

Original Research Article

A comparative study between proximal femur locking compression plate and dynamic hip screw fixation in management of intertrochantric femur fractures

Mithlesh Kumar Meena^{1*}, Vinay Joshi²

¹Department of orthopaedics, Government Medical College of Kota, ²R.N.T. Govt. Medical College of Udaipur, Rajasthan, India

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***Correspondence:**

Dr. Mithlesh Kumar Meena,

E-mail: drmithlesh.meena2608@gmail.com

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ABSTRACT

Background: Proximal femur fractures are one of the commonest fracture encountered in orthopaedic trauma practice. Dynamic hip screw (DHS) is the gold standard procedure for treatment for stable intertrochanteric fractures, however problem arises with unstable fractures in maintenance of neck shaft angle and proper reduction. Here we are giving results of trochanteric fractures treated with proximal femoral locking compression plate (PFLCP) as compared with dynamic hip screw (DHS).

Methods: This study was a prospective study. Two groups of trochanteric fractures of 25 patients operated with DHS and LCP were taken. Each patient was followed-up from July 2011 to October 2012 for minimum of 12 month or till the bony union. Every fracture was classified according to AO classification. Functional results will be assessed as per modified Harris hip evaluation score.

Results: Among 25 patient treated with PFLCP, length discrepancy was .857 cm while that for DHS was 1.2 cm. The mean time of unaided walking with LCP Was 14.20 weeks while for DHS it was 16.20 weeks. The mean varus angulation for LCP 8 degree while for DHS 10.2 degree. In LCP in 1 case screw cut out from head and neck of femur while in DHS, same is seen in 2 cases and in addition loss of position of lag screw seen in 5 cases. one case was found with superficial infection in LCP while in case of DHS 3 cases with deep infection for that implant was removed and 6 cases were found with superficial infection.

Conclusions: Proximal femoral locking plate (PFLCP) is simple, stable for fixation with fewer complications, and is an effective method for unstable intertrochanteric fractures. Comparing with DHS group, the locking plate has shorter operative time, fewer blood loss and drainage.

Keywords: Modified harris hip score, Proximal femur locking plate, Dynamic hip screw

INTRODUCTION

Proximal femur fractures are one of the commonest fracture encountered in orthopaedic trauma practice (about 3 lakhs per year with mortality rate of 4.5%-22%).^{1,2} Proximal fracture include intertrochanteric and subtrochanteric fracture hip fracture (intertrochanteric & femur neck) accounts 30% of hospitalization.³ Goal of treatment is early mobilization and return of patient to

their pre fracture level of function without long term disability and avoiding medical complication of prolonged recumbence. Treatment modalities includes non-operative and operative. Non-operative treatment needs prolong immobilization which is associated with high incidence of complication like thromboembolism, bed sore, pulmonary complication psychological problem like depression. In operative treatment two broad categories of internal fixation commonly used are:

- Sliding compression hip screw with side plate-dynamic hip screw
- Proximal femur locking compression plate.

The present study was aimed to compare the management of inter-trochanteric fractures by using dynamic hip screw and proximal femoral LCP, to assess the result of above procedures in terms of benefits and complications and compare the end results of the both treatment modalities.

METHODS

After taking approval from ethical committee and informed consent from patient, a prospective study was conducted in the department of orthopaedics R.N.T. Medical college and associated group of hospitals, Udaipur. 50 fresh cases (less than 3 weeks) of closed inter-trochanteric femur fracture of >20 year age, either sex were included in this study. Every fracture was classified according to AO classification. Only closed fractures were included in the study. All patients were divided randomly into two groups by sealed envelope technique. In one group, Patients managed by open reduction and internal fixation with dynamic hip screw and side plate kept while in another group patients who were managed by proximal femur LCP were kept, The patients were categorized according to AO classification.

Exclusion criteria were pathological fractures, neglected fractures, fractures associated with polytrauma, previous surgery on ipsilateral hip or femur, severe concomitant medical condition (grade 5 on American society of anaesthesiologist (ASA scale). All the patients included in the study presented within 3 weeks of sustaining injury. Background variables including age, sex, ASA risk score, mode of injury and side of involvement were recorded. Baseline haemogram, TLC, DLC, blood urea, serum creatinine and random blood sugar were done in all patients.

Patients were reviewed at 4 weeks, 8 weeks, 3 months, 6 month and 1 year. Detailed clinical radiological examination will be done at each follow up. Status of union and functional recovery will be recorded in the proforma. Functional results will be assessed as per modified Harris hip evaluation score and radiological evaluation will be done as per status of union at fracture site and measurement of neck shaft angle.

RESULTS

This study was a prospective study. Two groups of 25 patients operated with DHS and LCP were taken. Each patient was followed-up from July 2011 to October 2012 for minimum of 12 month or till the bony union. The mean age of the patients in the DHS group was 61.12 years (range 41-80 years) of age while that in the LCP group was 60.24 years (range 42-76) years of age as given in Table 1.

Table 1: Distribution of cases according to age group.

Age of the patients (in years)	DHS	LCP
40-50	5	5
51- 60	7	7
61-70	9	8
71-80	4	5

In our study 80% of the patients in the study were male and 20% of the patients were female. 66% of the patients in this study had sustained low velocity injuries due to fall on floor or trivial trauma whereas 34% sustained high velocity injuries due to RTA. All fractures were classified according to the AO classification as in Table 2.

Table 2: Distribution of cases according to AO classification.

Type of Fractures	DHS	LCP
A1	16	3
A2	6	14
A3	3	8

Majority of the patients were operated within 3 days of fractures or as soon as he/she medically fit for surgery. The mean time for LCP surgery was around 70 minutes (50-110 minutes). The mean time for doing a LCP and DHS is nearly similar. The mean amount of blood loss for DHS surgery was 240 ml (90 to 300 ml) and that for LCP was 200 ml (100 to 350ml) which was comparable. In our study knee mobilization exercise was started within three days postoperatively in majority of patients as shown in Table 3.

Table 3: Time interval between surgery and knee mobilization.

Time Interval in days	DHS	LCP
01 to 3	19	23
4 to 6	6	2

In LCP group majority 14 patients were discharge within 10 days of surgery but in DHS group majority of patients were discharge after stitch removal as presented in Table 4.

Table 4: Distribution of cases according to duration of stay in hospital.

In Days	DHS	LCP
< 10 days	2	14
10-15 days	15	10
> 15 days	8	1

In DHS twenty patients were noted with limb length shortening with mean of 1.2 cm. while in LCP seven patients were noted with limb length shortening with mean of 0.857 cm. The mean radiological union time for trochanteric fracture fixed with DHS was 14 weeks (8

weeks to 16 weeks) while with LCP it was 16 weeks (8 weeks to 20 weeks) as given in Table 5.

Table 5: Distribution of cases according to protected weight bearing (with crutch/walker).

In Days	DHS	LCP
< 14 days	2	12
14-28 days	10	18
> 28 days	5	3

The functional status of the patients according to the modified Harris hip scoring system was as 91-100 excellent, 81-90 - good, 61-80 - fair, < 60 poor. First two categories of modified Harris hip scoring system as acceptable functional status and the last two categories as unacceptable functional status then the results are as under which are statistically significant as shown in Table 6.

Table 6: Distribution of cases according to functional status.

Functional result		DHS	LCP
		No.	No.
Acceptable	Excellent	14	18
	Good	6	6
Unacceptable	Fair	3	0
	Poor	2	1

After measuring the neck shaft angle on serial follow ups we found a tendency towards varus angulation. For DHS group, total seventeen patients were noted with varus angulation with the mean of 10.29° and while in the LCP total five patients were noted with varus angulation with mean of 8°. In the DHS group, 9 patients had post-operative infection out of which 3 had deep infection leading to loosening of implant for which the implants were removed. In LCP, only 1 of the patient had postoperative infection which was superficial and managed with intravenous antibiotics and dressing. The common modes of implant failure found in DHS group in the present study were loss of position of lag screw in 5 cases, cut out of lag screw in 2 cases. The modes of implant failure in the LCP were, screw cut out from head and neck of femur in 1 case. Medial migration of hip screw, fracture of femoral shaft, breakage of implant was noted in none of the case of LCP.

DISCUSSION

The present study tries to compare the treatment outcomes of inter-trochanteric fractures internally fixed with dynamic hip screw plate and proximal femoral locking compression plate. The primary objective of the study was to study the management of inter-trochanteric fractures using dynamic hip screw and proximal femoral LCP and the secondary objective was to assess the result of above procedures in terms of benefits and

complications and compare the end results of the treatment modalities.

In this study, mean age of the patients in DHS group was 61.12 years while that in PF-LCP group it was 60.24 years. This is comparable with the studies done by Luo et al, Wang et al and Zhu et al, whom noted the mean age of patients greater than 60 years of age in their studies.⁴ In our study 80% of patients were male and 20% were female. Gadegone and Salphale conducted study in series of 100 patients, 63 were male and 37 were female.⁵ According to AO classification 36% of patients of DHS group has unstable type of fractures and 64% were of stable type of fractures. In LCP group 12% of patients were of stable type of fracture and 88% were of unstable type of fracture. In our series 90% of the patients were operated within six days of injuries. This delay is because of either late reporting to the hospital, or because of other associated injuries or medical problem. The mean amount of blood loss for doing a DHS was 240 ml (90-300 ml) and that for LCP was 200 ml (100-350 ml). This is measured by soaked gauge pieces. This could be explained by the fact that LCP was inserted with a small incision and minimum dissection of soft tissue. While for DHS an open reduction is done which require extensive soft tissue dissection and drainage of fracture hematoma. Zhu et al found a significantly lower amount of blood loss in LCP group as compared to DHS group.⁶

In our series, LCP group 23 patients (92%) and DHS group 19 patients (76%) start knee mobilization within 3 days post operatively. This is because of pain at incisional site in DHS group is more than LCP. In our series, average stay in hospital, it was 10.2 days in LCP group and 14.8 days in DHS group. In our series, in LCP group 96% of patients were discharged from hospital within 15 days and in DHS group 68% of patients were discharged. Patients who stay more than 15 days in hospital were because of some uneventful complication, like infection.

In our study 22 patients (88%) of LCP and 20 patients (80%) of DHS mobilized within 14-28 days post operatively. In our series, union was observed in 24 cases of LCP and 23 cases of DHS. Average time of union was 16 weeks (8-20 weeks) in PF-LCP group and 14 weeks (8-20 weeks) in DHS group.

According to Wang et al and Zhu et al, LCP is associated with shorter operative time, lesser blood loss, minimally invasive with stable fixation and fewer complications. It has smaller wound and early recovery.^{7,8}

In DHS group 20 patients had limb shortening with the mean of 1.2 cm, while in LCP group, only 7 patients had limb shortening with mean of only 0.857 cm which was statistically significant. These results are comparable with the mean varus angulation. In case of DHS, total 17 patients had varus angulation with the mean angulation 10.29°, while in the LCP group, only 5 patients causes

varus angulation with mean of 8°. This may be due to the fact that in LCP there was very little collapse at the fracture site postoperatively. The collapse or compression at the fracture site lead to varus angulation i.e. decrease in the neck shaft angle and shortening of the limb. This is comparable to Kouvidis et al.⁶ In case of LCP with shortening, we found that the fracture was fixed with some varus angulation preoperatively and postoperatively screw cut out. While with DHS we found successive increase in varus angulation with each follow up. This may show the sliding nature of the lag screw of the DHS, which lead to compression at the fracture site and gradual shortening of limb.

In our study functional status of patients were measured according to the modified Harris hip scoring system at each follow up. In our study, in DHS group twenty patients (80%) patients found excellent to good result. Most of the patients fracture pattern was stable type. Remaining five patients (20%) found fair to poor results in which all fracture pattern was unstable type. While in LCP group, twenty four patients (96%) had excellent to good result, only one patient (4%) had non-union at fracture site with screw cut out. This was similar to the finding of Zha et al.⁷ Most of the patients of LCP group had unstable type of fracture. This was because LCP provides stable anatomical fixation of more comminuted fracture without shortening of abductor moment arm or changing proximal femoral anatomy. With the fixation device LCP, the bending moment on it is considerably less than on standard compression screw and slide plate devices. This is comparable to other studies like Luo et al, Wang et al and Zhu et al which support LCP as good implant for unstable intertrochanteric fracture.⁸

In DHS group three patient had deep infection for which implant had been removed later on and six had superficial infection which was managed by antibiotic coverage and dressing. In case of LCP, there was only one case of superficial infection was noted that was managed by antibiotic. This could be due to the fact that DHS require longer skin incision and extensive tissue dissection. While in LCP, there is lesser tissue dissection and operative time also is less.

In DHS group two patients with unstable intertrochanteric fracture were noted with screw cut out from head of femur with non-union at fracture site with marked reduction of neck shaft angle. This study found similar to study done by Kim et al.⁹ In five more patients loss of position of lag screw in successive follow up also noted with reduced neck shaft angle.

The mode of implant failure in the LCP was screw cut out from Head & Neck of the femur in one case. Medial migration of hip screw, fracture of femoral shaft, breakage of implant was noted in none of the case of LCP. These results found similar to study done by Wieser et al and Glassner et al.^{10,11}

Although LCP is a good implant for unstable intertrochanteric fracture but cost of LCP is high as compared to the DHS. So, DHS is an economical implant. Fluoroscopic exposure with the LCP is quite high as compared to DHS, because insertion of three neck screw required fluoroscopic guidance. So, DHS is still gold standard for stable type of intertrochanteric fracture femur.



Figure 1: X-ray showing cut through of lag screw and DHS failure after 7 week duration.



Figure 2: Postoperative X-ray at 12 week duration showing varus collapse.



Figure 3: Immediate postoperative X-ray.



Figure 4: Preoperative X-ray showing AO Type A3 fracture.



Figure 5: Follow-up after 10 weeks.



Figure 6: Preoperative X-ray showing AO type A3 fracture.



Figure 7: Postoperative X-ray after 10 week duration.

CONCLUSION

Proximal femoral locking plate is simple, minimally invasive, stable fixation with fewer complications, and is an effective method for intertrochanteric hip fractures. The PF-LCP represents a feasible alternative for the treatment of unstable inter and sub-trochanteric fractures. The method has the advantages such as smaller wound and early recovery, especially appropriate for older patients. LCP provide a good biomechanically stable construct for fracture inter-trochanteric femur allowing early fracture union and early weight bearing. Comparing with DHS group, the locking plate has shorter operative time, fewer blood loss and drainage. So, we recommend that unstable type or reverse oblique type of intertrochanteric fractures should be internally fixed with PF-LCP. As DHS is economically low cost implant and lesser fluoroscopic exposure is required, hence, DHS still gold standard for stable type of intertrochanteric fracture.

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