Section: Orthopedics

Original Research Article

# A PROSPECTIVE STUDY TO EVALUATE THE OUTCOME OF UNSTABLE TROCHANTERIC FRACTURES USING TROCHANTERIC STABILISATION PLATE

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ABSTRACT

**Background:** Intertrochanteric fractures are the most common proximal femur fractures, primarily affecting the elderly and causing significant morbidity. Their incidence is increasing due to longer life expectancy. These fractures usually result from simple falls in older adults, while high-energy trauma causes them in younger patients. Risk factors include weak muscles, poor reflexes, and impaired vision. As the femur is a major weight-bearing bone, such fractures lead to prolonged immobility and complications like bedsores, infections, and joint stiffness. Therefore, prompt surgical management using advanced implants, developed through improved understanding of fracture biomechanics, is essential to restore mobility and reduce mortality. The objective is to evaluate the unstable intertrochanteric fractures and their management by using modular extension of dynamic hip screw (Trochanteric Stabilization Plate). To analyze the functional and radiological outcome of the above procedure.

**Materials and Methods:** A prospective study was conducted on 20 patients with intertrochanteric fractures, assessing fracture healing, functional outcomes, and complications over a one-year follow-up period. Radiological evaluations included X-rays, CT, and MRI scans, while clinical assessments focused on joint mobility, weight-bearing ability, and complications.

**Results:** The results demonstrated as after analyzing functional outcome by Harris hip score Average Harris hip score was 83.2. We had 4 excellent results, 13 good results and 3 fair results.

**Conclusion:** The trochanteric stabilization plate (TSP) with a sliding hip screw (DHS) provides a biomechanically strong construct for unstable intertrochanteric fractures with lateral wall comminution. The TSP rebuilds the lateral wall, preserves the abductor lever arm, and enhances stability. An additional anti-rotation screw improves proximal fragment control, while the buttress effect reduces varus collapse and screw cut-out. The surgical technique is similar to a standard DHS with only a modest learning curve. Overall, DHS + TSP offers superior functional and radiological outcomes in unstable intertrochanteric fractures compared to DHS alone.

**Keywords:** Intertrochanteric fracture, trochanteric stabilization plate , sliding hip screw, Harris hip screw.

## INTRODUCTION

The most common fractures of the proximal femur are intertrochanteric fractures, which are among the most debilitating injuries that affect the elderly and mostly affect geriatric patients. Since the population's average life expectancy has increased dramatically over the past few decades, the incidence of proximal femur fractures is rising.[1]

The majority of proximal femoral fractures in the elderly are caused by mild to severe trauma. High-intensity trauma is typically the cause of these

fractures in younger patients. Intertrochanteric fractures affect the area along the lesser trochanter proximal to the medullary canal's formation, as well as the extracapsular basilar neck region.

The cause of an intertrochanteric fracture is a simple self-fall. Increase in the risk of self-fall are exacerbated by weakened muscles, impaired reflexes, blurred eyesight, and labile blood pressure.[1-3]

Since the femur is the primary bone that bears weight, a fracture of the intertrochanteric region in the lower limb causes the patient to remain bedridden for an extended amount of time, which raises morbidity and mortality (urinary tract infection, joint pain, respiratory tract infections, and bed sores). To avoid these problems, this fracture must be treated appropriately.[1-3]

Operative treatment is indicated to avoid these consequences. Numerous implants for treating fractures have been developed as a result of improved knowledge of fracture geometry and biomechanics

**Objectives of the Study**

1. To evaluate the unstable intertrochanteric fractures and their management by using modular extension of dynamic hip screw (Trochanteric Stabilization Plate).
2. To analyze the functional and radiological outcome of the above procedure.

## MATERIALS AND METHODS

This prospective observational study, conducted in Narayana General Hospital, aimed to evaluate the functional result of functional results of unstable trochanteric fractures treated with a Dynamic hip screw with Trochanteric stabilization plate. The time frame for this investigation was September 2024 to October 2025. Prior to surgery, the study participants had all the routine preoperative investigations. The study included a total of 20 patients have unstable trochanteric fractures. All patients who underwent dynamic hip screw with trochanteric stabilization plating were included after giving their informed consent, using a simple sequential allocation method.. There were two follow-up periods: three and six months. The study was carried out at the Narayana Medical College's Department of Orthopaedics in Nellore, Andhra Pradesh.

**Inclusion Criteria**

1. Cases of Intertrochanteric and subtrochanteric fracture femur of age group above 30 years and below 70 years.
2. Clinical diagnosis of unstable trochanteric fractures (AO type 31A2, and Type 3A3 and subtrochanteric fractures under Russel -taylor.

**Exclusion Criteria**

1. Patients with fractures less than 30 years of age and greater than 70 years of age.AO type 31A1 is excluded
2. Seriously ill patients and patients unfit for surgery
3. Fracture due to tumor or any other pathological cause
4. Compound fractures

**Clinical Evaluation**

Every patient's complete medical history was obtained.

The patient's medical history was gathered since it provides a hint for analysing the injury's mechanism, which indirectly evaluates the velocity of the injury. The history of the patient's comorbidity was gathered because the effectiveness of the surgical operation is believed to be significantly influenced by it.

The examination revealed the problems as the indicators of fracture, including edema, deformity observed on inspection & tenderness, abnormal movement, and crepitus felt during palpation. It is more crucial to assess the condition of the skin and look for any open wounds, bruising, or soft tissue swelling all the way around the hip. Additionally, ipsilateral hip joint injury was ruled out.

**Radiographic Evaluation**

Time to union, loss of reduction, and misalignment were all evaluated radiographically. AP & frog lateral images of the affected limb, consisting of the hip joint, comparisons were made during the radiographic evaluation

Mean lag screw size was 85mm, mean anti rotation screw size was 75mm.

Varus malunion is seen in 2 patients.

CT and / or MRI in patients with intraarticular injuries, hidden cartilaginous, ligamentous, tendon injuries

**Dynamic Hip Screw with Trochanteric Stabilization Plate**

**Principle:** The principle of using a trochanteric stabilization plate (TSP) with a dynamic hip screw (DHS) is to restore the lateral femoral buttress and convert an unstable intertrochanteric fracture into a mechanically stable, load-sharing construct. The TSP reconstructs the compromised lateral wall, resists lateral shear forces, and preserves the abductor lever arm, thereby maintaining hip biomechanics. The DHS provides controlled sliding and axial compression across the fracture site, promoting biological healing by converting shear into compressive forces. An additional anti-rotation screw enhances rotational stability of the proximal fragment, reducing the risks of varus collapse and screw cut-out. Overall, the combined DHS + TSP system allows early mobilization, maintains alignment, and provides a stable environment for fracture union in unstable intertrochanteric fractures.

**Indications:** Indications for using a trochanteric stabilization plate (TSP) with a dynamic hip screw (DHS) include unstable intertrochanteric fractures characterized by lateral wall comminution, posteromedial fragment instability, reverse obliquity patterns, and fractures where the lateral wall is thin or at high risk of collapse. It is particularly indicated when standard DHS alone would be insufficient to maintain stability, in osteoporotic bone where varus collapse is likely, and in patients requiring early mobilization. The TSP is recommended whenever additional lateral buttressing is needed to prevent

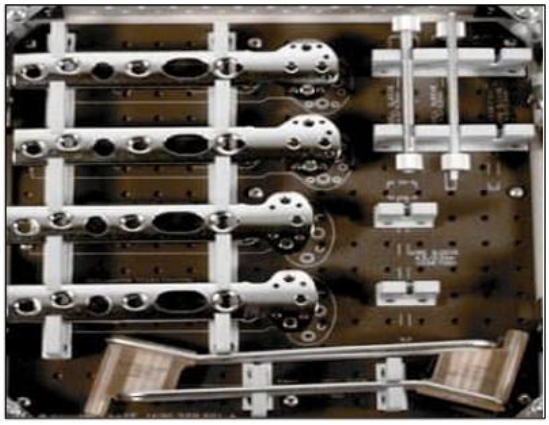
screw cut-out, maintain alignment, and provide a stable construct for biological healing.

**Advantages:** The trochanteric stabilization plate combined with a dynamic hip screw offers several advantages, including restoration of the lateral femoral wall, which provides improved stability in unstable intertrochanteric fractures. It significantly reduces the risk of varus collapse and screw cut-out by acting as an effective buttress. The construct preserves the abductor lever arm, resulting in better hip biomechanics and functional recovery. The addition of an anti-rotation screw enhances proximal fragment control, improving rotational stability. The technique has a relatively small learning curve since it is similar to the standard DHS procedure. Overall, it allows earlier mobilization, promotes reliable fracture healing, and yields superior functional and radiological outcomes compared with DHS alone.

**Disadvantages:** The trochanteric stabilization plate with DHS also has certain disadvantages. It involves a larger surgical exposure than intramedullary devices, which may increase soft-tissue disruption and operative time. The construct is bulkier, potentially causing irritation or discomfort over the lateral thigh, sometimes requiring later implant removal. In severe comminution or very unstable patterns, fixation may still be less stable compared with intramedullary nails, especially during early weight-bearing. The procedure can be technically demanding in osteoporotic bone, with risks of plate malposition or inadequate screw purchase. Additionally, as an extramedullary device, DHS + TSP may have a higher chance of implant failure in extremely unstable fracture configurations.

**Characteristics:** The trochanteric stabilization plate is a modular, contoured extramedullary device that acts as a lateral buttress to restore the compromised lateral wall. It works with the dynamic hip screw to allow controlled sliding and compression, improving stability in unstable intertrochanteric fractures. An optional anti-rotation screw enhances proximal fragment control, and the design helps preserve normal hip biomechanics and enable early mobilization.

**Dynamic HIP screw set**



**Trochanteric Stabilisation Plate Set**

**Surgical procedure**

1. Patient prepared on the morning of surgery; test dose given and prophylactic antibiotics administered.
2. Spinal anesthesia used for all cases.
3. Patient positioned on fracture table with the normal leg flexed/abducted and injured leg in a boot.
4. C-arm positioned opposite the injured limb and checked for optimal AP and lateral visualization.
5. Closed reduction performed using traction, rotation, and correction of posterior sag as required.
6. Operated limb painted and draped; standard lateral approach to hip used.
7. Tensor fascia lata and vastus lateralis split to expose proximal femur.
8. Guidewire inserted 2 cm below vastus lateralis ridge under C-arm using a 135° guide.
9. Guidewire positioned inferior in AP and central in lateral view for proper anti-rotation screw placement.
10. Length measured; triple reamer used; lag screw inserted to 5 mm below subchondral bone.
11. A 5-hole barrel plate connected to lag screw and fixed to femoral shaft with cortical screws.
12. Trochanteric stabilization plate contoured and placed over DHS, fixed with remaining cortical screws.
13. Anti-rotation screw inserted above the lag screw; greater trochanter fixed if needed.
14. Wound closed in layers, drain inserted, sterile dressing applied.
15. Post-operative care included antibiotics, early mobilization from day 3, chest physiotherapy, guided weight-bearing, and monthly radiographic follow-up for 9 months.

**Outcome Measures:** Post operative functional outcome was assessed by using the Harris Hip Score

**1. Pain (Max 44 points)**

- None or ignores it (+44)
- Slight, occasional (+40)
- Mild/moderate with minimal activity restriction (+30 to +16)
- Severe or disabling (as low as +0)

**2. Function**

a. Limp (Max 11 points)
- None (+11)
- Slight (+8)
- Moderate (+5)
- Severe (+0)

b. Support (Max 11 points)
- None (+11)
- Cane for long/short walks (+7–5)
- One or two crutches (+2–1)
- Unable to walk without support (+0)

c. Walking Distance (Max 11 points)
- Unlimited (+11)
- Six, three, or one–two blocks (+8–2)
- Indoors only or bed/chair (+0)

d. Sitting (Max 5 points)
- Chair comfortably for 1 hour (+5)
- High chair for 30 min (+3)
- Cannot sit comfortably (+0)

e. Stairs (Max 4 points)
- Normally with railing (+4)
- Normally without railing (+2)
- Unable (+0)

f. Putting on Socks/Shoes (Max 4 points)
- With ease (+4)
- With difficulty (+2)
- Unable (+0)

**3. Absence of Deformity (Max 4 points)**
- <30° fixed flexion contracture
- <10° fixed adduction
- <10° fixed internal rotation
- Leg length discrepancy <3.2 cm

(All conditions must be met to score +4)

**4. Range of Motion (Max 5 points)**
- Based on a motion arc including flexion, abduction, adduction, external and internal rotation.

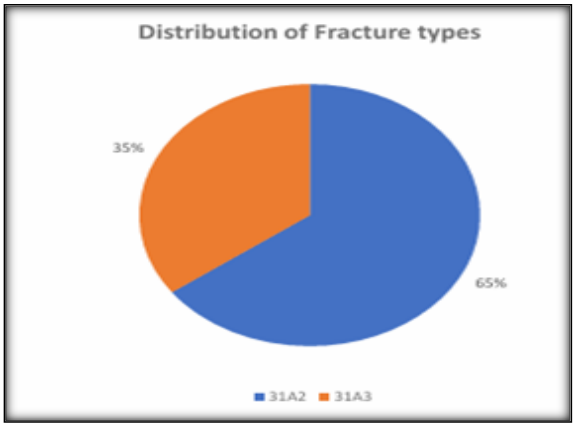
## RESULTS

**Table 1: Distribution and fracture types**

| Fracture types | No. of patients | Percentage |
|---|---|---|
| 31A2 | 13 | 65% |
| 31A3 | 7 | 35% |
| Total | 20 | 100% |

**Table 2: Gender distribution**

| Gender | No. of patients | Percentage |
|---|---|---|
| Females | 14 | 70% |
| Males | 6 | 30% |
| Total | 20 | 100% |



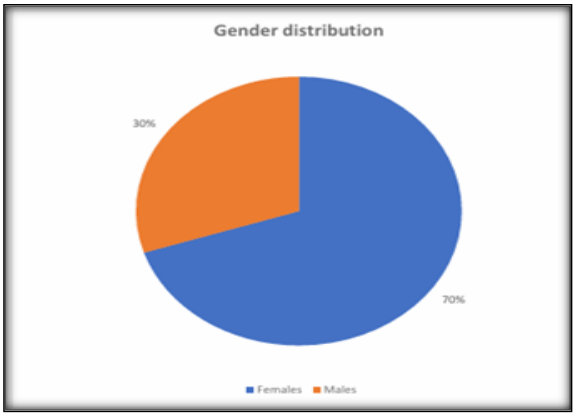
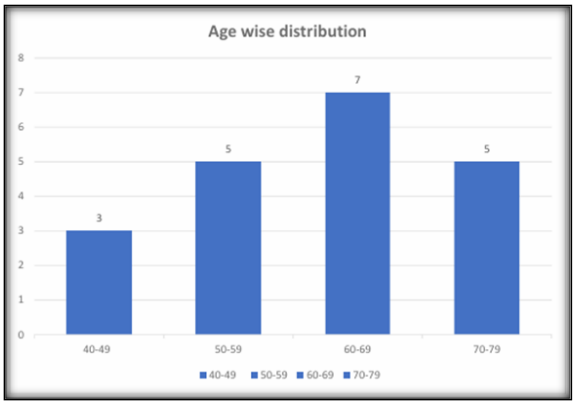




**Table 3: Age wise distribution**

| Age | No .of Patients | Percentage |
|---|---|---|
| 40-49 | 3 | 15% |
| 50-59 | 5 | 25% |
| 60-69 | 7 | 35% |
| 70-79 | 5 | 25% |
| Total | 20 | 100% |

**Table 4: Side Distribution**

| Side | No .of patients | Percentage |
|---|---|---|
| Right | 12 | 60% |
| Left | 8 | 40% |
| Total | 20 | 100% |



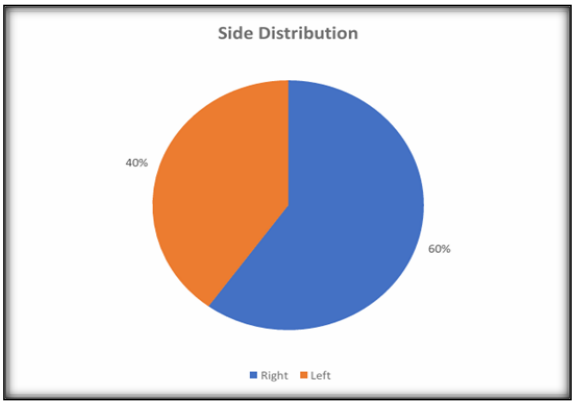
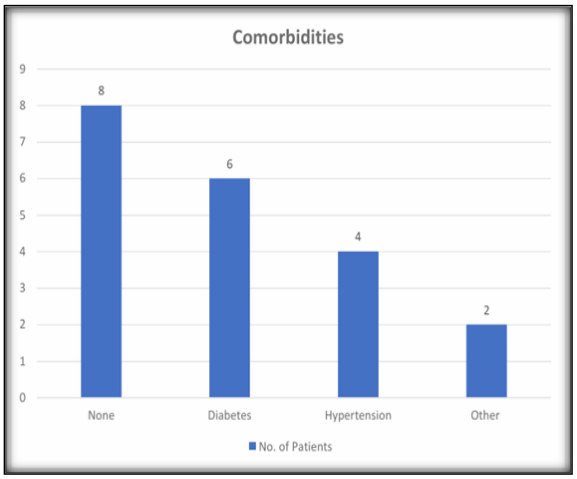



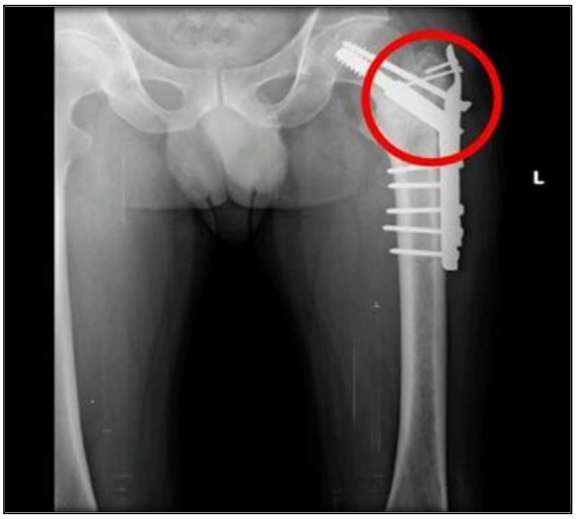

**Table 5: Comorbities**

| Comorbities | No. of patients | Percentage |
|---|---|---|
| None | 8 | 40% |
| Diabetes | 6 | 30% |
| Hypertension | 4 | 20% |
| Other | 2 | 10% |
| Total | 20 | 100% |

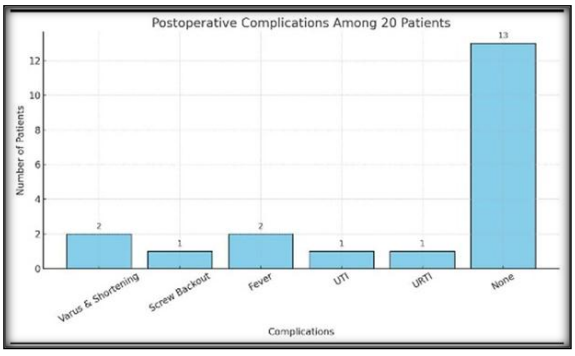



**Complications:** The infection decreased with prolonged antibiotics and one wound wash. Two male patients had fever on 5th postoperative day. One patient was diagnosed with urinary tract infection and another had upper respiratory tract infection which decreased with antibiotics.

One patient had greater trochanter cancellous screw backing out at 12 weeks.




The patient was followed up for another 9 weeks till radiological union occurred and then Under anesthesia screw was removed. Two patients had varus and shortening less than 1 cm.




1. The postoperative radiological outcome was assessed by taking serial X rays of affected hip in anteroposterior and frog lateral view.
2. All patients achieved radiological and clinical union.

3. 6 patients underwent radiological union by 16 weeks.
4. 4 patients underwent by 18 weeks
5. 5 patients underwent union by 20 weeks
6. 3 patients underwent union by 22 weeks.
7. Two patients had varus malunion.
8. Average limb length discrepancy was 0.5 cm
9. 2 patient's had <1cm shortening
10. Average time for radiological union was 23.5 weeks

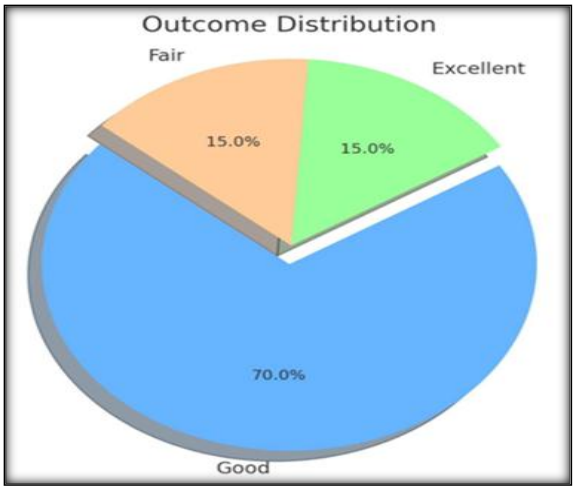
**Functional Outcome**

The postoperative functional outcome was assessed by Harris Hip Score at 20 weeks.

Average Harris hip score was 83.2.

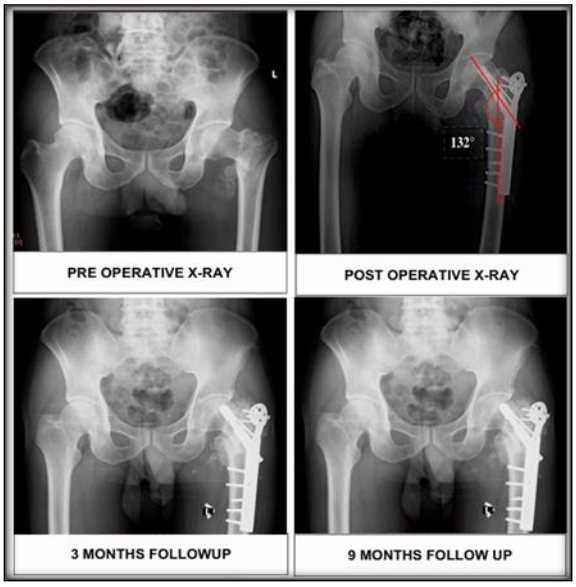
We had:

- 3 Excellent Results
- 14 Good Results
- 3 Fair Result

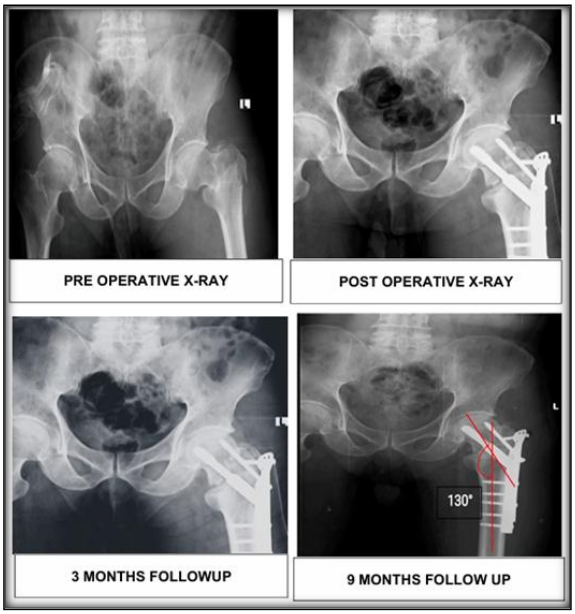



**Case Illustration**

**Case 1:** A 56 Years male with a closed fracture who was hurt in automobile accident to his left lower extremity underwent surgery that involved DHS + TSP. His recovery from surgery was smooth and uneventful.




**Case 2:** A 50-year-old man with a closed fracture who was hurt in an automobile accident to his left extremity underwent surgery that involved DHS + TSP with apical and distal mediolateral locking bolts. His recovery from surgery was smooth and uneventful.




## DISCUSSION

Half of all hip fractures in those over 60 are caused by intertrochanteric femur fractures, and as life expectancy rises, so does the frequency of intertrochanteric hip fractures.

The most frequent way that a patient is hurt is by a simple fall from a standing height. The higher incidence is caused by impaired muscular tone, balance, reflexes, and vision.

**There are several treatment options, including**

1. Dynamic condylar screws,
2. Cephalomedullary nails,
3. Sliding hip screws,
4. Hemiarthroplasty,
5. Trochanteric stabilizing plates.

Early patient mobilization is the aim of treatment in order to avoid complications from fracture illness.

The most popular implant for these situations is still the sliding hip screw.

However, severe varus collapse and lateral wall communication are drawbacks of unstable intertrochanteric fractures.

Backing out of screws is the reason being lack of lateral wall support and single point fixation.

The trochanteric stabilizing plate offers the following advantages in certain situations:

1. The influence of lateral buttresses
2. Two-point fixation [anti-rotation screw]
3. A method similar to the sliding hip screw
4. Minimal learning curve

Twenty consecutive patients with unstable intertrochanteric fractures with lateral wall

communication received DHS with trochanteric stabilization plate treatment in our study, which was carried out at Narayana Medical College and Hospital in Nellore.

Fractures of AO Type 31A2 to 31A3 and All Russel-Taylor sub trochanteric fractures were included in our study after they were categorized using the AO/OTA classification system.

All cases were followed up for a minimum of 9 months and were assessed for clinical, radiological and functional outcome. The results were analysed. The observations of our study are as follows:

1. **Age:** Most of the patients in our study were in the age group of 60-69 years.
2. **Gender:** There was a male preponderance with 14 males and 6 females
3. **Mode of injury:** Fall from standing height was the most common mode of injury.
4. **Type of fracture:** In our study we encountered 13 patients of AOType 31A2,and 7patients of AO Type 31A3
5. **Side of fracture:** 12 patients suffered fracture on right side and 8 patients suffered fracture on left side.
6. Comorbidities

In our study the comorbidities of our patients are as follows

- None: 8
- Diabetes: 6
- Hypertension: 4
- Others: 2

7. All the patients had good postoperative mobility and were ambulating unassisted.
8. Majority of patients were operated within 7 days, the average being 8.6 days.
9. Mean operating time was 102 minutes.
10. Mean blood loss was 150.25 ml.
11. Mean length of incision was 12cm. On an average it was 3cm larger than routine DHS incision. Longer incision was required for applying trochanteric stabilization plate.
12. Mean lag screw size was 85 mm, mean anti rotation screw (6.5 mm cancellous screw) size was 75 mm.
13. Average hospital stay was 7 days.
14. Partial weight bearing in most of cases was allowed immediately on 3rd postoperative day on the basis of construct stability and bone quality.
15. All fractures united on an average of 19 weeks.
16. After analyzing functional outcome by Harris hip score Average Harris hip score was 83.2. We had 4 excellent results, 13 good results and 3 fair results.
17. Two patients had a superficial wound infection. Both patients were suffering from Type II Diabetes Mellitus.

The infection decreased with prolonged antibiotics and one wound wash. Two male patients had fever on 5th postoperative day. One patient was diagnosed with urinary tract infection and another had upper respiratory tract infection which decreased with antibiotics

In the study done by Chetan puram et al [2017] Outcomes of dynamic hip screw augmented with trochanteric wiring for treatment of unstable type A2 intertrochanteric femur fractures, the non-union rates of greater trochanter in cases treated with no wiring is proved to be higher than cases treated with trochanteric wiring.

Mohammad et al study on "The current systematic review indicated that there is no statistically significant difference between patients operated with Dynamic Hip Screw with Trochanteric lateral Stabilization Plate and Proximal Femoral Nail". The current systematic review indicated that there is no statistically significant difference between patients operated with Dynamic Hip Screw with Trochanteric lateral Stabilization Plate and Proximal Femoral Nail. The current systematic review indicated that there is no statistically significant difference between patients operated with Dynamic Hip Screw with Trochanteric lateral Stabilization Plate and Proximal Femoral Nail. Said that there is no statistically significant difference between patients operated with Dynamic Hip Screw with Trochanteric lateral Stabilization Plate and Proximal Femoral Nail.

## CONCLUSION

A biomechanically robust structure, the trochanteric stabilization plate with sliding hip screw enables lateral wall rebuilding while preserving sufficient lever arm and abductor strength (power arm) in unstable cracks of the intertrochanteric wall with communication of the lateral wall.

The proximal piece has improved rotational stability thanks to an additional anti rotation screw. The lateral wall buttress effect lessens the likelihood of screw cutoff and varus collapse. There is a slight learning curve for the operating technique, which is comparable to sliding hip screws.

Overall, DHS combined with a trochanteric stabilization plate can provide better functional and radiological results for patients with unstable intertrochanteric fractures and lateral wall communition.

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