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Original Research

Evaluation of functional and radiological outcome of modified short PFN in intertrochanteric fractures of femur

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ABSTRACT

Background: Standard Proximal femoral nail (PFN) was introduced by AO/ASIF in 1996 for inter trochanteric (IT) fracture fixation and it is the reference nail for other varieties of PFN. Anthropometric measurements of proximal femur in the Indian population are smaller than western population. Hence to suit Indian patients, modified short PFN (MS – PFN) was introduced by Yogeshwar implants private limited. Many times it is also called TFN (Trochanteric fixation nail) [7]. It has smaller dimensions suitable for Indian patients and works on the principles of PFN. There are limited studies on MS-PFN (TFN). This study aims at evaluating functional and radiological outcome of MS-PFN in IT fractures. **Methods:** This is a prospective study conducted on patients of intertrochanteric fracture reported to a tertiary health care center. After obtaining informed and written consent, patients who met inclusion and exclusion criteria were involved in the study and surgical fixation of fracture with MS-PFN is performed. Operating time, intraoperative blood loss is analysed. Patients are followed up till 1-year post op in different intervals, functional outcome using Harris hip score, fracture union, incidence of anterior thigh pain and complications are assessed.**Results:** In our study, the average age of the patients is 71.29 years with male predominance and right-side predominance. Majority of the fractures belong to type1 group 2 and type 1 group 4 of Evan's classification. The average operating time is 78.00 minutes and average intraoperative blood loss is 66.80 minutes. Average fracture union time is 14.92 weeks. The average Harris hip score at post op 6 weeks is 65.54, 3 months is 71.78, 6 months is 81.69 and at 1 year it is 86.18. There is no incidence of post-operative anterior thigh pain. Two patients had shortening >1cm, 1 patient had surgical site infection and 2 patients had varus collapse with Z effect.**Conclusion:** MS-PFN is one of the implants of choice for the treatment of IT fracture extending not beyond lesser trochanter with less intraoperative blood loss, less operating time, good Harris hip score, zero incidence of post-operative anterior thigh pain and significant less complication rates.

Key words: Intertrochanteric (IT) fracture; Modified short proximal femoral nail (MS-PFN); Trochanteric fixation nail (TFN); Harris hip score

INTRODUCTION

Intertrochanteric (also known as peritrochanteric) fractures are defined as an extra capsular fracture of the proximal femur that occurs between the greater and lesser trochanter[1]. It usually occurs in the elderly population as a result of trivial trauma (fall from standing height), due to poor bone quality (osteoporosis). It is also seen in young adults with high velocity injuries[1]. With increase in population and life expectancy, the incidence of intertrochanteric fractures has sharply risen among the geriatric population[2].

The treatment of choice is normally surgical and the preferred implant is cephalomedullary nail. Standard PFN – 240mm was introduced by AO/ASIF in 1996 and it is the most commonly used cephalomedullary nail, the reference nail for other varieties of PFN. Anthropometric measurements of proximal femur in the Indian population are smaller than western population. Hence to suit Indian patients, modified

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short PFN was introduced by Yogeshwar implants private limited. Many times it is also called TFN (Trochanteric fixation nail) [3]. It has smaller dimensions and works on the principles of PFN.
There are limited studies on MS-PFN (TFN). This study aims at evaluating functional and radiological outcomes of MS-PFN in IT fractures.

METHODS

This is a prospective study conducted on patients of intertrochanteric fracture reported to the tertiary referral health care center in Karnataka, India, from July 2021 to June 2023. This study included patients of age > 18 years with intertrochanteric fractures. IT fractures with subtrochanteric extension, associated with ipsilateral segmental or other level femur fracture, associated with ipsilateral other lower limb fracture, previous fracture in ipsilateral hip or femur, pathological fractures - other than osteoporosis, ongoing chemotherapy or irradiation treatment due to malignancy, inability to walk before the fracture, refusal to provide informed consent and patients who are not fit for surgery were excluded.
After obtaining informed and written consent, patients who met inclusion and exclusion criteria were involved in the study and surgical fixation of fracture with MS-PFN (Fig.1, Table 1) is performed. Operating time, intraoperative blood loss is analyzed. Patients are followed up till 1-year post op in different intervals, functional outcome using Harris hip score, fracture union, incidence of anterior thigh pain and complications are assessed. Total patients enrolled for study were 30. 5 patients' follow up was lost. Hence, result analysis was done with a total of 25 cases.

RESULTS

In our study, the mean age of the patients with IT fracture is 74.44 years with majority being in 71-80 years of age group (36%). Majority are males (64%) and right side is the common side (56%). Majority of the fractures were Type 1 group 4 according to Evan's classification (36%). Mean operating time is 78.00 minutes, mean blood loss is 246.4 ml and mean radiological union is 14.92 weeks. Incidence of post op anterior thigh pain is zero. Harris hip score was analysed at post op 6 weeks, 12 weeks, 6 months and 1 year, the results are tabulated in table 2 and graph 2. Complications like 8% shortening, 4% screw cut out and 4% Z effect / reverse Z effect were noted (Table. 3).

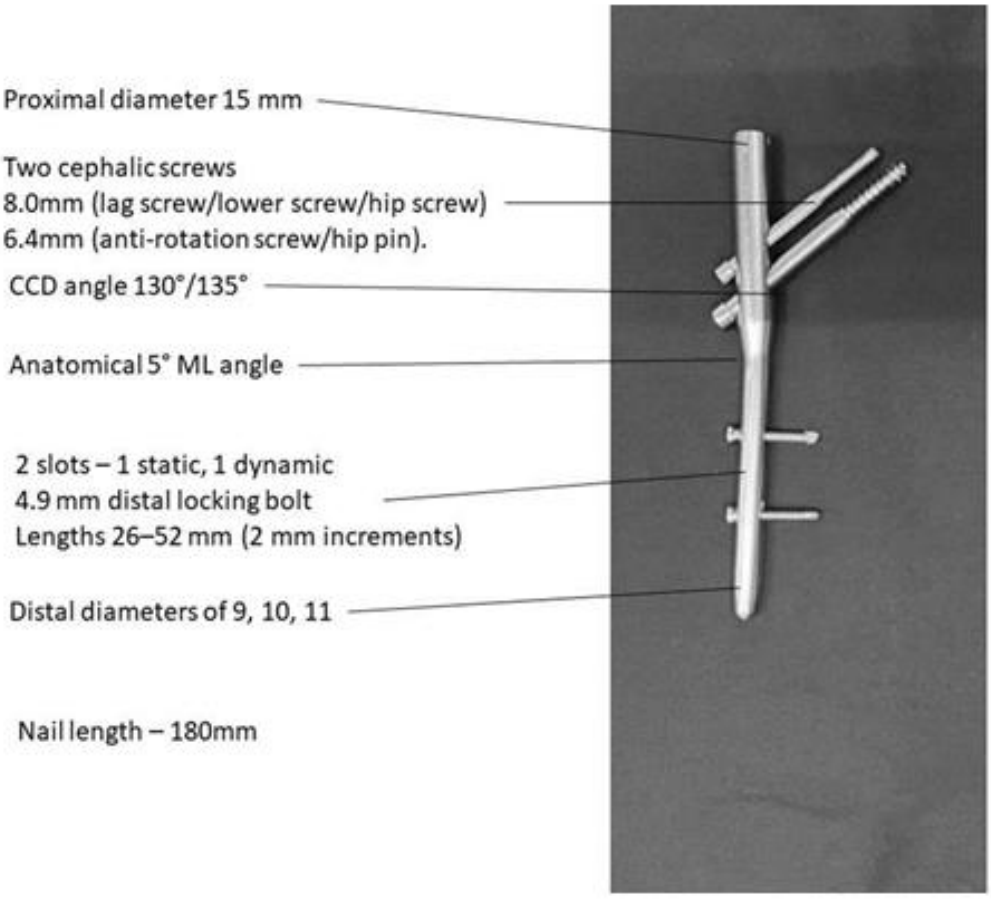

Figure 1: Implant specifications (MS-PFN)

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Table 1: Implant specifications

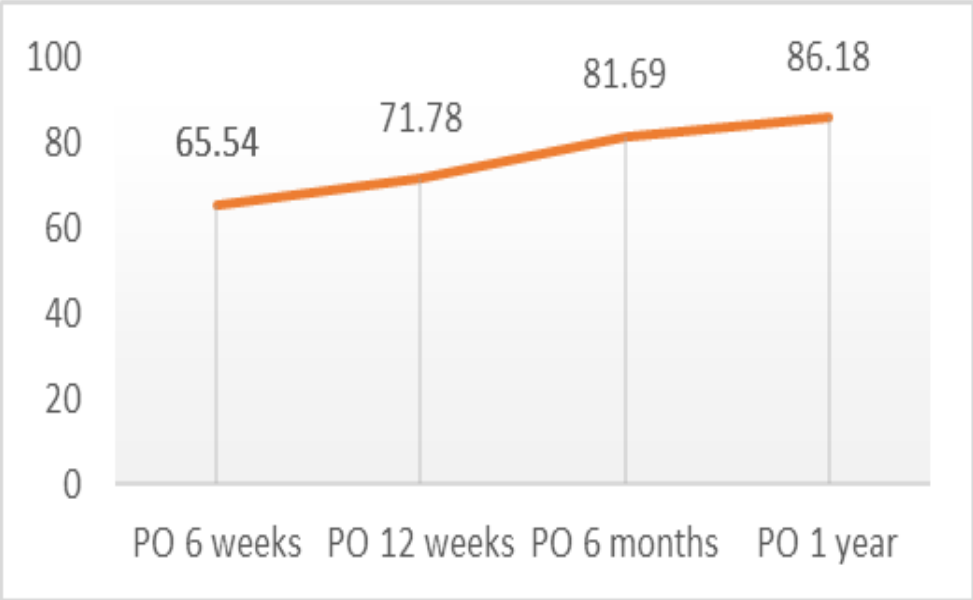
PROPERTIES	MS – PFN
Proximal nail diameter	15mm
Distal nail diameter	9,10,11, 12mm
Nail length	180mm
Medio-lateral angle	5 degree
Lateral surface angulation	Flat lateral surface (***Less lateral cortex impingement***)
Fracture fixation	8mm compression screw and 6.4mm de-rotation screw
Distal locking bolt size	4.9mm
Distal locking slots	2, 1 static and 1 dynamic

Table 2: Harris Hip Score

Time points	MS-PFN group	
	Mean	**SD**
PO 6 weeks	**65.54**	6.04
PO 12 weeks	**71.78**	5.61
PO 6 months	**81.69**	4.92
PO 1 year	**86.18**	5.28

Table 3: Complications

Complications	MS-PFN group	%
Shortening	2	8.00
Screw cut out	1	4.00
Surgical site infection	0	0.00
Varus collapse	0	0.00
Z effect / reverse Z effect	2	8.00



Graph 2: Harris Hip score

DISCUSSION

In our study, the average age of the patients is 74.44 years which is comparable to Indian as well as foreign authors. In a study by Jha V *et al.*[3] the average age is 71.45 years which is comparable with our study. We have a male gender and right-side predominance. It is comparable with a study by Jha V *et al.*[3] and a study by Devadoss*et al.*[4].

The average operating time is 78.00 minutes. In a study by Jha*et al.*[3], average operating time is 68.7 minutes. The average intra operative blood loss is 246.40 ml. In a study by Rai B *et al.*[5], average blood loss is 200ml which is equivalent to our study. But, in a study by Jha*et al.*[3], average blood loss is 130ml which is significantly lesser.

In our study average radiological union is 14.92 weeks. In a study by Basant Rai *et al.*[5], it is 13.8 weeks.In a study by Gadegone WM *et al.*[6] the average time for fracture consolidation is 18 weeks. In a study on MS-PFN by Jha*et al.*[3], average time for

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radiological union is 17.32 weeks and

In our study, the mean Harris hip score was 65.54 at 6 weeks, 71.78 at 3 months, 81.69 at 6 months and 86.18 at 1 year post-operative follow up. In a study on PFN by Mandice*et al.*[7] Harris hip score at 6 months post op is 88.75 which is comparable to our study.

In our study there was no incidence of anterior thigh pain. In a study on PFN by Kaustav Mukherjee *et al.*[8], 16 out of 53 patients had anterior thigh pain. In a study on PFN-A2 by Kumar GK[9]*et al.*, 3 among 25 patients experienced anterior thigh pain.

In our study, 2 patients had shortening. In a study on MS-PFN by Jha*et al.*[3] out of 120 patients, 9 patients had shortening.And in a study on PFN-A2 by Rai B *et al.*[5], among 25 patients, 2 patients had shortening. 1 patient had complication of screw cut out; 2 patients had Z effect / reverse Z effect. In a study on PFN by Chopra B L *et al.*[10], out of 125 patients, 5 had Z effect / reverse Z effect. In a study on MS-PFN by Jha*et al.*[3] out of 120 patients, 14 patients had above-mentioned complications.

CONCLUSION

Modified short proximal femoral nail (MS-PFN) is one of the implants of choice for the treatment of inter trochanteric fractures of femur extending not beyond lesser trochanter with less intraoperative blood loss, less operating time, good Harris hip score, zero incidence of post-operative anterior thigh pain and significantly less complication rates.

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