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PROSPECTIVE STUDY ON MANAGEMENT OF UNSTABLE PERTROCHANTERIC FRACTURE FEMUR BY USING DYNAMIC HIP SCREW WITH MODIFIED TROCHANTERIC STABILIZING PLATE

Orthopaedics

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ABSTRACT

Introduction : Pertrochanteric fractures account for 50% of all hip fractures. About 50 to 60 percent of all pertrochanteric fractures are unstable. (AO/OTA type 31A). Fracture patterns that are unstable include posteromedial massive separate fragments, Basicervical pattern, reverse obliquity pattern, displaced or avulsed greater trochanteric, and fractures of the lateral wall. **Aim of the study:** Aim of this study is to evaluate the functional & radiological outcome of unstable pertrochanteric fracture femur in AO type 31A2.3 & 31A2.2 treated by DHS with Modified TSP. **Materials and methods:** A prospective study with 30 cases of unstable pertrochanteric fractures treated with modified trochanteric support plate, was conducted between October 2020 to October 2022. Patients were followed up at 6 weeks, 3 months, 6 months & 1 year for radiological and functional assessment. **Results:** In this study, among thirty patients, majority of the patients had satisfactory results according to Harris hip score . **Conclusion:** DHS with Modified TSP aids in stabilization, anatomical reduction, and great outcomes in unstable pertrochanteric fracture types 31A2.2 or 31A2.3, as well as aids in minimizing the aforementioned problems.

KEYWORDS

Pertrochanteric fracture, Trochanteric support plate, Dynamic hip screw

INTRODUCTION:

The elderly population is a significant source of concern for hip fractures. Hip fractures are associated with high rates of death and morbidity. Stable fractures include those without displacement and those with the posteromedial cortex intact. Pertrochanteric fracture patterns that are unstable include posteromedial communition or large fragment, Basicervical pattern, reverse obliquity pattern, displaced or avulsed greater trochanteric, and fractures of the lateral wall.

The most frequent cause is usually a low-energy trauma like a straightforward fall. A direct blow to the greater trochanteric region is the most common cause of pertrochanteric fractures.

Aims Of The Study:

AIM of this study is to evaluate the functional & radiological outcome of unstable pertrochanteric fracture femur in AO type 31A2.3 & 31A2.2 treated by DHS with Modified TSP**.**

Objectives:

This study is done for the management of unstable pertrochanteric fracture femur having posteromedial comminution (31A2.3) or vertical split fracture (31A2.2) of greatertrochanter in coronal plane, lateral wall blow out, by using dynamic hip screw (DHS) and this Modified TSP to see whether this augmentation
gives better results and reduces the complications.

MATERIALS AND METHODS :

The clinical material for the study, consists of 30 cases (n=30) of fresh pertrochanteric fractures of the femur in elderly of trivial traumatic etiology meeting inclusion and exclusion criteria, admitted in King George Hospital attached to Andhra Medical College, between October 2020 and October 2022.

Inclusion Criteria

a. unstable pertrochanteric fracture femur that includes

- posteromedial comminution (31A2.3) and
- vertical split fracture (31A2.2) of greater trochanter in coronal plane
- lateral wall blow out

b. females with more femoral bow , where long proximal femoral nail is contraindicated.

Exclusion Criteria

- Compound fractures.
- Pathological fractures.
- Reverse oblique fractures
- Fractures with subtrochanteric extension.
- Simple pertrochanteric fractures.
- Patients with cognitive disorders, on steroids or immunosuppressants

Methodology

Upon the arrival of patients were assessed clinically and stabilized haemodynamically. They were subjected for radiographs of pelvis with both hips antero posterior view with 15^0 internal rotation and full length thigh antero-posterior and lateral views. Following radiographs, patients were admitted to orthopaedic wards and were maintained on upper tibia pin traction over a Bohler-Braun frame till surgery.

All patients were taken for elective surgery as soon as possible after necessary blood investigations and radiographic pre-operative work-up. Patient attenders were explained the nature of the injury and its possible complications. Patient attenders were also explained about the need for the surgery and complications of surgery. Written and informed consent was obtained from the patient and their attendants before surgery.

After pre anaesthetic check up, under regional anaesthesia, Closed reduction and fixation with DHS with M.TSP was done. Patients were discharged on tenth post operative day following suture removal. Patients were assessed clinically andradiologically on 2nd post operative day, at 6 weeks, 3 months, and then between 6 months to 1 year depending upon the fracture union.

Operative Procedure :

Patient prepared on the morning of day of surgery. Single dose preoperative antibiotic given after test dose.

Patient Positioning And Fracture Reduction

Under suitable anaesthesia patient was placed on fracture table with unaffected leg in flexion and abduction attitude by using lithotomy post. Affected leg placed in traction boot and fracture reduced by traction & internal rotation/external rotation along with adduction or abduction. C arm checked and placed in optimal position relative to patient's position to ensure better visualization of fracture reduction in both Anteroposterior and lateral projections.

Reduction Maneuver:

Closed reduction maneuver planned by using preoperative x-rays and perioperative C arm image fracture pattern. Fracture reduced by using traction and internal orexternal rotation.

Surgical Approach:

Under aseptic precautions affected limb painted and draped in standard fashion for hip surgery in supine position. Fracture site is exposed by standard lateral approach to hip joint. Skin and subcutaneous tissue

incised, tensor fascia lata and vastus lateralis was reflected from lateral intermuscular septum and proximal part of femur exposed.

Approximately 2 cm below vastus ridge guide wire is inserted under C arm guidance and it passed through CCD angle inferiorly in AP view and central in lateral view. This allows correct placement of antirotation screw. 5mm beneath subchondral bone guide wire is placed. Then guide wire length measured and by using triple reamer, reaming done and lag screw inserted.

Modified TSP was placed inside the sliding plate and under fluoroscopic guidance contouring of TSP done, according to the shape of greater trochanter. The 1st cortical screw fixed DHS plate with TSP with shaft of femur thus stabilizing DHS with M.TSP,rest of cortical screws of side plate are inserted.

- Patients were taught quadriceps strengthening exercises, hip abduction exercises and knee ROM in the 2nd postoperative day and discharged. Sutures removed on 14th postoperative day. Patients were encouraged to weight bear partially with walker depending on the pain tolerability of individual patient.

Scoring System Used In The Study: Harris Hip Score

RESULTS:

Functional outcome by Harris Hip score	No. of patients	Percentage
Excellent	24	80%
Good	4	13%
Fair	2	6.6%
Poor	0	0

Clinical Evaluation At Different Levels

Clinical Evaluation		Follow up at 6 weeks	Follow up at 3 months	Follow up at 6 months	Follow up at 1 year
Union	YES	25	27	30	30
	NO	5	3	0	0
Deformity	YES	0	0	0	0
	NO	30	30	30	30
Limb Length Discrepancy	YES	0	0	0	0
	NO	30	30	30	30
Infection	YES	3	1	0	0
	NO	27	29	30	30

Radiological Evaluation At Different Levels Of Followup:

		6WEEKS	3MONTHS	6MONTHS	1YEAR
UNION	YES	25	27	30	30
	NO				
GREATER TROCHANTER POSITION	NONDISPLACED	30	30	30	30
	DISPLACED				
POSITION OF IMPLANT	DISPLACED				
	INSITU	30	30	30	30

Complications

Table no 8

Wound complications	3
Screw Migration	2
Implant (Fixation) failure	0
Shortening	0
Deformity	0
Medialization of Femoral Shaft	0
Limb length discrepancy	0

DISCUSSION:

The elderly population is a significant source of concern for hip fractures. Hip fractures are associated with high rates of death and morbidity.

Unstable pertrochanteric fractures consist of those with subtrochanteric fracture extensions, reverse oblique fracture patterns, or fractures that severely comminute the postero-medial femoral cortex.

The goal of treatment for these fractures is to quickly restore patients to daily activities by achieving stable fixation of anatomically reduced fractures, early mobilization, rapid rehabilitation, and early mobilization (ADL).

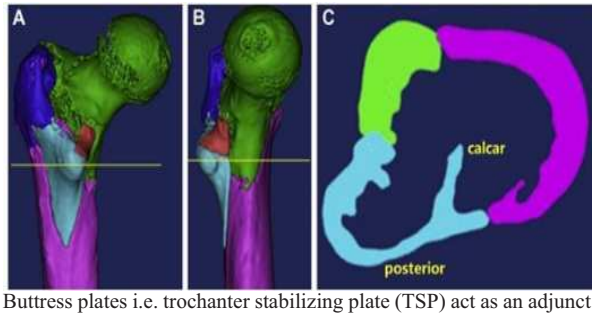
The GOLD STANDARD for stable pertrochanteric fractures is still the compression hip screw, however it has a significant failure rate and morbidity in unstable pertrochanteric fractures.

The primary risks of DHS[37] in unstable pertrochanteric fractures are severe medialization of the femoral shaft, increased screw cut-out frequency, and shortening with upward migration of the greater trochanter.

The lateral femoral cortex[38] at the drilling site for the head-neck fixation implant makes up the majority of the trochanteric lateral wall. The fragment and fixation of the head- neck can serve as a natural buttress in this region. The vastus lateralis, gluteus medius, and minus terminals are attached to form the arduous aponeurotic structure known as the soft tissue lateral wall. In elderly osteoporotic patients, the lateral wall's biomechanical strength is extremely weak.The anterior or lateral cortex[38] cannot be relied upon to maintain the head-neck component because complete lateral wall rupture is usually accompanied by simultaneous anterior cortex fracture.

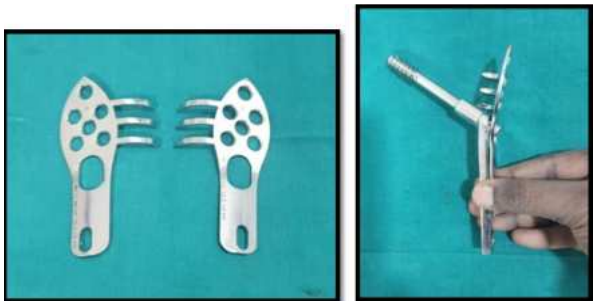
The presence of a posteromedial intermediate fragment (the third lesser trochanter) is the key characteristic that differentiates simple (A1) and communited (A2) pertrochanteric fracture patterns.

Biomechanical studies have shown that the lesser trochanter fragment[38] plays a key role in the reconstruction of fracture stability, and the larger the size of the defect, the more unstable the fracture. 87% of lesser trochanter fragment contained the femoral calcar, which was an intramedullary vertical cortex strut in the posteromedial region.



Buttress plates i.e. trochanter stabilizing plate (TSP) act as an adjunct to sliding screw plate devices and aim to restore the deficient lateral buttress in unstable pertrochanteric fractures. Standard TSP[39] provides reconstruction of trochanteric wall only laterally, but does not support posteriorly and medially in unstable pertrochanteric fracture femur especially when there is comminution or vertical split fracture of greater trochanter in coronal plane.Therefore, this MODIFIED TSP[25] in such a way that it will support posteriorly and medially in addition to lateral support.

With this aim of stable surgical reconstruct , this study was done to evaluate functional, clinical and radiological outcome of unstable pertrochanteric fracture operated with dynamic hip screw with modified trochanteric stabilizing plate.



Three additional curving spikes are added to one side of the normal spoon- shaped TSP, running postero-medially to secure the medial and posterior portions of the greater trochanter. In particular, when there is comminution or a vertical split fracture of the greater trochanter, contouring of the proximal part and additional spikes will help to maintain reduction of the unstable pertrochanteric fracture of the femur and reduce complications like proximal or lateral migration of the proximal fragment of the greater trochanter, medialization of the femoral shaft, implant failure, and varus deformity and limb shortening.

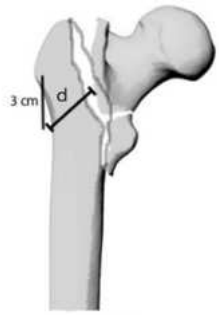


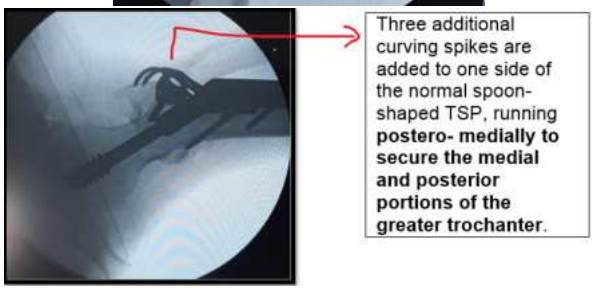
Fig. 1

Diagram showing the lateral wall thickness (d), defined as the distance in mm from a reference point 3 cm below the innominate tubercle of the greater trochanter, angled at 135° upward to the fracture line (the mid-line between the two cortex lines) on anteroposterior radiograph.

Fig 24

lateral wall thickness < 20.5 mm should not be treated with DHS alone, due to risk of a secondary lateral wall[40] fracture.

This secondary complication can be prevented by modified trochanteric support plate.



Additionally, to stop the rotation of the proximal fragment, the antirotation screw can be put via the hole on top of the modified TSP. When necessary, 6.5 mm cancellous or 4.5 mm cortical screws are used to fix the greater trochanter fragment in the several holes present across the modified TSP. The issue of unstable pertrochanteric fracture is still open. The best implant for osteosynthesis has proven to be the sliding hip system. However, DHS has a number of challenges while treating unstable pertrochanteric fractures. When used with DHS, modified TSP is intended to lessen these issues.

Limitations

Our study has limitations of small sample size and short follow up. Therefore it needs prospective studies with large number of patients at different institutes with longer follow up, to conclude that Dynamic Hip Screw with Modified TSP is better implant for the management of unstable pertrochanteric fracture femur specially in AO type 31A2.2 or 31A2.3.

CONCLUSION

DHS is always a GOLD STANDARD implant for stable pertrochanteric fractures, but due to complications like excessive medialization of the femoral shaft, screw cut-out, limb shortening, and proximal or lateral migration of the greater trochanter, the same resultsare not reproducible with unstable pertrochanteric fractures.

Particularly for AO type 31A2.2 or 31A2.3, DHS with standard TSP does not support posteromedially in unstable pertrochanteric fractures. DHS with Modified TSP aids in stabilization, anatomical reduction, and great outcomes in unstable pertrochanteric fracture types 31A2.2 or 31A2.3, as well as aids in minimizing the aforementioned problems.