



Clavicle hook plate fixation for displaced lateral-third clavicle fractures (Neer type II): a functional outcome study

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Background: Controversy exists with the use of the acromioclavicular hook plate for the treatment of lateral-third clavicle fractures (Neer type II). This is thought to stem from problems associated with the hook plate causing impingement symptoms, which can cause long-term limitation of movement and pain. Our aim was to evaluate the functional outcomes of patients with lateral-third clavicle fractures treated with the hook plate.

Methods: We prospectively reviewed all patients who underwent surgery from July 2005 to August 2009 using our prospectively recorded electronic patient information database. All patients were assessed in the clinic to determine both Oxford and Constant shoulder scores.

Results: We identified 36 patients who underwent surgery with the hook plate, 26 men and 10 women. The mean age was 36.2 years (range, 22-60 years). Of the patients, 46% were smokers. The median length of hospital stay was 2 days (interquartile range [IQR], 1-3). The median follow-up was 28 months (IQR, 23-37). The median time from date of injury to surgery was 7 days (IQR, 4-76). The mean time to union was 3 months (IQR, 2-4), and the union rate was 95%. In total, 92% of plates were removed. The median time to removal was 4.5 months (IQR, 3-8.75). There were no complications. Two patients presented months later after falls with fractures around the medial end of the hook plate.

Conclusion: Hook plates are an effective form of treatment for lateral third clavicle fractures. The best outcomes occur with plate removal before 6 months postoperatively, provided that the fracture has healed.

Level of evidence: Level IV, Case Series, Treatment Study.

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Keywords: Hook plate; functional outcomes; lateral-third clavicle fractures; constant score

This study received institutional ethical board approval.

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There is equipoise for many surgeons with regard to the management of displaced lateral-third fractures of the clavicle (Neer type II) (Fig. 1). This stems from the fact that both conservative treatment and surgical treatment are associated with complications. Conservative management

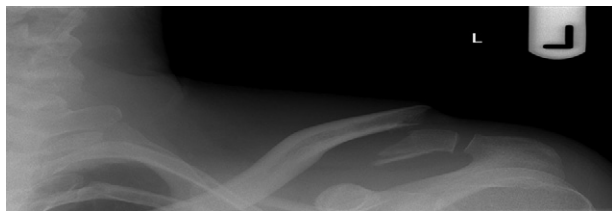


Figure 1 Radiograph showing lateral-third displaced fracture of clavicle (Neer type II).

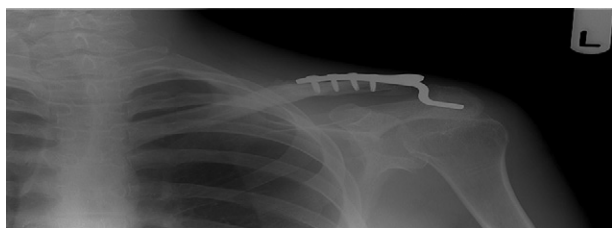


Figure 2 Radiograph showing hook plate in situ.

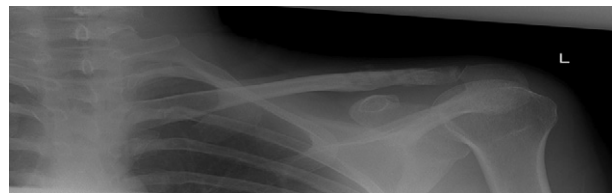


Figure 3 Radiograph after hook plate removal.

of these fractures has been shown to be associated with relatively high rates of nonunion, delayed union, and malunion.^{14,15,19} It is also associated with acromioclavicular (AC) joint arthritis.¹⁹ Many surgeons would recommend surgical treatment for this fracture; however, there is no consensus as to the optimal method of fixation to use.⁷ Many published studies showing good outcomes are from small case series describing a new technique or using several different operative techniques from a single center over a long period of time with small patient numbers, and it is difficult to draw strong conclusions from these studies.¹⁰ A recent systematic review of 425 fractures found that conservative treatment resulted in a higher rate of nonunion (33.3%) compared with surgical treatment (22.2%) but yielded a lower rate of complications.¹⁵ This systematic review concluded that should surgical intervention be considered, it should be performed with intramedullary screw fixation, coracoclavicular stabilization, and interfragmentary fixation, because they have the lowest complication rates.

Whereas the manufacturer of the hook plate (Synthes-Stratec Medical, Solothurn, Switzerland) recommends removal after union,¹⁸ there are reports of patients retaining the implant without any problems.^{8,13} The timing of removal of the implant has been controversial as a result.

We report the use of the clavicle hook plate for the treatment of patients with displaced lateral-third clavicle fractures (Neer type II) presenting to our hospital over a 5-year period (Fig. 2). Our experience with the use of the hook plate for this fracture type contrasts with a recent meta-analysis,¹⁵ and we aim to show our results. We also aim to analyze whether there is a relationship between length of time that the implant is retained and decreased functional outcome.

Materials and methods

We reviewed all patients with displaced lateral-third clavicle fractures treated surgically from July 2005 to August 2009. We retrospectively identified all patients who were treated surgically for any clavicle fracture and then sub-selected those with a displaced lateral-third (Neer type II) clavicle fracture. Patients were identified using our electronic patient information database. They were then prospectively reviewed in the outpatient department to determine functional outcomes at a median follow-up of 28 months after the date of surgery. Functional outcome was assessed with the new Oxford shoulder score⁴ and the Constant shoulder score, both of which have been widely used and validated to determine functional outcome in this setting.^{10,17} The Oxford shoulder score is particularly sensitive in revealing shoulder girdle problems.¹⁰

Outcome data included patient demographics, smoking status, union, time from injury to surgery, time from surgery to removal of plate, length of hospital stay, time to union, and any complications that occurred.

Union of fractures was defined radiologically when 3 of 4 cortices were healed on 2 separate radiographs (Fig. 3). This was assessed prospectively and independently after review by 2 senior members of the orthopedic team. Union was accepted after independent agreement between the two.

The operative technique was standardized among operating surgeons and is explained in detail elsewhere.³ Postoperatively, patients are managed by use of a shoulder sling for 1 week before starting early range of movement. They are advised against range of movement above 90° in flexion or abduction and to avoid sporting activity and heavy physical activity; this is in line with other institutions.²

Statistics

After data collection, the data were entered into an Excel spreadsheet (Microsoft, Redmond, WA, USA), and we used paired *t* tests when comparing Oxford and Constant scores in different groups.

Results

We identified 134 patients who had open reduction—internal fixation (ORIF) of a clavicle fracture over the 5-year study period. Of these patients, 36 underwent ORIF for displaced lateral-third fractures of the clavicle (Neer type II). All 36 had ORIF with the clavicle hook plate. There were 26 men and 10 women, with a mean age of 36.2 years (range, 22–60 years); 46% were smokers. The

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