

—Reports on Experiments and Clinical Cases—

Surgical treatment of comminuted fractures of the distal clavicle using wolter clavicular plates

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Abstract

Surgical reduction and fixation using Wolter clavicular plates was performed in 16 patients with distal clavicle fractures. Good bony union was obtained in all cases. The patients had neither postoperative pain nor muscle weakness. Compared with tension band wiring, the Wolter clavicular plates were better able to maintain the anatomic repositioning of comminuted distal clavicle fractures. However this method takes longer and requires a second operation for plate removal. Wolter clavicular plate placement is the treatment of choice for unstable distal clavicle fractures with small comminuted fragments. (J Nippon Med Sch 2000; 67: 32—34)

Key words: fracture, distal clavicle, Wolter clavicular plate

Introduction

Generally, union of clavicle fractures occurs readily, and most such fractures are treated conservatively. However, in fractures of the distal clavicle, delayed union sometimes occurs, causing functional impairment. At that site surgical treatment is frequently indicated for unstable fractures. The purpose of this study was to evaluate the clinical results of surgical treatment of distal clavicle fractures using Wolter clavicular plates.

Materials and Methods

Sixteen patients with distal clavicle fractures were treated using Wolter clavicular plates between February 1994 and January 1997. The group comprised 14 men and 2 women aged 22 to 53 years (mean: 39.1 years). The time from injury to surgery ranged from 9 to 26 days (mean: 15.1 days). The mean follow-up period was 19 months (range: 9 to 36 months). The fractures were classified as type II (n=10), or type V (n=6) using Craig's system¹. According to the Nakagawa

system², the fractures were classified as type 1 (n=4), type 2 (n=8), type 3 (n=1), or type 4 (n=3). A three-hole plate was used in 13 patients, and a five-hole plate was used in 3 patients. Pendulum exercises were started 7 to 10 days postoperatively. This was followed by active range of motion exercises starting at the fourth week.

Results

Good radiographic bony union was achieved in all 16 patients (**Fig. 1**). The mean postoperative range of motion of the shoulder joint was 168° of elevation and 159° of abduction. Four middle-aged patients exhibited a slight limitation in the range of motion. The clinical Japan Orthopedic Association (JOA) Scores ranged from 86.5 to 100 points (mean: 95.1 points). The clinical results were not dependent on the type of fracture. Even fractures with comminuted distal fragments (Craig type V and Nakagawa types 2 and 4) were fixed firmly enough to allow early rehabilitation (**Fig. 2**). The Wolter plates were very effective.

The plate was removed in 14 of the 16 patients. The

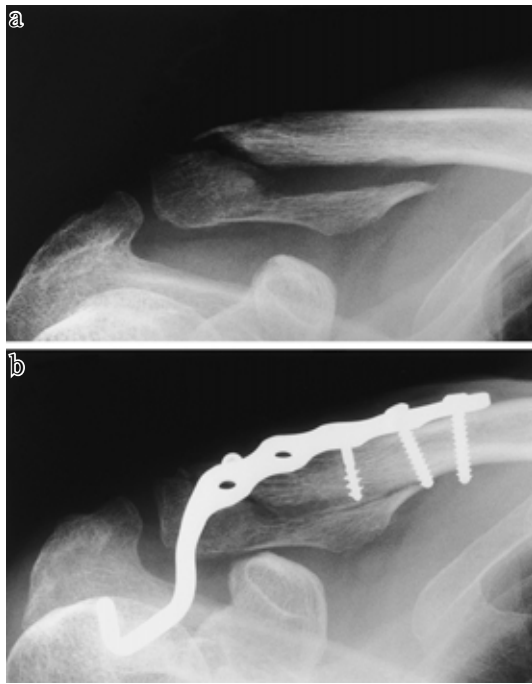


Fig. 1 Radiographs of a large distal clavicle fracture in a 44-year-old man. a: The fracture was classified as type 3 according to Nakagawa's system. b: The fracture was reduced and plated 22 days after the injury. Since the fracture line was long, a five-hole plate was used.

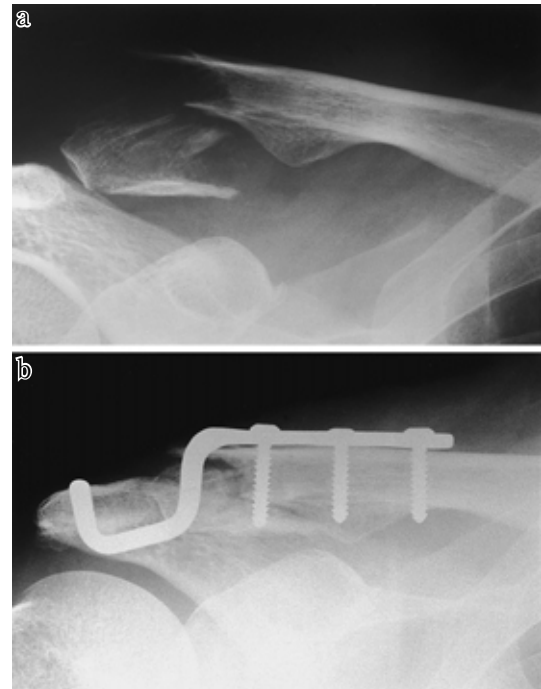


Fig. 2 Radiographs of a comminuted distal clavicle fracture in a 53-year-old man. a: The fracture was classified as type 2 according to Nakagawa's system. b: The fracture was reduced and plated with a three-hole plate 13 days after the injury.

mean time to removal was 12.5 months. Four patients complained of pain where the tip of the hook on the plate protruded subcutaneously. The pain continued after removal of the plate in three patients. The pain was secondary to pressure from firm fibrous tissue that protruded from the hole in the acromion where the hook had been inserted. Four patients showed bone atrophy around the hole in the acromion.

Discussion

Generally, clavicle fractures unite well after conservative treatment. However, in patients with distal clavicle fractures accompanied by coraco-clavicular ligament injury, it is difficult to maintain the reduction by conservative treatment, and union is less easily obtained. Surgical treatments such as tension band wiring have previously been performed in these patients². However, in markedly displaced unstable fractures and those with comminuted distal fragments, adequate reduction and fixation by tension band wiring were difficult.

Since 1994 we have treated unstable distal clavicle fractures using Wolter clavicular plates. Even if the distal fragment is comminuted, relatively firm maintenance of anatomic reduction is possible without damaging the acromio-clavicular joint. In addition, movement at the hook inserted into the acromion means that the plate does not prevent rotation of the clavicle with elevation of the upper extremity. This enables early rehabilitation³. However, several problems are associated with this method. First, a large skin incision as long as that used for the initial operation is required for removal of the plate (**Fig. 1 B**). In addition, improper positioning of the hole for the hook leads to less effective fixation, which is dependent on the shape of the plate. Finally, bone atrophy occurs around the hole for the hook as the range of motion in the shoulder increases.

Nakagawa et al.² have successfully used tension band wiring for fracture types 1, 2, and 3. Satisfactory results have been reported using conventional methods, depending on the type of fracture⁴. Since Neer's classification⁵ does not adequately describe all types of

unstable distal clavicle fractures, the operative method and fixation materials must be selected for each patient according to the status of the distal fragments and the severity of displacement. It is unsafe to assume that the Wolter clavicular plate is appropriate for all patients. Our experience indicates that the Wolter plate is the treatment of choice for Nakagawa type 2 and type 4 fractures, fractures with small comminuted distal fragments that are very unstable, in which adequate fixation is not achievable with wires, and fractures that are difficult to fix without damaging the acromio-clavicular joint.

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