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**Original Research**

# Anti Rotational Blade Implant Versus Two Screw Implant In The Treatment Of Per-Trochanteric Fractures: A Comparative Study

[1]Lenka Bhabani Shankar, [2]Sahoo Sarthak, [3]Sahoo Kumuda Bandhu, [4]Rout Bijayashree Durgaprasad, [5]Bhuyan Manoja

[1]Associate Professor, Department of Orthopaedics, SCB Medical College, Cuttack, Odisha
[2]Assistant Professor, Department of Orthopaedics, SCB Medical College, Cuttack, Odisha
[3]Associate Professor, Department of Orthopaedics, BB Medical College, Balangir, Odisha
[4]Post PG Senior Resident, Department of Orthopaedics, SCB Medical College, Cuttack, Odisha
[5]Assistant Professor, Department of Community Medicine, SCB Medical College, Cuttack, Odisha

**Corresponding author:**
Dr. Bijayashree Durgaprasad Rout
Post PG Senior Resident, Department of Orthopaedics, SCB Medical College, Cuttack, Odisha
**Email:** bijayashree.godfdr@gmail.com

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**Abstract**

**Background:** Per-trochanteric fractures are common in elderly patients, often requiring surgical intervention. The choice of implant plays a critical role in outcomes. This study compares the efficacy of anti-rotational blade implants (ARBI) and two-screw implants (TSI) in the treatment of per-trochanteric fractures.

**Methods:** A prospective comparative study was conducted in the department of Orthopaedics of SCB Medical College, Cuttack on 30 patients with per- trochanteric fractures, divided into two groups: Anti Rotational Blade Implant (n=15) and Two Screw Implant (n=15) from May 2023 to June 2024. Outcomes were assessed based on operative time, blood loss, fluoroscopic time, fracture union time, functional outcomes (Harris Hip Score), and complications.

**Results**: Operative time has an average of 70.33 minutes for Two screw implant. Mean blood loss of 195 ml. Mean usage of image intensifier was 110 seconds. Abductor lurch was seen in one patient. Average union time in weeks is 15.8 weeks.
Operative time has an average of 68.6 minutes for Anti rotational blade implant Mean blood loss of 175 ml. Mean usage of image intensifier was 104secsonds. Abductor lurch seen in 1 patient alone. Average union time in weeks is 15.4weeks.
From the p-value it was considered that there wereno significant difference in functional outcome for both the implants.

**Conclusion:** Anti-rotational blade implants have no significant difference in terms of operative efficiency, fracture healing, and reduced complications compared to two-screw implants in the treatment of per-trochanteric fractures.

**Keywords**: per-trochanteric fracture, blood loss, Harris Hip Score, fracture union, ant rotational blade implant, two screw implant, operative time



## INTRODUCTION

Per-trochanteric fractures represent a severe injury commonly seen in the elderly population, with the frequency of occurrence rising as individual ages.[1] These fractures significantly restrict mobility and independence in daily tasks, leading to a higher reliance on assistance for basic and complex activities. Approximately half of hip fracture cases in older adults are attributed to trochanteric fractures, and a significant portion of these fractures are classified as unstable trochanteric fractures. The intramedullary fixation methods, such as the Proximal Femoral Nail, Intramedullary Hip Screw, and Gamma Nail, which offer advantages like reduced surgical time, decreased blood loss, and earlier mobilization for patients.[2,3]

The intramedullary placement of the PFN prevents excessive collapse of the proximal fragment and inward shifting of the distal fragment. Acting as a load-sharing device within the medullary canal, the PFN facilitates early post-operative mobility, weight-bearing, and promotes prompt fracture healing.[4] Utilized as a closed nailing technique, the PFN preserves the fracture hematoma, leading to reduced blood loss and shorter surgical durations.[5,6]

Currently, unstable intertrochanteric and subtrochanteric fractures are managed using intramedullary nail devices. Various types of intramedullary nails have been developed, such asthe

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proximal femur nail-Two screw implant, intertrochanteric nail, and proximal femur nail- Anti-rotation blade implant.[7] The sliding hip screw remains a commonly used extramedullary implant, with different designs available from various manufacturers like the Gamma nail, intramedullary hip screw, proximalfemoral nail, and ACE trochanteric nail. The PFN, introduced by AO in 2004, is an intramedullary device featuring a helical blade for improved fixation in the femoral head compared to traditional screws. While the functional outcomes of Two screw implant have shown variability and complications have been reported, issues like the Z-effect and reverse Z-effect have been discussed, primarily due tothe lag screw's tendency to migrate proximally, posing a significant challenge.[8]

The outcomes of treating per-trochanteric fractures are influenced by four key factors:

i) The specific fracture patterns.
ii) The bone quality.
iii) The accuracy of the reduction.
iv) The suitability of the implant used.

Therefore, inadequate control of the latter two factors can lead to implant failure. Additionally, addressing varus malrotation in these unstable fractures is a significant concern. Consequently, regardless of the fracture type or implant choice, achieving a high-quality reduction is crucial for ensuring stable fixation of per-trochanteric fractures.

Recent literature has focused significantly on the management of these fractures. In younger patients without osteoporosis but with unstable factors, achieving stable fixation is crucial for enabling early mobilization and reducing the risks of morbidity and mortality. [9]However, there were no notable differences observed among the various nail types regarding reduction outcomes, implant positioning, femoral head penetration, significant lateral migration of hip screws, Z-effect, reverse Z-effect, implant failures, non-union, malunion, delayed union, or Harris Hip Score.

**AIMS & OBJECTIVES**

i. To compare clinical outcome of patients undergoing surgery for unstable per-trochanteric femur fractures (intertrochanteric & sub trochanteric fractures of femur) by both conventional **Two screw implant** and **Anti rotational blade implant**.

ii. To compare and contrast the complications resulted during surgery for fixation of unstable per-trochanteric fractures by both **Two screw implant and Anti rotational blade implant.**

iii. To assess mean operative time, mean blood loss, mean fluoroscopy time when performed using **Two screw implant and Anti rotational blade implant.**

Operation time was measured as the interval from the start of reposition to the wound closure. Blood loss performed after operation was recorded in mL.

**MATERIAL & METHODS**

This study is a prospective study and was conducted in the department of Orthopaedics at SCB MCH ,Cuttack, Odisha after getting approval from IEC ( Institutional Ethics Committee )from MAY 2023 to JUN 2024. Comparison was done between conventional two screw implant and anti-rotational blade implant used for fixation of unstable per-trochanteric fractures of femur.Atotal of 30 patients with unstable per-trochanteric fractures were selected, they were divided randomly into 15 patients whose per-trochanteric fractures were operated by Two screw implant and other 15 patients whose per-trochanteric fractures were operated by Anti rotational blade implant.After obtaining a detailed history, a completegeneral, physical and systemic examination, the patients will be subjected to relevant investigations and surgery.

**INCLUSION CRITERIA**

a.Patient of age more than 30 years and less than 75 years of either sex(Male/Female)

b.Patients with post traumatic unstable inter-trochanteric and sub-trochanteric fractures without history of Ankylosingspondylitis,Rheumatoid Arthritis.

c.Patients having varus collapse,comminuted osteoporotic fractures.

**EXCLUSION CRITERIA:**

a.Age less than 30 years and above 75 years.

b.patient unwilling for surgery and postsurgery lifestyle modifications

c.patient medically unfit for surgery

d.pathological fractures.

e. patients not giving consent to participate in the study.

Pre-operative templating with AP – Roentgenogram of injured hip wasused to measure the nail diameter and lag screw length.

The procedure was performed on a conventional radiolucent fracture table with the patient lying in a supine position, utilizing an image intensifier for guidance.

**Surgical technique**

All the fractures were treated with initial closed reduction with alignment of the medial cortex under epidural and spinal anaesthesia. In two patients we could not achieve closed reduction and in those cases open reduction was done.

The duration of the operation was measured from the initiation of the surgical incision until wound closure, fluoroscopy time was determined by number of exposure at the end of operation and the time the image intensifier was utilized during PFN treatment was recorded in seconds. Blood loss was estimated based on the number of surgical mops used, with each mop equivalent to 50ml of blood. Sutures were removed on the 12th day post-operation.

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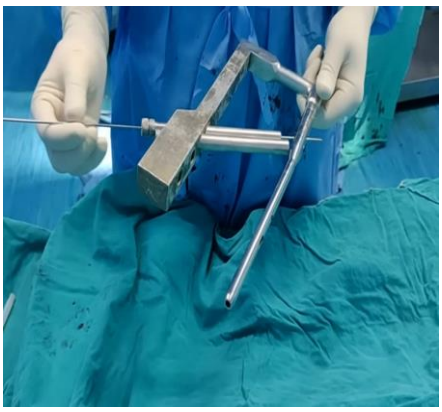
Rehabilitation was delayed in a patient with bilateral trochanteric fractures. Fracture healing progress was assessed using both radiographic and clinical criteria,[8] with clinical union defined as the absence of tenderness or pain during full weight-bearing. Patients were followed up at 6 week, 3 months, 6 months postoperatively and complications also documented.



**TWO SCREW IMPLANT**

**ANTI ROTATIONAL BLADE**

Statistical analyses were carried out using SPSS version 17 . The t- test was used to determine whether there were any significant differences. The 2-tailed, unpaired t test was used to evaluate the differences between two groups. All continuous data are expressed as the mean ± standard deviation (SD). Independent sample t tests were used for the continuous variables. The level of significance was set at $p < 0.05$ for all statistical analyses.

## RESULTS

**Table 1 : Comparison of operating time between two implants**

| OPERATING TIME (MIN) | TWO SCREW IMPLANT | | ANTI ROTATIONAL BLADE IMPLANT | | P-VALUE |
|---|---|---|---|---|---|
| | NO. | % | NO. | % | |
| 40-44 | 0 | 0 | 0 | 0 | P = 0.08 |
| 45-60 | 4 | 26 | 6 | 40 | |
| 61-75 | 5 | 33 | 2 | 13 | |
| 76-90 | 6 | 41 | 7 | 47 | |
| **Mean** | **70.33** | | **68.6** | | |

**Table 2 : Comparison of blood loss during surgery between two implants**

| BLOOD LOSS (ML) | TWO SCREW IMPLANT | | ANTI ROTATIONAL BLADE IMPLANT | | P-VALUE |
|---|---|---|---|---|---|
| | NO. | % | NO. | % | |
| 101-150 | 3 | 26 | 2 | 13 | P = 0.09 |
| 151-200 | 7 | 46 | 9 | 60 | |
| 201-250 | 4 | 26 | 4 | 27 | |
| 251-300 | 1 | 8 | 0 | 0 | |
| **Mean** | **195** | | **175** | | |

**Table 3 : Comparison of fracture union time between two implants**

| TIME (WEEKS) | TWO SCREW IMPLANT | | ANTI ROTATIONAL BLADE IMPLANT | |
|---|---|---|---|---|
| | NO. | % | NO. | % |
| 10-15 | 10 | 67 | 11 | 74 |
| >15 | 5 | 33 | 4 | 26 |
| **Mean** | **15.8** | | **15.4** | |

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**Table 4 : Types of complication in two implants**

| Type of Complication | Two screw implant | Anti rotational blade implant |
|---|---|---|
| Abductor Lurch | 1 case | 1 case |
| Varus deformity | 1 case | 1 case |
| Screw Back out | 1 case | Nil |
| Nail Breakage | Nil | Nil |

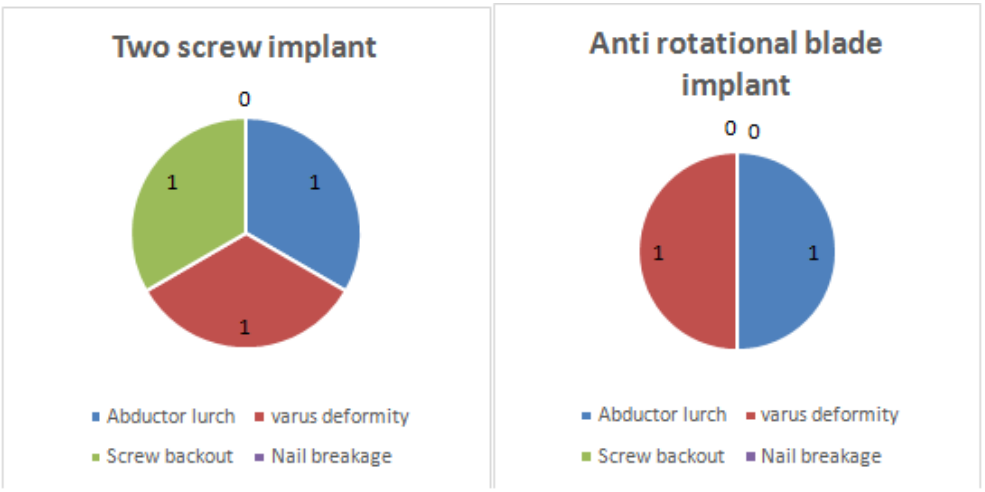


**Table 5 : Fluoroscopic Exposure time in two implants**

| Intensity expressed in seconds | Two screw implant | | Anti rotational blade implant | | P-VALUE |
|---|---|---|---|---|---|
| | No | % | No | % | |
| Upto 100 secs | 8 | 54 | 9 | 60 | P = 0.09 |
| > 100 secs | 7 | 46 | 6 | 40 | |
| **Mean** | **110 secs** | | **104 secs** | | |

**Table 6 : Comparison of different variables between two implants**

| Variables | Two screw implant | Anti rotational blade implant | P-VALUE |
|---|---|---|---|
| Operating Time | 70.33 mins | 68.6 mins | P = 0.102 |
| Blood Loss | 195 mL | 175 mL | |
| Abductor Lurch | 1 case | 1 case | |
| Varus deformity | 1 case | 1 case | |
| Screw Back out | 1 case | Nil | |
| Fracture Union | 15.8wks | 15.4wks | |
| Image Intensifier | 110 secs | 104 secs | |
| Harries Hip score at 6 months | **80.6** | **80.4** | |

Patients were evaluated clinically and radiologically at 3 weeks interval for first 3 months and there after monthly for the next 3 months and bimonthly for next 12 months. During follow up the Harris Hip Score was evaluated at 3 months and 6 months post operatively. Various parameter like pain, limp, use of support, distance walked, stair climbing, sitting, absences of deformity, range of motion were evaluated using Harris Hip Score.[9]

Operative time has an average of 70.33 minutes for Two screw implant. Mean blood loss of 195 ml. Mean usage of image intensifier was 110 sec. Abductor lurch was seen in one patient. Average union time is 15.8 weeks.[10,11,12,13]

Operative time has an average of 68.6minutes forAnti rotational blade implant. Mean blood loss of 175 ml. Mean usage of image intensifier was 104sec. Abductor lurch seen in 1 patient alone. Average union time is 15.4weeks. All the patients were allowed for partial weight bearing from the 2-3rd pod with aids. Harris hip Score at the end of 6 months is 80.6 for Two screw implant and 80.4 for Anti rotational blade implant.[10,11,12,13]

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From the p-value it was considered that therewereno significant difference in functional outcome for both the implants.

## DISCUSSION

The PFN serves as an effective intramedullary device for load-sharing, combining nature. principles from the Zickel Nail, Dynamic hip screw, and locked intramedullary nail.Advantages of Anti rotational blade implant include minimal blood loss, shorter operative time, and reduced risk of screw cut out, in contrast to Two screw implant which has longer operative times and more blood loss. Our study indicates that Anti rotational blade implant results in less blood loss and shorter operative times than Two screw implant.[10,11,14]

Techniques such as reducing implant curvature, proper diameter selection, controlled reaming of the femoral canal, manual implant insertion, and careful distal locking screw placement can reduce the risk of femoral shaftfractures(**I.B. SCHIPPER et.at.2004**).[14]In our study, we did not observe any preoperative or postoperative femoral shaft fractures with either Two screw implant or Anti rotational blade implant.

The unique blade geometry of Anti rotational blade implant behaves differently under load compared to a threaded tip screw, potentially leading to medial perforation or axial cut-out if inserted too close to the subchondral bone. [15]

In a large multi-center study by **Simmer macher**, medial blade migration was linked to patients falling directly onto the trochanteric region, causing axial loading on the implant's head component.[16]

A prospective, randomized trial involving 30 patients aimed to assess the Harris Hip Score (HHS) as the primary objective. The secondary objectives included comparing clinical outcomes such as operation time, fluoroscopy time, lateral hip pain, walking ability, reoperation rate, and the incidence of cut-out based on implant position and fracture reduction quality while no significant differences were found between groups in terms of HHS, walking ability, and reoperation rate, there were notable discrepancies in operation and fluoroscopy times.

Our study also indicated no significant differences in HHS outcomes.

## CONCLUSION

In this comparative study, no significant differences were observed between anti-rotational blade implants (ARBI) and two-screw implants (TSI) in terms of functional outcomes, fracture union time, or complication rates. Both implants demonstrated comparable efficacy in the treatment of per-trochanteric fractures, suggesting that either option can be effectively utilized based on surgeon preference, patient-specific factors and cost factors. Further studies with larger sample sizes and longer follow-up periods are recommended to confirm these findings and explore potential subtle differences between the two implants.

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