

A Study of the Efficacy and Complications of Clavicular Hook Plates in the Treatment of Distal Clavicle Fractures

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Abstract

Objective: To investigate the clinical efficacy of distal clavicle fracture treatment with clavicle hook plate and its complications prevention and treatment.

Methods: 90 cases of clavicle fracture patients admitted to our hospital from August 2022 to August 2023 were selected and divided into an experimental group and control group by randomized numerical table, with 45 patients in each group, patients in the experimental group were treated with clavicle hook plate and patients in control group were treated with Kirschner's pin tension band, and the amount of intra-operative volume, operation time, postoperative hospitalization time, postoperative drainage flow, occurrence of loosening of internal fixation, shoulder pain, and postoperative drainage flow, were recorded in the patients of the two groups after different treatments. We observed and recorded the intraoperative volume, operation time, postoperative hospitalization time, postoperative drainage flow, the occurrence of internal fixation loosening, shoulder pain, and infection complications, as well as the rate of excellent shoulder function of the two groups of patients. **Results:** Compared with the control group, there was no significant difference in the operation time, intraoperative volume, and postoperative drainage flow in the experimental group, $P > 0.05$, no statistical significance. The number of patients with internal fixation loosening, shoulder pain, and infection in the test group was significantly lower than that in the control group, $P < 0.05$, statistically significant. The excellent rate of Karlsson shoulder joint function evaluation of the patients in the test group was 91.11%, and the excellent rate of Karlsson shoulder joint function evaluation of the control group was 88.89%, which was significantly higher in the test group than in the control group, $P < 0.05$, with statistical significance. **Conclusion:** The treatment of distal clavicle fracture with internal fixation of clavicular hook plate can reduce the pain of patients by internal fixation loosening, shoulder pain, and infection complications, and it is worth popularizing in the clinic.

Keywords

Clavicle hook plate; Kirschner pin; distal clavicle fracture; clinical efficacy; complications

Fractures of the distal clavicle are mostly caused by the resulting injury, which is caused by mild internal rotation and abduction of the arm under the action of great force [1]. Clavicle fracture is a common clinical injury, and the most common injury site is the outer third of the clavicle. Commonly used in the treatment of clavicle fracture is surgical

internal fixation treatment, through the internal fixation of the restoration of bone and joint stability, as soon as possible to restore the normal function of the body, pain and arthritis, and other complications [2]. Our hospital this time used a clavicle hook steel plate and Kirschner pin tension band wire fixation two treatment of clavicle fracture patients, compare and observe the efficacy of the two on this disease and the occurrence of complications, achieved good results, the results of the study are reported as follows:

1. Materials and Methods

1.1 General information

Ninety patients with distal clavicle fractures admitted to our hospital from August 2022 to August 2023 were selected and divided into experimental and control groups using a random number table. 45 patients in the experimental group, 29 males and 16 females, aged between 25 and 72 years old, with an average age of (47.7±6.1) years old, of whom 20 were injured in car accidents, 18 were injured by falls, 6 were injured by falls, and 1 was injured by others. There were 45 patients, 24 males and 21 females, aged between 21 and 73 years old, with an average age of (45.4±6.3) years, including 19 cases of automobile accidents, 11 cases of fall injuries, 10 cases of fall injuries, and 5 other cases. There was no significant difference in the general data of age, gender, condition, and disease duration of all patients, and they were comparable.

1.2 Methods

The patients in the test group were treated with internal fixation of clavicular hook steel plates. The patient was selected in the supine position after general anesthesia, a curved incision was made around the shoulder suture, and the skin and subcutaneous tissues of the surgical site were incised layer by layer so that the surgical field is adequate and excess soft tissues, blood clots, and other foreign bodies are removed. The length and curvature of the required plate were predetermined according to the patient's own condition, and the plate was placed under the acromion behind the acromioclavicular joint and then fixed with 3.5 mm screws. Subsequently, the ligaments and soft tissues around the fracture site were checked for damage and repaired to determine whether the plate was fixed or not, and after confirming that there were no problems, the plate was rinsed and sutured layer by layer.

Patients in the control group were treated with Kirschner's pin fixation, patients were placed in the supine position after general anesthesia, and a curved incision was made around the shoulder suture, the skin and subcutaneous tissues of the surgical site were incised layer by layer, and the surgical field was made full, and the excess soft tissues, clots, and other foreign objects were removed. Drill a transverse hole in the outer end of the clavicle or 25mm away from the broken end with a Gram's needle, reset the clavicle according to the anatomical position, drill the Gram's needle into the clavicle, fix the fracture, and then repair the surrounding ligaments and other soft tissues after confirming that the joint is stable, and then clean the wound, and then close the wound layer by layer.

1.3 Estimation

The time taken for surgery, intraoperative volume, and postoperative drainage volume, as well as postoperative complications of internal fixation loosening, shoulder pain, and infection, were recorded in detail, and the Karlsson score was used to evaluate the shoulder function of the patients in the two groups. Evaluation: Excellent: no pain, normal muscle strength of upper limb, free shoulder joint movement, X-ray showed acromioclavicular joint gap < 5 mm; good: slight pain, mild limitation of shoulder joint movement, X-ray showed acromioclavicular joint gap of 5-10 mm; poor: pain, severe limitation of shoulder joint movement, X-ray showed acromioclavicular joint thrown with dislocation.

1.4 Data analysis

SPSS18.0 statistical software was used for the data obtained in this study, the χ^2 test was used for count data, the t -test was used for measurement data, and the data were expressed in the form of mean \pm difference ($\bar{x} \pm s$), with $P < 0.05$ representing statistical significance.

2. Results

2.1 Comparison of intraoperative and postoperative conditions between the two groups of patients

There was no significant difference in operative time, intraoperative volume, and postoperative drainage compared with the control group in the experimental group, $P > 0.05$, not statistically significant.

Table 1. Intraoperative and postoperative conditions ($\bar{x} \pm s$)

	Number of examples	Surgical time (min)	Surgical volume (ml)	Postoperative drainage (ml)
Control subjects	45	55.2 ± 5.3	91.0 ± 5.2	117.2 ± 11.0
Test group	45	52.3 ± 6.2	98.5 ± 4.0	114.3 ± 14.0
<i>P</i> value		> 0.05	> 0.05	> 0.05

2.2 Loss of correction and complications

The number of patients in the test group who experienced internal fixation loosening, shoulder pain, and infection was significantly lower than that of patients in the control group, $P < 0.05$, which is statistically significant.

Table 2. Loss of correction and complications [n (%)]

	Number of examples	Loss of correction	Shoulder pain	Infections
Control subjects	45	4(8.89)	7(15.56)	3(6.67)
Test group	45	0(0.00)	5(11.11)	0(0.00)
<i>P</i> value		< 0.05	< 0.05	< 0.05

2.3 Functional evaluation of the shoulder joint

Shoulder function was evaluated in both groups using the Karlsson score. The excellent rate of shoulder joint function evaluation of patients in the test group was 91.11%. The excellent rate of shoulder joint function evaluation of the control group patients was 88.89%. The experimental group was significantly higher than the control group, $P < 0.05$, which is statistically significant.

Table 3. Evaluation of shoulder joint function in two groups of patients [n (%)]

	Number of examples	Excellent	Good	Poor
Control subjects	45	36(80.00)	5(11.11)	4(8.89)
Test group	45	30(66.67)	10(22.22)	5(11.11)
<i>P</i> value		< 0.05	< 0.05	< 0.05

3. Discussion

Clavicle fractures account for 6% of total body fractures and more than 35% of shoulder fractures are found in young adults. They are usually caused indirectly. After a fall, the upper limb is propped up and the clavicle is impacted. Fractures are formed. When clavicle fractures occur, the clavicle area is usually painful, and it is more obvious when lifting the upper limb. There are bruises and swelling in the injured area [3]. Non-surgical conservative treatment is the treatment of clavicle fracture, but compared with surgical conservative treatment, the incidence of malunion in nonunion is high, and malunion will affect the appearance and function of shoulder joint. In the past decades, a variety of internal fixation techniques have been used in clinical practice, such as distal clavicle locking plate, Endobutton plate, clavicle hook plate, Kirschner wire tension band internal fixation, etc. However, there is no consensus on which internal fixation is gold [7]. A clavicular hook plate is a special type of plate with a transverse hook on one side. The hook hooks the medial acromion toward the outside. The screw hole on the plate can fix the lateral clavicle. If the raised lateral clavicle is pressed down, the fracture can be fixed [4]. The clavicular hook is specially designed according to the clavicle anatomy of the patient. The clavicular hook plate with different hook depths can be selected according to the acromion slope of the patient. The clavicular hook plate is made of titanium and has good compatibility with tissues in the aspect of fixation, using the lever principle can provide good and stable pressure for the distal clavicle and allow the fixed shoulder joint to have certain fretting, which accords with the fretting of acromioclavicular joint and effectively preserves the function of acromioclavicular joint, which is beneficial to postoperative recovery [5]. Commonly used internal fixation and Kirschner wire fixation Kirschner wire is a kind of fixation material commonly used in orthopedics. It is widely used in a wide range of applications. After Kirschner wire fixation,

compression is carried out to fix the fracture site [6]. Kirschner wire tension band technology has the advantages of simple operation, less soft tissue injury, etc. Kirschner wire can fix fractures, and tension band can effectively prevent fracture angle deformity and generate dynamic compression between fractures; At the same time, this operation does not need to peel off periosteum and soft tissue widely, which has little influence on blood supply and effectively promotes fracture healing However, Kirschner wire is poor in firmness, soft in texture, easy to loosen, and the needle is broken, so it cannot meet the needs of early functional exercise of patients [8]. The purpose of this study was to evaluate and compare the efficacy and complications of clavicular hook plate and Kirschner wire tension band in the treatment of distal clavicle fractures. The study showed that there was little difference between the two kinds of internal fixation, but the number of patients with shoulder pain and infection due to loose internal fixation in the experimental group was significantly lower than that in the control group and the excellent and good rate of shoulder joint in patients with clavicular hook plate internal fixation is obviously higher However, the complications related to clavicular hook plate cannot be ignored. Shoulder pain is often caused by the impact of the plate and the anterior acromion during periosteum surgery. Clinically, it is generally recommended to take out the clavicular hook plate as soon as possible after the fracture healing of the distal clavicle [9]. A clavicular hook plate for the treatment of distal clavicle fracture is effective clavicular hook plate can stably fix distal clavicle fracture support early functional exercise promote functional recovery relieve pain improve patient life at the same time shoulder pain incision infection and other related complications less than Kirschner wire tension band technology In addition, clavicular hook plate can also be combined with other techniques to treat distal clavicle fractures. Related studies reported that a clavicular hook plate combined with bone anchor is more effective in treating distal clavicle fractures than a clavicular hook plate alone, which can reduce coracoclavicular space and acromioclavicular space and improve shoulder joint function [10]. To sum up, a clavicular hook plate is an effective treatment for distal clavicle fracture, which is worth popularizing in clinics.

References

- [1] Liang JY, Lai JQ, Deng JH. Discussion on the efficacy of clavicular hook plate and Kirschner's pin tension band in the treatment of acromioclavicular joint dislocation and distal clavicle fracture. *Jilin Medical*. 2015;36(7):1288-1289.
- [2] Li SP, Huang H, Peng WB. Comparison of the efficacy of clavicle hook plate and Kirschner pin tension band in the treatment of acromioclavicular joint dislocation and distal clavicle fracture. *Modern Preventive Medicine*. 2012;39(12):3162-3163.
- [3] Yu SW, Liu HD, Zhang B, et al. Experience of 86 cases of distal clavicle fracture and acromioclavicular joint dislocation treated with clavicle hook plate. *Clinical Orthopedics*. 2013;16(1):107.
- [4] Zheng JH, Yuan N, Hu SB. Clavicular hook plate for distal clavicle fracture and acromioclavicular joint dislocation. *Trauma Surgery*. 2011;13(1):38-40.
- [5] Gong YQ. Artificial femoral head replacement in the treatment of femoral neck fracture in the elderly. *Journal of Baikou'en Medical College*. 2011;9(5):342-343.
- [6] Ju W, Jiang FG, Qian XF, et al. Complications and prevention after clavicular hook plate internal fixation. 2015;30(7):706-708.
- [7] von Räden C, Rehme-Röhr J, Augat P, Friederichs J, Hackl S, Stuby F, Trapp O. Evidence on treatment of clavicle fractures. *Injury*. 2023 Oct;54 Suppl 5:110818. doi: 10.1016/j.injury.2023.05.049. Epub 2023 May 15. PMID: 37217399.
- [8] Kim DW, Kim DH, Kim BS, Cho CH. Current Concepts for Classification and Treatment of Distal Clavicle Fractures. *Clin Orthop Surg*. 2020 Jun;12(2):135-144. doi: 10.4055/cios20010. Epub 2020 May 14. PMID: 32489533; PMCID: PMC7237254.
- [9] Pan X, Lv RY, Lv MG, Zhang DG. TightRope vs Clavicular Hook Plate for Rockwood III-V Acromioclavicular Dislocations: A Meta-Analysis. *Orthop Surg*. 2020 Aug;12(4):1045-1052. doi: 10.1111/os.12724. Epub 2020 Jul 19. PMID: 32686335; PMCID: PMC7454145.
- [10] Chen XY, Chen K, Liu ZD, et al. Clavicular hook plate joint bone anchor treatment is the clinical curative effect of the type of III acromioclavicular joint dislocation. *Journal of Practical Combine Traditional Chinese and Western Medicine Clinical*. 2023;23(11):103-106. DOI: 10.13638/j.iSSN.1671-4040.2023.11.029.