

Comparison of the efficacy of hook plate versus pinning in treatment of acute acromioclavicular joint dislocation

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ABSTRACT

Objective: Type III acromioclavicular joint dislocation is treated by various methods including hook plate, pinning and fixation by a screw. Each of these methods have their own advantages and disadvantages. This study was designed to compare the efficacy of hook plate and pinning methods in the treatment of type III acute acromioclavicular joint dislocation.

Methodology: In this study, 50 patients with type III acute acromioclavicular joint dislocation aged 20 to 40 years old who referred to Emam Khomeini and Razi Hospital of Ahvaz Iran, between the years of 1998 and 2010 were enrolled. Twenty patients were treated with pinning and 30 patients were treated with hook plate method. All the patients were hospitalized for 24 hours after surgery and were followed up one year after surgery. Data was collected by acquiring an x-ray and completing a questionnaire.

Results: The pins of the patients in the pinning group were removed using local anesthesia. In the hook plate group, the patients underwent another surgery to remove their plate. No further dislocation was reported in any patients. However, subluxation was seen in 25% of the pinning group and 23.3% of the hook -plate group. The mean surgery time was 35 minutes in the pinning and 45 minutes in the hook plate group and the amount of bleeding was estimated to be 70 and 100 respectively. Only one case of superficial infection was seen in the hook plate group. Also one of the pinning group patients and 10 hook plate patients complained of pain during activity.

Conclusion: The pinning method had relatively less complications such as pain, post surgical infection and bleeding and the surgery time was shorter. Also the costs were lower and no further surgery was needed to remove the instruments. Therefore, it seems that pinning method was more suitable than hook plate method.

KEY WORDS: Acute acromioclavicular joint dislocation, Hook plate, Pinning.

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INTRODUCTION

The most common mechanism of acromioclavicular joint (AC) injury is direct trauma that usually happens by falling onto the shoulder, especially when the shoulder is adducted. Dislocation of the AC joint is classified into six groups according to the direction and extent of the clavicle against acromion and ligament injury. In type one, a slight swelling, and tenderness occurs but no dislocation is palpable. In type two, there is more swelling and pain and in the examination of the lateral part, a vertical subluxation of clavicle is seen. In type three, a complete dislocation of the AC joint is present and

clavicle is subluxated in both directions (Fig.1). In type four, the lateral area of clavicle is moved to the posterior area and gets caught in the trapezius muscle. Type five is a severe form of type three. In type six, the lateral part of clavicle moves downward and occurs due to severe trauma, therefore the presence of other injuries is probable.¹

Liu and colleagues opened a comprehensive and academic discussion in 2010. They showed that although many different surgery options have been introduced, there is still no concordance regarding the treatment of AC joint dislocation. The main purpose of all these methods is to replace the ruptured coracoclavicular ligament in order to stabilize the clavicle. These investigators have emphasized that due to the increased knowledge regarding the physical aspects of the injury and the biomechanical behavior of the joint, the nature of these treatments has been changed.² Different surgical techniques have been used to stabilize the AC joint including pinning which is an older technique and hook plate which is a relatively new method. In the pinning method, two cross pins are used to stabilize the injured joint. The movement of a loose or broken pin towards the patient's vital organs is one of the fatal side effects of pinning.¹

Since there was no comprehensive study conducted in our center in order to compare pinning with hook plate method in the treatment of type III AC joint dislocation, we designed this study.

METHODOLOGY

In this study, 50 patients aged 20 to 40 years who were referred to Emam Khomeini and Razi Hospital in Ahvaz, Iran, between 1998 and 2010 were enrolled. Patients older than 40 years or younger than 20 years or with previous history of trauma, simultaneous fractures in the upper extremities, simultaneous vascular or nerve damage in the affected limb and patients who were not cooperative were excluded from the study. Among these patients, 20 were treated with pinning while 30 were treated with hook plate method.

All the patients were hospitalized for 24 hours. In the pinning method, shoulder immobilization was done using a velpau bandage for two weeks. Active movements of the shoulder began after that. In the hook plate method, the hook plates were removed in average of 8 months after surgery. This time was 8 weeks for the pinning method and local anesthesia was used for pins removal. In the hook plate method, the patients used a sling for 3 days and after that, the active movements of the shoulder was started. All the patients were followed up



Fig.1: Dislocation of the AC joint (type III).

after an average time of one year (between 8 to 14 months). Data was collected after acquiring an X-ray and by filling a form (which included age, sex, type of surgery, post surgical infection, dislocation or semi-dislocation after removing the pin or hook plate, amount of pain at rest, active pain and the time of returning to daily activities).

In this study, 45 patients (90%) were male and 5 patients (10%) were female the male to female ratio was 10 to 1. The mean age of was 38 years (age range of 20 to 36 years old) for men and 32 years (age range of 25 to 40) for women. Among all the patients, 20 were treated by pinning (all of them were male) and 30 were treated with hook plate and joint stabilizing (25 male and 5 female).

RESULTS

In this study, 90 percent of the AC joint dislocations occurred while falling onto the adducted shoulder and the other 10 percent in car accidents. None of the patients of the treatment groups experienced significant pain at rest. On the other hand, one patient of the pinning group and 10 patients of the hook plate group (about 33 percent of patients of this group) experienced pain during activity in shoulder elevation. Numerical pain score was used to assess the pain level. The mean pain score was two for the patients of the pinning group and four for the patients of the hook plate group (pain score range of 1 to 7). The difference of the pain scores between the groups was significant ($P=0.033$). The mean time of regaining full function was 6 weeks in the hook plate group and 4 weeks in the pinning group.

In this study, only one patient needed a second surgery. This patient was from the pinning group. In the pinning group, the pins were removed using local anesthesia, in an average time of 8 weeks after

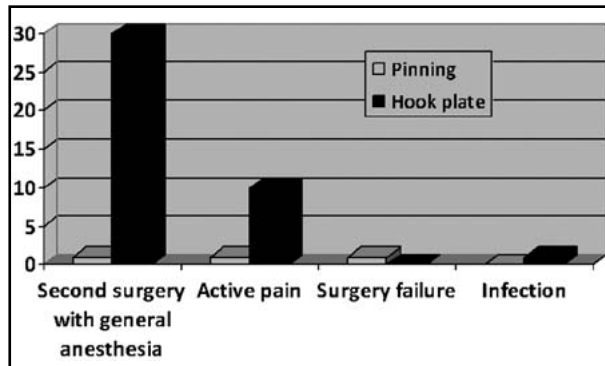


Fig.2: Comparing the results of pinning and hook plate in treating type three AC joint dislocations (part A).

surgery. On the other hand, the average time to remove the plate from the patients was 8 months after surgery. No failure in surgery was seen. The difference of surgery failure rate wasn't significant between the two groups ($P=0.4$).

No dislocation was reported in the patients of both groups until one year after surgery; however subluxation was seen in 25 percent of the patients of the pinning group and 23.3 percent of the patients of the hook plate group. This difference wasn't significant ($P=0.89$).

The mean surgery time of the pinning and hook plate group was 35 minutes and 45 minutes respectively. Also, the mean amount of bleeding was 70 cc for the pinning group and 100 cc for the hook plate group. The mean immobilization time was about two weeks for the pinning group and three days for the hook plate group. The immobilization time for the pinning group was five times more than the hook plate group. Only one case of infection was seen in the hook plate group which was cured with anti biotic treatment. No infections were reported in the pinning group. The hook plate method costs much more than the pinning method, especially because the hook plate method needs a second surgery to remove the plate.

DISCUSSION

Henkel and colleagues conducted a retrospective study in 1997 to assess the clinical and radiologic results of hook plate fixation (which was a new method in those years). In their study, 19 type three AC joint dislocated patients were treated with the hook plate method. Their study confirmed that hook plate was a proper treatment for type three AC joint dislocations. Only one case encountered pain in the AC joint after the surgery and two cases of superficial infection was seen. Both cases were successfully treated with antibiotics and removing the implant wasn't necessary.³

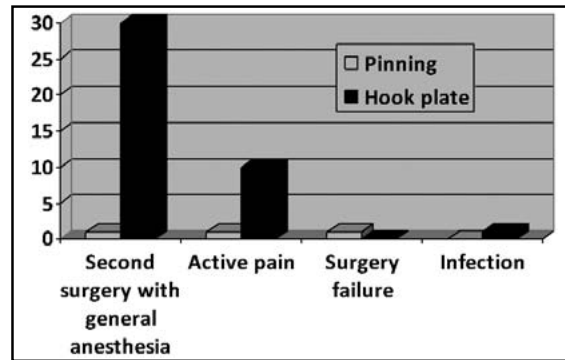


Fig.3: Comparing the results of pinning and hook plate in treating type three AC joint dislocation (part B).

In our study, only one patient of the hook plate group was diagnosed with surgical site infection. The patient was treated with antibiotics and removing the implant wasn't necessary. However, unlike Henkel and colleagues' study, 10 patients of the hook plate group reported active pain. Faraj and Cotzer studied 10 patients with AC joint dislocation in 2001. All of these patients were treated with hook plate method. The average follow up time was 11 months and all the patients were satisfied and regained full function. The patients returned to their jobs and their favorite sports after an average time of 3 and 6 months, respectively.⁴

In our study, patients of the hook plate group and pinning group regained an acceptable amount of function after an average time of 4 weeks and 6 weeks, respectively. Bates and colleagues carried out a retrospective study on 12 patients in 2004 to assess the results of the hook plate method in treating type three AC joint dislocation. They were followed up for an average time of 20 months. After evaluating the clinical and radiologic findings, the authors reported that none of the patients complained of pain. Also, no infections were reported.⁵ The findings of this study weren't similar to our results. Niu and colleagues conducted a comprehensive study in 2005 to assess different treatment options of type three AC joint dislocation. They enrolled 55 patients. They evaluated 3 treatments: double pinning was used for 10 patients, double pin and tension band fix were used for 22 patients and hook plate was used to treat 23 patients. At the end of the study, they concluded that the second and third method were preferable. The results of these two methods were similar.⁶

Wu and colleagues conducted a retrospective study in 2006 to assess the effects of hook plate treatment. They enrolled 39 patients and the mean follow up period was one year. The quality of fixation and treatment was good in all patients. No plate separation or loosening was reported in the

follow up period. All the patients were recovered very soon and no complications were reported after removing the plate.⁷ These results were consistent with our findings. Ejam and colleagues carried out a study in 2008 to evaluate the efficacy of hook plate surgery in the treatment of type three AC joint dislocations. In their study, 16 patients underwent open surgery and used the hook plate method to fix the joint. The plates were removed after an average time of 7 months. The patients were followed up for an average time of 29 months after removing the plate. Clinical and radiologic assessments were used to collect data. They reported that the hook plate method had very little complications and improved the time of regaining full function.⁸

Another study was conducted by Sulem and Es-hmelz in 2009 to describe the situation of AC joint dislocation patients with type three dislocation or higher. All the patients were treated with hook plate method. They reported that hook plate immediately stabilizes the injured joint and needed less immobilization time. Regarding the shoulder function and cosmetic issues, it was also considered as a proper treatment.⁹ In our study, patients treated with hook plate were able to actively move their shoulder, three days after surgery. Guo and Jav compared the effects of Kirschner wire with hook plate in type three AC dislocations. They enrolled 39 patients and reported that both methods were perfectly able to treat their injury.¹⁰

In 2009, Guan compared the Steel Wire treatment to hook plate treatment. They enrolled 67 patients with AC joint dislocation and concluded that Steel Wire is a much simpler method and costs less.¹¹ This result was similar to our findings. Lidel and colleagues conducted a 10 year study on 70 patients with type three AC joint dislocations who were treated with the pinning method. They concluded that pinning improves shoulder function in long term.¹ Cristoy and colleagues evaluated 37 patients in 2009 and 17 patients were treated with hook plate method and 20 were treated with the pinning method. They reported that in the hook plate group, shoulder movements started 24 hours after surgery and full recovery was obtained in 4 weeks. On the other hand, patients in the pinning group were immobilized for one to three weeks and full recovery was regained after six weeks.¹²

In our study, shoulder movements of the hook plate group and pinning group started 72 hours and two weeks after surgery, respectively. Tan and colleagues also carried out a study on 24 patients in 2010 to evaluate the clinical efficacy and complications of treating type three AC joint displacements with hook plate method. They

concluded that hook plate is an efficient treatment for this injury. However, patients with post surgical pain and complications need to remove the plate with a second surgery. The plates were removed from 20 patients in an average time of 10 months after surgery (3 to 16 months).¹³

Also in a study conducted by Tanja and colleagues in 2007, the average time for removing the plate was 11 weeks.¹⁴ In our study, the device was removed in an average time of 8 months.

CONCLUSION

The results of this study showed that both methods were successful. However, both had own advantages and disadvantages. By considering the amount of post surgical pain, lower surgery costs, shorter surgery time, less intraoperative bleeding, no post surgical infections and no second surgery requirement to remove the fixation device, it is concluded that the pinning method was more suitable than the hook plate method.

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