

OUTCOME OF THE TREATMENT OF THE INTERTROCHANTERIC FEMORAL WITH THE OSTEOSYNTHESIS BY LOCKING PLATE IN TAY NGUYEN GENERAL HOSPITAL

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SUMMARY

Objectives: To evaluate the outcomes of proximal femoral locking plate in intertrochanteric femur fractures. **Subjects and methods:** A prospective, cross-sectional study on 61 intertrochanteric femur fractures treated with proximal femoral locking plate at the Department of Traumatology and Orthopedics, Tay Nguyen General Hospital from September 2015 to May 2020. **Results:** The mean age was 68.18 ± 15.95 (range. 23 to 94 years). Mean duration time of operation: 56.72 ± 13.81 minutes, the average neck-shaft angle at time union: $126.61^{\circ} \pm 7.09$. 33 patients had excellent results (57.89%), 16 good (28.08%), 7 fair (12.28%), and one poor (1.75%) result according to Harris hip score. **Conclusion:** The proximal femoral locking plate is a good stable alternative in the treatment of intertrochanteric femur fractures. It provides good to excellent bone healing with limited complications.

* Keywords: Proximal femoral locking plate; Intertrochanteric fractures.

INTRODUCTION

Intertrochanteric femur fractures are one of three the most common fractures in old patients. In recent studies, the rate of intertrochanteric femur fracture increases with the rising life expectancy of the population. In the elder age group, most of the fractures were osteoporosis, resulting from a trivial fall. Conversation management had many limitations, high risk of death, so it only indicated for undisplaced intertrochanteric fractures or contraindicated for surgery. The aim of the surgery is to achieve initial stability and early mobilization of the patients and to avoid complications such as deep vein thrombosis, pulmonary embolism, urinary and lung infections, and ulcers...

Options for treating intertrochanteric femur fractures include dynamic hip screw (DHS), Gamma nail, angular blade plates, locking plate. A proximal femoral locking plate can provide a stress shield for the lateral trochanteric wall and prevent lateral migration of proximal fracture fragments. The three locking screw holes of the proximal femoral locking plate insertions within the complex trabecular zone of the head-neck region of the proximal femur provide for optimal mechanical stability. It is also ideal in osteoporosis bones. We do this research with the aim: *To evaluate of the outcome of the treatment of the intertrochanteric femur fracture by proximal femoral locking plate.*

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SUBJECTS AND METHODS

1. Subjects

61 patients with proximal femur fractures treated with proximal femoral locking plate from September 2015 to May 2020 in Tay Nguyen General Hospital.

* *Inclusion criteria:*

- Skeletally mature > 18 years.
- Intertrochanteric femur fractures type A1, A2, and A3 in AO/ASIF classification were treated with a proximal femoral locking plate.
- No medical contraindication for anesthesia.
- There are radiography and CT scan.
- Having the documentation protocol.

* *Exclusion criteria:*

- Pathological fractures, leg deformity or trauma sequel.

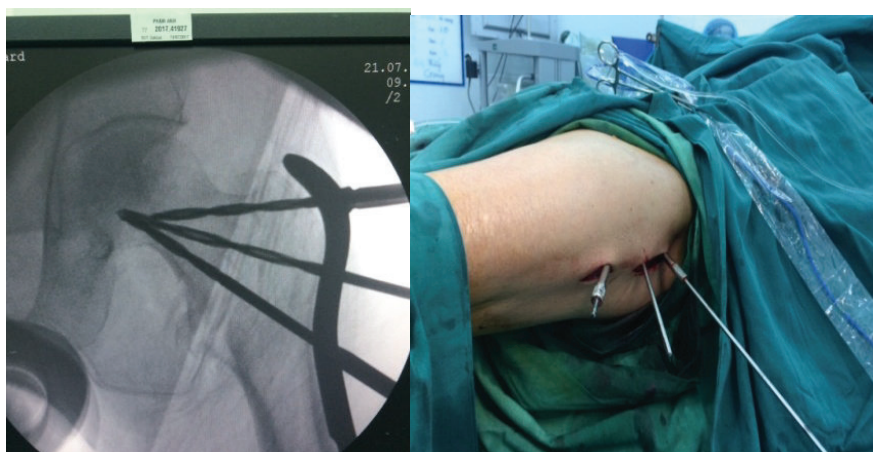


Figure 1: Osteosynthesis by proximal femoral locking plate.

2. Methods

* *Study design:* Prospective, case series study.

3. Evaluation outcome

* *The primary outcome measures:*

- Surgical scar: Wound healing, superficial infection, deep infection.
- The quality of the reduction of the fracture that was assessed based on restore

neck-shaft angle; excellent: 125° - 130° , good: 120° - 125° , fair: 110° - 120° , poor: $< 110^{\circ}$).

- Screw positioning in femur neck-head.
- Medical complications and postoperative complications.

* *Final follow-up:* Minimum postoperative follow-up time: after 12 months.

- Pain, gait, leg short.
- Hip rank flexion motion.

- Union fracture, neck-shaft angle of femur, plate status.

- Complications: non-union, femoral head avascular necrosis.

- The functional outcome was evaluated by Harris hip score [5].

4. Data processing: Using SPSS 20.0 software.

RESULTS

1. Patient characteristics

A total of 61 patients (32 males, 29 females; mean age 68.18 ± 15.95 years, (23 - 94 years). The mean age of males is 62.31 ± 16.48 years, and females are 74.66 ± 12.71 years. There was a significant relationship ($p = 0.002$).

- The causes of injury fall with trivial trauma in 45 patients (73.77%), 14 (22.95%) traffic accidents, 2 (3.28%) accidents at labor.

- Classification according AO: 12 patients (19.67%) were classified as AO types A1, 37 patients A2 (60.65%) and 12 patients A3 (19.67%). 32.79% of fractures involved type A2.2. Fractures of the lateral wall occurred in 29 (47.54%) patients.

- Degree of osteoporosis (Classification according Singh): type IV 28/61 patients (45.90%), type III 14/61 patients (22.95%), type V 12/61 patients (19.67%), type VI 6/61 patients (9.84%). Type II had one case (1.64%).

- Associated medical problems: 15 patients (24.59%) patients had hypertension, 16 patients (26.22%) cardiopathy, 4 patients

(6.55%) diabetes, 7 patients (11.47%) other chronic diseases, 9 patients (14.75%) had more than two chronic diseases.

- Classified according to ASA (American Society of Anesthesiology): 9 patients (14.75%) grade I, 37 patients (60.66%) grade II; 12 patients (19.67%) grade III, 3 patients (4.92%) grade IV.

2. Operative technique

The mean duration from fracture to surgery was 4.87 ± 3.29 days (from day 1 to day 21).

Table 1: Surgery technique.

Surgery technique	Mean duration of operation (SD) (min - max) (minutes)
Minimally invasive (n = 39)	52.05 ± 7.04 (45 - 85)
Conventional surgery (n = 22)	65.00 ± 18.51 (50 - 120)
Total (n = 61)	56.72 ± 13.81

3. Results

* Early results:

- 59/61 patients (96.72%) wound healing, we had two patients with superficial skin infections.

- The result of the reduction and fixation of the fracture, good: 54 patients (88.52%); accept: 7 patients (11.48%). The differences between the groups of patients were not significant ($p > 0.05$).

+ Neck-shaft angle $\geq 125^\circ$: 59 patients (96.72%).

+ Neck - shaft $< 125^\circ$: 2 patients (3.27%). No patients had neck-shaft angle $< 120^\circ$ in postoperation radiography.

Table 2: Postoperation neck-shaft angle (n = 61).

Neck-shaft angle	Number of patients (n)	Percentage (%)
Excellent: 125° - 130°	59	96.72
Good: 120° - < 125°	2	3.28
Fair 110° - < 120°	0	0.00
Poor < 110°	0	0.00
Total	61	100.00
Mean	129.23° ± 1.84	

+ Technique failures: There are not case cut out or intra-articular protrusion of screws.

* *Final results:*

- There are 57 patients who have been followed up for 1 year or more. The mean follow-up time is 26.63 ± 11.73 months (12 - 47 months). There are 4 patients who died before one year, during the follow-up period.

- Radiological union was noted in 57 patients.

Table 3: Neck shaft angle in final follow up (n = 57).

Neck-shaft angle	Number of patients (n)	Percentage (%)
Excellent: 125° - 130°	49	85.96
Good: 120° - < 125°	3	5.26
Fair 110° - < 120°	3	5.26
Poor < 110°	2	3.51
Total	57	100.00
Average femoral neck angle	126.61° ± 7.09	

- Mean femoral neck angle before surgery was 117.70° ± 9.32, postoperation is 129.23° ± 1.84° and at the last follow-up was 126.61° ± 7.09. The difference between the mean neck angle after surgery and at the time of the last examination was not statistically significant.

- 4 patients (7.01%) had resulted in limb shortening 1 -< 2 cm: mean limb shortening is 2.35 ± 4.15 mm.

Table 4: The Harris hip score in final follow-up (n = 57).

After 6 months	Final follow-up				Total
	Excellent	Good	Fair	Poor	
Excellent	10	0	1	0	11
Good	22	14	3	0	39
Fair	1	2	3	1	7
Poor	0	0	0	0	
Total	33 (57.89%)	16 (28.07%)	7 (12.28%)	1 (1.75%)	57
p	0.002				

The mean Harris hip score was 85.82 ± 8.08 , including 33 patients (57.89%) had excellent results, 16 patients (28.07%) had good results, 7 patients (12.28%) had fair results and 1 patient (1.75%) had poor result. The rate of good-excellent was 85.96%.

4. Complications

- One case of proximal screw breakage.
- One case of cut out.
- Collapse varus: At the time of the last examination, there are 3 patients had femoral neck angle $< 120^{\circ}$, 2 patients had femoral neck angle $< 110^{\circ}$.

DISCUSSION

1. Indication

We choose the PFLP (proximal femoral locking plate) for the treatment of adult intertrochanteric fractures, patients with type A1, A2, A3 according to AO classification, Singh type 2, 3, 4, 5, 6 among that type 2, 3: 48.85% patients and in the most patients upon 60 years old.

In Vietnam, the locking plate was used about a decade ago as a new implant. Difference conventional plating, the locking head screws of those implants are designed to lock tightly in the plate. This provides

axial and angular stability of the screw relative to the plate, avoid screws loosening, screws back out, plate back-out.

The current study showed that proximal femoral locking plate provides for optimal mechanical stability, it is also ideal in osteoporotic bones due to the varied angle of multiple screw insertions within the complex trabecular zone of the head-neck region of the proximal femur, prevent cut out, varus collapse when weight-bearing, especially on unstable intertrochanteric fractures.

In our study, 78.68% of patients, upon 60 years old, poor bone quality but the need for mobility and return to activities of daily living. So that, they have to surgery to anatomy reconstruction and stable fixation fracture. We choose the proximal femoral locking plate because it is a stable fixation implant, promoting an early mobilization of the patient, avoid complications screws loosening, screws back out and plate back out.

Stabilization of intertrochanteric femur fractures is one of the most key roles that is needed assessed preoperation. Etsuo, Wada [6, 7] showed that proximal femoral nail and DHS failure common reasons included assessed inadequate stabilization of interintertrochanteric fractures. The problems of instability of those fractures are related to discontinuity of the lateral wall, the medial femoral component... This may make it difficult to distinguish this fracture pattern on conventional X-ray. CT-3D may provide exact information about the fracture pattern in the trochanteric area, helping exact intertrochanteric fracture classification.

2. Discussing the result

** Early result:*

- Wound healing was the first period in 59/61 patients (96.72%).

- Postoperative reduction quality was good in 59 patients, femur neck-shaft angle $> 125^{\circ}$, and was acceptable in 2 patients femur neck-shaft angle $< 125^{\circ}$. Most of the patients had union after 12 weeks, maintain fracture reduction. Our results similar studies were done by Nguyen Van Tien Luu [2] and Doan Manh Linh [3].

** Final result:*

In our study of 57 patients, we were able to achieve a union rate of 100%. We had no cases of plate broken infections. One patient had a screw has broken, four patient screw backout, one patient had cut out varus collapse.

- Harris hip scoring system was used to evaluate the functional result in our

study, the outcome had 57.89% excellent, 28.07% good, 12.28% fair, and 1,75% poor results. Our result similar studies were done by Nguyen Nang Gioi [1] and Dinh The Hai [4].

Zha et al. [8] performed proximal femoral locking plate on 110 cases with intertrochanteric and subtrochanteric fractures and reported union in 100% of case. Zha showed that the varied angle of three screw insertions within the complex trabecular zone of the head-neck region of the proximal femur, provides for a mechanical stability neck shaft angle, even in unstable intertrochanteric fractures or osteoporosis.

CONCLUSION

- Proximal femoral locking plate fixation in intertrochanteric fractures was the best treatment in intertrochanteric fracture, provides good bone healing with a limited number of complications and instrument failure.

- Bone union was seen in 100% of patients in the follow-up period upon one year.

- The assessment by Harris Hip Score, the results were excellent in 33 patients (57.89%), good in 16 patients (28.07%), fair in seven patients (12.28%). There was one poor result.

- The complications in this study included implant breakage in 1 patient (1.75%), and loosening of a proximal femoral screw in 4 patients (7.01%) fractures, varus deformity in 5 patients (8.77%) fractures.

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