Fixation failure of the clavicular hook plate: a report of three cases

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ABSTRACT

Open reduction and internal fixation for unstable fractures of the lateral end of the clavicle (Neer type II) is not complication-free. Most clavicle fractures can be successfully treated by conservative methods. Neer type II fractures have a reportedly high rate of nonunion, therefore internal fixation is recommended. However, the need for surgical treatment remains controversial as nonunion seldom produces a poor functional outcome. We report 3 cases of fixation failure following treatment with a clavicular hook plate. None of the patients required re-fixation surgery and all achieved bony union with a good functional result.

Key words: bone plates; clavicle; fracture fixation, internal

INTRODUCTION

Internal fixation of unstable distal clavicle fractures (Neer type II) is recommended to reduce the incidence of nonunion' and this has been the standard treatment in the City Hospital, UK since 1997. Between 1997 and 2004, 23 consecutive patients with this type of fracture were treated by internal fixation using a clavicular hook plate (Synthes-Stratec Medical, Switzerland). It has been our practice to remove the hook plate once the fracture has united, as recommended by the manufacturer2 and other authors.3 During the period prior to plate removal, patients are advised not to abduct or flex the shoulder beyond 90 degrees, and to avoid heavy physical and sporting activities. Nonetheless, complications may occur and we present 3 cases of fixation failure, each of which had a different mode.

CASE SERIES

Case 1

In May 2004, a 62-year-old man fell and sustained a displaced fracture of the lateral end of the left clavicle (Neer type II). This was managed by open reduction and internal fixation using a 6-hole hook plate, with
4 screws into the medial fragment only, due to the presence of lateral comminution (Fig. 1a). A follow-up radiograph taken 3 weeks later showed that the plate had unhooked from beneath the acromion (Fig. 1b). Despite this, fracture reduction was maintained. The shoulder was immobilised in a sling for one further month, followed by physiotherapy. At 3 months after injury, the patient had a full range of pain-free shoulder movement. By 4 months, the fracture was radiologically united and the implant was removed.

Case 2

In May 2004, a 66-year-old intoxicated man fell from stairs at home and sustained a displaced fracture of the lateral end of his left clavicle (Neer type II). This was managed by open reduction and internal fixation using an 8-hole hook plate, with 5 screws in the medial fragment and a single screw into the lateral fragment (Fig. 2a). One month following surgery, the patient sustained a second fall and a radiograph showed a second fracture at the medial end of the plate (Fig. 2b). Despite the prominence of the plate, the patient had no pain and was able to elevate his arm to 90 degrees. The shoulder was immobilised in a sling for one more month. At 2 months after the initial injury, radiographs showed union of the fractures. The implant was removed 6 months following injury and the patient had a full range of painless shoulder movement.

Case 3

In October 2000, a 75-year-old woman sustained a displaced fracture of the lateral end of the right clavicle (Neer type II) following a fall. She was fit and active and was working as a receptionist. The fracture was managed by open reduction and internal fixation using a 6-hole hook plate, with 4 screws into the medial fragment only. At 6 weeks’ follow-up, the patient complained of increasing shoulder pain. A radiograph showed cut-out of the screws from the clavicle and that the plate had disengaged from the clavicle medially (Fig. 3). The implant was removed immediately and at operation the fracture was found to be partially united. The fracture went on to unite with no further complications. The patient was able to return to work with a good functional outcome.

DISCUSSION

The vast majority of clavicle fractures can be successfully treated using conservative methods. Unstable fractures of the lateral end of the clavicle with detachment of the coracoclavicular ligaments (Neer type II) are treated with surgical techniques, such as open reduction and internal fixation using hook plates.
type II) have been reported to have a high nonunion rate, therefore internal fixation is recommended.1 However, the need for surgical treatment remains controversial as nonunion seldom produces a poor functional outcome.4,6

Kirschner wire fixation has been advocated,7 but this has been shown to have a high complication rate.9 Kirschner wire migration may occur due to movements at the fracture site.

Biomechanical studies have confirmed that rotational movement occurs between the clavicle and the scapula. This produces problems with rigid fixation methods. The hook plate is designed to address this problem.3,9 Because hook plate fixation maintains the biomechanics of the acromioclavicular joint, it allows a degree of early mobilisation7 and avoids the need for reconstruction of the coracoclavicular ligaments. The recommended time for plate removal is usually 3 to 4 months after insertion2,3 to avoid acromion erosion and fracture, although some authors consider removal unnecessary.10

There have been few reports of hook plate fixation complications: 2 cases of fracture at the medial end of the plate following a new injury5,11 and 2 cases of non-union.3 Of 23 patients in this study, there were 3 cases of fixation failure: one plate unhooking from beneath the acromion, one periprosthetic fracture, and one plate loosening due to cut-out of the screws. These 3 cases occurred at the end of the study period, so surgeon inexperience was an unlikely factor. Despite these complications, none of these patients required re-fixation surgery and all achieved bony union with a good functional result. All 3 cases of fixation failure occurred in patients over 60 years old (one was also an alcoholic); osteoporosis may have been a contributing factor to fixation failure in cases 2 and 3.

Two of the 3 fixation failures occurred in the absence of a second injury; this raises the question of whether early active mobilisation of the shoulder should be allowed, especially in elderly patients with poor bone and soft-tissue quality. Our rehabilitation regimen allows early mobilisation but advises patients to avoid high reaching and heavy activities. This is done to minimise stresses on the fixation until the fracture unites for fear of screw cut-out and fracture displacement, and reduce movements of the hook under the acromion for fear of causing erosion of the acromion or unhooking. Although these restrictions may lead to some initial shoulder stiffness and delay rehabilitation, they are necessary to minimise the risk of fixation failure. There may have been some non-compliance with the rehabilitation instructions, although the patients denied this, which may have caused the failures in cases 1 and 3.

The unhooking of the plate from under the acromion in case 1 may have been due to a technical error during surgery; it is important that the hook is well seated beneath the acromion, posterior to the acromioclavicular joint.3

Treatment of distal clavicle fractures using a hook plate is not complication-free. Further studies are required to determine the long-term functional outcome following surgery or conservative treatment, and to provide guidance on which cases require internal fixation.

REFERENCES

2. Manufacturer’s guide: clavicular hook plate. Synthes-Stratec Medical, Switzerland.