



Comparison Between Treatment of Unstable Intertrochanteric Fracture of Femur by Dynamic Hip Screws (DHS) and Proximal Femoral Locked Compression Plate (PFLCP)

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Abstract

Background: Intertrochanteric fracture is one of the most common fractures of the hip especially in the elderly with osteoporotic bone. Dynamic Hip screws (DHS) is still considered the gold standard treatment for Intertrochanteric fracture. This study was done to compare the functional and radiological outcome for the treatment of unstable Intertrochanteric fracture. (AO/ATO: 31A2.2. , 31A2.3.). **Material & Methods:** The study included a total of 30 patients with intertrochanteric fractures who were subjected to PFLCP & DHS treatment. From January, 2020 to December 2022, a prospective comparative study was done who were operated by using PFLCP & DHS. Ethical community approval was taken from local ethical committee of President Abdul Hamid Medical College Hospital. Patient consent was taken in prescribed format. Functional outcome and radiological assessment is done using Harris hip score on 3rd, 6th & 12th months post-operatively. **Results:** We found that patient treated with DHS had increased blood loss (159 ml), longer duration of surgery (105 min), delayed mobilisation. But PFLCP - had lowered blood loss (73 ml), shorter duration (91 min) and early mobilisation. Shortening of the limbs in DHS group is 9.33 mm. Vs PFLCP groups is 4.72 mm. **Conclusions:** PFLCP is better than DHS for unstable intertrochanteric fractures in-term of decreased blood loss, duration, early weight bearing, mobilisation, less hospital stay, decreased infection and complications.

Keywords:- Dynamic hip screw (DHS), Proximal Femoral locked compression plate (PFLCP), Intertrochanteric fractures, Harris hip scores (HSS).

INTRODUCTION

Intertrochanteric fracture occurred due to advanced technology and high velocity of transport media, increase life expectancy & increased osteoporosis.^[1] Gulberg et al. has

predicted that the total number of hip fractures will reach 2.6 million by 2025 and 4.5 million by 2050.^[2] In 1990, 26% of all hip fractures that occurred in Asia were Intertrochanteric fractures whereas rises to 37% in 2025 and 45% in 2050.^[3] More than 90% of hip fractures in

elderly are intertrochanteric fractures with complication rate of 20-30% and mortality rate 17%.^[4,5,6] Unstable comminuted intertrochanteric fracture is difficult to treat. No implant is sufficient for better treatment. In this study, we analysed the results of unstable intertrochanteric fractures treated with PFLCP as compared with DHS. Unstable intertrochanteric fractures of the femur represent a challenging orthopedic condition that demands meticulous intervention to restore both function and stability to the hip joint. As a common occurrence, particularly in the aging population, these fractures necessitate surgical management to optimize outcomes and mitigate complications.^[2] Among the array of surgical techniques available, two prominent methods have emerged as primary contenders for treating these fractures: the Dynamic Hip Screw (DHS) and the Proximal Femoral Locked Compression Plate (PFLCP). This introduction aims to develop into a comparative analysis of these two approaches, exploring their respective mechanisms, biomechanics, advantages, and disadvantages. The Dynamic Hip Screw (DHS) has long been a stalwart in the surgical armamentarium for intertrochanteric fractures. Its reliance on a sliding screw mechanism provides dynamic compression at the fracture site, promoting stability during weight-bearing activities.^[5] The lag screw, anchored within the femoral head, is coupled with a side plate affixed to the lateral femoral shaft. This construct aims to harness the load-sharing principles, allowing the bone to bear some of the physiological load. In contrast, the Proximal Femoral Locked Compression Plate (PFLCP) takes a different approach, emphasizing fixed-angle stability

through locking screws and a plate with predetermined holes. This rigid fixation offers enhanced stability, particularly in terms of rotational forces, making it an attractive alternative to DHS. In the ensuing discussion, we will unravel the intricacies of these surgical techniques, examining their biomechanical underpinnings, advantages, and disadvantages.^[2] Moreover, considerations such as fracture type, patient factors, and surgeon experience will be elucidated to provide a comprehensive understanding of the nuanced decision-making process in selecting the optimal approach for the treatment of unstable intertrochanteric fractures. Through this exploration, we aim to equip clinicians with valuable insights to inform their clinical decision-making and enhance patient outcomes in the intricate landscape of femoral fracture management.



Figure 1: (a) Pre-operative intertrochanteric fracture A/P view. (b) Immediate post-operative X-ray Lateral View showing DHS in right proximal femur.

MATERIAL AND METHODS

Patients who fulfilled the inclusion and exclusion criteria underwent PFLCP or DHS respectively. This study included the patients

presenting to orthopaedics department of a Tertiary Level Hospital President Abdul Hamid Medical College Hospital, with fresh unstable intertrochanteric fracture.

Inclusion criteria

- Age of patient > 18 years.
- Fracture less than 02 weeks duration
- Pathological fracture-Osteoporotic.
- Sex: Both sexes
- Intertrochanteric AO/OTA 31A-A2, 31-A-A3

Exclusion Criteria

- Poly trauma
- DM, Neglected case > 3 weeks
- HTN
- Strokes.

Statistical Analysis of Data

After collection of data, all data were compiled in a master table first. Data was processed and analyzed using SPSS (13) for windows software. Qualitative data presented on categorical scale was expressed as frequency and corresponding percentage. Quantitative data was presented as mean and standard deviation (SD). P value was measured by paired t test (one tailed) and less than 0.05 is taken as significant.

Surgical Procedure

All cases were operated on a single standard fracture table under spinal anaesthesia using standard operating technique. C-arm was used in all cases. Prophylactic antibiotic Cefuroxime axetil 1.5 gm intravenously given prior to skin incision and continue next for 48 hours. The duration of surgery, exposure on radiation (C-

arm), per-operative blood loss, size of the incision and other complications were noted.^[2]

After achieving closed reduction in most of the cases, plate can also be applied by minimally invasive percutaneous plate osteosynthesis technique (MIPPO).

RESULTS

All patients underwent a similar rehabilitation protocol involving mobilization from 2nd post operative day. Static quadriceps, knee and ankle mobilization exercises. All drains were removed by 48 hours. The wounds were inspected on the 2nd post operative day. Stitches were removed between 10th-14th days. Functional outcome was assessed using Harris hip scores and radiological findings were compared at 3, 6 and 12th months post operatively. All patients were followed up for a minimum period of 01 year. There were no drop-outs in the study.

Within 30 patients, 16 patients are (53%) male and 14 patients (47%) females. Average age was 60 yrs. 85 yrs being the maximum and 18 years being minimum. Trivial trauma (77%) was the most common mode of injury, followed by road traffic accidents (23%). 50% were the right side 50% in the left side. PFLCP requires a smaller incision 5 cm to access the entry site. Compared to DHS which was found to be more (17cm). Since distal locking was done using percutaneous stab incision in PFLCP. The average duration of surgery for PFLCP was 90.6 mins, which was shorter than the average time required for DHS (105.3 mins) (P=0.04)

Following surgery, to determine the amount of blood loss. Similar to the method of lee et al.^[9]

The average blood loss during PFLCP was 73 ml. which was significantly less than DHS (159ml) ($P = 0.001$).



Figure 3: (a) 3 months after operation A/P view showing fracture without any change of the neck shaft angle and position of implant. , (b) 6th months after operation A/P view showing uniting intertrochanteric fracture.

The average limb shortening in DHS group was 9.33 mm as compared to PFLCP group which is about 4-7 mm ($P = 0.02$).The average hospital stay , was 12.4 days (8-14 days) in case of DHS. While 7-8 days (4-12 days) in case of PFLCP ($P= 0.001$). Return to pre injury walking ability in DHS group was an average of 12 weeks. Compared to PFLCP which was 8 weeks ($P=0.03$)

Radiological outcomes were assessed at 3, 6, 12 months post op. At 3 months post op. Two patient in attempted callus formation. 4 patients in DHS groups were found to have as callus formed with a gap. While in PFLCP group, 2 patients who underwent bone grafting showed good integration of the graft while remaining 2 shows callus formation with a minimum gap.

At 6 months post op. we found few variations and complications. In PFLCP groups, all the 15th patients showed good union of fracture. In the DHS group, 6 patients had collapse at fracture site and 8 patients showed solid union at the fracture site. One patient had varus malunion of 120 degrees due to excessive collapse.

At 12 months post operative, we found that 13 patients in the DHS groups had complete union of the fracture. In PFLCP group all the 15th patient showed good union of fracture at 12 months postoperatively.

6 & 12 months we found that the functional results calculated using the Harris Hip score. In patients of DHS groups scored an average of 32. 67 compared to PFLCP group that showed 52. 87 ($p= 0.001$). Scores increased to 67.6 and 85.4 for DHS and PFLCP group respectively at the end of the 6 months ($p=0.001$). After 12 months, the average functional scores in the DHS group increased to 89.08 as compared to PFLCP group which was 90.33 ($P=0.31$). There was not much significance between the two groups.

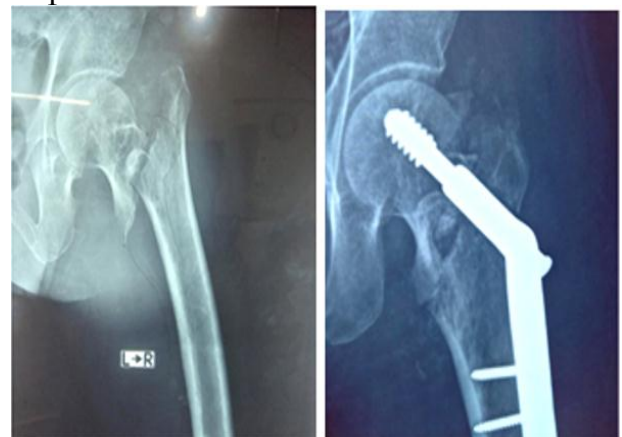


Figure 3: (a),(b), Pre operative X-ray showing unstable fracture left trochanter of femur., (b) Immediate post operative X-ray A/P view shows position of implant.

**Table 1:** Distribution of our study patients by characteristics

	PFLCP	DHS
No. of. Patients	15	15
Male: female	16	14
Mean age (years)	60	60
Side of injury (left: right)	50	50

Table 2: Showing the average number of days/weeks taken for post operative patient mobilization in each group

Patient mobilization	DHS (n=15)	PFLCP (n=15)
Active hip and knee mobilization	4.27 days	2.33 days
Non- weight bearing crutch walk	2.93 weeks	1.53 weeks
Partial weight bearing walking	7.87 weeks	3.73 weeks
Full weight bearing walking	11.80 weeks	7.93 weeks

Table 3: Showing the radiological outcome of DHS and PFLCP groups

Follow-up month	DHS (n=15)	PFLCP (n=15)
3rd Month	ACF* + Gap - 4 (26.7%) ACF - 11 (73.3%)	ACF - 11 (73.3%) ACF + ^BG Integration - 2 (13.3%) ACF With Gap-2(13.3)
6th Month	CAFS* - 6 (40%) CF - 8 (53.3%) United In Varus - 1 (6.67%)	CF - 11(73.3%) CF** + BG Integrated - 2 (13.3%)
12th Month	Complete Union -12 (80%) United In Varus - 1 (6.67%) Re-fracture - 1 (6.67%) Infection - 1 (6.67%]	Complete union - 13 (86.7%) Screw bend with Union- 2 (13.3%)

#ACF: attempted callous formation; *CAFS: callous at fracture site; ^BG: Bone Grafting, **CF: Callous Formation

Table 4: Average Functional Score (Harris Hip Score)

FUNCTIONAL SCORE (Follow-up)	DHS (n=15)	PFLCP (n=15)
3 months	32.67	53.87
6 months	67.60	85.40
12 months	89.08	90.33

DISCUSSION

Treatment of intertrochanteric fracture is challenging. The goal of treatment is to achieve

anatomic reduction with a stable fixation to allow early functional rehabilitation. Over the past decades, intertrochanteric fractures were predominantly treated by dynamic hip screw.^[9] Various methods of fixation devices have come and gone. The treatment still merits

the type of fracture and quality to bone. DHS has been considered the gold standard of inter trochanteric fracture fixation for a long time.

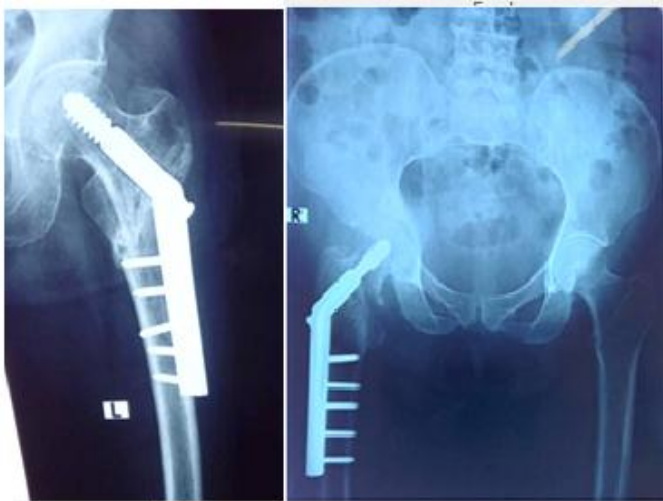


Figure 4: (a) 3 months after operation X-ray shows uniting intertrochanteric fracture. (b) 6th months after operation X-ray shows callous formation.

Historically, Smith Peterson nail and Jewet nail were introduced in the 1930's. In the 1950's and 60's Pugh and Massie modified sliding devices and Dynamic Hip Screw (DHS) were developed. Kuntscher, Ziegle, Grosse, Kempf and Russel and Taylor developed intramedullary nail (IMN) with sliding hip screw (SHS).^[10,11,12] The advantages and disadvantages of the original design of the Gamma nail have been well established. In several studies done in the past, usually by comparing the result with dynamic hip screw.^[13,14,15] Recent data suggests intramedullary devices have been very good with union rates up to 100% compared with other extramedullary devices which show union up to 80% only.^[14,15]

Kyle et al. has noted that increased forces are required to initiate sliding in intramedullary devices as compared to sliding hip screw with plate.^[16]



Figure 5: (a), (b) Pre operative X-ray of the hip A/P view showing unstable intertrochanteric fracture. (b) post operative X-ray of the hip A/P view showing ORIF with PFLCP.

Complication rate for unstable fractures treated with a DHS plate has shown to be as high as 3% to 26%.^[17] Primary or Secondary varus collapse and hardware failure by "cut-out" of the femoral head screw are the most frequently reported complications.^[18]

Role of intramedullary devices like proximal femoral nail (PFN), Gamma nail (GN), and proximal femoral nail anti rotation (PFNA) in the treatment of these unstable intertrochanteric fractures are also controversial with varying results.

Comminuted fracture of intertrochanteric region extending into the lateral cortex of femur, intertrochanteric fracture with long sub trochanteric extension, reverse oblique type of fractures, fractures associated with severe

osteoporosis are not successfully treated with DHS.



Figure 7: After 6 months operation X-ray showing good union.

The PFLCP seems to be superior to the DHS and plate. Because DHS lag screw doesn't hold the lateral cortex fracture fragments leading to varus collapse and shortening.^[20] PFLCP provides anatomic reduction, stable fixation and preservation of blood supply. Biochemically PFLCP is stronger or equivalent to other fixation methods for fractures of the trochanteric and subtrochanteric region.^[21] The size of incision, operating time, fluoroscopy time with DHS, blood loss significantly more in DHS.

Glassner PJ. et al.^[21] in their study, on 10 patients showed 70% failure including 30% with varus collapse; 20% each with breakage of

screw and plate when treated with PFLCP as compared to 12% failure rate in our study. Karl wieser et al.^[20] in their study on 14 patient showed 4 cases with failure when they used PFLCP. They conducted in their study that the prerequisite in using the PFLCP. In unstable fracture pattern, is restricted weight bearing until callus formation is seen.

We conducted the study on patients admitted in the President Abdul Hamid Medical College Hospital (300 bed - apply for 500 beds) in orthopaedics department. So limited the number of patients included in the study. The smaller sample size was the major limiting factor to come upon a strong conclusion. PFLCP represent a feasible alternative for the treatment of unstable intertrochanteric fracture. The bending stress, at the junction of the plate and proximal femur increase and may result in breaking of the proximal locking screws close to the plate as it occurred in one of our case. Proper reduction of the fracture and restriction to early post operative weight bearing can only prevent complications of PFLCP. Further bio mechanical studies are required to asses the effectiveness of PFLCP.

CONCLUSIONS

The purpose of surgical intervention in treatment of unstable intertrochanteric fractures is stabilization of fracture, early mobilization, restoration of limb length & painless function. This was achieved more satisfactorily with the use of PFLCP than with DHS. At present we consider PFLCP has a good promise for unstable intertrochanteric fractures even though more randomized control trials with higher sample size are needed to support reputate the present work.



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