

## ORIGINAL PAPER

# Trochanteric fractures treated with PFLCP versus DHS

Das Chinmoy<sup>1</sup>, Dinesh KM<sup>2</sup>, S Sunil<sup>3</sup>

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### ABSTRACT

**Background:** Trochanteric fractures can be treated successfully with conventional implants, such as sliding hip screws, cephalomedullary nails, angular blade plates, and rarely by a 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, clinical and radiological outcomes between the trochanter fractures treated by DHS with those treated by PFLCP. **Methods:** We studied 52 patients admitted and followed up at GMCH. 26 patients with trochanter fractures 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 usually the fractures of older population. They account for 45% of total hip fractures.<sup>1</sup> 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 have been described for the treatment of intertrochanteric fractures. The long list of devices 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, fractures with extension into piriformis fossa, and combined intracapsular and extracapsular fractures treated with DHS are generally prone to complications.<sup>2</sup> The Proximal Femoral Locking Compression Plate (PFLCP) was introduced in the 21<sup>st</sup> century as a new implant that allows angular – stable plating for the treatment of complex comminuted and osteoporotic fractures. The PFLCP is a newer addition in the array of implants for proximal femur fractures.

However, there is scarcity of literature comparing DHS with PFLCP in the treatment of intertrochanter fractures. Hence, we conducted a Randomised control study to evaluate the operative procedures, clinical outcomes and radiological outcomes in trochanteric fractures treated with DHS and PFLCP

### PATIENTS/METHODS

We conducted a Randomised control study in the Department of Orthopaedics of Gauhati Medical College and Hospital, Guwahati from December 2011 to December 2013.

#### The inclusion criteria were:

1. Only those who gave consent.
2. Adult patients (Age > 18 years)

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#### Address for correspondence:

<sup>1</sup>Associate Professor (Corresponding Author)

Department of Orthopaedics  
Tezpur Medical College and Hospital, Tezpur, Assam, India  
**Mobile:** +919435043908

**Email:** drchinmoydas@yahoo.com

<sup>2</sup>Dinesh KM, Assistant Professor, BGS Global Institute of Medical Sciences, Bangalore, Karnataka

**Mobile:** +919654539981, **Email:** dinikm@gmail.com

<sup>3</sup>Sunil S, Consultant, Sanjeevini Hospital, Mysore, Karnataka  
**Mobile:** +919717268537, **Email:** srsmysore@gmail.com

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. Only patient 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 included 52 patients, admitted either through the outpatient 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 levels of fracture were determined and were classified according to AO. The patient was prepared for elective surgery after performing the routine preoperative investigations and pre anaesthetic evaluation. 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 surgery. Standard lateral approach incising the iliotibial band and splitting the vastus lateralis parallel to the skin incision was used to expose the trochanter. As per the randomization 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 followed as per the AO guidelines. The procedures were performed confirming AP and lateral images using C-arm. After the implantation, 14 size negative suction drain was put and the tissues were closed in layers.

Sitting up in bed, Quadriceps exercise and range of movement exercises of the hip and knee started on the first day after surgery within limits of pain. The general supportive measures were taken and stitches were removed on tenth post operative day. Early ambulation was encouraged usually after 5-6 days. Depending on the age, fracture pattern, stability of fracture fixation, toe touching to partial weight bearing was allowed till first follow up (6 wks). Then unprotected full weight bearing was allowed after reviewing radiograph. Follow up was carried out at 6, 12, 16, 24 weeks and then at two monthly intervals. All statistical analyses were conducted with SPSS for windows (version 18.0, chicago, il), and  $p$  values of  $<0.05$  were considered significant.



Figure 1 PFLCP pre-op and post-op



Figure 2 DHS pre-op and post-op

## RESULTS

The youngest patient was of 23 yrs and the oldest was 78 yrs of age. 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). Most 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 the PFLCP group was found to be 93.07 minutes and in the DHS group was found to be 57.69 minutes. The above two values were tested statistically by unpaired  $t$  test. The  $p$  value was 0.00427, which is statistically significant. The average blood loss in the PFLCP group was found to be 305.76 ml and in the DHS group was found to be less, 230.65 ml. The above two values were tested statistically by unpaired  $t$  test. The  $p$  value was 0.000317, which is statistically significant.

Harris Hip Scoring system was used to evaluate the functional result in our study. We obtained 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 the total study group. No mortality was recorded in our series. Superficial wound infection was seen in 2 cases of PFLCP and 1 case in DHS group. The difference in the functional result between the two groups was not statistically significant.

The criteria of Anderson et al (1975) were taken into account to assess the union of the fracture. The union rate was 100% in the PFLCP group, with no delayed or non unions in the study, and there was 1 case of non union in DHS group. The time taken for union in the PFLCP group ranged from 15 to 22 weeks (mean 18.03 wks). The time taken in the DHS group for radiological union ranged from 15 to 22 weeks, (mean of 17.56 wks). There was 1 case of Implant cutout, Medialization and Nonunion each, in DHS group. Varus deformity was seen in 2 cases of PFLCP and 1 in DHS group (**Figure 3**).



**Figure 3** Complications

PFLCP Superficial infection	DHS non-union	PFLCP varus malunion	DHS screw cutout
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**DISCUSSION**

Agreement has been achieved on the significance of restoring stability and early mobilisation during the treatment of petrochanteric fractures. Although DHS is one of the standard treatments, high failure rates of sliding hip screws in unstable fractures have been reported. The PFLCP has been introduced as a new implant that allows angular – stable plating for the treatment of complex comminuted and osteoporotic fractures.

In our study, the mean operative time in the PFLCP group (93.07 min) and In the DHS group was 57.69 min. The above two values were tested statistically and the difference was found to be statistically significant (*p-value* was 0.00427 (**Table 1**)).

**Table 1** Mean Operative Time

Authors	Year	Operation	Mean Time (Min.)
Bridle <sup>3</sup> et al.	1991	DHS	42.5
Goldhagen et al. <sup>4</sup>	1994	DHS	47
O’Brien et al. <sup>5</sup>	1995	DHS	47
Habernek et al.	2000	DHS	27
Little et al. <sup>6</sup>	2008	DHS	40.4
Guo-Chun Zha <sup>7</sup>	2011	PFLCP	35.5
Present study	2013	PFLCP	93.07
		DHS	57.69

The increased operative time with PFLCP is may be because the surgeon is handling a new technique with new implant.

There have been a few studies in literature that have estimated the amount of blood loss. Little et al<sup>6</sup>, Guo-Chun Zha et al<sup>7</sup> studied the intra operative blood loss in DHS and PFLCP. The average blood loss in the PFLCP group was found to be 305.76 ml, and in the DHS group was found to be less, i.e., 230.65 ml. The above two values were tested statistically and the difference was found to be statistically significant (*p-value* was 0.000317) (**Table 2**).

**Table 2** Average Intra-Operative Blood Loss

Authors	Intra Operative Blood Loss
Little et al <sup>6</sup> (2008) DHS	160ml
Guo-Chun Zha et al <sup>7</sup> (2011) PFLCP	150ml
Present study ——— > PFLCP	305.76 ml
————— > DHS	230.65 ml

Functional results of the procedures were evaluated using Harris Hip Scoring System. In the PFLCP group, excellent results were in 53.84% of cases, good results in 34.61%, fair results in 7.69% and poor result in 3.84% cases each. In the DHS group, excellent results were in 65.38% of cases, good result in 19.28% of cases, fair result in 11.53% and poor result in 3.84% cases each. Kyle et al <sup>1</sup>(1979) obtained good to excellent result in 89% (**Table 3**).

**Table 3** Functional Results

Authors	Excellent and Good Functional Result	
Kyle et al <sup>1</sup> (1979)	89%	
P. Kamboj MS et al (2007)	80%	
Present study	PFLCP	88.45%
	DHS	84.66%

When we compare our series to previously done studies regarding functional result, we find comparable result.

There were 2 cases of superficial wound infection in PFLCP group and 1 case in DHS group in our study. We find increased rate with PFLCP group , probably because of increased operative time and increased blood loss (**Table 4**).

**Table 4** Post-Operative Infection

Authors	Implants	Infection Rate
Larsson et al <sup>8</sup> (1990)	DHS	1.8%
Birdle et al (1991)	DHS	3.9%
Butt et al <sup>9</sup> (1995)	DHS	4%
Hebernek et al (2000)	DHS	2.4%
Guo-Chun Zha et al <sup>7</sup> (2011)	PFLCP	1.81%
Present study	PFLCP	7.69%
	DHS	3.84%

Union of the fractures - The criteria of Anderson et al were taken into account to assess the union rate of the fracture. All the fractures in PFLCP group and 25 cases in DHS group united within 6 months of follow up, with an average of 17.8 weeks .The two groups were tested using the unpaired t test. The p value was 0.185, which is considered insignificant. When we compare our series to previously done studies regarding union of fracture, we find comparable result (**Table 5**).

**Table 5** Time For Union

Authors	Implants	Union time
Rao et al <sup>10</sup> (1983)	DHS	18 weeks
Birdle et al (1990)	DHS	24 weeks
Nakata et al <sup>11</sup> (1994)	DHS	10.6 weeks
Habernek et al (2000)	DHS	12 weeks
Present study	PFLCP	18.03 weeks
	DHS	17.56 weeks

Most authors reported no cases of non union in their series (Boldin et al<sup>12</sup>, Tyllianakis et al<sup>13</sup>, Fogagnolo et al <sup>18</sup>, Ulfen et al). However, Gadegone et al<sup>19</sup> had one case of non union out of 100. Kamboj et al also reported 1 case of non union and 2 cases of delayed union out of 30 cases in their series. Guo-Chun Zha et al<sup>7</sup> reported 1 case of nonunion in 110 patients treated by PFLCP. We encountered 1 case of non union in DHS group and no case in PFLCP group.

**Limitations:** Our study had few limitations. The study was limited to 52 subjects with 26 in each group, and we would wish to recommend a study with a larger group and a longer duration to have a better evaluation of the outcome. The surgeon was new to the operative techniques and principles of PFLCP, whereas he was well versed using a DHS. Hence there could be a technical bias favoring DHS. A future study at a later date when the surgeon becomes used to PFLCP, would negate this bias. The study included patients only from the northeast who have different demographic characteristics, and the results cannot be applied to whole of India. A multicentre study involving different regions of India, would be desirable to be applied to a larger population.

## CONCLUSION

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

**Conflicts of interest:** None.

**Contribution of Authors:** We declare that this work was done by the authors named in this article and all 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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