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A Comparative Study of the Functional Outcome of Intertrochanteric Fractures of Femur Surgically Treated With Dynamic Hip Screw (DHS) Versus Proximal Femoral Nailing (PFN)

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Abstract:
Background: *The incidence of intertrochanteric fractures is gender and race dependent and varies from country to country. Ninety percent[3] of intertrochanteric fractures in the elderly result from a simple fall and Intertrochanteric fractures in younger individuals are usually the result of a high-energy injury. Intertrochanteric fractures can be managed by conservative or operative methods. Conservative methods[4] are now indicated under 2 conditions,(i) Older person with high medical risk for anaesthesia and surgery. (ii) Non-ambulatory patient with minimal discomfort following injury. Rigid internal fixation and early mobilization have been the standard methods of treatment recently. The latest implant[9] for management of an intertrochanteric fracture is Proximal Femoral Nail[7].*
Materials and Methods*: The present study has been conducted at Government General Hospital -- Siddhartha Medical College, Vijayawada during the period between December 2017 and June 2019. Sixty patients between 18-75 years with intertrochanteric fractures were selected for the present study to compare the functional outcome of the surgical treatment with a proximal femoral nail and dynamic hip screw device, with respect to fluoroscopic time, duration of surgery, blood loss, fracture union and functional outcome.*
Results*: The functional outcome was assessed based on Harris Hip score[13]. Results showed most of them were between 51-75 years and males (66.6%) more affected than females. Nature of violence mostly being slip and fall, right side being more affected and associated with distal radius fractures(16.66%)and Boyd and Griffin[14] classification. Type1 fractures (50%)most commonly involved fracture pattern. Radiation exposure was more for PFN while blood loss was more for DHS. Intraoperative complications for DHS surgery were improper positioning of Richard screw(26.66%), and Varus angulation (16.66%) while for PFN, it was failure to achieve closed reduction(16.66%). Delayed complications like Hip stiffness, knee stiffness, shortening>1cm, varus malunion were seen mostly in DHS compared to PFN. The meantime for full weight-bearing in DHS was about 16 weeks, and for PFN about 12 weeks. Functional results like mobility 6weeks postoperatively, mean range of hip and knee movements were excellent in PFN (86.66%)when compared to DHS(70%).*
Conclusion: *Hence, we concluded that PFN is a better option for treating intertrochanteric femur fractures than DHS as PFN requires shorter operative time, smaller incision, less blood loss during surgery, lesser intraoperative and postoperative complications. Hence our study concluded PFN may be the better fixation device for most of the intertrochanteric fractures of the femur.*
Key Word*: intertrochanteric femur fracture, proximal femoral nail, dynamic hip screw, comparison of functional outcome*

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I. Introduction:

Intertrochanteric and peritrochanteric are generic[1] terms for pertrochanteric fractures. An injury creates a spectrum of fractures in this proximal metaphyseal region of the bone, with damage to the mechanically optimized placement of intersecting cancellous compression and tensile lamellae networks and the weak

cortical bone with resulting displacement from the respective attachment of muscle groups to the fracture fragments and adjacent high mobility joint. These structures are subject biomechanical stresses[2] after surgical repair. This region of the femur shares many common biomechanical properties with other short end-segment metaphyseal-diaphyseal fractures concerning the difficulty in obtaining stable fixation. The incidence of intertrochanteric fractures is gender and race dependent and varies from country to country. Ninety percent[3] of intertrochanteric fractures in the elderly result from a simple fall and Intertrochanteric fractures in younger individuals are usually the result of a high-energy injury.

Intertrochanteric fractures can be managed by conservative or operative methods. Rigid internal fixation and early mobilization have been the standard methods of treatment. . Implants[5] for the fixation of intertrochanteric fractures can be broadly divided into 1. Extra medullary devices, ex:-. Dynamic Hip Screw[6] 2. Intramedullary devices ex:- Proximal Femoral Nail[7]. Dynamic Hip Screw[6] with side plate assembly is the most commonly used device for fixation of intertrochanteric fractures. It is a collapsible[8] fixation device, which permits the proximal fragment to collapse or settle on the fixation device seeking its own position of stability. The latest implant[9] for management of an intertrochanteric fracture is Proximal Femoral Nail[7]. This implant is a cephalo-medullary device and has many potential advantages like

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

Because of these conditions, this study is taken up to compare the results of Dynamic Hip Screw[6] and Proximal Femoral Nail[7] in the management of intertrochanteric fractures. Now a controversy has arisen about the ideal implant for fixation of intertrochanteric fractures, i.e. Dynamic Hip Screw[6] or Proximal Femoral Nail[7]. Hence, aim of our study was to compare the functional outcome of the surgical treatment of intertrochanteric fractures of the femur with a proximal femoral nail and dynamic hip screw device, with respect to

- Fluoroscopic time
- Duration of surgery
- Blood loss
- Fracture union
- Functional outcome

II. Materials And Methods:

Study design: Prospective randomised controlled study
Study location: Government General Hospital -- Siddhartha Medical College, Vijayawada
Study duration: December 2017 and June 2019
Sample size: 60
Inclusion criteria:
1.Patients above 18years of age and less than 75years of age
2. All closed stable and unstable intertrochanteric fractures.
Exclusion criteria:
1.Patients with pathological fractures
2. Patients with active infection
3. Unstable medical illnesses
4. Fractures in children
5. Open fractures

Procedure methodology: All the patients with intertrochanteric fractures of femur who were admitted to Government General Hospital -- Siddhartha Medical College, Vijayawada were assessed clinically and were haemo dynamically stabilized. Radiographs of the pelvis with both hips (anteroposterior view) and full femur (anteroposterior view and lateral view) were taken for all the admitted patients. Skin traction was applied to the fractured limb and immobilized till surgery. Basic surgical profile was done, and anaesthesia fitness was obtained for all selected patients. Surgery was done over a fracture table in supine position under image intensifier(C-ARM) control. Drains were removed after 48 hours. Patients were assessed clinically and radiologically on the 2nd post-operative day. Gentle mobilization of the operated limb, change of position and physiotherapy (quadriceps strengthening exercises, hip and knee bending exercises) were taught. Suture removal was done on 12th post- operative day and discharged. The patient was called after six weeks, three

months, 6 months and finally after one year. Patients were assessed for recovery and relief using Harris Hip Score[13].

Statistical analysis The collective data analysed by the Z-test, Student t-test, Chi-square test (F^2), Wilcoxon signed rank sum test and the Mann Whitney U test using SPSS software to evaluate the results.

III. Results

The present study consists of 60 patients with intertrochanteric fractures treated with a proximal femoral nail and a dynamic hip screw, and their functional outcome was assessed.

AGE DISTRIBUTION: In this study, most commonly affected age group is 51-75 years (60%). The average age in this series was 60 years.

TABLE 1: Age distribution --- Total Cases: 60

DISTRIBUTION	CASES	PERCENTAGE
18-30 YEARS	04	6.66%
31-50 YEARS	20	33.3%
51-75 YEARS	36	60%

SEX DISTRIBUTION: In this study, 40 males (66.6%) and 20 females (33.3%) are there out of a total of 60 patients. The male: female ratio is approximately 2:1.

TABLE 2 : Sex distribution

Sex	No.of cases	Percentage
Male	40	66.6%
Female	20	33.3%
Total	60	100

NATURE OF VIOLENCE: In this study 36 patients (60%) had a slip and fall, 20 patients (33.3%) sustained road traffic accident and 4 patients had a fall from height Slip and fall –36 , Fall from height – 04, RTA- 20

TABLE 3: Nature of violence

Nature of violence	No. of patients	Percentage
Slip and fall	36	60%
Fall from height	04	6.66%
RTA	20	33.3%

SIDE AFFECTED:

In this study, 42 patients had right-sided (70%) intertrochanteric fracture and 18 patients had left-sided (30%) intertrochanteric fracture. Most of the patients involved are on the right side

TABLE 4: Side affected

Side	No. of cases	Percentage
Right	42	70%
Left	18	30%

ASSOCIATED INJURIES

In this study, most of the associated injuries were distal radius fractures (16.66%), and next were spinal injuries (10%), and the least associated injuries were head injuries (6.66%)

TABLE 5: Associated Injuries

	NO OF CASES	PERCENTAGE
HEAD INJURIES	4	6.66%
SPINE INJURIES	6	10%
DISTAL RADIUS FRACTURES	10	16.66%

TYPE OF FRACTURE

In this study, out of a total of 60 intertrochanteric fracture according to Boyd and Griffin classification[14], 30 cases (50%) type 1, 16 cases (26.6%) were type 2, and 14 cases were of type 3.

Trochanteric fractures are classified according to BOYD AND GRIFFIN CLASSIFICATION[14].

TABLE 6: Type of fractures

Type of fracture	No .of cases	Percentage
Type 1	30	50%
Type 2	16	26.6%
Type 3	14	23.3%
Type 4	--	--
Total	60	100%

INTRAOPERATIVE DETAILS

In this present study, the mean radiographic exposure for proximal femoral nail was 60, and for DHS, it was 40. The mean duration for operation for proximal femoral nail 80 minutes and dynamic hip screw it was 100 minutes. The mean blood loss for proximal femoral nail 220ml and dynamic hip screw it was 350 ml, and the mean length of incision was 8cm in proximal femoral nail and 16cm for the dynamic hip screw.

TABLE 7: INTRA-OPERATIVE DETAILS

INTRA-OPERATIVE DETAILS	PFN	DHS	S.D(PFN)	S.D (DHS)	T	p-value
Mean radiographic exposure (no. Of times	**60**	**40**	**6.25**	**2.8**	**15.995**	**> 0.01Not Significant**
Mean duration of operation (in minutes)	**80**	**100**	**3.8**	**1.08**	**27.729**	**< 0.01 Significant**
Mean Blood loss(in milli liters)	**100**	**200**	**26.8**	**25.9**	**22.044**	**< 0.01 Significant**
Mean length of incision (in cm)	**8**	**16**	**2.5**	**2.68**	**11.956**	**< 0.01 Significant**

INTRAOPERATIVE COMPLICATIONS OF DHS

In this present study, the following intraoperative complications were noted. There were 8 cases (33.3%) of improper positioning of Richard screw, 5 cases (20%) of varus angulation, and 1 (6.66%) case of drill bit breakage.

TABLE 8 : INTRAOPERATIVE COMPLICATIONS OF DHS

COMPLICATIONS	NUMBER OF CASES	PERCENTAGE	S.D	T	p-value
Improper positioning of Richard screw	8	33.33%	2.68	65.4318	>0.01 NS
Varus angulation	5	20%	2.01	64.5234	> 0.01 NS
Drill bit breakage	1	6.66%			> 0.01NS

In 5 of 15 cases, there was the improper placement of Richard's screw. The screw was placed superiorly. Drill bit breakage was encountered in one case as the entry point was made posteriorly, and there was difficulty in drilling through the posteriorly placed plate.

Difficulties were encountered in reverse oblique fractures as the fracture site extended to the entry point. The screw had to be inserted more proximally, which resulted in varus angulation. Comparatively DHS fixation was technically easier and had lesser intraoperative complications.

INTRAOPERATIVE COMPLICATIONS OF PFN

In this present study, the following intraoperative complications of the proximal femoral nail were noted. There were 5 cases (16.66%) failure to achieve closed reduction, 3 cases (10%) of fracture of the lateral cortex, 3 cases (10%) of fracture displacement by nail insertion and 1 case (3.33%) of failure to insert derotation screw**.**

TABLE 8 INTRAOPERATIVE COMPLICATIONS OF DHS

COMPLICATIONS	NUMBER OF CASES	PERCENTAGE	S.D	T	p-value
Improper positioning of Richard screw	8	33.33%	2.68	65.4318	>0.01 NS
Varus angulation	5	20%	2.01	64.5234	> 0.01 NS
Drill bit breakage	1	6.66%			> 0.01NS

In 5 of 15 cases, there was the improper placement of Richard's screw. The screw was placed superiorly. Drill bit breakage was encountered in one case as the entry point was made posteriorly, and there was difficulty in drilling through the posteriorly placed plate.

Difficulties were encountered in reverse oblique fractures as the fracture site extended to the entry point. The screw had to be inserted more proximally, which resulted in varus angulation. Comparatively DHS fixation was technically easier and had lesser intraoperative complications.

INTRAOPERATIVE COMPLICATIONS OF PFN

In this present study, the following intraoperative complications of the proximal femoral nail were noted. There were 5 cases (16.66%) failure to achieve closed reduction, 3 cases (10%) of fracture of the lateral cortex, 3 cases (10%) of fracture displacement by nail insertion and 1 case (3.33%) of failure to insert derotation screw.

TABLE 9 : INTRAOPERATIVE COMPLICATIONS OF PFN

COMPLICATIONS	CASES	PERCENTAGE	S.D	T	p-value
Failure to achieve closed reduction	5	16.66%	2.86	32.837	< 0.01 Significant
Fracture of lateral cortex	3	10%	3.62	11.9617	< 0.01 Significant
Fracture displacement by nail insertion	3	10%	2.42	17.8931	< 0.01 Significant
Failure to put derotation screw	1	3.33%			> 0.01 NS

DELAYED COMPLICATIONS

In this present study, the following delayed complications were noted

TABLE 10 DELAYED COMPLICATIONS - PFN & DHS FIXATION

Complications	PFN(30 Cases)	DHS(30 Cases)	f	p-value
Hip stiffness	1	2		
Knee Stiffness	1	3		
Non union	1	2		
Shortening of > 1 cm	1	3		
Varus malunion	1	3		
Implant failure	2	4		<0.01

			22.72727	Significant

ASSESSMENT OF RESULTS

In this present study, there were 19 cases (66.33%) who were independent, 8 cases (26.66%) who required aid and 3 cases (3%) were non-ambulatory. The mean time for full weight-bearing in weeks was 12 weeks for proximal femoral nails, 16 weeks for the dynamic hip screw. There were 13 cases (43.33%) who were independent, 10 cases (33.33%) required aid and seven cases were non-ambulatory for the dynamic hip screw.

Table 11 ASSESSMENT OF RESULTS POST OPERATIVE MOBILITY AND FULL WEIGHT BEARING

	P.F.N	D.H.S	f	P value
Mean time for full weight bearing(in weeks)	12	16	7.591	<0.05 Significant
Mobility after surgery(6 weeks post operatively)	0	0		
Independent	19	13		
Aided	8	10		
Non – ambulatory	3	7		

POST OPERATIVE PAIN:

Pain Score	Method of Fixation		Total (%)	Chi	P-value
	DHS(%)	PFN (%)			
1	5(16.66%)	14(46.66%)	19(31.66%)	15.6969	<0.01 Significant
2	8(26.66%)	14(46.66%)	22(36.66%)		
3	12(40%)	2(6.66%)	14(23.33%)		
4	5(16.66%)	0.00	5(8.33%)		
Total	30(100%)	30(100%)	60(100%)		

Table No: 12 POST OPERATIVE PAIN

1- **No Pain**
2- **Mild pain not affecting ambulation**
3- **Moderate pain affecting ambulation requiring regular analgesics**
4- **Severe pain, even at rest, requiring stronger analgesics.**

MEAN RANGE OF MOVEMENTS (6 WEEKS POST OPERATIVELY)

In this present study, 26 cases (86.66%) had mean range of movements of hip joint 0-110^0, 28 cases 93.33%) had mean range of movements of knee joint 0-120^0 in proximal femoral nail cases, about 26 cases (86.66%) had mean range of movements of knee joints, 21 cases (70%) had a mean range of movements of hip joint in the dynamic hip screw cases, and 9 cases (30%) were unable to move hip joint and 4 cases (13.33%) were unable to move the knee joints in dynamic hip screw cases.

		HIP JOINT (0-110^0)	**KNEE JOINT (0-120^0)**	**T**	**P-Value**
PFN	**Able to do**	26 (86.66%)	28 (93.33%)	28.3726	<0.01 Significant
	Unable to do	4 (13.33%)	2 (6.66%)		
DHS	**Able to do**	21 (70%)	26 (86.66%)		
	Unable to do	9 (30%)	4 (13.33%)		

Table 13 POST OPERATIVE MEAN RANGE OF MOVEMENTS OF HIP AND KNEE

TIME OF FRACTURE UNION

In this present study, the meantime for fracture union in case of DHS fixation and PFN fixation was 16 weeks and 12 weeks respectively for 30 cases each treated with DHS and PFN fixation

TABLE 14: TIME OF FRACTURE UNION

Method	No.of cases	Meantime (weeks)	S.D	Z	P-VALUE
DHS	30	16 weeks	2.05	9.065	<0.01 Significant
PFN	30	12 weeks	1.28		

ANATOMICAL RESULTS

In this present study 4 cases (13.33%) each had a shortening of > 1cm and restriction of hip movements, 3 cases had a varus deformity and 2 cases (6.66%) had restriction of knee movements in proximal femoral nail and 9 cases (30%) had restriction of hip movements, 7 cases (24.44%) had shortening >1cm, 5 cases (16.66%) had varus deformity, and 4 cases (13.33%) had restriction of knee movements in dynamic hip screw.

TABLE 15: ANATOMICAL RESULTS

	Total Number of cases – 60		f	p-value
Anatomical result	**PFN (30 cases)**	**DHS (30 cases)**		
Shortening >1cm	4 (13.33%)	7 (23.33)		
Varus deformity	3 (10%)	5 (16.66)		
Restriction of hip movement	4 (13.33%)	9 (30%)		
Restriction of knee movement	2 (6.66%)	4 (13.33%)	**36.7466**	**<0.01 Significant**

FUNCTIONAL RESULTS

In this study, interpretation of functional results of proximal femoral nail and dynamic hip screw, 28 cases (86.66%) had excellent functional results, 2 cases (6.66%) had good functional results and 1 case each gad fair and poor functional results and 1 case each had fair and poor functional results in proximal femoral nail and 21 cases (70%) had excellent functional results, 6 cases (20%) had fair functional results, 2 cases (6.66%) had good functional results and 1 case (3.33%) had a poor functional results in dynamic hip screw.

TABLE 16: Interpretation of functional results of PFN and DHS

Functional Results	PFN	DHS	F	P-Value
Excellent	26 (86.66%)	21 (70%)	36.746	< 0.01 Significant
Good	2 (6.66%)	2 (6.66%)		
Fair	1 (3.33%)	6 (20%)		
Poor	1 (3.33%)	1 (3.33%)		

IV. Discussion:

In the last 3-4 decades, treatment of intertrochanteric fractures has changed significantly. A large number of fixation implants have been devised and discarded. The treatment still merits the type of fracture and condition of the patient.

The development of the dynamic hip screw in the 1960s saw a revolution in the management of stable fractures. The device allowed compression of the fracture site without complications of screw cut out and implant breakage associated with a nail plate. However, the extensive surgical dissection, blood loss and surgical time required for this procedure often made it a contraindication in the elderly with comorbidities. The implant also failed to give good results in extremely unstable and the reverse oblique fracture.

In the early 90s, intramedullary devices were developed for fixation of Intertrochanteric fractures. These devices had numerous biomechanical and biological advantages over the conventional dynamic hip screw

Long term studies, however, revealed that the use of these devices was associated with higher intraoperative and late complications, often requiring revision surgery. Cephalomedullary fixation is superior to DHS fixation in unstable and reverse oblique type of trochanteric fractures. This has led to modifications in the device and technique of the intramedullary devices. In stable intertrochanteric fractures, DHS & PFN have the same functional outcome, when compared to unstable intertrochanteric fractures where surgical fixation with PFN has shown better outcome than DHS.

The results of the treatment of intertrochanteric fractures using Proximal Femoral Nail AO type were assessed by HARRIS HIP SCORE[13] system. This system is slightly modified according to the needs of Indian patients. i.e. in place of "put on shoes and socks" I have used "squatting" and in place of "sitting" I have used "cross- legged sitting."

In this study, the age group most affected was between 51-75 years. In **Bakshi S A[15] et al study**, the mean age of the present study population was 58.58 years, and more than 80% of the study population was above the age of 55 years. In **NeikarS et al[16] study**, most of the patients in the present study were age group 6th to 8th decade of life. Mean age in years both groups combined = 72.18. This signifies the fact that patients from these age groups are involved in low energy trauma like domestic fall (fall at home).

In this present study, patients are more males with intertrochanteric fractures compared to females. In **NeikarS et al**[16] study, in the PFN group, 20 were females, and 10 were males; in the DHS group, 15 males and 15 females.

Inani P et al[17] in his study stated that the mean duration of surgery for PFN was 62.6 mins (Range 45-85) and for DHS was 66 mins (Range 50-85). The average amount of blood loss was 410 ml (Range 401-450ml) in cases treated with DHS and 396 ml (Range 401-450ml) in cases with PFN. The present study has blood loss of about 150ml in PFN and about 300ml in DHS. **Sharma A et al[18]** in his study has stated that the mean length of incision was smaller in the PFN group, but radiation exposures were significantly more in PFN group. Duration of surgery was lesser in the PFN group, which was statistically significant. Average blood was significantly more in DHS group with two patients requiring blood transfusion postoperatively as compared to nil in the PFN group.

Gundle et al[19] has noted a positive correlation between sliding length and union. In

the study, he found that fractures fixed with a sliding length (i.e. the distance from the proximal tip of the barrel to the distal thread of the screw) of less than 10 mm had three times higher rate of failure than those with sliding length more than 10 mm. This is particularly true in devices that have a 32 mm threaded screw length with a 32 mm barrel. He thus recommends a short barrel for screws with less than 85 mm screw length.

Name of study	**Number of cases**		**Age**	**Blood loss**		**Time**		**Nonunion**		**Shaft #**	**Infection**	
	IMN	DHS		IMN	DHS	IMN	DHS	IMN	DHS		IMN	DHS
Hardy[95]	50 (Gamma nail)	50	79	144	198	71	57	0	1	2	0	0
Leung[96]	113 (Gamma nail)	113	78	765	115	53	42	1	0	2	1	3
Pajarinen[97]	54 (PFN)	54	79	320	357	55	45	--	--	--	-	--
Little[98]	92 (PFN)	98	83.4	78	160	54	40.3	--	--	--	5	10
Current Series	25 (PFN)	25	62.3	100	250	55	87	0	1	0	0	2

Table 17 Comparison of few published studies using nail for trochanteric fracture with current study[21,22,23,24].

In a randomised, prospective study comparing intramedullary versus extramedullary fixation, **Baumgaertneret al[21]** found no between-group differences in functional recovery rates.

In our study out of 60 cases, 40patients (66.6%) were males, and 20 patients (33.3%) were females. Males are more affected than females. **Kumar et al[22] in his study** males are more affected with IT fractures. In the study done by **Jonnes C et al[23]** in which it was noted that out of the 30 patients, 16 patients (53%) were males and 14 patients (47%), were females

In the current study, the most common mode of injury for Intertrochanteric fractures was slip and fall (70%), followed by road traffic accident (23.3%). Patients with slip and fall mode of injury were older, whereas patients with RTA were younger. The results in the present study were in agreement with an earlier study by **Jonnes Cet al[23]** who reported that trivial trauma (77%) was the most common mode of injury followed by road

traffic accidents (23%) for the intertrochanteric fractures.

Among all 60 cases, right side intertrochanteric fractures were conventional accounting for 70% than the left side (30%). On the contrast, the study done by **Kumar et al[22]** observed more IT fractures on the left side (29 cases) than the right side (21 cases). In our study, type I Boyd and Griffin[61] fractures were common, consisted of 50%. Type II and Type III were 26.6% and 23.3%, respectively. **Suranigiet al[24] conducted a study** in which it was found that the most common type of fracture was type II. There was no Type I pattern of fractures in their study. **Ravi Shankar et al[25]** showed that 60% of the patients had type II fracture.

In the current study, the mean duration of surgery required for PFN was 80 min, and for DHS, it was 100 min. **Faisal M et al[26]** noticed similar observations. This was in contrast with the findings of **Kumar et al[22]**.

In our study, mean blood loss was 220 ml for PFN group and 350 ml for DHS group. This difference in lesser blood loss in PFN procedure was due to less tissue damage. Similar observations were also done by **Suranigi[28] et al** and **Faisal[26] et al.**

In this study, it was observed that mean radiographic exposure was 60 times in PFN group and 40 times in the DHS group. The reason for the less radiation exposure in DHS procedure does not warrant the facility of the need of having an image intensifier. Radiation exposure was only needed in the placement of guide wire and positioning of Richard's screw[11]. Whereas in PFN procedure, more radiation exposure was needed for the insertion of three guide pins, two proximal screws and distal locking screw. **Ravi Shankar[25] et al** found that radiation exposure in PFN group was 40sec and in DHS group it was 30 sec. In our study among the PFN group, 5 cases (16.66%) were found to have a failure to achieve closed reduction, 3(10%) case had a lateral cortex, 3(10%) cases had displacement by nail insertion, and 1cases (3.33%) had failed to put derotation screw. In those cases operated by DHS, 8 cases (26.66%) had improper positioning of Richard screw[11].

There were less delayed complications in the PFN group compared to DHS group in the current study, which was supported by the studies **Faisal[26] et al** and **Bhakat U[27] et al**. DHS treatment involves extensive surgical exposure thereby involves considerable blood loss. Also, complications such as varus collapse, implant cut-out were commonly associated with it. So delayed complications may be more with DHS procedure. PFN procedure involves less surgical incision hence less blood loss. No complications such as Z effect and reverse Z effect[28] were seen.

In our study meantime for full weight-bearing in the DHS group was 16 weeks, whereas it was 12 weeks in PFN group. These findings were similar to the studies of **Pajarinen et al[20], Saarenpa et al[29]** compared functional outcomes with the DHS and Gamma Nail[12] fixation systems in terms of parameters including ability to walk and ability to dress and undress both pre-operatively and four months after surgery. Although there were no between-group differences in the use of walking aids, in the DHS group, 4-month outcomes were significantly better than pre-injury levels compared with the Gamma Nail[12] group.

Regarding functional recovery, **Dujardin FH et al[30]** showed that hip strength andmobility progressed similarly in the first three months after surgery in patients treated with the DHS[6] and in those treated with static nailing. However, significant differences favouring the intramedullary nail group were apparent six months after surgery.

This is consistent with the findings in the present study, where functional recovery was faster in PFN[7]-treated patients in the first six months after surgery. However, the authors found no differences in walking ability or recovery of independence. Again, this is consistent with our findings, even though **Dujardinet al[30]** followed patients for a shorter time (26 weeks) and used different scores.

The finding that functional recovery in the first six months after surgery is significantly poorer after DHS[6] treatment is important because it is widely known that elderly patients require faster recovery. Similar findings have been reported by **Goulidakiset al[31]** and **Calderón et al[32]**. Conversely, **Eschleret al[33]**found that patients treated with an extra-medullary device fared subjectively better. Ultimately, however, both groups had similar functional recovery outcomes and no significant loss of function at 1-year follow-up. The importance of this finding in elderly patients is relative. There were more deaths in the DHS group, although the difference was not significant.

Taken together, these data indicate that despite similar final scores, the most important result is that patients treated with the PFN[7] technique exhibited functional improvement as early as six months after surgery, unlike DHS[6]-treated patients. In practice, this means that PFN[7] treatment is associated with faster improvement in the quality of life than the DHS[6] technique.

Varley GW et al[34] in their study of 177 patients of proximal femoral fracture, in theirsurgeries, kept draining in the wound. They found that those patients in whom drain was kept showed better-wound healing in terms of Asepsis wound scoring system and had a reduced rate of infection.

In the series by **K.D. Harrington[35]** out of 72 cases, there were 4 cases of coxa varaand 56 cases of limb shortening at an average of 1.5 cm. In his series, shortening was noted in unstable fractures in which Dimon

Hughston[10] procedure was done. In the study series by **Rao JP[36],** of the 124 cases of intertrochanteric fractures, 5 cases of unstable fracture had limb shortening.

We found that the mobilisation of patient operated by both PFN[7] and DHS[6] was almost same, but the weight-bearing of patients from the PFN group was earlier. In the series of **PathakSK[37]**(30 patients), the average time of ambulation was 14 days.

Suman SK et al[38] in 2017 found that D.H.S had less surgical time and less blood loss. Faisal[26]et al found that P.F.N. had less intraoperative blood loss. **Singla G et al[39]** found that P.F.N. had less amount of intraoperative blood loss.

In our study, surgical time and blood loss were more significant in D.H.S group. Even though it was minimally invasive, the length of incision was longer in D.H.S group

The main advantages of PFN are that there is only required shorter exposure required than the sliding screw and has a lesser possibility of morbidity and operating time. In our study, the P.F.N group fractures healed fully earlier than D.H.S group for both stable and unstable fractures. The unstable fractures took more than 50% meantime, of stable P.F.N group to unite fully. **Ramanarayananan[40]** in his study stated that there was not much of the difference, with respect to the complications. **NizamoddinKhateeb[41]** found that in the treatment for intertrochanteric fractures the PFN has less operative blood loss, fewer complications, early return to daily activities and less sliding when compared to DHS treatment.

Bakshi SA et al[42] shows that the average duration of surgery for PFN was 54.70minutes which is shorter than average time required for DHS, which is 63.35 minutes. Duration of surgery was shorter in PFN group by a mean of 12.8 min; although the duration of implant fixation was almost similar in both the groups, the time required for wound closure was significantly longer in DHS group probably due to larger incision and extensive dissection as compared to the percutaneous technique of PFN.

Jonnes C[43] et al in his study stated that PFN is better than DHS in Type IIintertrochanteric fractures of the femur in terms of decreased blood loss, reduced duration of surgery, early weight-bearing and mobilization, reduced hospital stay, decreased the risk of infection and other complications. It is just a matter of time that PFN replaces DHS as the gold standard for Type II intertrochanteric fractures. Various studies have been conducted at different places to compare the advantages & disadvantages of these two procedures. The following table shows a few commonly seen advantages and disadvantages of PFN & DHS[44 & 45].

S.No.	Details	PFN	DHS
1	Duration of Surgery	55 – 58 min.	90 – 120 min.
2	Average Blood Loss in Surgery	100 – 115 ml	200 – 215 ml
3	Soft Tissue Dissection	Minimal	Significant
4	Shortening of the Extremity	10%	24%
5	Non-Union	0%	2%
6	Infection	6%	14%
7	Implant Failure	2%	4 to 5%
8	Hip Pain	11%	11%
9	Implant Cutout	Much Less	Seen
10	Sliding Properties	5.4 mm	7.5 mm
11	Mechanical Strain on the Implant	Less	More

TABLE 18 SHOWING THE ADVANTAGES AND DISADVANTAGES

In this present study, I have compared intraoperative observations, complications and functional outcome of two groups of patients treated with DHS and PFN. The mean length of the incision is smaller in the PFN group compared to the DHS group. This was comparable to the findings in various other studies like those by **Pan XH[46]**
et al and **Zhao et al[47]**.

Duration of surgery was shorter in PFN group although the duration of implant fixation was almost similar in both the groups, the time required for wound closure was significantly longer in DHS group probably due to larger incision and extensive dissection as compared to the percutaneous technique of PFN. Similar findings were noted by **Pan XH[46] et al, Saudan[44] et al, Shen[45] et al and Zhao[47] et al** in their studies**.**

Average blood loss was more in the DHS group compared to the PFN group. Mean duration of hospital stay and duration of allowing full weight-bearing were both slightly less in PFN group. Early complications included superficial infections and prolonged discharge from the wound in the DHS group, which were not noted in the PFN group, which resolved with regular dressings. These were probably due to the longer incision and extensive dissection in DHS cases, though no case of deep infection was noted

V. Conclusion:

By considering this present study, we conclude that PFN is a better option for treating intertrochanteric femur fractures than DHS. PFN requires shorter operative time and a smaller incision, and less blood loss during surgery. Intraoperative and postoperative complications are also less in PFN fixation. So it has distinct advantages over DHS even in intertrochanteric femur fractures as it is a cephalomedullary fixation. There are fewer complications in PFN group like less infection, less sliding, less limb length discrepancy compared to the DHS group. DHS will weaken the bone mechanically. Hence, in my opinion, PFN may be the better fixation device for most of the intertrochanteric fractures of the femur

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