



International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2017; 3(3): 628-637
© 2017 IJOS
www.orthopaper.com
Received: 28-05-2017
Accepted: 30-06-2017

Dr. Ajit swamy
Prof. & Hou, Department of
Orthopaedics, Dr. D.Y. Patil
Medical College, Pimpri, Pune,
Maharashtra, India

Dr. Amit Swamy
Prof, Department of
Orthopaedics, Dr. D.Y. Patil
Medical College, Pimpri, Pune,
Maharashtra, India

Dr. Aniruddha kshirsagar
PG Final Year, Department of
Orthopaedics, Dr. D.Y. Patil
Medical College, Pimpri, Pune,
Maharashtra, India

Dr. Kartikeya sharma
PG Final Year, Department of
Orthopaedics, Dr. D.Y. Patil
Medical College, Pimpri, Pune,
Maharashtra, India

Comparative study between dynamic hip screw & proximal femoral nail in treatment of intertrochanteric fracture

Dr. Ajit swamy, Dr. Amit Swamy, Dr. Aniruddha kshirsagar and Dr. Kartikeya sharma

DOI: <http://dx.doi.org/10.22271/ortho.2017.v3.i3i.100>

Abstract

Intertrochanteric fractures are those occurring in the region extending from the extra capsular basilar neck region to the region along the lesser trochanter. Due to an increasing life span and sedentary lifestyle the incidence of these fractures is on the rise. Also the geriatric age group has a higher incidence of osteoporosis, with low energy falls from standing height accounting for approximately 90% of the community hip fractures in patients more than 50 years of age, with a higher proportion in women. In intertrochanteric fracture, two types of implants are use for fixation. Extramedullary devices, example: Dynamic Hip Screw (DHS), Intramedullary devices, example: Proximal Femoral Nail (PFN).

Keywords: intertrochanteric fracture, Dynamic Hip Screw, Proximal Femoral Nail, Harris hip score, extramedullary device, intramedullary device

Introduction

This study was done to evaluate result of dynamic hip screw & proximal femoral nail in intertrochanteric fracture with regards to: Type of intertrochanteric fracture (stable or unstable), Functional outcome using harris hip score, Surgical method selected, Operative risks.

Intertrochanteric fractures are those occurring in the region extending from the extra capsular basilar neck region to the region along the lesser trochanter. Due to an increasing life span and sedentary lifestyle the incidence of these fractures is on the rise. Also the geriatric age group has a higher incidence of osteoporosis, with low energy falls from standing height accounting for approximately 90% of the community hip fractures in patients more than 50 years of age, with a higher proportion in women. Higher velocity traumatic intertrochanteric fractures are relatively rare and are more common in men less than 40 years of age^[1].

Cummings *et al*^[2]. noted that neither age related osteoporosis, nor the increasing incidence of falls with age sufficiently explains the exponential increase in the incidence of hip fracture with aging. Their hypothesis was that four conditions correlated for a fall to cause a hip fracture.

The faller must be oriented to impact near the hip.

b) Protective responses must fail.

c) Local soft tissues must absorb less energy than necessary to prevent fracture.

d) The residual energy of fall applied to the proximal femur must exceed its strength

This concept applies primarily to strategies to prevent hip fractures. Fall with rotational component is more common with extra capsular hip fractures^[3].

Intertrochanteric fractures can be managed by 1. conservative methods 2. operative methods.

Conservative methods: Were the treatment of choice until 1960 when Horowitz documented that the mortality rates in conservative methods were higher as compared to operative methods^[4].

Operative methods: Rigid internal fixation and early mobilization has been the standard

Correspondence

Dr. Amit Swamy
Prof, Department of
Orthopaedics, Dr. D.Y. Patil
Medical College, Pimpri, Pune,
Maharashtra, India

method of treatment.

Implants for the fixation of intertrochanteric fractures can broadly be divided into

A. Extramedullary devices, example: D.H.S

B. Intramedullary devices, example: P.F.N

D.H.S (Dynamic Hip Screw) with side plate assembly is most commonly used device for fixation of intertrochanteric fractures. It is a fixation device which permits the proximal fragment to collapse or settle on the fixation device seeking its own position of stability.

The latest implant for management of intertrochanteric fracture is the P.F.N (Proximal Femoral Nail). This implant is a cephalomedullary device and has many potential advantages⁵ like

1. Being intramedullary, load transfer is more efficient.
2. Shorter lever arm results in less transfer of the stress and less implant failures.
3. Advantage of controlled impaction is maintained.
4. Sliding is limited by intramedullary location, so less shortening and deformity.
5. Shorter operative time, less soft tissue dissection and less blood loss.

Materials and Methods

This was a prospective randomised study from July 2014 to July 2016 for management of intertrochanteric fracture treated by dynamic hip screw & proximal femur nail.

Sample size-60 cases

• Inclusion criteria: recent traumatic history.

- Isolated intertrochanteric fractures.
- Stable and unstable fractures.
- The patients willing to give consent to participate in the study.

• Exclusion criteria: patients with pathologic fractures.

- patients with old neglected fractures.
- fractures in paediatric age group.
- fractures in elderly patient with high medical risk for anesthesia and surgery.
- reverse intertrochanteric fractures.

Operative Procedure: Spinal anaesthesia given. Supine position given on fracture table. After which a closed reduction was then carried out by applying traction on the extremity & internal fixation done by dynamic hip screw or proximal femoral nail.

Physiotherapy: Static exercise in bed for glutei, hamstrings, quadriceps and breathing exercises were started next day of surgery. Sitting was allowed on next day of surgery with passive exercises in bed. Drain if inserted was removed after 48 hours. ROM exercises were started actively. The protocol for weight bearing was, in stable fractures partial weight bearing was started next day after surgery and full weight bearing was started after 6 weeks, while in unstable fractures non-weight bearing walking was allowed on operated side with the help of a walker or crutches next day after surgery, partial weight bearing after 6 weeks and full weight bearing was started after 3 months approximately.

Follow up: Follow up was done at 2, 4, 6 weeks, 3 months, 6 months, and 1 year after the surgery. The patients were assessed functionally on the basis of Harris Hip Score and

radiologically in the form of anteroposterior and lateral X-rays of the operated hip.

Results

Study was performed on 60 patients out of which 30 were treated by dynamic hip screw and 30 were treated by proximal femur nail. In study it was seen that dynamic hip screw & proximal femur nail by age, type of fracture, surgical time, blood loss, complications, harris hip score, pain & gait at 1 year.

Following are the observations of the study:

Table 1: Age wise distribution of cases in DHS and PFN group

Age (Yrs.)	DHS group	PFN group	Total
≤40	10	7	17
41 – 60	17	16	33
>60	3	7	10
Total	30	30	60

Chi-square = 2.16, P=0.34

The above table shows age wise distribution of the cases in the study group. Among 30 cases in DHS group 17 cases are in the age group 41 to 60 yrs. Among the PFN group 16 cases are in the age group 41 to 60 yrs. 10 cases were in the age group ≤40 yrs in DHS group and 7 cases are in the group >60 yrs among PFN group. To test whether this difference is statistically significant or not Chi-square test was applied as test of significance. Chi square value worked out to be 2.16 which was statistically not significant. (P<0.05)

Table 2: Type of fracture wise distribution of cases in DHS and PFN group

Type of fracture	DHS group	PFN group	Total
Type I	7	6	13
Type II	9	9	18
Type III	7	9	16
Type IV	7	6	13
Total	30	30	60

Chi-square = 0.40, P=0.94

The above table shows type of fracture wise distribution of the cases in the study group. Among 30 cases in DHS group 7 cases had type I, III and IV fracture respectively. 9 cases had type II fracture. Among the PFN group 9 cases had type II and III fracture respectively and 6 cases and type I and IV fracture respectively. To test whether this difference is statistically significant or not Chi-square test was applied as test of significance. Chi square value worked out to be 0.40 which was statistically not significant. (P<0.05) Kyle Gustilo classification was used.

Table 3: Comparison of surgical time in DHS and PFN group

Parameter	DHS group (n=30)		PFN group (n=30)		Z Value	P Value
	Mean	SD	Mean	SD		
Surgical time (min)	84.00	28.630	59.50	19.624	3.87	<0.0001

The above table shows comparison of surgical time in DHS and PFN group in the study. Mean surgical time among DHS group is 84 min (S.D.± 28.63) and 59.50 min (S.D.±19.62) in PFN group. The mean difference in the surgical time is analyzed using Z test and Z value is 3.87 which is statistically significant. (p<0.0001)

Table 4: Comparison of blood loss in DHS and PFN group

Parameter	DHS group (n=30)		PFN group (n=30)		Z Value	P Value
	Mean	SD	Mean	SD		
Blood loss (ml)	252.33	122.212	81.67	63.196	6.79	<0.0001

The above table shows comparison of blood loss in DHS and PFN group in the study. Mean blood loss among DHS group is 252.33 ml (S.D.± 122.212) and 81.67 ml (S.D.±63.19) in

PFN group. The mean difference in the blood loss is analyzed using Z test and Z value is 6.79 which is statistically significant. (p<0.0001)

Table 5: Complication wise distribution of cases in DHS and PFN group

Complication	DHS group (n=30)	PFN group (n=30)	Z Value	P Value
Bed sore	2 (6.67)	0	1.46	>0.05
Deep infection	1 (3.33)	0	1.02	>0.05
Non-Union	0	1 (3.33)	1.02	>0.05
Shortening	2 (6.67)	0	1.46	>0.05
Superficial infection	1 (3.33)	0	1.02	>0.05

The above table shows complication wise distribution in DHS and PFN group in the study. Bedsore was seen in 2 cases in DHS group, Deep infection in one case, shortening in 2 cases and one case with superficial infection in DHS group. only one case in PFN group had non-union as complication. The difference in the complication between group analyzed using Z test and Z value is 1.46, 1.02, 1.02, 1.46 and 1.02 for bedsore, deep infection, nonunion, shortening and superficial infection respectively which is statistically not significant. (p>0.05)

moderate pain and 3 cases in PFN group had moderate pain. No pain in 14 and 16 cases in DHS and PFN group respectively. To test whether this difference is statistically significant or not Chi-square test was applied as test of significance. Chi square value worked out to be 1.93 which was statistically not significant. (P>0.05)

Table 6: Post-operative pain at one year in DHS and PFN group

Pain	DHS group	PFN group	Total
Mild	9	11	20
Moderate	7	3	10
No	14	16	30
Total	30	30	60

Chi-square = 1.93, P=0.38

The above table shows postoperative pain at one year in DHS and PFN group in the study. Mild pain was seen in 9 cases in DHS and 11 cases in PFN group. 7 cases in DHS group had

Table 7: Post-operative GAIT at one year in DHS and PFN group

GAIT	DHS group	PFN group	Total
Walker	6	3	9
Stick	3	4	7
LIMP	4	7	11
Normal	17	16	33
Total	30	30	60

The above table shows postoperative GAIT at one year in DHS and PFN group in the study. Among 9 cases with walker 6 are in DHS group and 3 in PFN group. Among 7 cases with stick 3 are in DHS and 4 are in PFN group. Among 11 cases with Limp 4 are in DHS and 7 are in PFN group. Among 33 cases normal 17 are in DHS and 16 are in PFN group.

Table 8: Comparison of HARRIS HIP score in DHS and PFN group

HARRIS HIP score	DHS group			PFN group			MW test Z Value	P Value
	N	Mean	SD	N	Mean	SD		
At 2wks	30	49.30	16.682	30	57.03	13.200	2.10	0.036
At 4wks	30	57.03	15.747	29	61.55	13.879	1.47	0.14
At 6wks	28	68.79	12.081	28	71.43	10.426	0.88	0.38
At 3mths	26*	75.73	10.483	27*	78.04	9.753	0.91	0.36
At 6mths	26*	79.12	10.258	27*	80.96	8.860	0.80	0.42
At 1yrs	26*	81.00	9.814	27*	83.89	7.06	0.98	0.33

*1case death and rest cases loss to follow up

The above table shows comparison of HARRIS score in DHS and PFN group in the study. At 2 weeks mean Harris score was 49.30 in DHS group and 57.03 in PFN group. At 4 weeks mean Harris score was 57.03 in DHS group and 61.55 in PFN group. At 6 weeks mean Harris score was 68.79 in DHS group and 71.49 in PFN group. At 3 months mean Harris score was 75.73 in DHS group and 78.04 in PFN group. At 6 months mean Harris score was 79.12 in DHS group and 80.96 in PFN group. At one year mean Harris score was 81 in DHS group and 83.89 in PFN group this means PFN group had better HARRIS score than DHS group but not statistical significant at 4 wks to 1yrs. To analyzed this mean difference for significance Z test was applied and Z value was 2.10 for HARRIS score in 2 weeks which was statistically significant,

rest of the score are not significant.

Table 9: Outcome wise distribution of cases in DHS and PFN group

Outcome	DHS group	PFN group	Total
Excellent	7	8	15
Good	8	9	17
Fair	8	9	17
Poor	3	1	4
Total	26*	27*	53

*1case death and rest cases loss to follow up

Chi-square = 0.15, P=0.70 (By combining Excellent, Good Vs Fair, Poor)

The above table shows outcome wise distribution of cases in

DHS and PFN group. Among 15 cases with excellent outcome 7 are in DHS and 8 in PFN group. Among 17 cases with good outcome 8 are in DHS and 9 are in PFN group. Among 17 cases with Fair outcome 8 are in DHS group and 9 are in PFN group. Among 4 cases with poor outcome 3 are in DHS group and one in PFN group this means PFN group had

better outcome than DHS group but not statistical significant. To test whether this difference is statistically significant or not Chi-square test was applied as test of significance. Chi square value worked out to be 0.15 which was statistically not significant. ($P > 0.05$)



INSTRUMENTS FOR THE D.H.S

- | | |
|--------------------|--------------------|
| 1: Triple Reamer | 2: Guide Wire |
| 3: Drill Bit | 4: Cortical Screws |
| 5: T Handle | 6: D.H.S. Implant |
| 7: Screw Insertor | 8: Angle Guide |
| 9: Triple Reamer | 11: Tap |
| 12: Plate Impactor | |

D.H.S SURGICAL STEPS



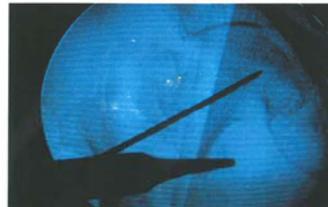
OPERATIVE SITE PREPARED



INCSION DEEPENED TILL BONE



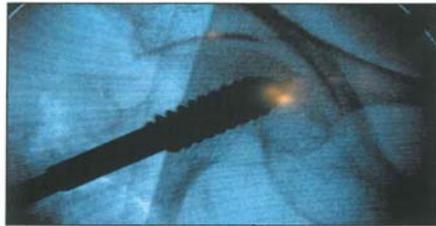
LATERAL CORTEX DRILLED



GUIDE WIRE PASSED



REAMING DONE WITH TRIPLE REAMER OVER A WIRE



POSITION OF SCREW CONFIRMED IN BOTH VIEWS



NUT TIGHTENED OVER PLATE

**PLATE ATTACHED TO THE
SHAFT WITH SCREWS**



**FINAL REDUCTION
CONFIRMED**

CLOSURE



INSTRUMENTS FOR THE P.F.N

- | | |
|--------------------------|---------------------------|
| 1: Awl | 2: Screw Driver |
| 3: Reamer | 4: Drill & Tap |
| 5: Trocar & Sleeve | 6: Screw Driver |
| 7: Conical Bolt | 8: Depth Gauze |
| 9: Jigg | 10: Conical Bolt Tightner |
| 11: Guide Wire for Screw | 12: Tommy Bar |
| 13: Extraction Rod | 14: T Handle |
| 15: Guide Wire | |

P.F.N SURGICAL STEPS



SKIN INCISION TAKEN



ENTRY POINT CONFIRMED



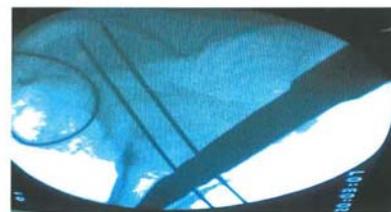
NAIL WITH AIMING DEVICE INSERTED



GUIDE WIRE FOR NECK SCREW INSERTED



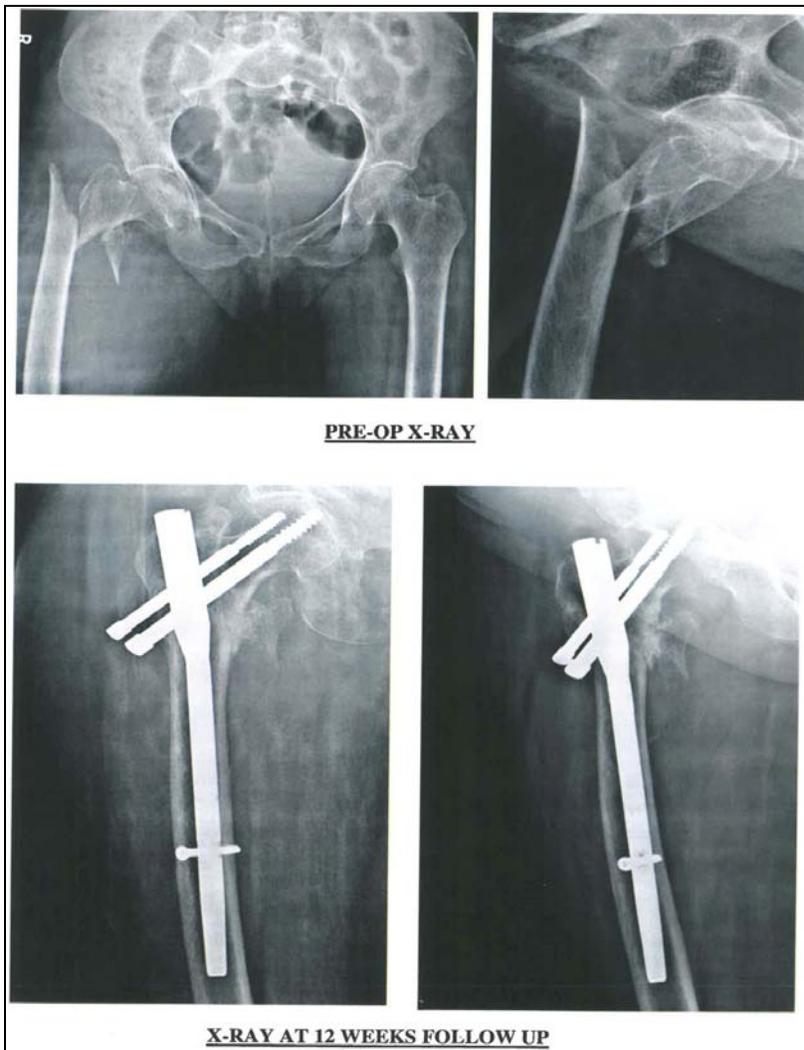
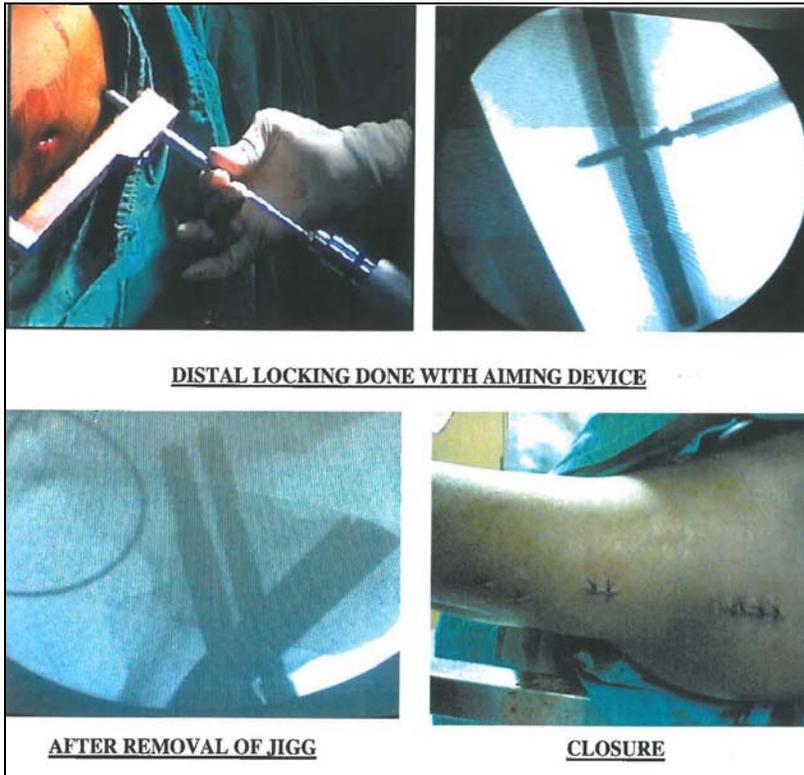
AIMING SLEEVE FOR HIP SCREW POSITIONED



AFTER DRILLING APPROPRIATE SCREWS INSERTED



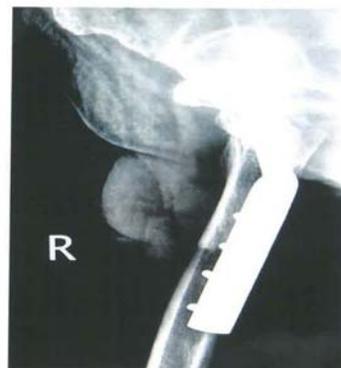
POSITION OF BOTH LOCKING SCREWS CONFIRMED IN BOTH VIEWS



POST OPERATIVE FUNCTION AT 3 MONTHS (P.F.N.)



PRE-OP X-RAY



POST OP. X-RAYS AT 12 WEEKS FOLLOW UP



Discussion

- Age was not significantly associated with the cases in dynamic hip screw & proximal femoral nail group in the study. Mean age was 47 years in DHS group and mean age was 49.73 years among PFN group. Majority of the cases with intertrochanteric fractures were in the age group 41 to 60 yrs. 10 cases were among more than 60 yr age group and 17 cases were in age group ≤ 40 yrs. (Table no.1)
Ranjeetesh Kumar, R.N. Singh and B.N. Singh (2012)⁶ compared the outcome of 50 cases with intertrochanteric fractures treated with Dynamic Hip Screw and Proximal Femoral nail. The average age of the patient was 62.3 years which did not resemble with our study finding as mean age in present study is 49 yrs. Similar finding was observed in a study conducted by Cyril Jonnes, MS; Shishir SM, MS; Syed Najimudeen, MS (2015)⁷ compared the functional and radiological outcome of PFN with DHS in treatment of Type II intertrochanteric fractures. 30 alternative cases of type II intertrochanteric fractures of hip were operated using PFN or DHS were studied. Average of fracture recorded was around 60 yrs. In present study age of fracture was from 41 to 60yrs. Type of fracture was not significantly associated with DHS and PFN group. Type II fracture was more among 60 cases (18 cases) followed by type III (16 cases). 13 cases had type I and IV fracture respectively. (Table no 2)
- Stable fracture were more among the study group in both DHS and PFN group. Type of fracture was not significant among the DHS and PFN group in the study. (Table no.2)
- Mean surgical time was significantly less among PFN group as compared to DHS group in the present study. Mean time was 84 min in DHS and 59.50 min in PFN group. (Table no 3) Similar finding was seen in a study conducted by Ranjeetesh Kumar, R.N. Singh and B.N. Singh (2012)⁶ compared the outcome of 50 cases with

intertrochanteric fractures treated with Dynamic Hip Screw and Proximal Femoral nail. The average operating time for the patients treated with PFN was 55 min as compared to 87 min in patients treated with DHS. Zhao C *et al* (2009)⁸ discussed characters of proximal femoral nail and dynamic hip screw for treating type A1, A2, A3 of after reviewing 104 cases with intertrochanteric fractures. Average operating time in DHS group was 68.8 min and in PFN group 51.5 min which resembled with our study finding.

- Mean blood loss was significantly less among PFN group as compared to DHS group in the study. Mean blood loss was 252 ml in DHS and 81.67 ml in PFN group. (Table no 4) Similar finding was seen in a study conducted by Ranjeetesh Kumar, R.N. Singh and B.N. Singh (2012)⁶ compared the outcome of 50 cases with intertrochanteric fractures treated with Dynamic Hip Screw and Proximal Femoral nail. The average blood loss was 100 and 250 ml in PFN and DHS group respectively. Similar finding was observed in a study conducted by Chaitanya.m *et al* (2015)⁹ who compared the results of Intertrochanteric fractures by DHS over PFN. 60 patients of Intertrochanteric fractures, 30 were treated with sliding hip screw with plate and 30 were treated by an intra-medullary hip screw. Mean blood loss in PFN group was 96 ml and in DHS group mean blood loss was 233 ml.
- Non-union was the only complication among PFN group. Bedsore, deep infection, shortening and superficial infection were other complication among DHS group. Complication were not significantly seen among the groups in the study (Table no 5) similar finding was observed in a study conducted by Chaitanya.m *et al* (2015)⁹ who compared the results of Intertrochanteric fractures by DHS over Proximal Femoral Nailing. 60 patients of Intertrochanteric fractures, 30 were treated with sliding hip screw with plate and 30 were treated by an intra-medullary hip screw. Complication among DHS

group were Infection and non-union and in PFN group complication were related to implants and medical related complications.

- Postoperative Pain at one year was not significantly associated among the both groups in the study. Moderate pain was seen in 10 cases and mild pain was seen in 20 cases in the study. 11 cases had mild pain and 3 cases had moderate pain in PFN and 9 and 7 cases had mild and moderate pain in DHS group respectively. (Table no 6)
- Postoperative gait at one year showed walker needed for 9 cases, 7 cases had Stick and 11 cases had Limp. Stick and Limp was more among PFN group and walker was need in DHS group more as compared to PFN group. (Table no 7)
- Harris Hip score was significantly more among PFN group as compared to DHS group in the study at 2 weeks period. PFN group had better HARRIS HIP SCORE than DHS group but not statistical significant at 4 wks to 1yrs. (Table no 8) Similar finding was seen in a study conducted by Ranjeetesh Kumar, R.N. Singh and B.N. Singh (2012)⁶ compared the outcome of 50 cases with intertrochanteric fractures treated with Dynamic Hip Screw and Proximal Femoral nail. Result showed that the patients treated with PFN started early ambulation as they had better Harris Hip Score in the early period (at 1 and 3 month) similar finding was observed in a study conducted by Chaitanya.m *et al* (2015)⁹ who compared the results of Intertrochanteric fractures by DHS over Proximal Femoral Nailing. 60 patients of Intertrochanteric fractures, 30 were treated with sliding hip screw with plate and 30 were treated by an intra medullary hip screw. Harris hip score did not show any significant change in both the group from one month to 1 year period. Harris hip scores of D.H.S and P.F.N for 6 months and 1year follow up were same (94.2 for D.H.S, 94.6 for P.F.N).
- Outcome wise distribution in the study group showed that 15 cases had excellent outcome with 7 in DHS and 8 in PFN group, 17 cases had good and fair outcome respectively with 8 in DHS and 9 in PFN group. 4 cases had poor outcome with 3 in DHS and 1 in PFN group this means PFN group had better outcome than DHS group but not statistical significant. (Table no 9) Similar finding was observed in a study conducted by S.K. Venkatesh Gupta, Veera Shekar Valiseti (2015)¹⁰ compared the clinical and radio graphical results of the DHS and PFN for the treatment of Intertrochanteric hip fracture. Results showed significantly better outcomes in PFN group for unstable intertrochanteric fractures and in unstable fractures reduction loss is significantly lower in PFN group.

Conclusion

- Mean surgical time and blood loss was significantly less with proximal femoral nailing as compared to dynamic hip screw procedure.
- Outcome after proximal femoral nailing was excellent as compared to dynamic hip screw for femur intertrochanteric fracture.
- In Proximal femur nailing early post-operative rehabilitation of the patients.
- Harris hip score was better for first 2 week among proximal femur nailing procedure as compared to dynamic hip screw. That means Proximal femur nailing gives better functional outcome than Dynamic hip screw.

- Proximal femur nailing is a close, quick, and less traumatic procedure and is biomechanically better implant.
- Proximal femoral nailing was better procedure as compared to dynamic hip screw for intertrochanteric fracture.

References

1. Hwang LC, Lo WH, Chen WM, *et al*. Intertrochanteric fractures in adults younger than 40 years of age, Archives of Orthopaedic and Trauma Surgery. 2001; 121(3):123-126.
2. Cummings SR, Nevitt MC. A hypothesis: The causes of hip fractures, Journal of Gerontology. 1989; 44(4):107-111.
3. Hopkinson-Woolley JA, Parker MJ. fractures of the hip: Does the type of fall really affect the site of fracture? Injury. 1998; 29(8):585-587.
4. Horowitz BG. Retrospective analysis of hip fracture, Journal of Gynecology and Obstetrics Surgery. 1996; 123:565.
5. Tencer AF, Johnson KD. Biomechanics in orthopedic trauma: Bone fracture and fixation, Current Orthopaedics. 1996; 10(3):208.
6. Ranjeetesh Kumar, Singh RN, Singh BN. Comparative prospective study of proximal femoral nail and dynamic hip screw in treatment of intertrochanteric fracture femur. Journal of clinical orthopaedics and trauma. 2012; 3(1):28-36
7. Cyril Jonnes MS, Shishir SM, Syed Najimudeen MS, Type II Intertrochanteric Fractures MS. Proximal Femoral Nailing (PFN) Versus Dynamic Hip Screw (DHS). Arch Bone Jt Surg. 2016; 4(1):23-28.
8. Zhao C, *et al*. Comparison of proximal femoral nail and dynamic hip screw for treating intertrochanteric fractures. Zhongguo Gu Shang. 2009; 22(7):535-7
9. Chaitanya m, *et al*. Comparison of Dynamic Hip Screw and Plate with Proximal Femoral Nail in Trochanteric Fractures of Femur. Journal of Dental and Medical Sciences. 2015; 14(4):73-82.
10. Venkatesh Gupta SK, Veera Shekar Valiseti. Comparative study between dynamic hip screw vs proximal femoral nailing in inter-trochanteric fractures of the femur in adults. International Journal of Orthopaedics Sciences. 2015; 1(1):7-11