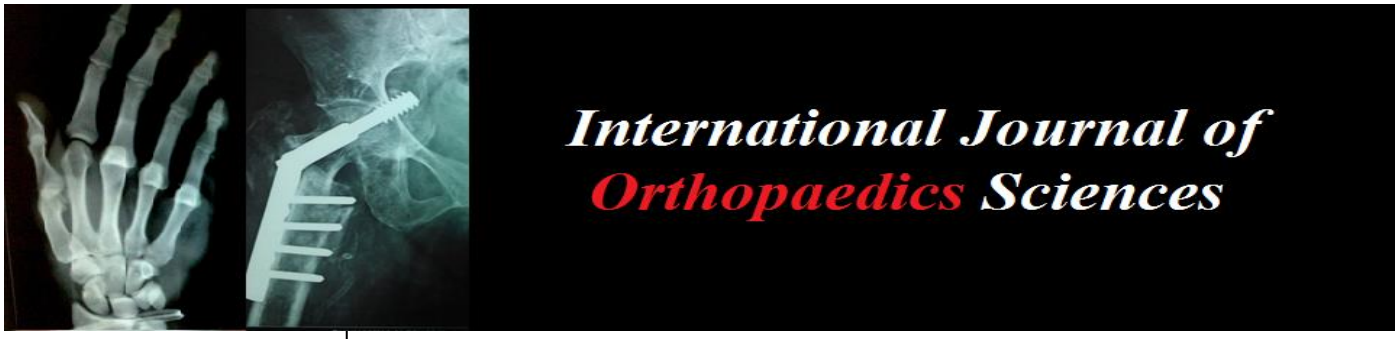


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# Comparing the outcomes of intertrochanteric fractures treated with DHS vs PFLCP

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**Abstract**
**Background:** For trochanteric fractures many implants have been used successfully like sliding hip screws, cephalomedullary nails, angular blade plates, and rarely by primary hip arthroplasty. The Dynamic Hip Screw (DHS) is one of the most widely used implant for stabilization of intertrochanteric fractures. The Proximal Femoral Locking Compression Plate (PFLCP) is a relatively newly introduced implant for trochanter fractures, and there is no sufficient literature comparing DHS and PFLCP.
**Objective:** (1) Compare the operative differences, radiological and clinical outcomes between the trochanter fractures treated by DHS with those treated by PFLCP.
**Methods:** We studied 52 patients admitted and followed up at MGMCH. Out of which 26 patients were treated with DHS, and 26 patients with PFLCP.
**Results:** The mean operative time and average intra-operative blood loss was more in the PFLCP group when compared with DHS group and it was found to be statistically significant ($p< 0.05$). DHS group had marginally better functional results than PFLCP group. There was no difference in the radiological outcome between two groups.
**Conclusions:** In trochanteric fractures of femur, both PFLCP and DHS provide excellent results. Functional outcome is more influenced by quality of fracture reduction, rather than the type of implant used.

**Keywords:** Trochanteric fractures, PFLCP, DHS, implants

## Introduction
Trochanteric fractures are common in older population. They account for 46% of total hip fractures [1]. With the increase in average life expectancy, the proximal femoral fractures have been marked as one of the biggest problems of the contemporary civilization Various operative procedures with different implants has been described for the treatment of intertrochanteric fractures. The different types of devices used is itself a testimony that none of the devices is ideal to treat all types of fractures in this region. The Dynamic Hip Screw (DHS) is one of the most widely used implant for intertrochanteric fractures, which has stood the test of time. However, comminuted unstable fractures, and combined intracapsular and extracapsular fractures treated with DHS are generally prone to many complications [2]. The Proximal Femoral Locking Compression Plate (PFLCP) was introduced in the 21st century as an implant that allows angular stable plating for the treatment of complex comminuted and osteoporotic fractures. The PFLCP is a newer addition for proximal femur fractures. However, there is scarcity of literature comparing DHS with PFLCP in the treatment of inter trochanter fractures. We conducted a Randomised control study to evaluate the operative procedures, clinical and radiological outcomes in trochanteric fractures treated with DHS and PFLCP.

## Materials and Methods
We conducted a Randomised control study in the Department of Orthopaedics at Mahatma Gandhi Medical College and Hospital, Jaipur from September 2017 to August 2019.
The inclusion criteria were: 1. Patients who gave consent. 2. Age > 18 years 3. Closed trochanteric fractures. 4. Competent neurological and vascular status of the affected limb. 5. Ipsilateral knee, Ankle, contralateral hip joint functionally good enough, not to exert a serious adverse effect on the rehabilitation process. 6. Patients with a near normal daily activities of life.

7. No associated fracture in same limb 8. Patients who can meet the medical standards for routine, elective surgery. The study had 52 patients, which were admitted either through the OPD or emergency department of the hospital. 26 patients were operated with DHS and other 26 with PFLCP. The subjects were randomized using online statistical computing web program - http://www.randomization.com/ All patients were admitted. The pattern of fracture were determined and were classified according to the AO.

The patient was prepared for the elective surgery and after performing routine preoperative investigations and pre anaesthetic checkup, spinal anaesthesia was given to the patients and closed reduction done using fracture table and C-arm. Once acceptable reduction was achieved, the operative part was scrubbed, painted and draped for the surgery. Standard lateral approach was used, incising the iliotibial band and splitting the vastus lateralis parallel to the skin incision. As per randomistion data for that particular case, DHS or PFLCP was used to stabilize the fracture after achieving good reduction (Figures 1 and 2). The procedure and techniques were as per the AO guidelines. The procedures were performed and confirmed on AP and lateral images using C-arm. After the implantation, a 14 size negative suction drain was inserted and the tissues were closed in layers. Sitting up in the bed, Quadriceps exercise and range of movement exercises of the hip and knee were started on the first day after surgery within limits of pain. General supportive measures were taken and stitches were removed on fourteenth post operative day. Early ambulation was encouraged usually after 5 days. Depending on the age, fracture pattern, stability of fracture fixation, partial weight bearing was allowed till first follow up - 6 wks. Then unprotected full weight bearing was allowed after reviewing AP and Lateral radiographs. Follow up was carried out at 6, 12, 16, 24 weeks and then at two to three monthly intervals. All the statistical analyses were conducted with SPSS for windows (version 18.0, Chicago, Illinois), and p values of $<0.05$ were considered significant.

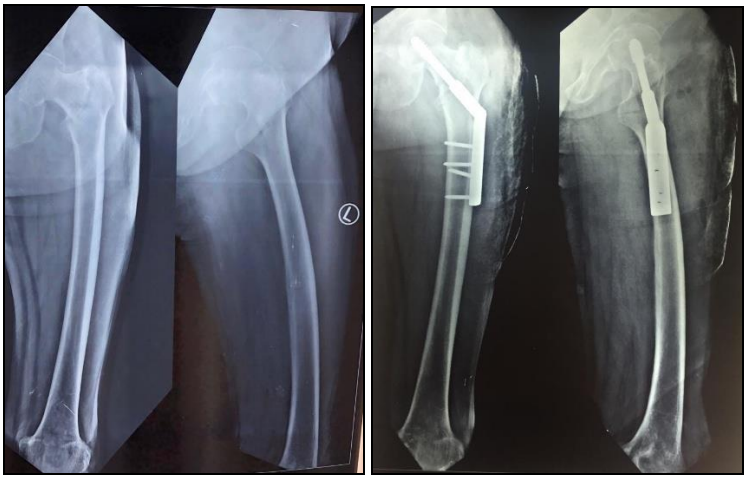

**Fig 1:** DHS pre-op and post-op

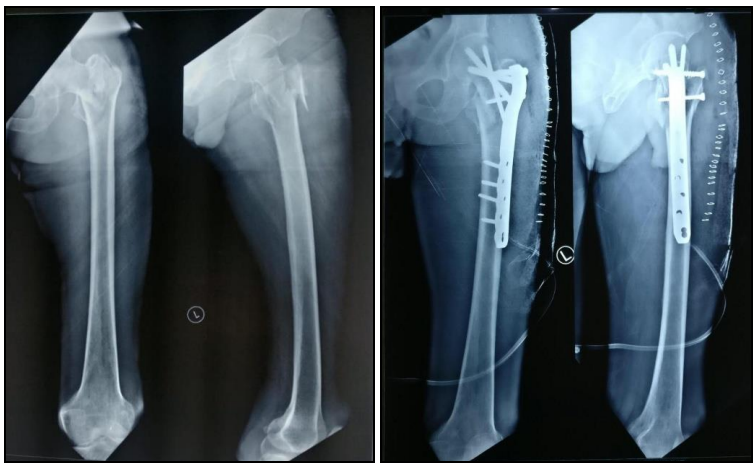

**Fig 2:** PFLCP pre-op and post-op

## Results

The youngest patient was 23yrs of age and the oldest was of 78 yrs. The mean age was 55.84 years. The male to female ratio was found to be 1.6:1. The fractures were more commonly encountered on the left side (53.84%). The commonest mode of injury in our patient was fall on ground (63.46%). The other modes were – road traffic accident (RTA), fall from height and assault. The fractures were classified according to AO classification system (1979). Majority of the cases (75%) were operated in 3-7 days following injury. The mean time interval between trauma and surgery was 5 days. The mean operative time of surgery in PFLCP group was 93.07 minutes and in the DHS group was 57.69 minutes. Above two values were tested statistically by the unpaired t test. The p value was found to be 0.00427, which is statistically significant. The average blood loss in the PFLCP group was 305.76 ml and in the DHS group was found to be less, 230.65 ml. The above values were tested statistically by unpaired t test. The p value was found to be 0.000317, which is statistically significant.

The Harris Hip Scoring system was used to evaluate functional result in our study. We achieved excellent result in 59.61% of cases, good result in 26.93% of cases, fair in 9.61% of cases and poor result in 3.84% of cases in total study group. No mortality was recorded in our study. Superficial wound infection was seen in two cases of PFLCP and one case of DHS group. The difference in functional result between the two groups were not statistically significant.

Criteria of Anderson *et al.* (1975) was taken into account to assess the union of the fracture. Union rate was 100% in PFLCP group, with no delayed or non unions, there was one case of non union in DHS group. Time taken for union in PFLCP group ranged from 15 to 22 weeks (mean was 18.03 wks). Time taken in DHS group for radiological union ranged from 15 to 22 weeks, (mean of 17.56 Wks). There was one case of Implant cutout, Medialization and Nonunion each, in DHS group. Varus deformity was seen in two cases of PFLCP and one case in DHS group.

## Discussion

Agreement have been achieved on the significance of restoring stability and early mobilisation during treatment of pertrochanteric fractures. Although DHS is one of the standard treatments, higher failure rates of sliding hip screws in unstable fractures have been reported. PFLCP was introduced as a new implant that allows angular – stable plating for the treatment of complex comminuted and osteoporotic fractures. In our study, mean operative time in the PFLCP group (93.07 min) and that in DHS group was 57.69 min. The above values were tested statistically and difference was found to be statistically significant (p-value was 0.00427).

The increased operative time with PFLCP is may be because the surgeon is handling a relatively new technique with new implant. There are few studies in literature that have estimated the amount of blood loss. Little *et al.* [6], Guo-Chun Zha *et al.* [7] have studied the intra operative blood loss in both DHS and PFLCP. The average blood loss in the PFLCP group was 305.76 ml, and in the DHS group was found to be lesser, 230.65 ml. The above values were tested statistically and the difference was found to be statistically significant (p-value was 0.000317).

Functional results of the procedures was evaluated using the Harris Hip Scoring System. In PFLCP group, excellent results were achieved in 53.84% of the cases, good results in 34.61%, fair results in 7.69% and poor result in 3.84% the cases each. In DHS group, excellent results were achieved in 65.38% of the cases, good result in 19.28% of the cases, fair result in 11.53% and poor result in 3.84% cases each. Kyle *et al.* 1(1979) did obtain good to excellent result in 89%.

When we compare our series to previously done studies regarding functional result, we find comparable result. There were two cases of superficial wound infection in PFLCP group and one case in DHS group in our study. We find increased rate with PFLCP group, probably because of the increased operative time and increased blood loss.

For the Union of fractures - The criteria of Anderson *et al.* was taken into account to assess the union rate of fracture. All the fractures in the PFLCP group and 25 cases in DHS group united within six months of follow up, with an average of 17.8 weeks. The two groups were tested using unpaired t test. The p value was found to be 0.185, which is considered insignificant. And when we compare our series to previously done studies regarding union of fracture, we find comparable result.

Most of the authors reported no cases of non union in their series (Boldin *et al.* Tyllianakis *et al.* Fogagnolo *et al.* Ulfin *et al.*) [12, 13, 18]. However, Gadegone *et al.* [19] had 1 case of non union out of the 100. Kamboj *et al.* reported 1 case of non union and 2 cases of delayed union out of the 30 cases in their studies. Guo-Chun Zha *et al.* [7] reported 1 case of nonunion in the 110 patients treated by PFLCP. In our study, we encountered 1 case of non union in DHS group and no case in PFLCP group.

## Limitations

Our study had a few limitations. The study was limited to 52 subjects with 26 in each group (DHS and PFLCP), and we would wish to recommend a study with a larger group and a longer duration to have better evaluation of outcome. The surgeon was relatively new to the operative techniques and principles of PFLCP, whereas he was well versed with the DHS. Hence there could be a technical bias towards DHS. A future study at a later date when the surgeon becomes used to technique of PFLCP, it would negate this bias. The study included patients mainly from Rajasthan and Haryana and the results cannot be applied to whole of India. A multicenter study involving the different regions of India, would be desirable to be applied to a larger group of population.

## Conclusion

In Trochanteric fracture of femur, the two implants used, PFLCP and DHS provide excellent results in terms of fracture union as well as the functional outcome. In our study there was marginally better functional results of DHS group than that of the PFLCP group. But these differences could not be stressed much, because of the small sample size and the difference was statistically insignificant. Both the implants used - the PFLCP and DHS were associated with low but comparable complications. The average operative time and the intra operative blood loss was more in PFLCP group compared to the DHS group and it was found statistically significant. A thorough knowledge of the concept, features and procedure of application of PFLCP is very important.

**Conflicts of interest:** None.

**Contribution of Authors:** We hereby declare that this work was done by the authors named in this article and all the liabilities pertaining to claims relating to the content of this article will be borne by the authors.

**Ethical clearance:** Taken from Institutional Ethical Committee

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