wiring was performed, and a favorable reduction position was obtained. (c) Plain X-ray films at the time of displacement 2 weeks after operation. Plain X-ray examination showed soft wire breakage, Kirschner wire distortion, and olecranon bone fragment displacement.

classification, type 2A) (Fig. 2a) [3]. 3 days after the injury, osteosynthesis using TBW was performed (Fig. 2b). 2 weeks after the operation, he developed the left elbow pain after falling and revisited our hospital. Plain X-ray examination showed soft wire breakage, K-wire distortion, and olecranon bone fragment displacement (Fig. 2c). Reoperation was performed. The broken wire and scar tissue at the fracture site was removed, and the bone fragments were freshened (Fig. 3a). Subsequently, TBW was performed using K-wires as intramedullary nails so that compression force could be applied as vertically as possible to the bone fragments. Furthermore, for further control of distal bone fragment instability, olecranon locking plate fixation (VA-LCP olecranon plate, Depuy Synthes, Tokyo, Japan) was performed using a posterior approach (Fig. 3b). At present, 12 months after the operation, the range of elbow motion is 130 for flexion, -10 for an extension, 85 for pronation, and 85 for supination. The visual analog scale score was 2/10, Quick Disabilities of the Arm, Shoulder, and Hand score were 2.27/100, and the Mayo Elbow Performance score was 85/100 (Good). Plain X-ray examination showed favorable bone union (Fig. 4a and b).

Discussion

Concerning surgical treatment for general olecranon fractures, Tarallo et al. reported a high rate (45%) of post-operative complications (such as wire loosening, skin disorder, infection, and non-union) describing that TBW is not a straightforward technique [4]. Therefore, there was a recent study recommending the active use of olecranon locking plates [5]. There have been the following opinions about surgical treatment for reverse oblique olecranon fractures as was observed in this patient. Iga et al. reported that there is anterior instability of the distal bone fragment/ulnar diaphysis in reverse oblique olecranon fractures, and TBW alone is inadequate to control this instability [6]. In addition, concerning whether K-wires should be used as intramedullary nails or transcortically placed through the anterior cortex, van der Linden et al. reported that K-wire instability developed in 75% of cases treated with intramedullary K-wires, and significantly favorable fixation could be obtained in cases treated with transcortical K-wires penetrating the anterior cortex [7]. Therefore, in patients such as our patient with reverse oblique fractures, we considered that methods to achieve two directional favorable fixation (in the major and minor axis directions of the ulna) are necessary. Favorable fixation in the major axis direction of the ulna can be achieved using TBW. As a method to apply compression force as vertical as possible to the bone fragments, K-wires were used as intramedullary nails (Fig. 5a). Favorable fixation obtained using TBW could be confirmed during the operation, but the instability of the distal ulnar diaphysis remained as van der Linden et al. reported [7]. To overcome the anterior instability of the ulnar diaphysis, which could not be controlled using K-wire intramedullary nails, the bone fragments of the diaphysis were posteriorly drawn using a posterior olecranon plate, and fixation in the ulnar minor axis direction was obtained (Figs. 3b, 4b, and 5b). When olecranon plates, mainly locking plates, are

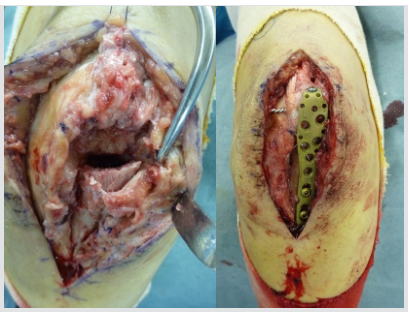

Figure 3: Findings during reoperation. (a) The scar tissue around the fracture site was removed, and the bone fragments were freshened. (b) Tension band wiring and posterior olecranon locking plate fixation were performed.

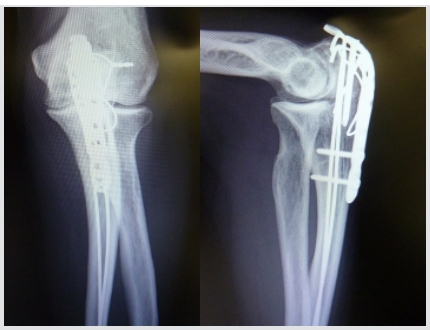

Figure 4: Plain X-ray images 12 months after operation. Plain X-ray examination 12 months after operation showed favorable bone union (A: frontal image, B: lateral image).

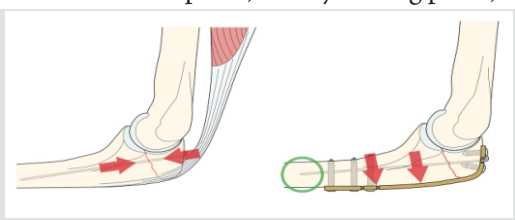

Figure 5: Our methods to improve fixation in a patient with a reverse oblique olecranon fracture. (a) To provide fixation in the major axis direction of the ulna using tension band wiring, Kirschner wires were used as intramedullary nails so that compression force could be applied as vertically as possible to the fracture line. (b) After the above fixation A alone, the instability of the distal ulnar diaphysis remained (c). Therefore, to provide fixation in the minor axis direction of the ulna, the distal ulnar diaphysis was posteriorly drawn using a posterior olecranon locking plate.

used, attention should be paid to the possible development of complications such as skin disorders [8]. Some authors have the opinion that low profile plates instead of locking plates should be used [9]. In our case, a locking plate was used, which is a limitation of our technique. Informed consent should be obtained from patients after an adequate explanation of the possible complications. When complications develop, coping including removal of intramedullary nails is necessary. Despite these disadvantages of olecranon locking plates, the combination of TBW and plates should be actively considered in reverse oblique olecranon fractures for which adequate fixation cannot be provided by TBW alone.

Conclusion

In reverse oblique fractures, the compression force applied to the fracture site is weak because it is not vertical to the fracture line. Therefore, stable osteosynthesis cannot be performed, and post-operative redisplacement occurs. The combination of TBW and plates should be actively considered in reverse oblique olecranon fractures for which adequate fixation cannot be provided by TBW alone.

Clinical Message

In reverse oblique fractures, stable osteosynthesis cannot be performed, and post-operative re-displacement occurs. The combination of TBW and plates should be actively considered in reverse oblique olecranon fractures for which adequate fixation cannot be provided by TBW alone.

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