

# Functional Outcome of Stable Intertrochanteric Femur Fractures Treated with Short Gamma3 Nail: A Prospective Study

Dr. Arun K N<sup>1</sup>, Dr. Bharath Narayanasamy<sup>2</sup>, Dr. Chandrahas A<sup>3</sup>, Dr. L Chendan<sup>4</sup>,  
Dr. Mullapadi Shashank Sai Charan<sup>5</sup>, Dr. Mullapadi Shashank Sai Charan<sup>6</sup>

<sup>1</sup>Medical Superintendent, Professor, Department of Orthopaedics, NMCH & RC, Raichur

<sup>2</sup>Professor & Head, Department of Orthopaedics, NMCH & RC, Raichur

<sup>3</sup>Assistant Professor, Department of Orthopaedics, NMCH & RC, Raichur

<sup>4</sup>Senior Resident, Department of Orthopaedic, NMCH & RC, Raichur

<sup>5</sup>Junior Resident, Department of Orthopaedics, NMCH & RC, Raichur (Corresponding Author)

<sup>6</sup>Junior Resident, Department of Orthopaedics, NMCH & RC, Raichur

**Abstract:** ***Introduction:** Intertrochanteric fractures are extracapsular fractures of the proximal femur occurring between the greater and lesser trochanters and are associated with substantial morbidity and mortality, particularly in the elderly osteoporotic population. The global incidence of hip fractures is rising steadily, with nearly half of the annual cases attributable to intertrochanteric fractures, and projections suggest a marked increase by 2040. Operative management is the standard of care, with intramedullary devices increasingly preferred for unstable fracture patterns due to superior biomechanical stability and preservation of reduction. The Gamma 3 Locking Nail has been developed with design modifications to enhance fixation strength and clinical outcomes compared with earlier generations of cephalomedullary implants. **Aim of the study:** To access the functional outcome of Gamma 3 nail for treatment of Stable Intertrochanteric fractures. **Materials and Method:** This hospital-based prospective study was conducted from January 2024 to July 2025, involving 30 patients aged 30 to 79 years with stable intertrochanteric fractures AO A1 treated Gamma 3 Nail. Data collected included patient demographics, mechanism of injury, clinical and radiological evaluations, and postoperative follow-up assessments using the Harris Hip Score. **Results:** The mean age of patients was 54.2 years, with ratio of 1:1 male and female. The right proximal was affected in 66.6% of cases, with road traffic accidents accounting for 63.3% of injuries. 180mm Short Gamma 3 Nail with 53.3% of 10mm distal diameter and with 8 mm & 60% 81-90cm length lag screw was used for intertrochanteric fracture. A union was achieved in all patients, with a mean time to union of 11.6 weeks. Two cases of femur shaft fracture occurred, which resolved with implant removal and Long PFN. The HHS scores showed an improving trend over time, with a final score of 88±5 at six months. These findings are consistent with the existing literature, particularly highlighting the effectiveness of Gamma 3 nailing in young and geriatric patients with shorter union times. **Conclusion:** Gamma 3 nail is an good surgical treatment for intertrochanteric fractures, offering satisfactory functional outcomes and union rates. Its minimally invasive nature and biomechanical advantages make it a preferable option for selected cases requiring surgical intervention.*

**Keywords:** Intertrochanteric fractures; Hip fractures; Intramedullary nailing; Gamma 3 nail; Cephalomedullary fixation; Osteoporosis.

## 1. Introduction

Intertrochanteric fractures, along with other hip fractures, are associated with significant morbidity and mortality. At present, approximately 280,000 hip fractures occur annually, with nearly half attributable to intertrochanteric fractures. By the year 2040, this number is expected to rise to approximately 500,000 fractures annually. [1] non-operative management is rarely indicated and should be reserved for non-ambulatory patients, those with a prohibitively high risk of peri-operative mortality, or individuals receiving palliative or comfort-based care. Outcomes following non-operative treatment are poor, owing to an increased risk of complications such as pneumonia, urinary tract infection, pressure sores, and deep vein thrombosis. [2, 3, 4] Intramedullary devices are more suitable than extramedullary implants for unstable fracture patterns. These nails reduce the risk of mechanical failure owing to their centromedullary position, which acts as a buttress against excessive medialisation, particularly in cases where the

lateral wall is deficient. [5] Intramedullary nails also preserve proximal femoral anatomy by effectively counteracting deforming forces in unstable fractures. Prospective randomised trials have demonstrated superior preservation of fracture reduction with these devices. The Gamma 3 Locking Nail (GN) (Stryker GmbH & Co. KG, Duisburg, Germany) was developed with a reduced nail diameter, a modification of the valgus angle from 10 degrees to 4 degrees, changes in the design of the femoral neck screw, and the option for dynamisation. [6] The Gamma 3 nail system has been shown to provide improved clinical outcomes and greater biomechanical stability compared with earlier generations of cephalomedullary devices. [7] More recent intramedullary nails, such as the Gamma 3 nail, have demonstrated superior quality of fracture reduction when compared with the proximal femoral nail anti-rotation (PFNA) system. [8] In this study our aim is to evaluate the functional outcome of Intertrochanteric fracture managed by Gamma 3 nail.

Volume 15 Issue 3, March 2026

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

[www.ijsr.net](http://www.ijsr.net)

## 2. Materials and Method

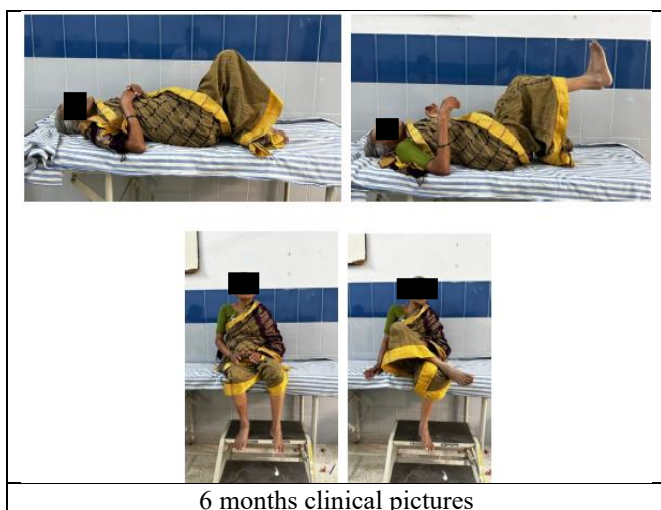
Our study was a prospective study which was conducted in Navodaya Medical College Hospital & Research Center with 30 intertrochanteric fractures treated with Gamma 3 Nail. This study was conducted for a duration of 18 months from January 2024 to July 2025. In our study we had included patients with age group  $\geq 18$  years, Acute post-traumatic inter-trochanteric fracture of femur, stable AO type A1 inter-trochanteric fractures, Patient with and without comorbidities like Diabetes mellitus, Hypertension, Ischemic Heart disease, Cardio-vascular diseases and Seizure disorders. We had excluded patients Age less than 18 years, patients with active infection, open fractures & congenital anomaly. The complete data was collected from the patients in a specially designed Case Record Form (CRF) which includes history of illness and detailed clinical examination and relevant investigations after patient fulfill the inclusion and exclusion criteria. Patients underwent clinical assessment to evaluate their overall condition and the specific injury site. Vital signs were recorded, and any associated injuries were carefully evaluated. Anteroposterior radiograph of Pelvis with Bilateral hip in traction and 15-degree internal rotation & lateral radiographs of the affected lower limb, including the Knee joints, were taken. The limb was immobilized with a skin traction. This study included the use of Fluoroscopy with Gamma 3 Trochanteric nailing system which. All patients underwent closed reduction on fracture table under fluoroscopic guidance. A short Gamma3 nail (180 mm) was inserted through the tip of the greater trochanter. Lag screw placement was central/inferior with maintenance of appropriate tip-apex distance. Distal locking was performed. Post operatively mobilization was initiated from postoperative day 1 partial weight bearing as tolerated. Patients were Followed up at 3 weeks, 6 weeks, 3 months and 6 months. Numerical values like age, sex, mode of injury, side of injury, associated injuries and commorbidities, trauma to surgery time interval, length of gamma nail, diameter of nail, Lag screw length, fracture union, complications, function outcome was assessed with Harris Hip Score.



## 3. Results

In 30 patient the lowest age was 30 years and the largest age was 79 years with an average mean age of 54.2 years. Age distribution was found to be more in 4<sup>th</sup> and 5<sup>th</sup> decade with 33.33%. Patient sex distribution was found to be equal with 15 males and 15 females. In our study occupation wise 14 labourers, 8 farmers, 5 homemakers, 2 electricians and 1 Bank employee was included. In this study out of 30 patients, 17 patients had RTA as Mode of injury. Rest 10 patients had history of trivial fall and 3 patient mode of injury was fall from height. 4 patients had head injury for which we had taken surgery reference and CT brain was done which was normal. Patient was taken for surgery after surgery team clearance. 7 patients had both type 2 Diabetes and Hypertension, 2 patients had only Type 2 Diabetes and 2 patients had Hypertension for which medicine reference was taken and after optimizing Blood sugar and Blood pressure patient was taken for Surgery. In this study we have operated on AO type 1 that is simple Intertrochanteric fracture with Stable fracture. 12 patients we had operated in 1-2 days, 4 patients we had operated in 3-4 days, 7 patients we had operated in 5-6 days, 5 patients we had operated in 7-8 days, 2 patients we had operated in 8-10 days. Average trauma to surgery in our study was 4.27 days. We have used short Gamma 3 Nail with length of 180 cm. 16 patients required

10mm diameter for short Gamma 3 nail rest 9 patients required 11mm diameter nail 2 patients required 9mm nail and 3 patients required 12mm nail. In 30 patients we had used 8mm lag screw with 18 patients with 81-90cm length lag screw and 12 patients with 71-80cm length lag screw. In our study the average weeks for the fracture union was  $11.6 \pm 1.3$  with 11 patients having 11 weeks for fracture union, 6 patients having 10 weeks for fracture union, 5 patient having 12 weeks for fracture union, 4 patient each had union at 13 weeks and 14 weeks. In our study 4 patients had surgical site infection for which we had done debridement and suturing where wound healing was achieved. 2 patients had Femur Shaft fracture due to stress of short Gamma nail on the Lateral cortex of femur for which we had done implant removal and we have used Long Proximal femoral nail good union was achieved. 2 Patient had anterior thigh pain which was managed conservatively and Implant removal was planned after remodeling of the fracture. 2 patient we observed screw back out for which we had advised for non-weight bearing with support with walker union was achieved. Harris hip score was used to access functional outcome for 3weeks, 6 weeks, 3 months and 6 months. The results we obtained was average  $41.6 \pm 5$ ,  $58.6 \pm 4$ ,  $73.3 \pm 4$  &  $88 \pm 5$  were obtained for 3 weeks, 6weeks, 3 months and 6 months respectively. In our study outcome was obtained was good according to harris hip score.



6 months clinical pictures

#### 4. Discussion

Variety of intramedullary and extramedullary fixations have been used in the treatment of intertrochanteric fractures. However, there are still controversies about the optimal treatment for intertrochanteric fractures, especially for stable intertrochanteric fractures. The basic biomechanical properties of the Gamma3 nail construct gave better results for stable fracture pattern.<sup>[9]</sup> Since many years dynamic hip screw fixation for stable intertrochanteric fracture provided superior results compared to other implants.<sup>[10]</sup> In Recent years interlocking intramedullary (IM) nailing has become the primary treatment approach, largely because they are easier to use and their insertion is less invasive compared with fixation using extramedullary sliding screws.<sup>[11]</sup> Gamma 3 Nail is a modified nail from its predecessor and have been refined over decades to overcome the shortcomings of previous intramedullary devices.<sup>[12]</sup>

Gamma 3 nail biomechanically better as it transmits weight closer to hip joint fulcrum.<sup>[13]</sup> It has the advantage of being minimally invasive, less traumatic operation technique, better cosmetic, less infection rate, less blood loss, great strength and stability.<sup>[14]</sup>

This study presents a comparative analysis of our results with those of various other studies employing Gamma 3 nail as treatment modalities for stable intertrochanteric fractures, aiming to provide a comprehensive evaluation of outcomes and complications across other studies.

In our study number of intertrochanteric fractures were common in 4<sup>th</sup> to 6<sup>th</sup> decade with average age of the patients 54.2 which was comparable to study done by **Dr Sonal Lal gupta**<sup>[15]</sup> where out of 50 patients he had obtained an average age of 54.82. In our study age distribution was 53.33% for age group between 41 – 60 years of age. We also found that 20% of patient were in the group of 71-80 years of age which was similar to studies by **Nguyen TA et al**<sup>[16]</sup> which showed that intertrochanteric fracture is a bimodal distribution.

In this study sex distribution was 1:1 among male and female. In a study conducted by **Zargar SM et al**<sup>[17]</sup> out of 30 patients 16 were female and 14 were males with ratio of 1.1:1 and **Areu MM et al**<sup>[18]</sup> out of 30 patient he had 16 male and 14 female with ratio of 1.1:1 which showed similar ratio of sex distribution to this study. Multiple studies such as **Tanner DA et al**<sup>[19]</sup> have reported high female to male ratio for intertrochanteric fractures mainly due to increase in age and osteoporosis.

In our study occupation distribution wise 46.66% of patients were having an occupation of labourer since our study was conducted in a district headquarters where large number of daily wage workers are present and 26.66% of patients had farmer as occupation because of the large cotton farms in and around our district.

In our study 63.33% of patient had Road traffic accident as mode of injury as a cause for intertrochanteric fractures mainly in age group of 4<sup>th</sup> to 5<sup>th</sup> decade. This was comparable to **Mahendra Et al**<sup>[20]</sup> in his study of 80 patient with intertrochanteric fracture had more patient with mode of injury as RTA. In our study the percentage of RTA was high because of our hospital is close to highway. In studies published by **Siva Et al**<sup>[21]</sup>, **Prakash AK et al**<sup>[22]</sup> showed that percentage of mode of injury was more with trivial fall in elderly.

In our study we found that 66.66% of patient had right side injury of intertrochanteric fracture compare to left side. This was comparable to study by **J Naveen Chandra Et al**<sup>[23]</sup> in his study out of 30 cases he had found that 19 cases had right sided injury with percentage of 63.33%. **James B et al**<sup>[24]</sup> in his study out of 22 patients 12 patient had right sided injury and 10 left side injury with percentage of right sided injury was 54.54% more compare to right.

In this study 4 patients had head injury for which we had taken surgery reference and CT brain was done which was normal. Patient was taken for surgery after surgery team

clearance. 7 patients had both type 2 Diabetes and Hypertension, 2 patients had only Type 2 Diabetes and 2 patients had Hypertension for which medicine reference was taken and after optimizing Blood sugar and Blood pressure patient was taken for Surgery.

In this study we have operated on AO type 1 that is simple Intertrochanteric fracture with Stable fracture.

In our study out of 30 patients, 12 patients we had operated in 1-2 days, 4 patients we had operated in 3-4 days, 7 patients we had operated in 5-6days, 5 patients we had operated in 7-8 days, 2 patients we had operated in 8-10 days. Average trauma to surgery in our study was 4.27 days. This data was very similar to study published by **Medina RJ et al**<sup>[25]</sup> where a patient group of 362 cases were treated with intertrochanteric fracture with an average trauma to surgery time of 4.2 days. **Dr Om Prakash Meena**<sup>[26]</sup> published that out of 45 patients in their study with intertrochanteric fracture trauma to surgery time average was 4.2 days.

In our Study we have preferred to use Short Gamma 3 nail with Nail length of 180cm gamma 3 nails for a stable intertrochanteric fracture

In 30 patients, 16 patients required 10mm diameter with 53.33% for short Gamma 3 nail rest 9 patients required 11mm diameter nail 2 patients required 9mm nail and 3 patients required 12mm nail. Studies which were similar to our study were **Cheung et al**<sup>[27]</sup> a retrospective cohort showed the predominance of 10mm diameter for intertrochanteric fractures treated by short cephalomedullary nails. Another study **Ergişi Y et al**<sup>[28]</sup> in his study he found that out of 91 patients treated with multiple distal diameters of nail for intertrochanteric fractures with cephalomedullary nails for intertrochanteric fractures 10mm diameter was commonly used in patients compared to other diameters.

In our study out of 30 patients we had used 8mm lag screw with 18 patients with 81-90cm length lag screw and 12 patients with 71-80cm length lag screw. This was comparable to studies **Han Sb et al**<sup>[29]</sup> in which out of 318 consecutive patients who underwent Gamma 3 nail with lag screw had a length of lag screw in the range of 70-90cm as predominance. **Yoo J et al**<sup>[30]</sup> in his study he mentioned that 70-90cm of lag screw is the common screw length for fixation of intertrochanteric fracture with Gamma 3 nail.

In our study fracture union duration was an average of 11.6 weeks with 11 patients with union time of 11 weeks, 6 patients with union time of 10 weeks, 5 patients with union time of 12 weeks and 4 patients each for duration time of 13 weeks and 14 weeks. This was comparable to **Hong KD et al**<sup>[31]</sup> In his retrospective series of 22 intertrochanteric fractures fixed with Gamma3 nail, the mean bone union time was 11.8 weeks. **Hans B et al**<sup>[21]</sup> in his prospective study of intertrochanteric fractures treated with a Gamma nail (third generation) found an average time to union of 11.6 weeks after fixation.

In our study 4 patients had surgical site infection for which we had done debridement and suturing where wound healing was achieved. 2 patients had Femur Shaft fracture due to

stress of short Gamma nail on the Lateral cortex of femur for which we had done implant removal and we have used Long Proximal femoral nail good union was achieved. 2 Patient had anterior thigh pain which was managed conservatively and Implant removal was planned after remodeling of the fracture. 2 patient we observed screw back out for which we had advised for non weight bearing with support with walker union was achieved.

In this study harris hip score at 6 months was average of 88 this was comparable to the studies done by **Wu D et al**<sup>[32]</sup> in which it was a comparative study between Gamma 3 nail and Intertan nail used for treatment of intertrochanteric fracture showed that harris hip score for gamma 3 nail was average of 85.6 overall. Hence Gamma 3 Nail give a good functional outcome at a follow up of 6 months when treated for intertrochanteric fracture.

in this study, we can use Gamma 3 Nail as a good alternative to other cephalomedullary Nails for fixation of Stable intertrochanteric fracture with good functional outcome with Harris Hip Score.

## 5. Conclusion

We conclude that fixation of intertrochanteric fractures with the Gamma 3 Locking Nail is a highly effective modality, providing excellent biomechanical stability, reliable fracture union, and favourable functional outcomes. The centromedullary position of the implant confers a load-sharing advantage, minimizes the bending moment across the fracture site, and preserves the biology of fracture healing through a minimally invasive technique. Its design modifications, including a reduced nail diameter and optimized neck-shaft angle, facilitate improved fracture reduction, enhanced rotational stability, and early mobilization, particularly in stable fracture patterns.

Despite these advantages, potential complications such as lag screw cut-out, varus collapse, implant failure, infection, and peri-implant fractures must be acknowledged. These adverse events can be substantially reduced through meticulous pre-operative planning, accurate assessment of fracture morphology, proper entry point selection, maintenance of an acceptable tip-apex distance, and vigilant post-operative rehabilitation protocols. Although extramedullary devices such as the dynamic hip screw remain appropriate for selected stable fracture configurations, the Gamma 3 nail demonstrates distinct advantages in unstable and osteoporotic fractures.

In conclusion, the Gamma 3 nail represents a safe, reliable, and biomechanically sound option for the management of intertrochanteric fractures, yielding predictable union rates and satisfactory functional recovery in the majority of patients when executed with sound surgical principles.

## References

- [1] Yang Y, Lin X. [Epidemiological features of 877 cases with hip fraction]. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2014 Apr;35(4):446-8.
- [2] Sharma A, Sethi A, Sharma S. Treatment of stable intertrochanteric fractures of the femur with proximal

- femoral nail versus dynamic hip screw: a comparative study. *Rev Bras Ortop.* 2018 Jul-Aug;53(4):477-481.
- [3] Wang F, Meng C, Cao XB, Chen Q, Xu XF, Chen Q. [Hemiarthroplasty for the treatment of complicated femoral intertrochanteric fracture in elderly patients]. *Zhongguo Gu Shang.* 2018 Sep 25;31(9):818-823.
- [4] Karakus O, Ozdemir G, Karaca S, Cetin M, Saygi B. The relationship between the type of unstable intertrochanteric femur fracture and mobility in the elderly. *J Orthop Surg Res.* 2018 Aug 22;13(1):207.
- [5] Kokoroghiannis C, Aktselis I, Deligeorgis A, Fragkomichalos E, Papadimas D, Pappadas I. Evolving concepts of stability and intramedullary fixation of intertrochanteric fractures—a review. *Injury.* 2012 Jun 1;43(6):686-93.
- [6] Bonnaire F, Lein T, Bula P. Trochanteric femoral fractures: anatomy, biomechanics and choice of implants. *Der Unfallchirurg.* 2011 Jun; 114: 491-500.
- [7] Buecking B, Bliemel C, Struewer J, Eschbach D, Ruchholtz S, Müller T. Use of the Gamma3™ nail in a teaching hospital for trochanteric fractures: mechanical complications, functional outcomes, and quality of life. *BMC research notes.* 2012 Dec; 5: 1-1.
- [8] Buecking B, Bliemel C, Struewer J, Eschbach D, Ruchholtz S, Müller T. Use of the Gamma3™ nail in a teaching hospital for trochanteric fractures: mechanical complications, functional outcomes, and quality of life. *BMC research notes.* 2012 Dec; 5: 1-1.
- [9] Buecking B, Bliemel C, Struewer J, Eschbach D, Ruchholtz S, Müller T. Use of the Gamma3™ nail in a teaching hospital for trochanteric fractures: mechanical complications, functional outcomes, and quality of life. *BMC research notes.* 2012 Nov 23;5(1):651.
- [10] Ma KL, Wang X, Luan FJ, Xu HT, Fang Y, Min J, Luan HX, Yang F, Zheng H, He SJ. Proximal femoral nails antirotation, Gamma nails, and dynamic hip screws for fixation of intertrochanteric fractures of femur: a meta-analysis. *Orthopaedics & Traumatology: Surgery & Research.* 2014 Dec 1;100(8):859-66.
- [11] Niu E, Yang A, Harris AH, Bishop J. Which fixation device is preferred for surgical treatment of intertrochanteric hip fractures in the United States? A survey of orthopaedic surgeons. *Clinical Orthopaedics and Related Research®.* 2015 Nov 1;473(11):3647-55.
- [12] Gul I. Gamma nail in the management of intertrochanteric fractures of femur in adults. *International Surgery Journal.*
- [13] Platzer P, Thalhammer G, Wozasek GE, Vécsei V. Femoral shortening after surgical treatment of trochanteric fractures in nongeriatric patients. *Journal of Trauma and Acute Care Surgery.* 2008 Apr 1;64(4):982-9.
- [14] Boriani S, Bettelli G, Zmerly H, Specchia L, Bungaro P, Montanari G, Capelli A, Canella P, Regnoli R, Rispoli R, Trabucchi L. Results of the multicentric Italian experience on the Gamma™ nail: a report on 648 cases. *Orthopedics.* 1991 Dec 1;14(12):1307-14.
- [15] Dr. Sohan Lal Gupta Assessment of intertrochanteric fractures: a cross-sectional prospective study. *Int.J.Med.Sci.Educ* 2019;6(2):101-104
- [16] Nguyen TA, Hoang AQ, Phan TN, Nguyen TX, Nguyen NN, Nguyễn PD. The retrospective analysis of trigen intertan nail in the treatment of unstable intertrochanteric femoral fractures at hospital for traumatology and orthopaedics. *Orthopedic Reviews.* 2024 Mar 9; 16: 94277.
- [17] Zargar SM, Nehvi TH, Baba AN, Mohd. Ganaie I. Clinical and functional outcome of inter-trochanteric fractures in the elderly patients using Proximal Femoral Nail Anti-rotational-II (PFNA-II). *International Journal of Orthopaedics Sciences.* 2024;10(1):113-117.
- [18] Areu MM, von Kaeppeler EP, Madison BB, Aguto AA, Alphones J, Zirkle LG, Morshed S, Shearer DW. Fixation of intertrochanteric femur fractures using the SIGN intramedullary nail augmented by a lateral plate in a resource-limited setting without intraoperative fluoroscopy: assessment of functional outcomes at one-year follow-up at Juba Teaching Hospital. *OTA International.* 2021 Sep 1;4(3):e133.
- [19] Tanner DA, Kloseck M, Crilly RG, Chesworth B, Gilliland J. Hip fracture types in men and women change differently with age. *BMC geriatrics.* 2010 Mar 9;10(1):12.
- [20] Mahendra, Mayank; Rastogi, Devarshi; Waliullah, Shah; Chakoo, Ritesh; Pant, Shatakshi; Kumar, Ashish. Evaluation of Functional and Radiological Outcomes in Patients with Unstable Intertrochanteric Fractures Treated Using the Proximal Femoral Nail Anti-rotation-2 Implant. *Journal of Orthopaedics, Traumatology and Rehabilitation* 17(1):p 28-33, Jan–Jun 2025.
- [21] Siva K, John L, Murugan K. Clinical and Radiological Outcomes of Intertrochanteric Femur Fractures Treated With the Trochanteric Fixation Nail: A Prospective Observational Study From a Tertiary Care Centre in South India. *Cureus.* 2025 Nov 27;17(11).
- [22] Prakash AK, Nagakumar JS, Shanthappa AH, Venkataraman S, Kamath A. A comparative study of functional outcome following dynamic hip screw and proximal femoral nailing for intertrochanteric fractures of the femur. *Cureus.* 2022 Apr 4;14(4):e23803.
- [23] J Naveen Chandra, Naga Kumar JS and PV Manohar. **A study of surgical management of intertrochanteric fracture of femur with dynamic hip screw.** *Int. J. Orthop. Sci.* 2017;3(3):788-794.
- [24] James B, Ram PV. Functional outcome of proximal femoral nailing in inter trochanteric fractures of femur: A prospective study. *Int J Orthop Sci.* 2017;3(2):513-8.
- [25] Medina RJ, Arenas ÁR, Orozco JV, Villanueva DO. Potential predictors for surgical delay in patients with intertrochanteric fractures and their impact on hospitalization length, in a Latin American trauma center. *Injury.* 2023 Nov 1; 54: 110807.
- [26] Dr Om Prakash Meena. Comparative advantages of cemented bipolar hemiarthroplasty in unstable intertrochanteric fractures in geriatric patients. *Int.J.Med.Sci.Educ* 2018;8(4):317-325
- [27] Cheung ZB, Selverian S, Barbera J, Forsh DA. The effect of nail diameter on proximal femoral shortening after internal fixation of pertrochanteric hip fractures with short cephalomedullary nails. *Journal of Orthopaedics.* 2020 Nov 1; 22: 358-61.
- [28] Ergişi Y, Özdemir E, Korkmazer S, Kekeç H, Altun O, Yalçın N. What is the importance of distal nail

diameter in the treatment of intertrochanteric femur fractures? *Joint diseases and related surgery*. 2022 Oct 27; 33(3): 639.

- [29] Han SB, Jung JK, Jang CY, Kwak DK, Kim JW, Yoo JH. Gamma3 nail with U-Blade (RC) lag screw is effective with better surgical outcomes in trochanteric hip fractures. *Scientific reports*. 2020 Apr 7;10(1):6021.
- [30] Yoo J, Kim S, Choi J, Hwang J. Gamma 3 U-Blade lag screws in patients with trochanteric femur fractures: are rotation control lag screws better than others?. *Journal of orthopaedic surgery and research*. 2019 Dec 16;14(1):440.
- [31] Hong KD, Sim JC, Ha SS, Kim TH, Choi YH, Kim JH. Operative treatment with gamma 3 nail in femur intertrochanteric fracture. *Journal of the Korean Fracture Society*. 2011 Jan 1;24(1):7-15.
- [32] Wu D, Ren G, Peng C, Zheng X, Mao F, Zhang Y. InterTan nail versus Gamma3 nail for intramedullary nailing of unstable trochanteric fractures. *Diagnostic pathology*. 2014 Oct 1;9(1):191.