ORIGINAL RESEARCH

Functional and radiological outcome of intertrochanteric fractures of the femur treated with proximal femoral nail antirotation II

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Received: 12 March, 2023 Accepted: 18 April, 2023

ABSTRACT

Background: Intertrochanteric fractures are one of the common injuries sustained predominantly in old age, with osteoporotic bones affecting the lifestyle. Conservative treatment usually results in malunion. To restore the patient to pre-injury condition at the earliest, surgical intervention is the only possible way. The type of implant influences on the surgical outcome and the complications.

Objectives: To study the surgical and radiological outcome of intertrochanteric fractures of the femur treated with the proximal femoral nail antirotation II.

Materials and Methods: This is a Prospective non-randomized case control study of 33 cases with Intertrochanteric fractures, admitted in Navodaya Medical College Hospital and Research Centre, Raichur during the period from January 2021 to July 2022. The cases were classified under AO and Boyd and Griffin Classification treated with PFNA2. The functional, surgical and radiological outcomes are assessed at regular intervals.

Results: In our study fractures managed with PFNA II had good surgical, functional and radiological outcomes. In our study the average incision length was 7.682±0779 cm, average duration of surgery was 51.06±9.743 min, average blood loss was 74.24±23.46 ml with average TAD 20.09±2.02 mm. Totally we had 11 cases of complications, 4 cases of postoperative pain subsided by 12 weeks, 3 cases of superficial infection, 4 cases of varus collapse of which required revision surgery and 2 cases of postoperative mortality, remaining cases united well and have an average HHS of 79.74±4.598 at 6months and 90.622±4.343 at 1 year follow up. There were no cases of peri implant fracture, implant failure encountered in the study.

Interpretation and Conclusion: The newer generation intra-medullary nails are easy to insert with smaller incisions, reduced blood loss, reduced operative time, with stable fixation, less complications and have more successful functional and radiological outcomes, when the parameters are restored.

Key words: Intertrochanteric fractures, PFNA II.

Introduction

The Intertrochanteric Fractures are the most frequent fractures of the proximal femur, these injuries typically occur in elderly osteoporotic females who sustain these fractures after a trivial trauma[1]. Type of implant has a very important influence on complications of fixation. Implant of choice is determined by whether the fracture is ‘‘stable’’ or ‘‘unstable[2]’’ which is predominantly dependent on the status of the posteromedial cortex[3]. The advantages of Intra-medullary devices like the proximal femoral nail is that, it provides a more biomechanically stable

construct as the placement of implant lies closer to the mechanical axis of the limb thereby decreasing a lever arm and bending moment on the implant[4]. Intramedullary implant allows early weight bearing and with limited limb shortening[5]. So, our study is to investigate whether PFNA- II shows a significant difference in the treatment of Intertrochanteric fractures in terms of fracture union, functional and radiological outcome by taking Modified Harris Hip Score into consideration

Materials and Methods

Ethics

Ethical committee clearance was taken from the ethical committee of our institute and informed consent was taken from parents/guardians of the patient.

Type of study: A prospective study

Source of Data: The study is conducted in 33 patients in the Department of Orthopedics of our institution.

Methods of collection of data

Inclusion criteria

1. All patients with an age group equal to or more than 18 years
2. All Acute post-traumatic inter-trochanteric fracture of femur
3. All stable and unstable trochanteric fractures
4. Patient with and without co-morbidities like Diabetes mellitus, Hypertension,
5. Ischemic Heart disease, Cardio-vascular diseases and Seizure disorders

Exclusion criteria

1. Patients Age <18yrs
2. Patients with active infection
3. Patients with bilateral fractures, pathological fractures and open fractures.
4. Patients with congenital anomaly or bone disease

Materials

1. Proximal Femoral Nail Antirotation II System
2. K-wires
3. Guide wires
4. Powered Drill

Operative Details

a) Position of the patient

Patient is in supine position on traction table with affected hip in leg holder in and opposite limb in abduction and lithotomy position. Reduction is achieved by traction and internal rotation primarily and adduction or abduction as required.

b) Procedure in detail

After Spinal Anaesthesia is given, a Kwire is placed through the neck into femoral head.

Incise the skin in line with the femoral shaft axis and about 5 cm proximal to the tip of the trochanter and deepened to the gluteus medius muscle. The entry point is taken with an awl on the tip of the greater trochanter or slightly medial to it. Insert the 2.8 mm guide wire through the tip of the greater trochanter and in line with the middle of the femoral neck, and slightly lateral to a line corresponding to the anatomical axis of the shaft. Advance the guide wire in the femur shaft and across the fracture site in 5^{o} of valgus. Its position is checked in the C-arm and the entry is widened with the owl. Insert the protection sleeve with its trocar over the guide wire and push it through the soft tissues until it abuts against the greater trochanter, Reaming of the proximal femur is done with the reamer provided with the set. Mount the nail on the insertion handle. Insert the nail over the guide wire. Once the nail engages with the medullary canal, remove the guide wire and advance the nail fully and the alignment is checked. Insert the nail to such a depth that it will allow the blade or lag screw to be placed in the center of the femoral head confirmed under C-arm. Insert the drill-sleeve assembly through the aiming arm and advance it through the soft tissues to the lateral cortex. The ideal position of the guide wires is parallel and in center of the neck in AP view and in the center of the neck in the lateral views. Advance the guide-wire tip deeply across the dense trabecular bone of the head and into the subchondral bone of the femoral head, stopping 5 mm before the joint. Drilling hole for the blade, open the lateral cortex with the 11.0 mm drill bit. Connect the blade to the inserter. Insert the blade over the guide wire to the stop by gentle tapping being in center-center or in inferior-center position as per fluoroscopic guidance. By rotational locking of the lag screw, a fracture gap can be reduced, interfragmentary compression may be performed by turning the compression nut clockwise before removal of the inserter handle and drill sleeve. One or two static or dynamic 4.9mm interlocking bolts are inserted via the jig in to the distal part of the nail. Out of which one is a static and another is a dynamic hole. It should be done after removing the traction along with the tightening of the proximal screws. For simple and multifragmentary pertrochanteric fractures, static locking is sufficient.

Insert a cortical screw of appropriate length bicortically.

c) Post-op Protocol

1. The limbs were elevated on pillow and patients are kept under observation in recovery room until stable then shifted to ward.
2. IV antibiotics were continued for first five days and then it was shifted to oral.
3. Static quadriceps exercises were started on the immediate postoperative day.
4. Dressing was done on 2nd, 5th and 10th post-operative day.

5. Active quadriceps and hip flexion exercise were started as tolerated[6].
6. Sutures were removed on 10th -12th Post-operative day.

d) Functional and Radiographic evaluation

all the cases were followed at an interval of 6weeks, 12 weeks, 6months and 1year following the surgery or earlier if required. Results were analyzed both clinically & radiologically. The results are evaluated with Harris Hip Score and merle d'aubigne score.

e) Statistical Method

The collected data was evaluated with a structure proforma. Data thus was entered in MS excel sheet and was analyzed using SPSS 24.0 version IBM USA. Descriptive analysis of the baseline characteristics will be analyzed with 95% confidence interval. The qualitative data was expressed in terms of proportions and percentages. The quantitative data was expressed in terms of Mean and Standard deviation.

Results

In our study fractures managed with PFNA II had good surgical, functional and radiological outcomes. In our study the average incision length was 7.682±0779 cm, average duration of surgery was 51.06±9.743 min, average blood loss was 74.24±23.46 ml with average TAD 20.09±2.02 mm. Totally we had 11 cases of complications, 4 cases of postoperative pain subsided by 12 weeks, 3 cases of superficial infection, 4 cases of varus collapse of which 1 required revision surgery and 2 cases of postoperative mortality, remaining cases united well and have an average HHS of 79.74±4.598 at 6months and 90.622±4.343 at 1 year follow up. There were no cases of peri implant fracture, implant failure encountered in the study.

Discussion

All patients in this study were older than 18 years.In elderly age these fractures are common often caused by trivial trauma. The incidence of trochanteric[7] fractures is two times more common due to trauma as compared to osteoporosis. It is three to four times more common in females who are post-menopausal and osteoporotic.Untreated fractures often end up in Malunion,shortening and rotation deformities.

The PFN A-II is an effectively designed intramedullary load - sharing device. Biomechanically PFN A-II, is more stiff, just like the conventional PFN, it has shorter moment arm that is from the tip of helical blade to the center of femoral canal there by reduction in significant stress on weight bearing and hence less incidence of Lag screw cut out and varus malunion.

In our study of 33 patients there was a loss in follow up of 2 patients due to mortality, 4 patients had chronic pain which was assessed at the first follow up, which was not seen in the successive follow ups. There were 3 superficial infections which did not even require debridement or secondary suturing, only antibiotic duration was prolonged. Radiologically varus collapse was seen in 4 patients, of them 3 patients did not require any further surgery, one case had associated anterior angulation, helical blade[8] impinging the acetabulum and loss of reduction which required revision surgery with head replacement which was seen in sero positive patient.

The time interval in our study ranged from 3 to 10 days following trauma, which was based on the patient's condition and time required for correction of the parameters and making the patient fit for the proposed surgery. The mean time was 5.67 ±1.67 days from the injury. In our study, 23 patients- 69.69% patients were operated between 4to6 days post trauma.

In our study the radiological status of healing, visible callus was visualized the mean period was 6.58±0.96 weeks. In our study the callus was visualized in 2 patients at 5 weeks, in 8 patients at 8 weeks. Though it is not a definitive measure of fracture union but gives an idea, the signs of healing.

Table 1: AO CLASSIFICATION[9]

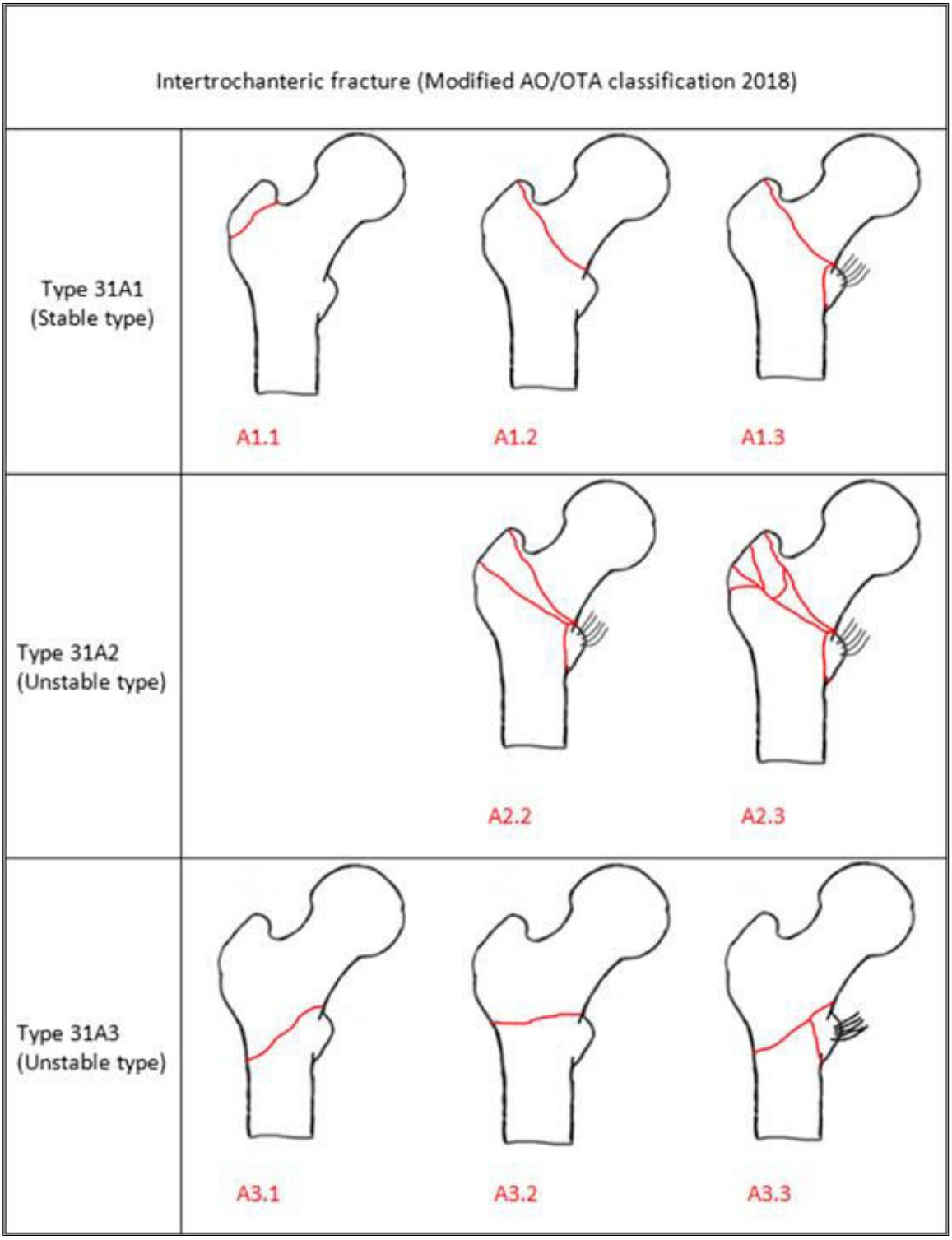

Table 2: Harris Hip Score[10]

Variable	Points
Pain	
None or ignores it	44
Slight, occasional	40
Mild pain, rarely moderate	30
Moderate pain	20
Marked pain	10
Totally disabled, pain in bed	0
Function	
Limp	
None	11
Slight	8
Moderate	5
Severe	0
Support	
None	11
Cane, long walks	7
Cane, most of the time	5
One crutch	3
Two canes	2
Two crutches	0
Not able to walk	0
Distance walked	
Unlimited	11
Six blocks	8
Two to three blocks	5
Indoors only	2
Bed and chair	0
Stairs	
Normally without railing	4
Normally with railing	2
In any manner	1
Unable to do	0
Shoes and socks	
With ease	4
With difficulty	2
Unable	0
Sitting	
Ordinary chair for 1 h	5
High chair for 1 h	3
Unable to sit in any chair	0
Public transport	
Able to use	1
Unable to use	0

Table 3: Merle d'Aubigne Score

	Pain	Mobility	Ability to walk
0	Intense and permanent	Ankylosis with bad position of the hip	None
1	Severe even at night	No movement; pain or slight deformity	With crutches/walking device only
2	Severe when walking; prevents any activity	Flexion under 40 degrees	With canes only
3	Tolerable with limited activity	Flexion between 40 and 60 degrees	With one cane, less than one hour; very difficult without cane and with a limp
4	Mild when walking; it disappears in rest	Flexion between 60 and 80 degrees; patients can reach his foot	A long time with a cane; short time without a cane and with a limp
5	Mild and inconstant; normal activity	Flexion between 80 and 90 degrees; abduction of at least 15 degrees	Without cane but with a slight limp
6	None	Flexion more than 90 degrees; abduction to 30 degrees	Normal

Table 4: Data of Surgical correction of Fracture

Sl No	IP No	Name	Age	Gender	Comorbities	Side affected (Right/ Left)	Mode of injury (RTA/ Fall)	AO Classification	Boyd and Griffin Classification	Singh's Index	Time interval between trauma & surgery	Length of PFN A2 nail	Length of Helical Blade	Length of incision: Entry site incision	lag screw incision	distal screw incision	total	Duration of Surgery	Blood loss	Duration of hospital stay (Days)	Radiological appearance of callus	TAD	Cleveland Index-quadrant
1	8648/21	Nagamma	60	F	_	R	SF	A2.2	2	3	3	240	90	5	3	1.5	9.5	65	150	14	7	22	2
2	10112/21	Sanna Nagamma	59	F	HTN	L	SF	A2.2	2	3	7	240	85	5	3	1.5	9.5	50	100	16	6	24	4
3	12450/21	Parvathi	54	F	DM	L	SF	A2.3	3	4	5	240	90	5	2.5	1.5	9	50	100	15	6	18	5
4	21769/21	Sarojamma	56	F	HTN	L	RTA	A2.2	2	3	5	180	85	4	2	1	7	45	150	14	8	19	8
5	23495/21	Bheemanna	52	M	HTN	R	SF	A2.3	3	4	6	180	90	4.5	2	1.5	8	50	70	15	6	22	6
6	26246/21	Eresh	65	M	_	L	SF	A3.1	4	3	7	180	90	5	2	1	8	45	60	16	8	18	5
7	28527/21	Rodappa	70	M	DM	R	SF	A2.3	3	2	4	240	90	4	2.5	1	7.5	60	70	12	6	20	4
8	28667/21	Darsha Bee	48	F	_	R	SF	A1.3	2	3	5	240	90	5	2	1	8	50	60	16	6	19	5
9	21227/21	Sankaramma	78	F	DM	R	SF	A1.3	2	2	4	180	85	4.5	2	1.5	8	50	80	14	7	20	5
10	34715/21	Chandrashekar	50	M	HTN	R	SF	A2.2	2	3	5	180	85	4	2	1	7	40	70	15	8	16	2
11	35419/21	Sabiya Begum	48	F	DM	L	RTA	A2.3	2	4	6	180	75	4	2.5	1	7.5	45	60	17	6	18	5
12	36103/21	Anasuyamma	52	F	HTN	R	SF	A2.2	2	4	7	180	80	5	2	1	8	40	70	18	5	20	5
13	37361/21	Mumtaz Begum	61	F	_	L	SF	A2.3	3	3	8	180	95	4.5	2	1	7.5	50	80	17	6	19	6
14	37604/21	Dharani	56	F	DM	R	RTA	A2.2	2	3	10	180	75	4	2	1	7	45	50	21	8	22	5
15	40303/21	Sarjan Gowda	78	M	HTN	L	SF	A1.3	2	3	6	180	95	4	2	1	7	45	60	16	8	26	5
16	411079/21	Huligappa	55	M	HTN	L	SF	A2.2	2	4	5	180	95	5	2	1	8	45	50	15	8	19	5
17	42347/21	Devayya	57	M	DM	L	SF	A2.3	3	4	4	180	80	4	2	1	7	50	70	15	7	20	5
18	43200/21	Ramanna	68	M	_	R	SF	A2.3	2	3	5	240	80	4	2.5	1.5	8	55	80	16	6	22	2
19	46309/21	Basamma	80	F	HTN, DM	L	SF	A2.2	2	2	6	180	85	3.5	2	1	6.5	70	100	17	-	17	4
20	44083/21	Ranga Reddy	52	M	-	R	RTA	A1.3	2	4	5	240	100	4	2	1	7	50	70	16	6	21	5
21	44394/21	Rabiya	56	F	DM	R	SF	A2.2	2	3	4	180	85	4	2.5	1	7.5	50	60	15	5	23	5
22	44865/21	Hampayya	70	M	HTN,DM	L	SF	A2.2	2	2	5	240	90	4	3	1	8	70	70	16	6	21	2
23	46924/21	Raziya Begum	50	F	-	L	RTA	A3.2	4	4	7	180	90	4	2	1	7	50	60	18	8	19	5
24	47496/21	Basamma	61	F	DM	L	SF	A2.2	2	4	3	180	95	5	2.5	1.5	9	40	60	14	7	17	2
25	51682/21	Premakka	56	F	-	L	SF	A2.3	2	4	8	180	85	4	2	1	7	45	70	17	6	18	4
26	52256/21	Srikanth	65	M	DM	R	SF	A2.3	3	3	6	240	85	4	2	1	7	50	80	17	6	22	5
27	52510/21	Sarojamma	74	F	HTN	R	SF	A2.2	2	3	5	180	85	4	2.5	1	7.5	50	70	16	-	21	5
28	54831/21	Rajappa	50	M	_	L	RTA	A1.3	2	4	10	180	90	5	2	1.5	8.5	40	60	15	6	23	1
29	55873/21	Neelamma	54	F	DM	R	SF	A2.2	2	4	6	180	85	4	2	1	7	45	70	15	6	19	5
30	58517/21	Kashinath	56	M	HTN	R	SF	A2.2	2	3	5	240	75	4	2	1	7	45	50	16	6	20	2
31	60670/21	Thayamma	52	F	DM	R	SF	A1.3	2	4	6	180	80	4	2.5	1	7.5	50	60	17	8	21	5
32	61911/21	Varalakshmi	55	F	_	R	SF	A2.2	2	3	5	180	85	4	2	1	7	80	80	15	6	19	5
33	880/22	Erappa	61	M	HTN	L	SF	A2.3	3	3	4	180	90	5	2.5	1	8.5	70	60	14	6	20	5

Sl No	Post op complications (Yes/No): Pain	Superficial infection	Deep infection	Inflammatory reaction	Delayed union and non-union	Varus angulation	Valgus angulation	Anterior angulation	Posterior angulation	Loss of reduction requiring new reduction or surgery	post of walking in wks	HHS: 6 weeks	12 weeks	6months	1year	SF-36 at end of 1 year	The Merle d'Aubigne Hip Score: Pre operative	Post operative	absolute results	relative results	Functional outcome
1	-	-	-	-	-	-	-	-	-	-	7	60	69	74.5	89.5	76	3	11	Very Good	16	Good
2	+	-	-	-	-	+	-	-	-	-	6	57	63	73.2	87.3	74	2	11	Very Good	18	Good
3	-	-	-	-	-	-	-	-	-	-	6	61	67	83.2	95.3	82	3	12	Very Good	18	Excellent
4	-	+	-	-	-	-	-	-	-	-	8	58	64	78.5	91	80	2	12	Very Good	20	Excellent
5	-	-	-	-	-	-	-	-	-	-	6	57	63	74.3	89.5	79	2	10	Good	16	Good
6	-	-	-	-	-	-	-	-	-	-	8	61	70	84.5	92	80	2	10	Good	16	Excellent
7	+	-	-	-	-	-	-	-	-	-	6	55	62	78.3	87	74	2	9	Medium	14	Good
8	-	-	-	-	-	-	-	-	-	-	6	60	67	88.1	98.4	84	1	11	Very Good	22	Excellent
9	-	-	-	-	-	-	-	-	-	-	7	61	70	84.2	95	80	3	12	Very Good	18	Excellent
10	-	-	-	-	-	-	-	-	-	-	8	64	71	84.5	96.5	82	2	11	Very Good	18	Excellent
11	-	-	-	-	-	+	-	-	-	-	6	58	65	76.5	89	78	3	10	Good	14	Good
12	-	-	-	-	-	-	-	-	-	-	5	62	66	79	90.5	79	3	11	Very Good	16	Excellent
13	-	-	-	-	-	-	-	-	-	-	6	57	62	72	81	73	2	9	Medium	14	Good
14	-	-	-	-	-	-	-	-	-	-	8	59	68	74.5	88	76	3	10	Good	14	Good
15	-	+	-	-	-	-	-	-	-	-	8	57	61	72	79	67	2	9	Medium	14	Fair
16	-	-	-	-	-	-	-	-	-	-	8	61	65	83.2	94	80	3	12	Very Good	16	Excellent
17	-	-	-	-	-	-	-	-	-	-	7	62	71	79.5	91	80	2	11	Very Good	18	Excellent
18	-	-	-	-	-	+	-	-	-	-	6	58	63	73.3	87	78	3	10	Good	14	Good
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	6	55	61	85.2	92.5	82	2	12	Very Good	20	Excellent
21	-	-	-	-	-	-	-	-	-	-	5	57	63	81.5	91.2	80	3	11	Very Good	16	Excellent
22	-	-	-	-	-	-	-	-	-	-	6	57	64	83.2	98.5	84	2	12	Very Good	20	Excellent
23	+	-	-	-	-	-	-	-	-	-	8	55	62	75	86	78	3	10	Good	14	Good
24	-	-	-	-	-	-	-	-	-	-	7	60	66	85	92.3	81	2	11	Very Good	18	Excellent
25	-	-	-	-	-	-	-	-	-	-	6	59	66	78	88	76	3	10	Good	14	Good
26	-	-	-	-	-	-	-	-	-	-	6	63	71	82.5	90.4	78	2	10	Good	16	Excellent
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	+	-	-	-	-	+	-	+	-	+	5	52	60	-	-	-	3	9	Medium	12	-
29	-	+	-	-	-	-	-	-	-	-	6	57	64	81	93	80	2	11	Very Good	18	Excellent
30	-	-	-	-	-	-	-	-	-	-	6	58	70	84	94	82	3	12	Very Good	16	Excellent
31	-	-	-	-	-	-	-	-	-	-	8	61	67	81.3	90.3	79	2	10	Good	16	Excellent
32	-	-	-	-	-	-	-	-	-	-	6	60	66	78	89	76	3	10	Good	14	Good
33	-	-	-	-	-	-	-	-	-	-	6	62	70	84.2	92.5	81	3	11	Very Good	16	Excellent

Fig 1:Pre-op Radiograph.

Fig 2: Immediate Post-op Radiograph

Fig 3: 6 months Folllow Up.

Fig 4: 12 months Follow Up

Fig 5: Clinical Follow Up at 1year

Conclusion

Our study shows that appropriate patient selection and adequate reduction of fracture and stabilisation with Proximal Femoral Nail A II helps to achieve good correction with reduced complications.Additional rotational locking of the lag screw,fracture gap is reduced,this interfragmentary compression augments healing at the fracture site to yield excellent results.

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