

SOME CLINICAL CHARACTERISTICS OF ADULT PATIENTS TREATED BY OSTEOSYNTHESIS METHOD FOR THE PROXIMAL HUMERUS FRACTURE

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ABSTRACT

Objectives: To describe some clinical characteristics of adult patients with closed proximal humerus fracture (PHF), treated by osteosynthesis method with locking plate. **Subjects and methods:** Adult patients who were closed PHF treated by open reduction and locking plate fixation at Military hospital 175. Report of a retrospective study conducted on 42 clinical cases. **Results:** The average age for both gender was 51.38 ± 14.63 , the age group over 60 accounted for 26.19%. The ratio of female/male patients was 1.1/1, the difference was not statistically significant ($p > 0.05$). The cause of injury due to traffic accidents (TA) accounted for the highest rate at 73.81%, due to daily life accidents (DLA) accounted for 21.43%, and due to work accidents (WA) accounted for 4.76%. Anatomical damage of PHF according to the classification of author Neer C.S. on X-ray, including groups III, IV, V, VI, 3-part fractures accounted for the highest proportion with 54.76%. **Conclusion:** The patients in the study group were mostly middle-aged from 18 to 60 years old. The main cause of TA was the age group from 18 to 60, which was the group with a large traffic demand (accounting for 80.64%), the majority of injuries had 3-4 broken parts (accounting for 61.29%), due to DLA, mainly in the group of people over 60 years old (accounting for 55.56%) with 3-4 broken parts accounting for 66.67%.

Key words: Upper limb, proximal humerus fracture, osteosynthesis.

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I. INTRODUCTION

PHF include fractures of the anatomical neck, greater trochanter, lesser trochanter, and surgical neck of the humerus. This type of fracture accounts for about 30 to 40% of humerus fractures and is the third most common fracture in people over 65 years old after fractures of the proximal femur and distal radius [1]. About 70% of cases occur in people over 60 years old and up to 75% are women [1]. At Military Hospital 175, treatment of closed PHF has been performed for many years. Statistical reporting of clinical and paraclinical characteristics will be the basis for clinicians to make initial judgments in predicting treatment. We conducted a study with the goal of "Describe some clinical characteristics of adult patients with closed PHF, treated by osteosynthesis method with locking plate".

II. SUBJECTS AND METHODS

2.1. Research subjects

Research period from January 2022 to December 2023 at Military Hospital 175.

Inclusion criteria was adult patients (≥ 18 years old) with closed PHF, treated by osteosynthesis method with locking plate, agree to participate in the study.

Exclusion criteria include the patient did not agree to participate in the study and did not have follow-up visits after surgery; had brachial plexus injury from the beginning; had a combination of injuries such as closed traumatic brain injury, damage causing hemiplegia on the same side with PHF from

the beginning; had a traumatic brain injury with cognitive disorder, mental illness, failure to cooperate with treatment; had old deformities, had lost part of the function of the shoulder joint, and had pathological fractures.

2.2. Research methods

Prospective research design with Sample size formula

$$n = Z_{1-\frac{\alpha}{2}}^2 \times \frac{p \times (1 - p)}{\Delta^2}$$

According to author Nguyen Duc Vuong (2021) [2], we had p = 83.33%, Δ was 12%. Minimum sample size was 38. After that, 42 eligible cases were collected. Stata 16.0 was used to analyze data.

III. RESULTS

Table 1: A few characteristics of research objects (n=42)

Gender	Male: 20 (47.62%) Female: 22 (52.38%)
Male/Female ratio	1.1 / 1
The average age	All: 51.38 ± 14.63 (from 22–83 years old) Female: 53.73 ± 12.98 Male: 48.8 ± 16.19
Age groups	18 – 60: 31 (73.81%) over 60: 11 (26.19%)
Causes of bone fractures	TA: 31 (73.81%) DLA: 9 (21.43%) WA: 2 (4.76%) Sports accident (SA): 0
Frequency of fracture side	Left: 23 (54.76%) Right: 19 (45.24%) Both: 0

Results from Table 1, among the 42 patients, there were 22 female patients (52.38%) and 20 male patients (47.62%). The ratio of female/male patients is 1.1/1, the difference was not statistically significant (p>0.05). Minimum age was 22, highest age was 83. The average age of female patients was 53.73 ± 12.98 and that of male patients was 48.8 ± 16.19. The overall average age for both sexes was 51.38 ± 14.63 years. The age group 18 - 60 years old accounts for 73.81%. TA had 31 patients, accounting for the highest rate of 73.81%. DLA had 9 patients, accounting for 21.43%. WA had 2 patients accounting for 4.76%. The frequency of the left side is higher than the right one, the difference is not statistically significant (p>0.05).

Table 2: Classification of fractures according to Neer on X-ray (n=42)

Groups	Number of broken parts			Total	Ratio (%)
	2 parts	3 parts	4 parts		
I	0	0	0	0	0
II	0	0	0	0	0
III	8	1	0	9	21.43
IV	6	20	0	26	61.90
V	1	0	2	3	7.14
VI	1	2	1	4	9.52
Total	16	23	3	42	100
Ratio (%)	38.1	54.76	7.14	100	

In Table 2, group III had 9 patients (2 parts: 8; 3 parts: 1) accounting for 21.43%; group IV had 26 patients (2 parts: 6; 3 parts: 20), accounting for 61.9%; group V had 3 patients (2 parts: 1; 4 parts: 2), accounting for 7.14%; group VI had 4 patients (2 parts: 1; 3 parts: 2; 4 parts: 1) accounting for 9.52%.

Table 3: Classification of fractures according to Neer, causes of fractures, and age groups (n=42)

Groups	Causes of bone fractures				Age groups	
	TA	DLA	WA	SA	18 – 60	> 60
III	6	2	1	0	7	2
IV	19	6	1	0	17	9
V	2	1	0	0	3	0
VI	4	0	0	0	4	0
Parts	TA	DLA	WA	SA	18 – 60	> 60
2 parts	12	3	1	0	12	4
3 parts	17	5	1	0	16	7
4 parts	2	1	0	0	3	0
Total	31	9	2	0	31	11
Ratio (%)	73.81	21.43	4.76	0	73.81	26.19

According to Table 3, TA had 31 patients (group III: 6; group IV: 19; group V: 2; group VI: 4) (2 parts: 12; 3 parts: 17; 4 parts: 2). And age group 18 – 60 had 31 patients (group III: 7; group IV: 17; group V: 3; group VI: 4) (2 parts: 12; 3 parts: 16; 4 parts: 3).

Table 4: Preoperative treatment methods (n=42)

Treatments	Number of patients	Ratio (%)
Initial first aid, no specialized treatment yet	31	73,81
Adjust and wear the Desault belt	11	26,19
Traditional medicine treatment	0	0

From Table 4, there were 31 patients (accounting for 73.81%) who received initial first aid at the accident site by hanging their arms and then transferred to the hospital for emergency examination and treatment. There were 11 patients who had been treated conservatively by wearing a Desault belt. Because the conservative treatment period was long, they also requested to be admitted to the hospital for surgical treatment. No patient was given traditional medicine.

Table 5: Time from hospital admission to surgery (n=42)

Time	Number of patients	Ratio (%)
Within 24 hours	11	26.19
2 - 7 days	26	61.90
8 - 30 days	5	11.90
Trên 30 days	0	0

From Table 5, 11 patients (accounting for 26.19%) had surgery on the first day, when the patient was eligible for surgery, we advocated early surgery. 26 patients had surgery within the first week after hospital admission (accounting for 61.90%).

IV. DISCUSSION

The ages of the patients ranged from 22 years to 83 years old, the average age of the

study group was 51.38 ± 14.63 years old. The common age of the research group was 18 - 60 years old, accounting for 73.81% of

patients in the study sample. The patients in the research group were mostly middle-aged, in working age, participating in transportation and doing many different jobs. The age group over 60 accounted for 26.19% of the total research group because this age group was retired, rarely had to do heavy work, and had a lower traffic participation rate, these were mainly elderly cases often accompanied by osteoporosis, so falling during daily activities will also lead to a PHF. This result is also similar to the opinion of author Mafi R. [3] that PHF tend to increase in the elderly due to bone thinning and osteoporosis.

Among the 42 patients, there were 22 female patients (52.38%) and 20 male patients (47.62%). The ratio of female/male patients was 1.1/1, the difference was not statistically significant ($p > 0.05$), the ratio between male and female groups was nearly equal. In this study, vertebral column fractures occurred more frequently in women than in men, and in the over 60 age group also accounted for a significant proportion. It may be because risk factors for osteoporosis are more common in older women, so a fall due to daily activities can also lead to bone fractures.

The cause of TA accounts for 73.81%, the age group from 18 to 60 years old has 25/31 cases, a group with great traffic needs. In the age group over 60, the rate of cervical fractures due to TA is lower, only 6/31 cases. The cause was DLA in 9 cases, accounting for 21.43%, with 5/9 cases in people over the age of 60. It is possible that bone quality in the elderly gradually declines, so even a slight trauma such as falling on the shoulder or falling on an arm while walking in daily activities can lead to bone fractures. The study of Hessmann M. et al [4] had 18/142 cases (12.7%) due to traffic accidents and 76/142 cases (53.5%) of bone fractures were due to falls while walking around the house.

According to Table 2, there were no cases of group I and group II fractures. There were 21.43% of cases with group III fractures (simple upper humerus fractures). Group IV had 26 cases, accounting for 61.9%. According to Neer, group IV was the group with large trochanteric fractures. In this group IV, there were 6 cases of isolated greater trochanteric fractures, 20 cases of greater trochanteric fractures accompanied by surgical neck fractures and there were no cases of 4-part fractures, i.e. fracture of the greater trochanter, fracture of the surgical neck, and fracture of the lesser trochanter.

There were 3 cases of group V, accounting for 7.14%, of which a simple fracture of the lesser trochanter is 1 case and 2 cases of fractures of both the lesser trochanter, the greater trochanter, and the surgical neck.

Group VI fractures are fractures of the upper humerus with dislocation. In our study, the number of group VI fractures on XR was 4, including 1 case of surgical neck fracture with shoulder dislocation, 1 case of surgical neck fracture and greater trochanter along with shoulder dislocation, 2 cases of shoulder dislocation with fracture of the lesser trochanter, greater trochanter, and fracture of the surgical neck of the humerus.

Results in Table 4 show that 31 patients (accounting for 73.81%) received initial first aid at the accident site by hanging their arms and then transferred to the hospital for emergency examination and treatment. There were 11 patients who had conservative treatment by wearing the Desault belt. Because the conservative treatment time was long and having to wear the belt for a long time was cumbersome and itchy, they also asked to be admitted to the hospital for surgical treatment. After entering the hospital, patients are immobilized with temporary Desault belt to temporarily fix the

fracture, which is essential to reduce pain and limit displacement and secondary damage.

Choosing the time of surgery is also an important issue, displaced fractures in the epiphysis, whether they are in the joint or not, require surgery for early treatment [2]. According to Hettrich C.M. [5], anatomic reduction, firm fixation of the fracture and early mobilization will help restore blood circulation early, nourish the humeral head better, and reduce the risk of humeral head necrosis. However, Chapmann M.W. also issued a warning that PHF in cases of great traumatic force need to be examined thoroughly and comprehensively. The assessment and classification are specific and meticulous, requiring careful pre-operative preparation, especially equipment, and osteosynthesis plans to be proactive during the surgical process. Early surgery has many advantages, but you should not rush it [2].

From data in Table 5, 11 patients (accounting for 26.19%) had surgery on the first day. Most of these patients, after the accident, were immediately hospitalized for treatment, when tested to be eligible for surgery, we advocate early surgery. And 26 patients had surgery in the first week after injury (accounting for 61.90%).

According to author Nguyen Duc Vuong (2021) [2] the favorable time to have surgery for a PHF is within the first 48 hours or wait 7-10 days after the injury. Surgery should not be performed too early before assessing all associated injuries. In cases where there is a risk of traumatic shock, it should be delayed until the patient's overall condition allows and should not have surgery later than 10 days because by then the fracture and joint capsule will have fibrosis, many new blood vessels will be created, it will be difficult to correct and there is a risk of bleeding.

If surgery is performed later, bone grade I will have already formed at the fracture site,

both ends of the fracture must be renewed, the possibility of more bleeding, and sometimes the fracture line can no longer be clearly seen to correct and restore perfect anatomy. Simultaneously, when surgery is late, the ligaments of the joint capsule have become fibrotic, so post-operative rehabilitation will also be more difficult.

V. CONCLUSION

The patients in the study group were mostly middle-aged from 18 to 60 years old. The main cause of TA was the age group from 18 to 60, which was the group with a large traffic demand (accounting for 80.64%), the majority of injuries had 3-4 broken parts (accounting for 61.29%), due to DLA, mainly in the group of people over 60 years old (accounting for 55.56%) with 3-4 broken parts accounting for 66.67%.

REFERENCES

1. **Vishal A., Ganesan G.R. (2014)** Conservative versus surgical management of proximal humerus fractures. *IOSR Journal of Dental and Medical Sciences*. 13 (12):43-45.
2. **Nguyen Duc Vuong (2021)** Research on anatomical damage characteristics and treatment results of proximal humerus fracture with locking plate, Doctoral thesis, Vietnam Military Medical University.
3. **Mafi R., Khan W., Mafi P., et al. (2014)** Orthopaedic approaches to proximal humeral fractures following trauma. *Open Orthop J*. 8:437-441.
4. **Hessmann M., Baumgaertel F., Gehling H., et al. (1999)** Plate fixation of proximal humeral fractures with indirect reduction: surgical technique and results utilizing three shoulder scores. *Injury*. 30 (7):453-462.
5. **Hettrich C.M., Boraiah S., Dyke J.P., et al. (2010)** Quantitative assessment of the vascularity of the proximal part of the humerus. *J Bone Joint Surg Am*. 92 (4):943-948.