

# Surgical outcomes of fixation of closed intercondylar humerus fractures using locking plates at the 108 Military Central Hospital

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## ABSTRACT

This study aimed to describe the clinical and paraclinical characteristics of patients with closed intercondylar humerus fractures and the outcomes of surgical fixation using locking plates at the 108 Central Military Hospital. A retrospective cross-sectional study of 33 patients from January 2020 to December 2023 found that the average age of the patients was  $49.35 \pm 11.2$  years. Fracture classification according to AO was 27.3% for type C1, 66.7% for type C2, and 6% for type C3. The mean Mayo Elbow Performance Score (MEPS) was  $93 \pm 6$ . According to Morrey's scale, 81.8% of patients had good to very good outcomes, while 18.2% had fair outcomes, with an average Morrey score of  $85.4 \pm 11.2$ . Conclusion: Surgical treatment with locking plates for intercondylar humerus fractures is a good treatment method, providing favorable anatomical and functional recovery for patients, and enabling early functional rehabilitation post-surgery.

**Keywords:** Closed intercondylar humerus fracture, Locking plate, Outcome

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Received: March 26, 2024

Reviewed: April 4, 2024

Accepted: June 2, 2024

## INTRODUCTION

Intercondylar humerus fractures fall within the category of distal humerus fractures, including supracondylar, lateral condyle, and intercondylar fractures.

Intercondylar humeral fractures in adults are complex articular fractures that pose challenges for treatment decisions. Depending on the nature of the injury, the treatment options may include conservative management, surgical fixation, or elbow joint replacement.

With the development of transportation techniques, the pattern of intercondylar humeral fractures has gradually changed. Previously, these fractures were primarily seen in the elderly with low-energy domestic accidents; however, in recent

years, the incidence among young, working-age individuals with high-energy accidents has been increasing. Various techniques have been employed in the complex scenario of intercondylar humerus fractures with multiple fragments and articular involvement. However, the rate of post-operative complications remains high. Common complications include limited elbow mobility due to stiffness, ulnar nerve injury, and posttraumatic osteoarthritis.

This study aimed to describe the clinical and subclinical characteristics and treatment outcomes of closed intercondylar humeral fractures using locking plate fixation at 108 Military Central Hospital. From this, we hope to gain insight and improve the quality of treatment at local healthcare facilities.

## PATIENTS AND METHODS

### Patients

This study included 33 patients with closed intercondylar humerus fractures who underwent locking plate fixation between January 2020 and December 2023 at the Upper Limb Trauma and Microsurgery Department, 108 Military Central Hospital. The study was approved by the ethics committee of 108 Military Central Hospital. All patient information was kept confidential.

### Inclusion Criteria

Patients diagnosed with closed intercondylar humerus fractures (type C according to AO classification) who agreed to participate in the study and met the following criteria were included: patients over 18 years old, indicated for surgery and treated with locking plate fixation, and had complete medical records.

### Exclusion Criteria

Patients diagnosed with closed intercondylar humerus fractures treated conservatively or with other surgical methods, open fractures, pathological

fractures, those without complete medical records, or those who did not agree to participate in the study.

This was a retrospective cross-sectional descriptive study. Sample size and convenience sampling were used. Data were collected from patient records in the archives of 108 Military Central Hospital, including medical records, preoperative and postoperative X-rays, AO fracture classification, surgery waiting time, age, and sex.

Clinical outcomes were assessed based on a standardized medical record form, including a minimum of six months of functional recovery evaluation, range of motion, pain level according to the VAS scale (0, no pain; 10, maximum pain), satisfaction level according to the VAS scale (0 = not satisfied and 10 = very satisfied), and the Mayo Elbow Performance Score (MEPS), with 100 being the optimal score.

Data processing and analysis were performed using medical statistical algorithms on a computer with SPSS 21.0.

## RESULTS

The age groups–18-40 and 41-60 years age groups did not show significant differences in their proportions (accounting for 42.4% and 39.4%, respectively). The primary cause of injury was traffic accidents (48.5%). All patients (100%) exhibited swelling in the elbow region, with typical deformities observed in 90.9%, and 3% had radial nerve injury. The most common injury type was C2 (66.7 %), whereas C3 was the least common (6 %). Most patients underwent surgery within 2–3 days from the time of injury, and the majority of patients were treated within 7 days (63%). (Table 1)

*Table 1. Patients' characteristics*

Characteristics	Classification	Number of patients	Percentage
Age	18-40	14	42,4
	41-60	13	39,4

	>60	6	18,2
<b>Cause of trauma</b>	Traffic accident	16	48,5
	Work accident	3	9,1
	home accident	14	42,4
<b>Symptoms</b>	Swelling in the elbow area	33	100
	Deformity of the two condyles	30	90,9
	Loss of elbow motion	8	24,2
	Radial nerve injury	1	3
	Ulnar nerve injury	0	0
<b>Lesion classification (AO)</b>	C1	9	27,3
	C2	22	66,7
	C3	2	6
<b>Time of operation</b>	<24h	10	30,3
	2-3 days	20	60,6
	4-7 days	2	6,1
	>7 days	1	3
<b>Duration of treatment</b>	<7 days	26	78,8
	7-15 days	7	21,2

The study results of 33 patients with a minimum follow-up period of 6 months after surgery showed that the Mayo Elbow Performance Score (MEPS) was comparable to that reported by international authors, with a score of  $93 \pm 6$ .

Functional assessment of distal radius fractures treated according to Morrey at 6 months post-surgery showed that 91% of patients achieved good to very good results, 6% had fair results, and 1 patient had poor results.

**Table 2. Postoperative outcomes**

Characteristics	Classification	Number of patients	Percentage
Condition of the surgical scar	Soft	31	94,6
	Keloid scar	2	5,4
	Adhesive and contractile scar	0	0
Bone healing results	Complete realignment	28	83,8
	Slight misalignment	4	13,5
	Significant misalignment	1	2,7
	Delayed bone healing	0	0
	Nonunion	0	0
Pain level (VAS)	0-3	32	97
	4-6	1	3
	7-10	0	0

Range of motion of the elbow joint	> 100°	30	91
	50°- 100°	2	6
	< 50°	1	3

The bone healing rate post-surgery was 100%, with no cases of nonunion or refracture after fixation. The postoperative results showed that soft scar tissue accounted for 94.6% of cases, and complete fracture alignment was achieved in 83.8% of cases. Pain relief and functional range of motion (flexion extension) were also high, consistent with findings from other studies, both domestically and internationally. (Table 2)

Overall, the results according to Morrey's scale were high, with an average score of  $85.4 \pm 11.82$  points. (Table 3)

**Table 3.** Overall assessment of treatment results according to Morrey at 6 months post-surgery (n = 33)

Functional assessment	Number of patients	Percentage (%)
Very good	24	72,7
Good	6	18,3
Fair	2	6
Poor	1	3

## DISCUSSIONS

In our study group, the average age was  $49.35 \pm 11.2$  years, with the majority being of working age; patients under 60 years accounted for 81.8%. We observed that intercondylar humeral fractures significantly affected the working age group. Therefore, treatment must aim to restore functional movement of the elbow joint, enabling a return to normal work activities. According to Nam's report (2021), the average age was 43.1 years.

Our study shows three main causes: traffic accidents, work accidents, and domestic accidents, with traffic accidents being the most common at 48.5%. According to Nam, 54.4% of 46 patients at Viet Duc Hospital also had traffic accidents as the cause. Jupiter reported that 50% were due to domestic

accidents, with traffic accidents accounting for 35%.

Thus, the main cause of traffic accidents in Vietnam remains unknown. The disease pattern in Vietnam differs from international reports, highlighting that traffic accidents in general and adherence to traffic safety measures, in particular, remain pressing issues that need to be addressed to reduce accident numbers. For patients aged > 60 years, the leading cause of intercondylar humerus fractures is domestic accidents, with six out of six patients being female. Osteoporosis progresses more rapidly and severely in women aged > 60 years than in men, primarily due to domestic accidents involving direct falls on the elbow.

Clinically, all patients presented with pain and swelling of the elbow. A typical deformity was observed in all 33 patients.

Complications from closed intercondylar humeral fractures were rare in our study. There was one case of radial nerve injury that was surgically fixed with plates and screws two days after the accident. Postoperative radiographic results were good, and the nerve injury recovered after three months.

In the study, we used the AO classification, with type C2 injuries being the most common (66.7%), followed by C1 (27.3%) and C3 (6%). These rates are quite similar to those reported by Nam, with C2 at 66.7% and C1 at 27.3%. We believe that the discrepancy is due to our study being conducted at the 108 Military Central Hospital, a tertiary care facility. Therefore, milder injuries (C1) are partly managed surgically at provincial hospitals, whereas more severe injuries (C3) often involve open fractures, which were not included in our study.

**Surgical Outcomes:** All patients had immediate skin closure, with no cases of superficial infection or osteomyelitis. Thomas R. Yetter reported an infection rate of 2.1 % in 391 patients in 2021. The authors agree that to limit surgical site infections, in addition to sterile techniques during surgery, it is crucial to accurately assess soft tissue injuries. If the arm is significantly swollen or has nutritional disorders, temporary splinting, cold compression, and edema reduction are necessary, surgery is performed only when the soft tissue is stable.

**Postoperative X-ray Results:** Of the 33 patients, 28 had complete fracture alignment (83.8%), 4 patients (13.5%) had minor misalignments, and only one patient had a significant misalignment due to a very complex fracture with multiple fragments, requiring plaster splinting for six weeks post-surgery. With good radiographic results,

patients begin functional recovery exercises immediately after surgery.

**Postoperative Results:** There are cases of delayed union or nonunion, achieving a 100% union rate. Among these, 28 patients (83.8%) formed neat calluses, with the fracture line no longer visible and straight axes in the frontal view, and the angle between the humeral shaft and distal end was  $45^{\circ} \pm 5^{\circ}$ , indicating good bone healing and alignment. Only four patients had minor misalignments (13.5%), and one patient had poor healing with significant misalignment, classified as a type C3 fracture according to the AO classification.

Based on Morrey's scale, our study results showed very good outcomes in 72.7% of cases, good in 18.3%, average in 6%, and poor in 3%. These results are consistent with those of other studies: Dang Hoang Nam's 2021 report showed very good outcomes in 64.9%, good outcomes in 18.9%, average in 13.5%, and poor in 2.7%.

## CONCLUSIONS

Surgical treatment with locking plates for intercondylar humerus fractures is a good treatment method, providing favorable anatomical and functional recovery for patients, enabling early functional rehabilitation post-surgery.

### Acknowledgements

The authors thank patients and colleagues who kindly supported this study.

### Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

### Sources of funding

None.

### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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