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Are the complication rates too high in clavicle hook plates?

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Abstract

Background/Aims: Clavicle hook plates are commonly used for distal clavicle and acromioclavicular joint (ACJ) injuries, though their popularity has declined due to concerns over complications such as subacromial impingement, rotator cuff tears, and acromion erosion. Our study aims to assess complication rates in our patient population and compare our findings with existing literature.

Methods: A retrospective single-centre cohort study was conducted on 48 patients (aged 13-74) who underwent hook plate fixation between 2019 and 2021. Data were collected from medical records and follow-up telephone surveys, including QuickDASH scores. Statistical analysis was performed using chi-squared tests with a significance level of 0.05.

Results: Of the 48 patients, 4% (2/48) reported complications post-initial fixation ($p=0.0997$). After hook plate removal, 14% (6/43) reported symptoms, including reduced mobility ($n=2$), ACJ instability requiring surgery ($n=2$), and scar hypersensitivity ($n=2$). Two of five patients who retained their hook plate experienced symptoms. Follow-up QuickDASH scores showed 60% (18/30) of patients had no residual symptoms or functional impairment.

Conclusion: Our study found a lower complication rate compared to existing literature, possibly due to high surgical expertise and frequent procedural use at our centre. With an average removal time of 204 days, our findings suggest that timely removal and experienced surgical teams contribute to better patient outcomes.

Keywords: Clavicle, hook plates, complications, acromioclavicular joint

Introduction

The clavicle hook plate is an orthopaedic device utilised in surgical management of distal clavicle fracture, acromioclavicular joint (ACJ) and coracoclavicular injuries. These injuries are not uncommon with distal clavicle fractures accounting for up to 4% of all adult fractures^[1]. ACJ injuries account for nearly 12% of all injuries around the shoulder girdle. Hook plates are staple in the operative management of these injuries in our institution. Hook plates work by demonstrating impressive resistance to upward displacement due to their design in how they sit inferior to the patient's acromion while preserving the articular cartilage of the ACJ. This allows the plate to achieve a mechanically stable environment even in difficult injuries^[2].

However, despite its uses, hook plates have long been the subject of debate within the orthopaedic community and have decreased in their popularity amongst surgeons^[3]. By analysing the current literature, it is apparent that certain drawbacks have been identified in association with the use of hook plates. Firstly, the hook plate can overcrowd the subacromial space making it prone to subacromial impingement as well as attritional rotator cuff tears in some instances^[4]. The other concern is that the hook plate sits under the acromion and this can cause damage over time. Acromion erosion has been reported as high as 62-100%^[5, 6] and ultimately can lead to a fracture of the acromion. Due to this, most surgeons would advocate the elective removal of the hook plate with a second operation. A second operation carries the risk of surgical complications. Studies have shown that the duration from initial surgery to removal of hook plate affects the incidence of the severity of acromion complications associated with hook plating^[7].

Considering the current literature highlighting the possible pitfalls of using these plates, we have embarked on conducting research in our institution to understand the true nature of complications related to hook plates. Our study will aim to characterise complication rates within our patient population at our centre and to discuss how our results compare to established findings.

Patients and Methods

This retrospective single centre cohort study looked at consecutive clavicle hook plate cases performed in a two-year period between January 2019 and December 2021 in a busy orthopaedic Trauma Unit as part of an NHS Teaching Hospital trust in the United Kingdom. All patients had a minimum follow up for two years.

Our inclusion criteria were all patients who underwent a clavicle hook plate operation during the above time period. This included operations performed both for fracture lateral clavicles or acromioclavicular joint injuries. These patients were identified by their specific operation coding using our theatre management software. Open fracture injuries were excluded.

Data was collected by searching through individual patient medical records which included their medical notes while in hospital, clinical letters, operation notes and any relevant imaging. Furthermore, any patients with incomplete records were contacted by telephone to obtain further information. All patients were given a minimum of one routine clinical follow up appointment after each of their initial and subsequent surgeries, maintaining follow up of minimum two years. Patients were contacted again via telephone in 2024 and QuickDASH scores calculated using an online tool.

Statistical analysis was conducted using Microsoft Excel software. Frequencies, means and proportions were used to describe the data. A chi-squared test at the 0.05 significance level was used to compare proportions of our results.

Results

52 patients were treated with hook plate fixations in our institution in the time period specified. Of the 52 cases identified, three were lost to follow up and were excluded. One patient had a follow up operation privately, and was also excluded, leaving 48 total patients. 35 patients (73%) were male, 13 (27%) were female. The mean age of the cohort was 41 years, with an age range of 13-74 years. 34 (71%) patients who underwent hook plate fixation had sustained a lateral clavicle fracture, 13 (27%) had isolated ACJ dislocation and one patient (2%) had both a clavicle fracture and ACJ dislocation (Rockwood Grade III). Of the 14 patients with an ACJ dislocation, 29% (4/14) were classified as Rockwood Grade III, 29% (4/14) were Rockwood Grade IV, and 42% (6/14) were Rockwood Grade V. In 63% (30/48) of operations, the operating surgeon was a consultant.

43 patients (90%) had the hook plate removed, with a mean of 204 days (median 179 days, range 86-438 days) between initial fixation and subsequent removal surgery.

4% (2/48) of patients reported complications after initial hook plate fixation ($p = 0.0997$). One patient reported a restriction of movement (forward flexion and abduction limited to 90 degrees each) in their shoulder. The other patient reported a feeling of persistent 'painful clicking' when moving their shoulder. Six patients reported experiencing slight discomfort during initial follow up. However, these symptoms resolved themselves shortly thereafter and were excluded from the complications.

Following hook plate removal, 14% (6/43) reported symptoms on follow up ($p = 0.0997$). Two patients reported limited mobility (in forward flexion and overhead abduction) and were referred to physiotherapy services. Two patients went on to have ACJ reconstruction for

chronic ACJ instability (initial injuries were a Grade IV ACJ dislocation and clavicle fracture respectively). Two patients reported persistent hypersensitivity over the scar site. One patient reported slight discomfort in the shoulder which resolved itself shortly thereafter and was excluded from the complications.

Two of the five patients who did not have the hook plate removed experienced symptoms on follow up. One reported pain and one reported a 'clicking' sensation since the initial surgery.

On statistical analysis of the number of reported complications before and after hook plate removal, p -value was calculated as 0.0997 (Chi Square = 2.71) and was not significant at the $p < 0.05$ significance level.

On follow up telephone calls in 2024, 30 patients were available to complete QuickDASH scoring. 60% (18/30) of patients reported a QuickDASH score of 0% - no symptoms or functional impairments reported. 17% (5/30) patients reported a QuickDASH score of 2.3 %. Of the remaining seven patients, three reported a QuickDASH score of 4.5%, two a score of 6.8%, one a score of 9.10% and one a score of 13.60%.

Discussion

Hook plate fixation is a frequently used method for lateral clavicle fractures and ACJ dislocations in our institution but is not without pitfalls, primarily a need to consider removal in the future.

Numerous studies have reported complications associated with hook plate fixations, concerning of which are rotator cuff attritional tears, subacromion impingement and acromion erosion that are seen with prolonged periods of time before removal of plate [4-8]. A higher frequency of complications including pain around the ACJ joint and reduced shoulder function has been reported in those having hook plates in comparison to alternative operative methods [8, 9], and that these improve when the hook plate is removed [8]. Consequently, it has been recommended that hook plates are removed early to better avoid these complications [4, 8]. A systematic review by Oh *et al* reported that the overall complication rate with hook plate fixation of distal clavicle fractures was approximately 41% in 167 patients [10].

Campbell *et al* reported that there was no difference in shoulder function or complication rate when comparing those who either had hook plates removed within or after 6 months [11].

Our study aimed to investigate complication rates for the patient population undergoing hook plate fixation, comparing the period after initial surgery and then after removal.

We found that only 4% of patients reported complications after initial hook plate surgery. 14% of patients reported complications following hook plate removal, out of which only two of these patients required further surgical intervention. On further telephone follow up, the majority of available patients reported QuickDASH scores of 0%, reflecting a lack symptoms or functional impairments following operations.

The rate of complications described in our study is significantly lower than reported in previous studies as described above, which is potentially a reflection on improved operative technique in the years since the literature was published. Furthermore, we are a centre with a high volume of patients that have this procedure, resulting

in a corresponding high level of familiarity and experience within our surgical team. A significant level of consultant surgeon engagement was observed, with the majority of operations being performed by this group. With the mantra of Getting It Right First Time (GIRFT) it may be that this high turnover of patients and high level of expertise results in better outcomes and lower complication rates rather than the implantation of the hook plate itself inherently being the cause.

On reviewing the rates of complications reported after hook plate removal seen in our study. We established the mean length of time to removal of the hook plate in our institution was 204 days, influenced by the elective nature of the follow up operation. As mentioned above, it has been found that there is no difference in complication rate or shoulder function in those having hook plate removals before or after 6 months ^[11], and so this may not have been a decisive factor. Instead, the findings of our research support this as an adequate duration for hook plate removal.

There were some limitations to our study, including its methodology as a single centre retrospective study, and a loss of patients to follow up. In addition, there is scope for analysis of further factors such as the types of injury sustained.

Conclusion

Our study corroborates the assertion that clavicular hook plates, when performed with appropriate expertise and consistent frequency can yield favourable outcomes with minimal complication rates. Further investigation is warranted with a larger patient cohort and comprehensive analysis of other potential factors.

Conflict of Interest

Not available

Financial Support

Not available

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