

## **Comparison of the effect of the fixation of the articular plate and the hollow screw and the band anchorage in the large nodule of humerus.**

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### **Abstract**

**Objective:** To explore the effect of the fixation of the bone plate, the hollow screw and the band anchorage in the large segmental fracture of the humerus.

**Methods:** A total of 108 patients with displaced large fissure of the humerus were selected as the study subjects from January 2015 to January 2017, and they were randomly divided into fixation group (group A), hollow screw fixation group (group B) and bandline anchor fixation group (group C), 36 cases in each group. The intraoperative blood loss, operation time, length of stay and fracture healing time were recorded for the three groups of patients. The shoulder function of the three groups was scored. The complications were recorded in three groups of patients follow up for 2 years.

**Results:** The intraoperative blood loss and operation time of groups B and C were significantly lower than those of group A ( $P<0.05$ ). The operation time of group C was significantly lower than that of group B ( $P<0.05$ ). The time of fracture healing in groups B and C was significantly lower than that in group A ( $P<0.05$ ). The time of fracture healing in group C was significantly lower than that in group B ( $P<0.05$ ). The scores of group C were significantly higher than those of groups B and C, and there was significant difference between the two groups ( $P<0.05$ ). A group of 6 cases of complications, B group of 2 cases, C group of 2 cases.

**Conclusion:** Compared with the fixation of the plate and the fixation of the hollow screw, the clinical effect of the line anchorage fixation is better, the patient is well recovered and worthy of clinical promotion.

**Keywords:** Humeral large nodular displacement fracture, Plate fixation, Hollow screw fixation, Band anchorage fixation, Clinical effect comparison.

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### **Introduction**

Proximal humeral fractures are common type of bone fracture, accounted for about 4%~5% of the whole body bone fracture, and humeral large nodular displacement fracture accounted for about 15% of the proximal humeral fractures and mostly with shoulder joint dislocation, which is mainly due to the direct or indirect violence and seriously affect the quality of survival in patients [1]. In the last 30 y, the incidence of large nodular shift fractures in older adults in the age of 60 showed a straight uptrend, especially in the elderly with osteoporosis [2]. After the shoulder joint dislocation, the restoration can be a real good recovery. However, there are still significant nodules in the patients after the restoration. The bone mass of the fracture may cause a collision on the shoulder seam, which requires surgical incision for fixation [3]. A total of 108 patients with displaced large fissure of the humerus were selected as the

study subjects from January 2015 to January 2017, exploring the effect of the fixation of the bone plate, the hollow screw and the band anchorage.

### **Information and Methods**

#### **General information**

A total of 108 patients with displaced large fissure of the humerus were selected as the study subjects from January 2015 to January 2017, including 69 cases of male and 39 cases of female, age of 35 to 65 y, the average age was  $51.84 \pm 5.67$ . The diagnosis of humeral large nodular displacement fracture was due to trauma, including 38 cases of falling injury, 25 cases of sports injury, 18 cases of ground falls, 21 cases of injury, and 6 cases of other injuries. The time of surgery was 13 h~5 d, on average ( $2.34 \pm 1.92$ ). All joint dislocation

patients in clinic were timely reset and shoulder joint function felt better, but there still existed with humeral large nodular displacement fracture, vertical displacement in 1.0 cm or more, shirt displacement of front and back more than 0.5 cm. The patients were randomly divided into fixation group (group A), hollow screw fixation group (group B) and band anchor fixation group (group C), 36 cases in each group. The basic and clinical data of the three groups were not statistically different and comparable ( $P>0.05$ ). In the case of consent of the ethics committee, the patient has signed informed consent.

### ***Inclusive and exclusive criteria***

**Inclusive criteria:** (1) The imaging diagnosis was a simple large tubercle fracture, and the displacement distance was over 5 cm. (2) Without complications before trauma. (3) The clinical data were complete and no contact was lost during the follow-up.

**Exclusive criteria:** (1) The large nodular humeral displacement fracture caused by the compound injury. (2) Patients with other diseases such as peri-arthritis of shoulder, shoulder pain and physical inconvenience. (3) Non-simple large nodules fracture. (4) Patients with open joint injuries. (5) Patients with neurological diseases.

### ***Surgical method***

Routine examinations were performed before surgery, and the doctor will make the operation plan and inform the family members to sign the consent form. The operation was done with brachial plexus anesthesia or general anesthesia. Patients of group A was plate fixation fracture, high shoulder pad, entering from the outside of shoulder joint and oblique cut line 6~8 cm incision, blunt separation of deltoid muscle and cut off, protecting adversary venous, upper arm outreach extortion exposing greater tuberosity fracture block, traction to reset the large nodular fracture along with the rotator cuff, gram needle fixation, after resetting the success of the lateral anatomical proximal humeral plate, steel plate upper surrounding the footprint of the around the large nodular, humerus head top plane 1 cm higher than that of the bone plate, and screws. After finishing the operation, you need to observe whether the reduction is good and the joint activity is limited. The deltoid muscle was cut off after the reposition, the wound was washed with saline, and the tissue was sutured. The corresponding rehabilitation training began after the second day of surgery.

Patients of group B with hollow screw fixation group. Anesthesia in patients with supine position, padding shoulder highly, small incision in the inside of the shoulder joint about 3 cm, distinguish between front and back the shoulder seam edge, and a third blunt dissection of the deltoid muscle, protection of axillary nerve and cartilage, clean up blood clots and ecchymosis. The resetting of the large nodular fracture displacement, with one gram for temporary fixation needle first, determine the reset was good, in 2~3 pieces of needle a direction perpendicular to the large nodular fracture and pay attention to the direction and distance. Selecting the

appropriate hollow screw to be completely screwed along the guide needle with the supporting screwdriver, and the length of the hollow screw will be appropriate to the lateral bone cortex. The film checks the reset condition, and detects the activity of the shoulder joint, washes the wound with saline water, and repairs the surrounding soft tissue, and sutures layer.

Patients of group C with band anchorage fixation, the methods of anesthesia and preoperative preparation were the same as these two groups, upper arm extortion, outside in the shoulder peak operating a 3 cm incision, protection of axillary nerve and cartilage, clean up the blood clot and ecchymosis. Separate the deltoid blunt, exposing part of the large nodular, and reset the gripping the muscle tissue of the large nodular to reset it, in a shift of the large nodular fracture line 1 cm from the opposite direction of normal bone in the vertical screw anchor nails into 2-4 pieces of belt line, make its tail completely within the bone, film making and joint rotation test reset condition, physiological saline cleaning, closing a wound.

### ***Observational index***

(1) Records of intraoperative blood loss, operation time and length of stay in three groups of patients. (2) Comparing the time of fracture healing for three groups of patients, and the criteria for the determination of fracture recovery [4]: there was no compression pain in the fracture site, no longitudinal tapping pain and abnormal activity. X-ray examination revealed that the fracture line was close to disappearing, and no continuous callus. The patient was able to lift a weight of 1kg and hold it for more than 1min after lifting the external fixation. (3) The function of the shoulder joint was scored in the three groups, with pain of 15 points, 20 points for daily activities, 40 points for activities, 25 points for shoulder muscle strength. The score of 86-100 was excellent, 71-85 were good, 56-70 were okay, and under 55 were bad. (4) To record the complications of three groups of patients at 2 years.

### ***Statistical method***

This study all data using SPSS 17.0 statistical analysis software for processing and research, adopts the method of double entry check, all data measurement data in the form of ( $\bar{x} \pm s$ ), using t-test. The counting data are used in the form of (n, %), using the  $\chi^2$  test.  $P<0.05$  means the difference was statistically significant.

## **Results**

### ***Comparing the operation of three groups of patients***

The intraoperative blood volume and operation time of patients in groups B and C were significantly lower than that in group A, and there was a statistical difference between the two groups ( $P<0.05$ ). The operation time of patients in group C was significantly lower than that in group B, and there was a statistical difference between the two groups ( $P<0.05$ ).

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However, there was no significant difference between the three groups ( $P > 0.05$ ), as showed in Table 1.

**Table 1.** Comparing the operation of three groups of patients ( $\bar{x} \pm s$ ).

Groups	Intraoperative blood volume (ml)	Operation times (h)	Hospitalization days (d)
Group A (n=36)	251.27 ± 83.31	2.64 ± 0.83	16.82 ± 4.38
Group B (n=36)	134.81 ± 54.29 <sup>a</sup>	2.09 ± 0.57 <sup>a</sup>	17.09 ± 5.29
Group C (n=36)	146.45 ± 76.47 <sup>a</sup>	1.38 ± 0.94 <sup>ab</sup>	16.59 ± 5.07

Note: compared with group A, <sup>a</sup> $P < 0.05$ ; compared with group B, <sup>b</sup> $P < 0.05$

### Comparing the time of fracture healing in three groups

The fracture healing time of patients in groups B and C was significantly lower than that in group A, and there was a statistical difference between the two groups ( $P < 0.05$ ). The fracture healing time of patients in group C was significantly lower than that in group B, and there was a statistical

**Table 3.** Comparing the function scores of shoulder joints in three groups ( $\bar{x} \pm s$ ).

Groups	Pain	Daily life	Scope of activities	Muscle powerful	Total scores
Group A (n=36)	11.94 ± 5.54	13.82 ± 5.13	29.22 ± 8.46	19.27 ± 5.13	76.41 ± 10.54
Group B (n=36)	13.47 ± 6.17 <sup>a</sup>	15.64 ± 6.55 <sup>a</sup>	32.72 ± 9.10 <sup>a</sup>	21.57 ± 6.55 <sup>a</sup>	88.66 ± 15.82 <sup>a</sup>
Group C (n=36)	14.84 ± 6.43 <sup>a</sup>	17.27 ± 5.71 <sup>ab</sup>	35.84 ± 7.49 <sup>ab</sup>	23.84 ± 5.49 <sup>ab</sup>	92.41 ± 13.42 <sup>ab</sup>

Note: compared with group A, <sup>a</sup> $P < 0.05$ ; compared with group B, <sup>b</sup> $P < 0.05$

### Comparing the complications of the three groups in 2 years

3 patients with large nodular relocation and malformation healing, 2 patients with pain and stiffness in the shoulder, and 1 case of the patients with shoulder bump syndrome in Group A. 2 patients with fixed looseness occurred in group B and 2 patients with pain and stiffness of shoulder joint in group C. None of the three groups showed serious complications including infection or nonunion. There was no significant difference between the three groups of patients during follow-up of 2 y ( $P > 0.05$ ).

## Discussion

In clinical, for the treatment of fracture is follow the principle of the two, first of all should maintain the normal supply of blood flow to fracture, moreover should keep the wound bone physiological structure and mechanics stable environment, to prevent bone necrosis caused by ischemia, and increase bone remodeling. Shoulder joint is easy to be dislocated after external force, large nodular fracture is often accompanied by shoulder cuff injury, resulting in a significant decrease in joint stability and function [5]. Clinical, a large nodular fracture

difference between the two groups ( $P < 0.05$ ), as showed in Table 2.

**Table 2.** Comparing the time of fracture healing in three groups ( $\bar{x} \pm s$ ).

Groups	The time of fracture healing (w)
Group A (n=36)	13.94 ± 5.27
Group B (n=36)	10.24 ± 2.55 <sup>a</sup>
Group C (n=36)	8.57 ± 6.71 <sup>ab</sup>

Note: compared with group A, <sup>a</sup> $P < 0.05$ ; compared with group B, <sup>b</sup> $P < 0.05$

### Comparing the function scores of shoulder joints in three groups

In the three groups, the total score of patients with shoulder joint function score was significantly higher than that of groups B and C, and there was a statistical difference between the two groups ( $P < 0.05$ ). The total score of group A was lowest, and group B was second, as showed in Table 3.

with displacement is usually treated with a restoration and fixation. In this study, three fixed methods were compared.

Plate fixation fracture is commonly used in clinical, it applied ability strength which can rise to reliable fixation, and after the fixed surgery in patients with can carry on the exercise of the shoulder joint in the early to promote the recovery of bone fracture healing. But it also has some disadvantages. The position of firing board needs to be higher, the probability of post-operation shoulder bump syndrome is higher. And the surgical site is bigger which need to be near the fracture of soft tissue dissection, the nerve damage is greater, and often need long time for operation, intraoperative blood loss is bigger. It is common in patients with postoperative shoulder pain, joint stiffness, and so on [6]. The results also showed that the patients of group A plate fixation fracture surgery for a long time, intraoperative blood loss, fracture healing time longer, minimum shoulder joint function score, and more postoperative complications.

The hollow screw fixation method can extrude the fracture block to suppress the control force of the fracture block, and the fixed force is larger. Hollow screw thread in the process of the screw can be combined with bone, make it strong and increase fracture of the contact force. It is a very stable fixed way and only need to 2 - 3 pieces of broken hollow screw to

fix, the broken bone can heal by the direct pressure to avoid shoulder peak appeared [7]. More important, the screw can best match the surface of the bone through the screw by its own screw, increasing the compression force of the bone mass and not avoiding the appearance of malformed bone healing such as rotation. But its normally only fixed relatively complete bone block, for a broken bone block cannot have very good fixed effect, and if the patient bone osteoporosis, prone to screw fall off phenomenon, it will cause complications such as bone block shift again [8]. Postoperative complications were often placed through the external fixation. The study results show that the method have a good effect, hollow screws limits heart patients with less intraoperative blood loss, shorter operative time, fracture healing time, less shoulder joint function score is higher, 2 years postoperative patients with fixed loose occurred in 2 cases, general fixed effect is good.

Band anchorage fixation can provide more powerful mechanical strength and have better biocompatibility with the human body, so it is generally not needed to take out a secondary. With smaller incision length of anchor nail fixed, the fracture of soft tissue and nerve injury is lesser, and bringing the smaller line anchor nails, nail it with the long handle propeller into bone, with super suture of blocks of avulsion fracture suture, thereby reducing the operating time [9]. The postoperative recovery is relatively fast, and the patient can carry out the appropriate activity of the shoulder and promote the recovery of postoperative function from 2 d after surgery. More importantly, in the case of comminuted fracture, the clinical curative effect of line anchor nails is significant, which compensates for the deficiency of a hollow screw and bone plate [10]. But as a result of ground anchor is metal components, its stay in the human body can be back to the foreign body reaction, cause bone tissue surrounding the bone degradation, eventually lead to drop anchor nails, may cause damage to other organs [11]. This study results show that the belt line anchor nail fixation method has good clinical effect, unconstrained intraoperable blood loss in patients with a minimum of heart screws, shortest operation time, fracture healing time, at least shoulder joint function score the highest, postoperative complications, 2 patients with shoulder joint pain occurs only stiff.

In conclusion, compared with plate fixation fracture and hollow screw fixation, the clinical effect of the band anchorage fixation is better, and the patient recovery is better after surgery, so it is worthy of clinical promotion!

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