ORIGINAL ARTICLE

A prospective study to compare functional outcome of Dyanamic Hip screw versus Proximal femoral nail in treatment of intertrochanteric fracture of femure

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Abstract:
Background: Trochanteric fractures account for approximately half of the hip fractures in elderly; out of this, more than 50% fractures are unstable. The choice between extra medullary or intramedullary devices for pertrochanteric fracture treatment among surgeons remains controversial and significant variation in surgeons' device choice for trochanteric fractures exists. Hence, the objective of the present study was to compare functional outcome of Dyanamic Hip screw versus Proximal femoral nail in treatment of intertrochanteri fracture of femure. *Material and Methods:* A total sample size of 30 patients with unstable trochanteric fractures and treated by either extramedullary or intramedullary internal fixation between July 2015 to June 2016 were included in the study. The study patients for operative procedure were randomly selected into two groups by surgeon's preference. The patients were then assessed clinically to evaluate their general condition and the local injury. The functional outcome of both the methods was evaluated by Harris Hip Score. *Results:* Majority of the patients were in the age group of 60-70 years i.e. in Group A (53.3%) and Group B (66.7%). Majority of patients were male in both groups. Nineteen (63.3%) had a history of road traffic injury (RTI). In group A, 9 (60%) patients and in Group B, 10 (66.7%) patients had RTI. The functional outcome in both the groups showed no statistical significance. (P>0.05) *Conclusion:* The intramedullary device can be used effectively to treat unstable trochanteric fractures and may be the best choice particularly in unstable trochanteric fractures because of its low re-operation rate.

Keywords: Dyanamic Hip screw, Proximal femoral nail, Trochanteric fractures, Harris Hip score.

Introduction:

Hip fractures commonly include fracture of neck femur, trochanteric fractures and subtrochanteric fractures. The proximal femur consists of the femoral head, the femoral neck, and the trochanteric region (including the greater and lesser trochanters). A trochanteric hip fracture occurs between the greater trochanter, where the gluteus medius and the gluteusflexor minimus (hip extensors and abductors) attach, and the lesser trochanter, where the iliopsoas (hip) attaches [1].

Despite the relatively small incidence, hip fractures are responsible for approximately 3.5 million hospital days in the world; hip fractures account for more hospital days than tibial fractures, vertebral fractures, and pelvic fractures combined. In addition, hip fractures account for more than half of the total hospital admissions of all fractures and more than half of the ambulance calls for fractures [2].

Among individuals older than 60 years, trochanteric fractures occur more than twice as often in women as they do in men. The mean age for this fracture is 81 years. In this group, the major contributing factors are osteoporosis and the propensity of older patients to fall. In the age group between 11 and 60 years, however, males sustain more fractures than females. The causative factor in this age group is high-energy trauma. It is also more common to see trochanteric fractures in Caucasians [3].

Trochanteric fractures account for approximately half of the hip fractures in elderly; out of this, more than

50% fractures are unstable. Unstable intertrochanteric fractures are those in which comminution of posteromedial buttress exceeds a simple lesser trochanteric fragment or those with subtrochanteric extension [4].

The goal of treatment of any trochanteric fracture in elderly is to restore mobility safely and efficiently while minimizing the risk of medical complications and technical failure and to restore the patient to the preoperative status. Restoration of mobility in patients with unstable trochanteric fracture ultimately depends on the strength of surgical construct [4].

The two major forms of internal fixation for trochanteric fractures are extramedullary and intramedullary implants [5].

Extramedullary devices attach externally along the outside of the upper femur. One of the earliest and most commonly used extramedullary devices is the sliding hip screw [5,6]. The device has multiple screws, lag screw and plate.

Intramedullary internal fixation devices use the same type of anchoring lag screw that is used in the sliding screw/plate devices, and the controlled bony impaction at the fracture site is accomplished with the same dynamic motion as in the sliding hip screws. However, unique to this class of implants is the portion that controls the fracture, which is placed inside the canal of the femur, rather than alongside it, hence the term intramedullary. The devices are commonly called intramedullary nails (IMN), since the femoral portion of the device is essentially a very large surgical nail within femoral canal [6].

The choice between extra medullary or intramedullary devices for trochanteric fracture treatment among surgeons remains controversial and significant variation in surgeons' device choice for trochanteric fractures exists. For stable fracture patterns, the literature suggests that the sliding plate/screw devices remain the treatment of choice, although surgeon practice varies widely. However, for unstable fractures, consensus has not been reached, with the possible exception of the reverse oblique fracture for which the intramedullary nail is better suited [7].

A combination of factors, such as poorly controlled systemic illnesses, psychiatric illness, and environmental factors are thought to be responsible for this poor result. Many of these factors cannot be addressed at the time of fracture presentation. Because the operative procedure is a major component in the treatment of patients with hip fractures, understanding the causes of failure is integral to any attempt to achieve an improved functional outcome. Fracture collapse is one of the major reasons for failure of fixation of these fractures. Defining fracture collapse, in contrast to fracture impaction and controlled fracture impaction, is a first step in understanding the contribution of collapse to failure of fixation after trochanteric hip fracture [7]. Hence, the objective of the present study was to compare functional outcome of Dyanamic Hip screw versus Proximal femoral nail in treatment of intertrochanteri fracture of femure.

Material and Methods:

The present study was observational prospective study undertaken in all the patients presenting to the hospital with history of trauma to proximal femur and diagnosed as having unstable trochanteric fracture of femur on X-ray.

The patients with unstable trochanteric fractures, were treated by either extramedullary or intramedullary internal fixation between July 2015 to June 2016 at Sushrut Hospital, Research Center and Post graduate Institute of Orthopaedics, Ramdaspeth, Nagpur were included in the present study. During the period, a total of thirty patients were fulfilled the selection criteria and were included in the study. The study was approved by the Ethical Committee of the institute.

The study patients for operative procedure were randomly selected into two groups by surgeon's preference: Group A:Operated with intramedullary nailing = 15 Group B:Operated with plating (Extramedullary fixation) = 15.

Inclusion Criteria: Adults, both males and females, Unstable trochanteric fracture of femur, Patients above the age of 18 years, Patients fit for surgery and Patient with single unstable trochanteric fracture.

Exclusion criteria: Unstable trochanteric in children and adolescents, Patient not willing for surgery,

Patient unfit for surgery with significant co morbidities affecting bone healing, Patients with stable fracture pattern and Patients with neck of femur extensions.

ASA (American Society of Anesthesiologists) GRADE

Grade	Score
I	Healthy patient
II	Patient with mild systemic disease
III	Patient with severe systemic disease not incapacitating
IV	Patient with incapacitating systemic disease
V	Moribund patient

The selected subjects were visited and the questionnaire was administered after a written informed consent was obtained from the participants. Patient history was obtained from all patients admitted with acute unstable trochanteric fracture of proximal femur to reveal the mechanism of injury and the severity of trauma. The patients were assessed clinically to evaluate their general condition and the local injury. Methodical examination was done to rule out fractures at other sites such as local examination of the injured lower limb, including the affected limb in compared with its normal counterpart, as well as any abnormal swelling and deformity.

The clinical signs and symptoms were usually obvious in trochanteric fractures of femur, so were the radiologic signs. Plain radiographs including an AP pelvis, and cross table lateral of the affected hip are usually recommended for diagnosis & preoperative planning. Traction films are helpful in comminuted and high energy fractures in determining implant selection.

Pre-operative investigations like radiographs and routine blood investigations were done recorded. The outcome measures were done as per age and sex distribution along with the side effects and mode of injuries. The functional outcome of both the methods was evaluated by Harris Hip Score [8].

The categorical data was expressed as rates, ratios and proportions and comparison was done using chi-square test or Fisher's exact test. The continuous data was expressed as mean ± standard deviation (SD) and independent sample 't' test was used to compared the data. A probability value ('P' value) of less than or equal to 0.05 at 95% confidence interval was considered as statistically significant.Data collected in the study was analyzed using statistical package for the social sciences (SPSS) software for windows version 20.

Results:

Table No.1: Basic characteristics

Characteristics	Group A (%)	Group B (%)	Total (%)
Age (years)			
<60	03 (20)	02 (13.3)	05 (16.7)
60-70	08 (53.3)	10 (66.7)	18 (60)
>70	04 (26.7)	03 (20)	07 (23.3)
Mean Age (years)	66.20 ±7.55	67.40 ±6.46	P=0.62*
Sex			
Male	09 (60)	10 (66.7)	19 (63.3)
Female	06 (40)	05 (33.3)	11 (36.7)
Mode of Injury			
H/O Fall (Trival injury)	06 (40)	05 (33.3)	11 (36.7)
RTI	09 (60)	10 (66.7)	19 (63.3)
Grade of Fracture American Society of Anesthesiologists Grade (ASA)			
I	08 (53.3)	09 (60)	17 (56.7)
II	06 (40)	04 (26.7)	10 (33.3)
III	01 (06.7)	02 (13.3)	03 (10)
Union time (weeks)			
Time (weeks)	16.30 ±1.49	16.20 ±1.31	>0.05

Table No. 2: Showing Distribution of patients according to intraoperative variables

Intraoperative variables	Group A	Group B	P value
Duration of surgery (min)	63.70 ±6.23	87.50 ±9.78	0.04*
Blood loss (ml)	363.70 ±12.47	429.50 ±34.86	0.03*
Fluoroscopy time (min)	3.1 ±0.73	2.6 ±0.69	0.02*
Hospital stay (days)	10.30 ±1.42	10.70 ±1.06	0.43

(* - P <0.05 Statistically Significant)

Table No.3: Showing Distribution of patients according to Intraoperative variables

Intraoperative variables		Group A (%)	Group B (%)	Total (%)	P value
Type of reduction (n=30)	Closed	10 (66.7)	08 (53.4)	18 (60)	>0.05
	Mini open	04 (26.7)	06 (40)	10 (33.3)	
	Open	01 (06.6)	01 (06.6)	02 (06.7)	
Difficulty in reduction (n=30)	Easy	13 (86.7)	12 (80)	25 (83.3)	>0.05
	Moderately difficult	02 (13.3)	03 (20)	05 (16.7)	
	Difficult	00 (00)	00 (00)	00 (00)	
Surgeon perception for surgery (n=30)	Easy	12 (80)	11 (73.3)	23 (76.7)	>0.05
	Moderately difficult	03 (20)	04 (26.7)	07 (23.3)	
	Difficult	00 (00)	00 (00)	00 (00)	

(* - P >0.05 Statistically Significant)

Table No.4: Showing Distribution of patients according to Functional Outcome at end of 6 months

Functional Outcome	Group A (%)	Group B (%)	Total (%)
Excellent (100-90)	03 (20)	03 (20)	06 (20)
Good (89-80)	07 (46.7)	06 (40)	13 (43.4)
Fair (79-70)	03 (20)	04 (26.7)	07 (23.3)
Poor (<70)	02 (13.3)	02 (13.3)	04 (13.3)
Total	15 (100)	15 (100)	30 (100)

Table No. 5: Showing Distribution of patients according to complications

Complications	Group A (%) (N=15)	Group B (%) (N=15)	Total (%) (N=30)
Non- union	00 (00)	00 (00)	00 (00)
Migration of screw	00 (00)	01 (6.7)	01 (3.3)
Implant Failure	00 (00)	02 (13.3)	02 (6.7)
Deep vein thrombosis	00 (00)	00 (00)	00 (00)
Infection	01 (6.7)	02 (13.3)	03 (10)

Figure No. 1: Pre-operative X-ray Ap view showing unstable trochanteric fracture AO/OTA type 31 A3.3

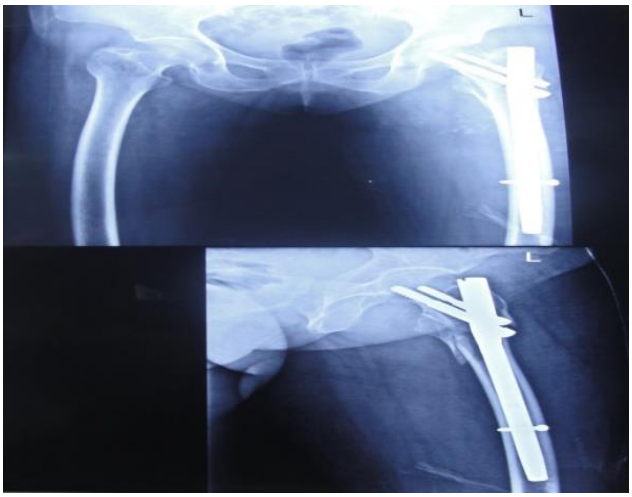

Figure No. 2: Immediate post-operative X-ray Ap and Lateral view showing good stable fixation achieved by PFN

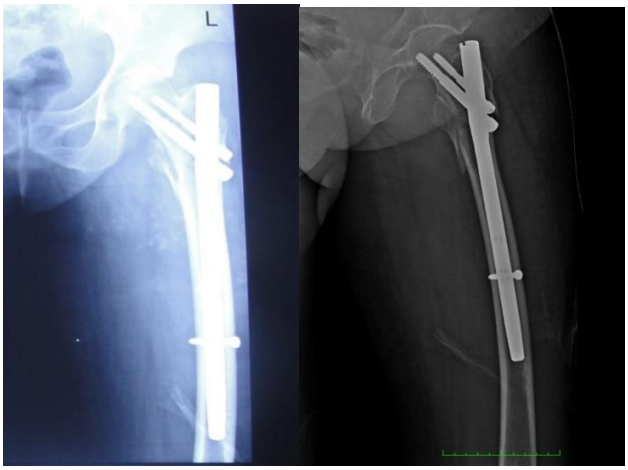

Figure No.3 A: 6 weeks post-operative x-ray Ap and Lateral view showing callous formation at fracture site

Figure No. 3 B: 3 months post- operative Ap view showing good position of implant and good callous formation at fracture site

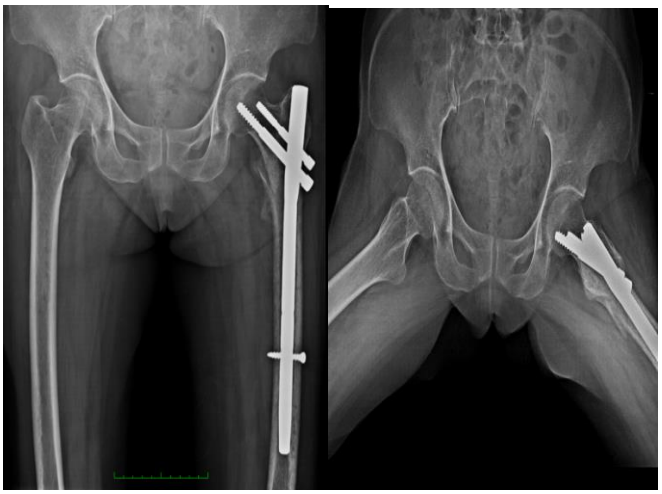

Figure No. 4: 16-week post- operative Ap and Dunn's view showing complete union at fracture site

It was observed that majority of patients were from age group 60-70 i.e., in Group A (53.3%) and Group B (66.7%). The mean age in Group A and Group B was 66.20 ±7.55 and 67.40 ±6.46 years. There was no statistical difference between ages among both groups.

It was observed that majority of patients were males in both groups. In Group A, 9 (60%) males and Group B, 10 (66.7%) males were present.

It was observed that out of 30 patients, 19 (63.3%) had history of road traffic injury (RTI). In Group A, 9 (60%) patients and Group B, 10 (66.7%) patients had RTI.

It was observed that among 30 patients distribution to ASA grade, 17 (56.7%) were in Grade I. In Group A, 8 (53.3%) patients and Group B, 9 (60%) patients were in Grade I of ASA (American Society of Anesthesiologists).

It was observed that mean time for union in Group A and Group B was 16.30 ±1.49 and 16.42 ±1.31 weeks respectively. The rate of union showed no statistical significance among both groups. (P>0.05).

It was observed that mean duration of surgery in Group A and Group B was 63.70 ±6.23 and 87.50 ±9.78minutes respectively. The mean duration of surgery in Group B was longer compared to Group A with statistical significance. (P=0.04)

It was observed that mean blood loss in Group A and Group B was 363.70 ±12.47 and 429.50 ±34.86ml

respectively. The mean blood loss in Group B was more compared to Group A with statistical significance. (P=0.03).

It was observed that mean fluoroscopy time in Group A and Group B was 3.1 ±0.73 and 2.6 ±0.69 minute respectively. The mean fluoroscopy time in Group B was shorter compared to Group A with statistical significance. (P=0.02).

It was observed that mean hospital stay in Group A and Group B was 10.30 ±1.42 and 10.70 ±1.06 days respectively. The mean hospital day showed no statistical significance in both the groups (P>0.05).

It was observed that majority of type of reduction was closed in both groups with no statistical significance (P>0.05). It was observed that difficulty in reduction was felt easy in 86.7% and 80% patients in Group A and Group B respectively with no statistical significance (P>0.05). The perception of surgeons for surgery was found to be easy in 80 % and 73.3 % of patients in Group A and Group B, respectively, with no statistical significance (P>0.05).

It was observed that in Group A functional outcome was 20%, 46.7%, 20% and 13.3% excellent, good, fair and poor respectively. Similarly, in Group B functional outcome was 20%, 40%, 26.7% and 13.3% excellent, good, fair and poor respectively. The functional outcome in both the groups showed no statistical significance. (P>0.05).

It was observed that in Group A; 1(6.7%) patient suffered from skin infection. In Group B; 2 (13.3%) patients suffered from skin infection and 1 (6.7%) showed migration of screw and 2 patients showed Implant failure. (13.3%).

Discussion:

Basic characteristics:

Age: In the present study, it was observed that majority of patients were from age group 60-70 i.e., in Group A (53.3%) and Group B (66.7%). The mean age in Group A and Group B was 66.20 ±7.55 and 67.40 ±6.46 years. There was no statistical difference between ages among both groups (P>0.05).

Similar findings were reported in study done by RehanUl Haq et al., where there was no difference between ages among both the groups. But the mean age in Group A and Group B was 55.55 ±17.09 and 53.95 ±14.75 years. The variation in ages was mostly due to different study population with smaller sample group [9].

Sex: In the study; it was observed that majority of patients were male in both groups. In Group A, 9 (60%) males and Group B, 10 (66.7%) males were present.

Similar findings were seen in study done by RehanUlHaq et al. where there was male predominance in study with no statistical difference between sex among both the groups [9]. The findings were in contrast to study by Vineet Kumar et al. where female predominance was found; 65% women and 35% men in the group A (PFN), and 54% women and 46% men in the group B (DHS) [10].

Mode of injury: In the present study; it was observed that out of 30 patients, 19 (63.3%) had history of road traffic injury (RTI). In Group A, 9 (60%) patients and Group B, 10 (66.7%) patients had RTI.

Similar findings were reported in study by Poluboina Aswin Kumar et al. who compare and analyzed intramedullary versus extramedullary fixation in trochanteric fractures where majority of patients had mode of injury due to road traffic accidents. This explains that trochanteric lateral wall fractures were common in high velocity trauma [11].

Grade of Fracture: It was observed that among 30 patients, 17 (56.7%) had Grade I fracture. In Group A, 8 (53.3%) patients and Group B, 9 (60%) patients were in Grade I of ASA. The both groups showed no statistical difference in relation to ASA grades. (P>0.05).

The findings were in contrast to study done by Rehan Ul Haq et al. where majority of patients were in Grade 2 of ASA (50%) [9].

Union time (weeks): It was observed that mean time for union in Group A (intramedullary) and Group B (Extramedullary) was 16.30 ±1.49 and 16.42 ±1.31 weeks respectively. This shows that fracture healing time was little longer in extramedullary group as compared to intramedullary group. But the rate of union showed no statistical significance among both groups. (P>0.05) Similar findings were seen in study

done by Vineet Kumar et al. where healing time was longer in extramedullary group as compared to intramedualIry group [10].

The findings were also in accordance with study done by Poluboina Aswin Kumar et al. who compare and analyzed intramedullary versus extramedullary fixation and reported that extramedullary group required 18 weeks and intramedualIry group required 16.5 weeks for fracture healing [11].

Intraoperative variables: It was observed that mean duration of surgery in Group A and Group B was 63.70 ±6.23 and 87.50 ±9.78minutes respectively. The mean duration of surgery in Group B was longer compared to Group A with statistical significance (P=0.04).The findings were in accordance with study done by RehanUlHaq et al. where PNF intramedullary group required less time for surgery compared to extramedullary group with statistical significance. (P=0.02) [9].

Similar findings were also seen in done by Vineet Kumar et al. where operative time significantly longer in the group B Extramedullary (DHS) (84.89 ± 14.96 min) than in the group A intramedullary group (PFN) (65.37 ± 11 min) (P < 0.05) [10].

It was observed that mean blood loss in Group A and Group B was 363.70 ±12.47 and 429.50 ±34.86ml respectively. The mean blood loss in Group B was more compared to Group A with statistical significance (P=0.03).

The findings were in accordance with study done by RehanUlHaqet al. where PFN intramedullary group had less blood loss during surgery compared to extramedullary group with statistical significance. (P=0.001) [9].

Similar findings were also seen in done by Vineet Kumar et al. where blood loss significantly more in the group B Extramedullary (DHS) than in the group A intramedullary (PNF)(P < 0.05) [10].

It was observed that mean fluoroscopy time in Group A and Group B was 3.1 ±0.73 and 2.6 ±0.69 minute respectively. The mean fluoroscopy time in Group B was shorter compared to Group A with statistical significance. (P=0.02).

The findings were in accordance with study done by RehanUlHaqet al. where PNF intramedullary group had longer fluoroscopy time compared to extramedullary group with statistical significance. (P=0.0001) [9].

Similar findings were also seen in done by Vineet Kumar et al. where fluoroscopy times significantly less in the group Bextramedullary (DHS) than in the group A intramedullary group (PNF) (P < 0.05) [10].

It was observed that mean hospital stay in Group A and Group B was 10.30 ±1.42 and 10.70 ±1.06 days respectively. The mean hospital day showed no statistical significance in both the groups. (P>0.05).

Similar findings were also seen in done by Vineet Kumar et al. where hospital stay had no statistical significant in the group B extramedullary (DHS) and group A intramedullary group (PNF) (P >0.05) [10].

It was observed that majority of type of reduction was closed in both groups with no statistical significance. (P>0.05) It was observed that difficulty in reduction was felt easy in 86.7% and 80% patients in Group A and Group B respectively with no statistical significance. (P>0.05) It was observed that surgeons perception for surgery was felt easy in 80% and 73.3% patients in Group A and Group B respectively with no statistical significance. (P>0.05).

The findings were in accordance with study done by RehanUlHaq et al. although there was no statistical difference in the surgeons perception of the difficulty of surgery, surgeons found doing the reverse-DFLCP (Distal Femoral Locking Compression Plate) moderately difficult or difficult 15 of 20 times, as compared to PFN where it was eight of 20 times [9].In addition, use of screws and side plates to create bone tension by an extramedullary implant, which increases the risk of fractures distal to the implant [12,13].

It was especially difficult and time consuming to put multiple locking screws into the femoral head through the neck and required multiple AP and lateral images. This was in spite the fact that the surgeons doing the procedure were adequately trained in both the procedures and had been doing it regularly before the start of the trial.

Functional Outcome: It was observed that in Group A functional outcome was 20%, 46.7%, 20% and 13.3% excellent, good, fair and poor respectively. Similarly, in

Group B functional outcome was 20%, 40%, 26.7% and 13.3% excellent, good, fair and poor respectively. The functional outcome in both the groups showed no statistical significance. (P>0.05).

The findings were in accordance with study done by RehanUlHaqet al. where majority of patients had good functional outcome in both the groups with no statistical significance (P>0.05) [9].

The findings were in similar to study done by Vineet Kumar et al. where functional outcome assessed in the two treatment groups had no statistically significant differences between the two groups (P>0.05) [10].

Complications: It was observed that in Group A; 1(6.7%) patient suffered from skin infection. In Group B; 2 (13.3%) patients suffered from skin infection and 1 (6.7%) showed migration of screw and 2 patients showed implant failure. (13.3%).

Similar findings were observed in a study by RehanUlHaq et al. where PFN intramedullary group at one-year follow-up out of 20 patients 17 patients had fracture union. One patient had failure due to technical reasons for which revision surgery was done, while the other two were lost to follow up. No patient had a malunion or nonunion. In reverse-DFLCP (Distal Femoral Locking Compression Plate) group 11 patients had fracture union; two had nonunion while one had malunion in 100° coxavara. Thus, there were a total of six failures in reverse-distal Femoral locking compression Plate. The failure rate was significantly higher in the reverse-distal Femoral locking compression Plate group (p= 0.036)9. Another study reported that, the overall complication rate did not differ statistically between the PFN and DHS groups [10]. Further, in the line of outcome, the author suggested that, the stabilization of trochanteric wall with trochanteric buttress plate restores anatomy, increases the stability of construct and prevents inherent complication of screw migration and cutout [14].

The successful treatment of trochanteric fractures depends on many factors, including the patients factor (age, general health, time from fracture to treatment, comminution, bone quality, concurrent medical treatment), surgeon factor (competency, stability of fixation) and the implant factor. Discussion about the ideal implant for the treatment of trochanteric fractures continues, mainly due to the fact that there is insufficient knowledge on the biological and biomechanical factors that lead to the uneventful healing of this type of fracture in patients, most of whom are elderly. Amongst the currently available devices, all have their advantages and disadvantages.

Conclusion:

In conclusion, an intramedullary nail is a load sharing device that allows for early postoperative weight bearing, so stress shielding is less in intramedullary nail and peri implant fractures are less. The intramedullary device can be used effectively to treat unstable trochanteric fractures and may be the best choice particularly in unstable trochanteric fractures because of its low re-operation rate.

Conflict of Interest - Nil
Sources of Support - Nil

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