

Research Article

Clinical, radiological & functional outcome of intertrochanteric fractures managed with cephalomedullary nail with helical blade in elderly patients

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Abstract: Intertrochanteric fractures are very common in geriatric population. We present our experience in surgical management of intertrochanteric fractures with cephalomedullary nail with helical blade in the management at Maharaja Agrasen Medical College, Agroha. Methods: The study was conducted from October 2022 to December 2023 and included 35 patients above 60 years of age. Clinical and radiological evaluation was done at 6 weeks, 3 months and 6 months. Functional outcome was assessed according to Harris Hip Scoring Scale. Results: The average age of patients in our study was 69.57 years

with male preponderance. Slip and fall was the mode of injury in 85.7% cases. The average duration of surgery was 47.9 minutes. The average time of union was 15.94 weeks. There was no case of delayed union, non-union and deep infection. The average Harris Hip Score was 84.42.

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INTRODUCTION

Intertrochanteric fractures are extracapsular fractures of the proximal femur that occur between the greater and lesser trochanter. The vast metaphyseal region has a more abundant blood supply, contributing to a higher union rate and less osteonecrosis as compared to femoral neck fractures.^{1,2} Intertrochanteric fractures are more common in the elderly population with osteoporosis and occur with a low energy mechanism, whereas a high energy trauma is required in young adults. With improved medical facilities, prolonged life expectancy, growing population, industrialization and increase in road traffic accidents, the incidence of intertrochanteric fractures is increasing drastically.³ Although many treatment methods have been developed, controversy exists regarding the optimal management of these fractures. Surgery is the preferred treatment of choice in view of early mobilization. Implants fall under two categories – extramedullary and intramedullary. The basic principle of surgery is to use an implant that is minimally invasive, has a less operative time and allows for early mobilization and weight bearing.⁴ Several

methods of fixation have been proposed such as dynamic hip screw, fixed angle blade plate, intramedullary sliding hip screw, external fixator, double screw conventional proximal femoral nail and recently introduced PFN with helical blade.⁵ The cephalomedullary device consists of an intramedullary nail with a proximal angulation of 6 degrees available in both short and long versions. The cephalomedullary nail was designed to achieve better stabilization of the femoral head and neck by using a single helical blade rather than a screw system for fixation. The helical blade gives better cancellous bone compaction in femoral neck particularly in osteoporotic patients, thereby decreasing the risk of secondary displacement, and has more resistance to rotation and varus collapse as compared to conventional PFN.

MATERIAL AND METHODS

The study was conducted on 35 adult patients with age 60 and above, presenting with intertrochanteric fractures to Department of Orthopaedics in Maharaja Agrasen Medical College, Agroha, Hisar, from October 2022 to December 2023. Patients who were ambulatory before trauma and the duration was upto 2

weeks were included for management with cephalomedullary nail with helical blade. In every patient a detailed history regarding the mode, duration and nature of injury was taken. Radiological investigation was done and included Xray Pelvis with bilateral hip joint and Xray of the affected hip with thigh in both antero-posterior & lateral view. The fracture was classified according to AO classification. The limb was kept in skin traction till patient became fit for surgery. Pre-operatively IEC approval and informed consent was taken & planning was done to decide the size and length of cephalomedullary nail with helical blade to be used.

Per-operatively standard operative techniques as per AO were followed²³.

Post-operatively patients received broad-spectrum intravenous antibiotics for a minimum of 3 days, and then were shifted to oral antibiotics until suture removal. Hip, knee and ankle mobilization exercises were started on the next day of surgery. Weight bearing on the affected limb was gradually allowed, starting from partial to full weight bearing, based on findings on X-rays, including the fracture pattern & stability, presence of osteoporosis, quality of fracture reduction, and implant position.

Clinical and Radiological evaluation of the patients was done at the 6 weeks, 3 months,

and 6 months. Functional outcome was done at 6, 12, 18, weeks according to the Harris Hip Scoring.

RESULTS

The average age of patients in our study was 69.57 years with male preponderance (57.1%). In 60% patients there was right sided involvement and rest 40% had left sided fractures. Slip and fall was the mode of injury in 85.7% cases and road traffic accidents in 14.3% of cases. All of the fractures were closed. 12% patients were having associated injuries and 34.3% patients were having associated medical illnesses. The average duration of surgery was 47.9 minutes. The average time of union was 15.94 weeks in present study. The average blood loss was 189 ml. The mean Neck Shaft Angle was 127.2°, however in two patients it was less than 120°. Mean Tip Apex Distance (TAD) was 22.9mm. No patients had delayed union and non-union. Backout of the blade was seen in two patients. Shortening less than 2 cm was seen in three cases which included two cases with varus collapse. In rest 27 (77.14%) patients there were no complications. None of the patients had any deep infection. The average Harris Hip Score was 84.42 in this study.

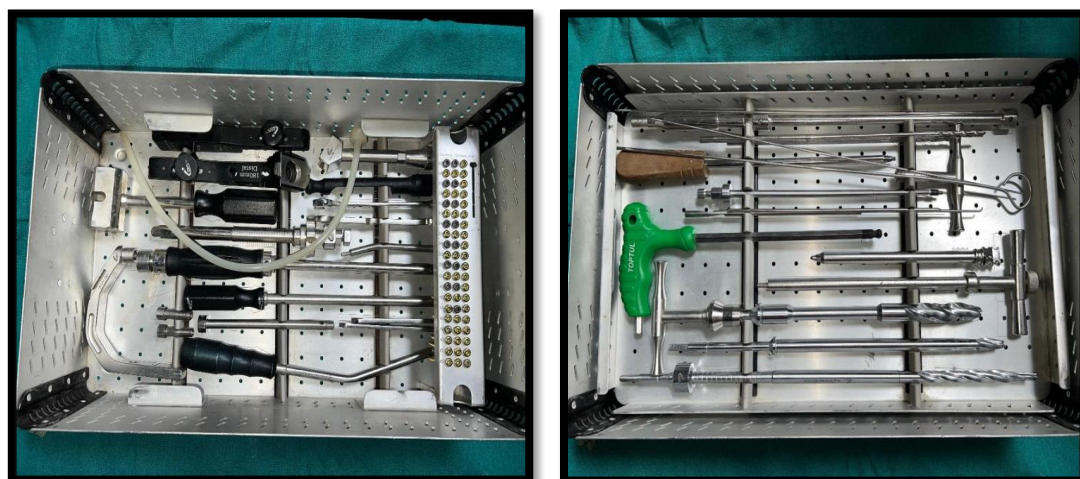


Fig 1 – Complete Instrumentation Set



Fig 2- Limb Position on traction table and C-Arm position at the time of making an entry

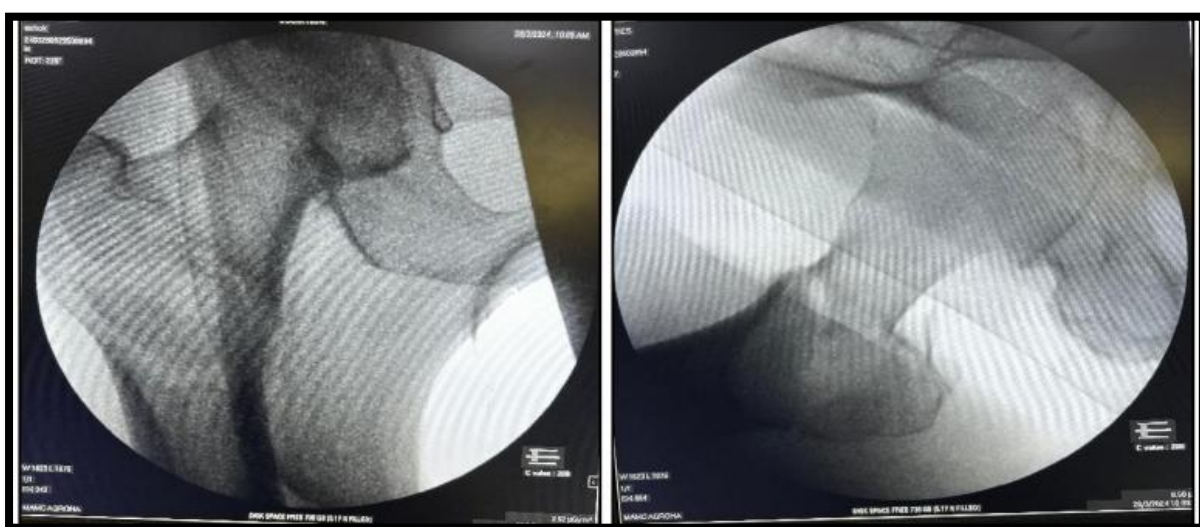


Fig 3- Pre-Operative Reduction on Traction Table confirmed with flouroscopy



Fig 4 - Insertion of Anteversion wire and entry with curved awl

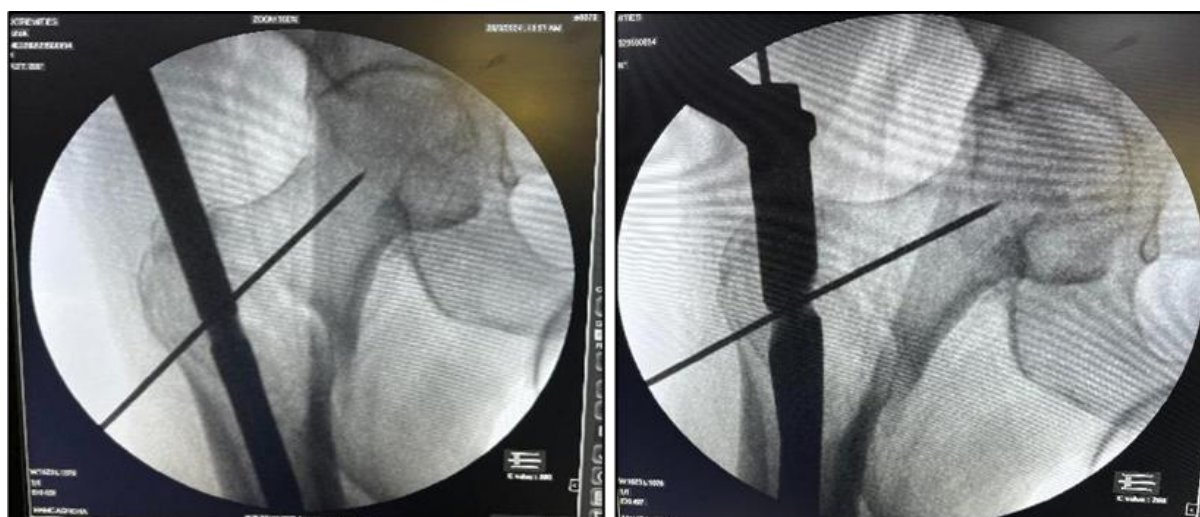


Fig 5-Insertion of nail after guidewire insertion

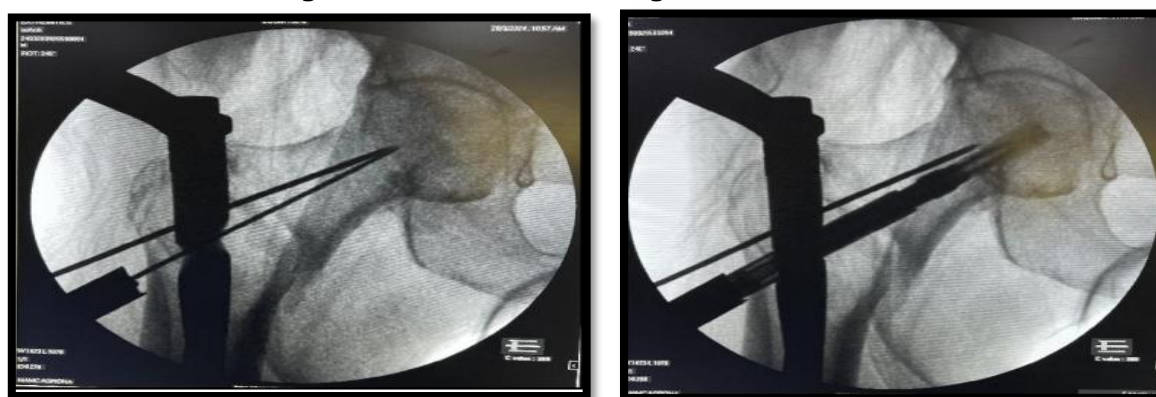


Fig 6 – Insertion of nail and helical blade

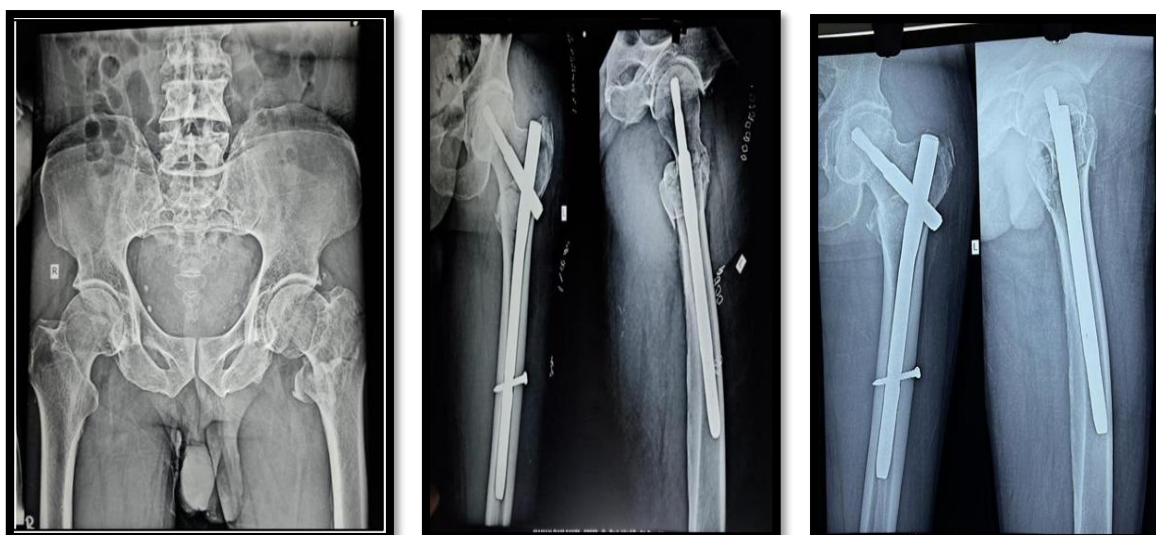


Fig 7- Xrays showing preop, immediate post op fracture fixation and after fracture union

DISCUSSION

Intertrochanteric fractures of femur is always considered to be challenge by orthopaedic surgeons not only for obtaining fracture union but also for achieving optimal functional recovery. It is advisable that the elderly patients

with intertrochanteric fractures be treated with minimally invasive operations, which can ensure optimal reduction and assembly with fewest intra-operative and post-operative complications and lowest mechanical failure rate. Early surgical management and

mobilization reduces the morbidity and mortality in patients. The cephalomedullary nail with helical blade is an effectively designed intramedullary load sharing device. Biomechanically cephalomedullary nail with helical blade, just like the conventional PFN, is more stiff, it has shorter moment arm i.e. from the tip of helical blade to the center of femoral canal, whereas the DHS has a longer moment arm undergoes significant stress on weight bearing and hence higher incidence of lag screw cut out and varus malunion. The larger proximal diameter (17 mm) of the cephalomedullary nail with helical blade compared with PFN (15 mm) gives additional stiffness to the nail. Minimal blood loss, shorter

operative time, early weight bearing, less chances of implant failure, easier helical blade insertion (compared with cumbersome lag screw and derotation screw), lesser chances of post-operatively hip pain, better performance than any other implant in elderly osteoporotic patients are all advantage of cephalomedullary nail with helical blade.^{6,7}

In our series we had 35 homogenous fracture patterns included the intertrochanteric fractures in elderly patients which were treated with cephalomedullary medullary nailing with helical blade. The results were evaluated and compared with other studies which used the same fixation device.

Series	Year	Total n. of patients	Duration(mins)
Kasha S. et al.⁸	2017	78	48
Raj S D. et al.¹¹	2019	25	67
Mallya et al.¹³	2019	37	34.45
Mathur H et al.¹⁵	2020	50	40
Kadam et al.¹⁴	2021	30	48.73
Present study	2023	35	47.9

Table 1: Table showing comparison of operating time with other studies

Average operating time in our series was 47.9 minutes. In our initial cases operating time was on the higher range. With experience the operating time reduced. The operating time was more in 22 cases which were mainly

unstable type of fracture as compared with other stable type. Open reduction and internal fixation was required in 6 cases which took more time for the surgery.

Series	year	Total n. of patients	Blood loss during surgery(ml)
Bajpai et al.¹⁶	2015	37	351.22
Mallya et al.¹³	2019	37	51.35
Mathur H et al.¹⁵	2020	50	100
Kadam et al.¹⁴	2021	30	116
Present study	2023	35	189.29

Table 2: Comparison of Blood loss during surgery

All the patients were operated with closed reduction except for soft tissue interposition in 3 cases for which open reduction was done, flexed proximal segment in 2 cases and

retroverted proximal fragment in 1 case for which ORIF was done. The average blood loss was 189.29±36.64 ml

Series	Year	Total n. of patients	Union
Kasha S. et al.⁸	2017	78	14.2weeks
Raj S D. et al.¹¹	2019	25	16
Mallya et al.¹³	2019	37	28
Goyal A et al.¹⁶	2019	10	12.45
Mathur H et al.¹⁵	2020	50	20
Present study	2023	35	15.94

Table 3: Comparison of time for Union

The time to union was 15.94 weeks in our study ranging from 12 to 19 weeks. Which is comparable with others in the literature(table-

3). Kasha S. et al.⁸ in their study had time of union 14.2 weeks. Mathur H et al¹⁵ had time of union 20 weeks in their study.

Series	Year	Total n. of patients	Mean (Neck shaft angle)
Radaideh et al.¹⁷	2018	50	127.2°
Naja et al.¹⁸	2018	69	127.59°
Present study	2023	35	127.2°

Table 4: Comparison of Neck Shaft Angle with other studies

In our study, the average neck-shaft angle was 127.26°. A neck shaft angle of more than 120 degrees was achieved in all patients except 2 patients who had NSA <120° degrees but fracture union was achieved . In the study by

Radaideh et al¹⁷ on 50 patients, neck shaft angle was above 120° in 44 patients (88%) and only six patients (12%) developed secondary varus collapse (neck shaft angle <120°).

Series	Year	Total n. of patients	Tip Apex Distance Mean(mm)
Geller et al.¹⁹	2009	82	20.28mm
Sharma A. et al.¹⁰	2017	48	21.13mm
Shin. et al⁹	2017	181	17.81mm
Baek S et al.²⁰	2020	85	18.40mm
Present study	2023	35	22.9mm

Table 5: Comparison of Tip Apex Distance (TAD)

Mean TAD in our study is 22.9mm which is comparable with mean TAD of Geller et al¹⁹ and Sharma et al.¹⁰ with mean TAD 22mm and 21.13 mm respectively. Cut-out is one of the

complications of cephalomedullary nailing of the proximal femur fracture most feared by surgeons due to its great impact on functional recovery and life expectancy in elderly patients.

Series	Year	Total n. of patients	Harris Hip score
Bajpai et al. ¹⁶	2015	78	88.73
Sharma et al.¹⁰	2017	48	78.85
Gadhe S et al.¹²	2019	25	83.36
Mallya et al.¹³	2019	37	74.55
Goyal A et al.¹⁶	2019	10	92.5
Mathur H et al¹⁵	2020	50	86
Kadam et al.¹⁴	2021	30	82.8
Present study	2023	35	84.42

Table 6: Comparison of Harris Hip Score

The functional outcome was evaluated using the Harris Hip Scoring. The average Harris Hip Score in our patients was 77.19 (at the end of three months) and 84.42 (at the end of six months). Most of them were graded as "good" as per Harris Hip Scoring. Fair scores were seen with higher age group and higher AO types. The mean Harris Hip Scoring of the study is 84.42 ± 6.39 of which 9(25.7%) of the patients had excellent results,17 (48.57%) patients had good results, 9(25.7%) patient had fair results and no patient performed poorly. Similar outcomes were reported by other studies. The

proper physical therapy attributed to the excellent outcome. Efforts were made to start proper physical therapy (active-assisted and passive hip range of motion) on post day 1 to attain pre-operative hip and knee range of motion so hip and knee stiffness could be avoided.

COMPLICATIONS

In our study out of the 35 cases 3 cases had superficial wound infection in the immediate post operative period, which was treated with i.v. antibiotics. Kasha et al.⁸ in their study had

3 cases which had superficial infection, similarly Kriplani et al.²¹ and Baek et al.²⁰ had 1 case each which had superficial infection to incision wound. In our study one patient had an intra operative varus reduction but the fracture union was good at 16 weeks follow up. 1 patient had post operative varus collapse with good fracture union and functional mobility. Varus deformity was seen in 8 patients in study by Kriplani et al.²¹ and 1 in study by Baek et al.²⁰. Superior migration of the helical blade was not seen. Lateral migration of the blade was seen in 2 cases in our study while in studies by Mallya et al.¹³ and Jadhav et al.²² had 1 case of lateral migration of the blade in each study. No case of non-union was reported in our study while 1 case of non-union was seen in study by Mallya et al.¹³ and 5 cases was seen in study by Baek et al.²⁰. No case of medial migration of helical blade into acetabulum was seen in our study but studies of Mallya et al.¹³, Baek et al.²⁰ and Jadhav et al.²² had 1,2,2 cases respectively of medial migration of helical blade into acetabulum. None of the patients had peri-implant fractures was seen in our study but 1 case of peri-implant fracture was seen in study of Mallya et al.¹³. Shortening less than 2 cm was seen in 3 cases which includes two cases with varus collapse.

LIMITATIONS

Limitation was that the comparative group with DHS and PFN would have given more information about the results and benefits of our study over DHS and PFN. Regular usage of the Cephalomedullary nail with helical blade is restricted due to high cost which acts as a deterrent in developing countries like India.

CONCLUSION

Cephalomedullary nail with helical blade is a good implant option for the operative management of intertrochanteric fractures, especially in the elderly osteoporotic individuals. It offers us shorter operative time, lesser bleeding, and minimum risk of implant failure. It offers early rehabilitation and early return to work.

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