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Results of the Bosworth method for unstable fractures of the distal clavicle

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Summary. *Eleven consecutive Neer's type II unstable fractures of the distal third of the clavicle were treated by open reduction and internal fixation, using a temporary Bosworth-type screw. In all cases, fracture healing occurred within 10 weeks. Shoulder function was restored to the pre-injury level. A Bosworth-type screw fixation is a relatively easy and safe technique of open reduction and internal fixation of type II fractures of the distal third of the clavicle.*

Résumé. *11 fractures instables du type II de Neer du tiers externe de la clavicule ont été traitées par réduction et fixation interne par vis de type Bosworth. La consolidation s'est toujours effectuée en moins de 10 semaines avec une récupération complète de la fonction de l'épaule. La fixation avec une vis temporaire de type Bosworth est une technique sûre et relativement facile dans ce type de lésion.*

Introduction

Distal clavicle fractures, with disruption of the coracoclavicular ligaments (Neer type II), are very unstable due to the four deforming forces [5]. Most authors have recommended open reduction and internal fixation. Various techniques, such as transacromial Kirschner wire fixation [2, 5], transference of the coracoacromial ligament [4] and Bosworth-type screw fixation [1], are recommended. However, none of these reports was based on a treated series of patients. Beginning in 1980, the authors undertook open reduction using a temporary Bosworth-type screw fixation and report the results.

Patients and methods

Eleven patients with fresh Neer type II lateral clavicular fractures were treated operatively in our hospital between 1980–1997; 10 were male and 1 was female. The average age at the time of the operation was 39 (14–72) years. The causes of injury included a fall from a height (5), bicycling (3), and motor accidents (3). Ten patients were available for an interview and/or a physical examination. The remaining patient had adequate cases note and radiographs. The follow-up period ranged from 2 to 184 months (average: 68 months) (Table 1).

The operations were performed under general anesthesia, with the patient in a semi-sitting posture. We exposed the acromio-clavicular joint, the fracture site, and the proximal clavicle through a transverse skin incision. The fracture was reduced anatomically. A 3.2-mm hole was drilled through the clavicle and coracoid process. A 5.5-mm hole was drilled only through the clavicle. An A0 malleolar screw or an Ace cannulated screw with a washer was placed through the drill hole and screwed into the base of the coracoid process. The washer prevented the penetration of the clavicle by the screw head. The screw was tightened until the fracture was reduced. In the case of a comminuted fracture, transacromial Kirschner wire fixation was added.

Following the operation, the arm was placed in a sling for 2 weeks. Pendulum exercise was started. Active flexion and abduction was carried out for 3 to 4 weeks postoperatively. The screw was removed under local anesthesia after healing of the fracture 6 to 10 weeks postoperatively. The patient then started more vigorous exercise.

Results

Fracture healing occurred within 10 (average 7) weeks in all cases. Shoulder function was restored to

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Table 1. Clinical and radiological findings of 11 patients

No. of case	Sex	Side	Age at operation	Causes of injury	Kirschner wire fixation	Fracture healing (weeks)	Follow-up (months)
1	M	R	14	bicycle	–	6	184
2	F	R	33	fall	–	6	2
3	M	R	43	bicycle	–	7	158
4	M	L	35	bicycle	–	6	102
5	M	R	62	MVA	+	7	19
6	M	L	33	fall	–	6	76
7	M	R	20	MVA	+	7	75
8	M	R	32	fall	+	6	69
9	M	R	56	fall	+	8	36
10	M	R	72	fall	–	10	13
11	M	L	26	MVA	–	6	12

MVA: Motor vehicle accident

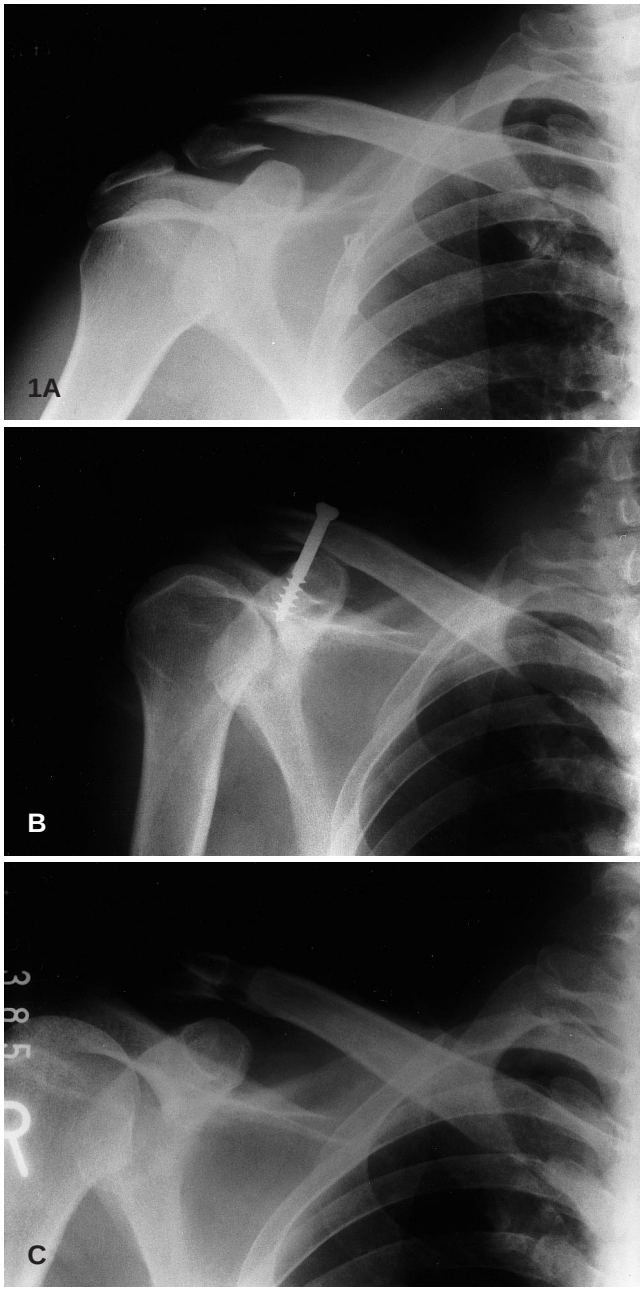

Fig. 1. A Initial radiograph. **B** Immediately after the operation. **C** Four months after the operation, the fracture has united

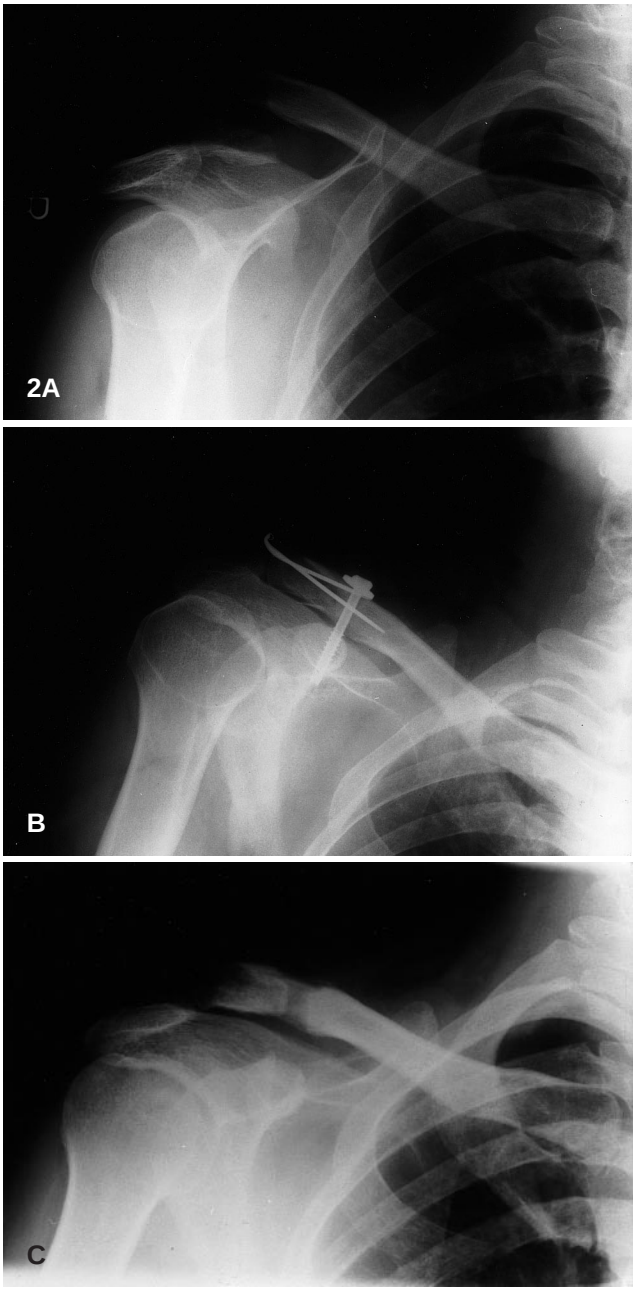

Fig. 2. A Initial radiograph. **B** Immediately after the operation. **C** Eight months after the operation

the pre-injury level in all cases. All patients had returned to their pre-injury levels of work and sports activities by at most 8 months. There were no surgical complications and of refractures.

Case 3

A 43-year-old man had a distal clavicular fracture due to a fall from a bicycle (Fig. 1A). Six days after the injury, the fracture was fixed with a Bosworth-type screw (Fig. 1B). Fracture healing occurred 6 weeks postoperatively. Full use was possible after 4 months (Fig. 1C). Thirteen years postoperatively, he was asymptomatic and had returned to his pre-injury level of sports activities.

Case 9

A 56-year-old man had a comminuted distal clavicular fracture due to a fall down (Fig. 2A). Three days after the injury, the fracture was fixed with a Bosworth-type screw and transacromial Kirschner wires (Fig. 2B). Eight months after the operation, the fracture united and there was no malalignment in the clavicle (Fig. 2C). Three years postoperatively, he was asymptomatic and worked as a barber.

Discussion

The type II fracture of the distal third of the clavicle is frequently displaced due to four deforming forces. Neer reported a high frequency of non-union with closed treatment because of this [5]. Most authors are of the opinion that a type II clavicle fracture is an indication for operative treatment. However, no single method has been generally accepted.

Neer recommended transacromial Kirschner wire fixation [5], but Kona et al. demonstrated that this method led to a satisfactory result in only 6 out of 13 patients; there was a 32% rate of non-union [3]. The poor results obtained with transacromial Kirschner wire fixation may be due to comminution of the lateral fragment which could not be stabilised by the Kirschner wire.

Murota et al. [4] treated patients with internal fixation using coracoacromial ligament transfer. Of their four cases, all united and excellent results were obtained. However, in their method, surgical techniques are complicated, and one normal ligament must be sacrificed.

Since 1980, the authors have treated 11 cases of type II lateral clavicle fracture using a temporary Bosworth-type screw fixation. In all cases, full radiological healing and full return of function have been obtained. This method is relatively easy and safe. It is clear that scapular motion causes rotation and tilting at the fracture site, and this causes screw penetration of the clavicle. This complication has been minimal so long as shoulder motion was prevented until after the removal of the screw. The use of the washer prevented penetration.

We consider that the Bosworth-type screw is the best form of fixation of the type II fractures of the distal clavicle.

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