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FUNCTIONAL AND RADIOLOGICAL OUTCOME OF UNSTABLE INTERTROCHANTERIC FRACTURES TREATED WITH MODULAR EXTENSION OF DYNAMIC HIP SCREW WITH TROCHANTERIC STABILIZATION PLATE

Orthopaedics

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ABSTRACT

Aim:

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

Materials and methods: The study was done at our tertiary care Centre in the department of Orthopaedics for 18 months, on all 50 consecutive cases of unstable intertrochanteric fractures of femur classified with AO type 31A2, A3 treated with modular extension of dynamic hip screw with trochanteric stabilization of plate. For 6 months all of them were followed up and were assessed at each follow up for functional and radiological outcome using Hip Rating Score of Merle D'aubugne and Radiological union score for Hip (RUSH)

Results:- During post-op 6th month, 14 (28%) patients had excellent and 14 (28%) had very good Merle D'Aubugne Score (Hip function) while 12 (24%) patients had good and 7 (14%) patients fair score. 3 (6%) patients had poor score. There was significant improvement by post-op 6th month as per Chi-Square test (**p<0.05**).

At the end of follow up (post op 6 month), 46% patients had RUSH scores between 10-20 and rest (54%) patients had scores between 20-30 points. The construct prevented excessive medialisation of femur in 48 patients by lateral wall buttress effect.

Conclusion:- Trochanteric stabilization plate with sliding hip screw is a biomechanically stable construct allowing reconstruction of lateral wall to maintain adequate lever arm and abductor strength (Power arm) in unstable intertrochanteric fractures with lateral wall comminution. Additional anti-rotation screw provides enhanced rotational stability to the proximal fragment. Lateral wall buttress effect reduces the chance of varus collapse, femoral medialisation and screw cut-out. Also, it has a small learning curve as that of DHS.

KEYWORDS

Functional and radiological outcome, unstable intertrochanteric fractures, DHS, TSP

INTRODUCTION:-

Intertrochanteric fractures (IT) fractures, especially unstable ones, are a tremendous burden to the healthcare system. Although consistently good results are obtained while treating stable IT fractures, treatment failure rates with unstable fractures are much higher.[1,2] Unstable IT fractures' have propensity to drift into varus and excessive collapse can result in pain, functional deficit, and implant failure. Achieving a stable fixation in these fractures is the prime motive of managing these injuries. The intact lateral wall plays a key role in stabilization of unstable trochanteric fractures by providing a lateral buttress for the proximal fragment, and its deficiency leads to excessive collapse and varus malpositioning.[3,4] Therefore, maintaining the integrity of this structure should be an important objective in all stabilization procedures for unstable intertrochanteric fractures.

The unstable intertrochanteric fractures with loss of postero-medial contact or lateral wall contact or both are a major cause of telescoping and medicalization with a biomechanically unstable head-neck fragment.[5] this results in significant limb shortening, fracture collapse and implant failure which increase the rates of re-operation. Parker and colleagues first noted the importance of integrity of the lateral wall after fixation of these injuries.[6]

Trochanter Stabilizing Plate (TSP) is used to stabilize the greater trochanter and the lateral wall and it is used as a modular extension of the Dynamic Hip Screw (DHS).[7] Fixation of unstable intertrochanteric fractures with a TSP have noted to have lesser incidence of femoral medicalization and improvement is noted in the functional outcome. Hence the present prospective study was done at our tertiary care Centre

MATERIALS AND METHODS:-

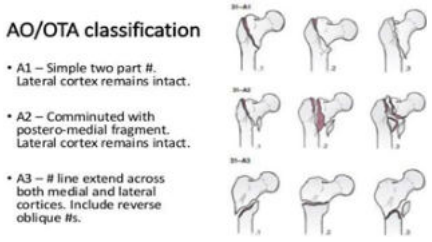
The study was done at our tertiary care Centre in the department of Orthopaedics at Rajarshee Chhatrapati Shahu Maharaja Govt. Medical College, Kolhapur on attending OPD/IPD after due permission from the Institutional Ethics Committee and Review Board and after taking Written Informed Consent from the patients. Study was conducted with 50 patients of age >40 years and <75 years, of both genders, for 18 months, on all confirmed cases of unstable intertrochanteric fractures (AO Type 31A2.1, 31A2.2 & 31A2.3) of femur. Patients with open fractures, pathological fractures, reverse oblique fractures, dementia, using steroids and immunosuppressant were excluded from study.

Radiographic evaluation-

- X-ray pelvis with both hip AP view
- X-ray ipsilateral hip lateral view

Fracture classification-

AO/OTA classification system.



Preoperatively prophylactic antibiotic were given after test dose on the operation table. Spinal anaesthesia used for all cases. Patient was placed on fracture table with unaffected leg in flexion and abduction position by using leg holder. Affected leg placed in boot and fixed to the fracture table. C arm was placed on the opposite side of affected extremity.

Fig. 1 DHS implant system

Fig. 2
a) 4.5 mm non locking cortical screw
b) Richard's screw
c) DHS plate
d) TSP

Fig. 3 Assembly of DHS with TS

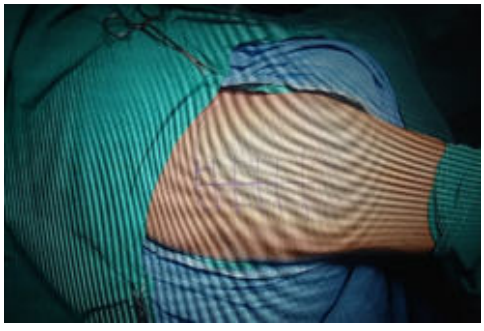


Fig. 4 Skin incision

Operated limb painted and draped in standard fashion for hip surgery in supine position. Standard lateral approach to hip joint was utilized for exposing the fracture site. Skin and subcutaneous tissue incised. Tensor fascia lata and Vastus lateralis split and proximal femur were exposed.

A five hole barrel plate was fixed to lag screw and fixed to shaft of femur using cortical screws in 2nd and 5th hole of plate. After precontouring trochanteric stabilization plate was placed over the plate and fixed using remaining holes in the plate by utilizing cortical screws. Afterwards anti rotation screw were inserted superior to lag screw. If deemed necessary, greater trochanter is additionally fixed by using 4 mm cancellous screws or SS wire.

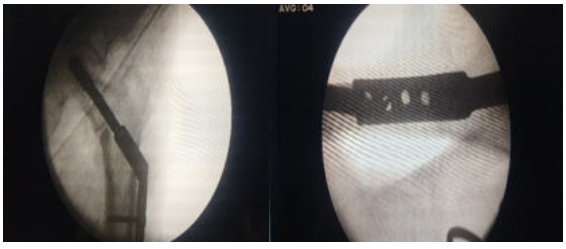


Fig. 5 **Fig. 6**

Richards screw with DHS plate in AP and lateral views

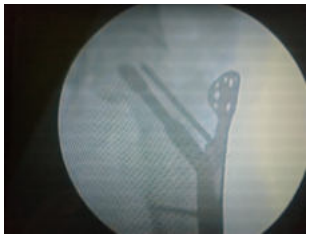


Fig. 7 Final radiograph in AP view

Fig. 8 **Post OP X-ray in AP and Lateral views** **Fig. 9**

Intravenous antibiotics were continued for first three days. Check X-RAY was done on 1st post-operative day. Patients were taught about sitting on bed, quadriceps static exercises & knee bending exercises. Standing with support was encouraged from post op day 1. Walker mobilization was also started from post op day 1 (with non-weight bearing for 4 weeks, with partial weight bearing for 4 weeks and with full weight bearing after radiological signs of union)

Patients were followed up at 1 month, 2 months, 3 months and 6 months post op. On each follow up visit HIP RATING SCORE OF MERLE D'AUBUGNE and Radiological union score for Hip (RUSH) was calculated for each patient.

RESULTS:-

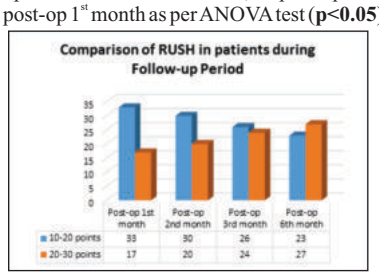
In this study, the mean age of patients was 60.86 ± 10.37 years. There were 31 (62%) male patients and 19 (38%) female patients in the study group. 29 (58%) fractures were on left side while 21 (42%) fractures were on right side.

The most common mode of injury was fall from standing height (48%) followed by fall while walking (36%) and Road Traffic Accident (16%). Nine (18%) and 7 (14%) patients had Diabetes Mellitus and Hypertension respectively whereas 4 (8%) and 1 (2%) patient had anaemia and Chronic Obstructive Pulmonary Disease (COPD) respectively.

Majority of the patients (66%) had Type 31A2.2 fracture followed by Type 31A2.3 (20%) and 31A2.1 (14%).The mean duration of trauma to surgery was 7.38 ± 3.64 days. The mean operative time was 77.86 ± 15.47 minutes. The mean blood loss was 177.30 ± 40.73 ml. The mean duration of hospital stay was 6.56 ± 3.30 days.

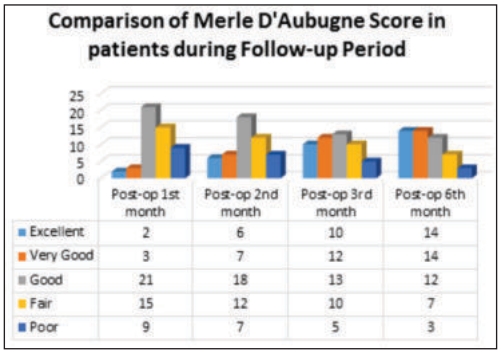
Two patients had varus collapse with shortening of >2 cm while 1 patient had superficial wound infection which was managed by debridement and appropriate antibiotics. 1 patient had urinary tract infection which was also managed with antibiotics after proper consultation. 1 patient had hip pain which was managed with analgesics, proper physiotherapy after ruling out infection.

The mean duration for full weight bearing was 13.10 ± 5.10 weeks.
The mean RUSH score of patients was 20.54±6.49 points. There was significant improvement in RUSH score, at post-op 6th month when compared to post-op 1st month as per ANOVA test (**p<0.05**).



Graph 1: Comparison of RUSH in patients during Follow-up Period

During post-op 6th month, 14 (28) patients each had excellent and very good **Merle D'Aubugne** score while 12 (24%) and 7 (14%) patients had good and fair score respectively. 3 (6%) patients had poor score. There was significant improvement by post-op 6th month as per Chi-Square test **(p<0.05).**



Graph 2: Comparison of Merle D'Aubugne Score in patients

Six months followup ROM

Fig 10 : One legged standing

Fig 11 : Extension

Fig 12 : Internal rotation

Fig 13 : External rotation

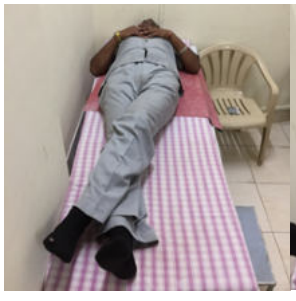


Fig 14 : Adduction

Fig 15 : Abduction

DISCUSSION:-

A hospital based prospective study was conducted with 50 patients to evaluate functional and radiological outcome of unstable intertrochanteric fractures managed by modular extension of dynamic hip screw with trochanteric stabilization plate.

Despite the advancements in the clinical care of the patients, management of unstable intertrochanteric fractures is a clinical challenge for orthopaedic surgeons because of the high degree of instability and it is associated with an increased rate of mortality and morbidity, especially in elderly osteoporotic patients[14]. An increasing trend has been reported due to intertrochanteric femoral fractures and nearly half of the hip fractures are intertrochanteric fractures in elderly patients[15]. Due to a lack of strength and coordination, these fractures counter the undue stress in elderly patients while ambulating with support and crutches[16]. High rates of mortality and morbidity can be associated with prolonged immobilization and other adverse medical conditions in these patients[17].

An early restoration of patient pre-fracture activity and lifestyle is the primary goal, especially in elderly patients. However, various factors influence the functional outcomes in these patients including adequate internal fixation, minimal blood loss, minimal anaesthesia time, early mobilization, and general health of the patient[16,18]. Preservation of ambulatory function is a vital part of the treatment of these fractures in patients with intertrochanteric fracture. It vastly depends on the quality of fracture stabilization, associated skeletal injuries, post-operative early ambulation, and perioperative complications[18].

The advantage of a DHS is a steep learning curve and better exposure of fracture site[19], but, failures have been noted in unstable intertrochanteric fractures, which is primarily due to posterolateral wall fractures[20]. A biomechanical study reported that the TSP had the ability to resist femoral medialization which was comparable to the abilities of the intramedullary devices[8].

In the present study, majority of the patients (32%) were from the age group of 61-70 years followed by 26% from the age group of 71-75 years, 22% from the age group of 51-60 years and 20% from the age group of 41-50 years. The mean age of patients was 60.86 ± 10.37 years. There were 31 (62%) male patients and 19 (38%) female patients in the study group. This is similar to the studies of Lakho MT et al[12], Prabhakar S et al[21] and Shetty A et al[10].

Fractures were classified according to the OTA and AO classification systems. It was observed in our study that majority of the patients (66%) patients had Type 31A2.2 fracture followed by Type 31A2.3 (20%) and 31A2.1 (14%). This is consistent with the studies of Prabhakar S et al[21] and Shetty A et al[10].

The mean duration of hospital stay was 6.56 ± 3.30 days. Prabhakar S et al[21] study assessing the effectiveness of TSP in unstable intertrochanteric fractures observed mean duration of hospital stay was 6.9 days, mean duration of operation was 82 minutes and mean blood loss in mL was 166.25 mL.

The mean duration for full weight bearing was 13.10 ± 5.10 weeks. This is similar to the study of Prabhakar S et al[21].

The mean RUSH score of patients was 20.54±6.49 points. There was significant improvement at post-op 6th month when compared to post-op 1st month as per ANOVA test (**p<0.05**). Similar observation was noted in the studies of Chiavras MM et al[22], Shetty A et al[10], Lakho MT et al[12], Prabhakar S et al[21], Saha P et al[9], Raman DT et al[11] and Srinivasan PI et al[13].

Shetty A et al[10] prospective study assessing the radiological union and hip function after fixation of unstable intertrochanteric fractures with DHS and TSP observed fifteen patients had a RUSH score of 10-20 and 17 patients had a score of 20-30. The RUSH score had a mean of 21.03+ 2.132 points. All the patients had RUSH scores of 10-30 points. Nobody had a score less than 10 points. Majority of the patients (17 of the 32) reported a range between 20-30 points which was indicative that the rate of fracture union was high.

Srinivasan PI et al[13] prospective study found excellent results in 45%, Good in 45% and Fair in 10% and average Harris Hip Score was 86.9 During post-op 6th month, 14 (28) patients each had excellent and very good Merle D'Aubugne score while 12 (24%) and 7 (14%) patients had good and fair score respectively. 3 (6%) patients had poor score. There was significant improvement by post-op 6th month as per Chi-Square test (**p<0.05**). This is comparable to the studies of Shetty A et al[10], Saha P et al[9], Prabhakar S et al[21] and Xie H et al[23].

CONCLUSION:-

Dynamic hip screw (DHS) results in acceptable outcomes in the majority of the patients and it is a suitable treatment option. Trochanteric stabilization plate with sliding hip screw is a biomechanically stable construct allowing reconstruction of lateral wall to maintain adequate lever arm and abductor strength (Power arm) in unstable intertrochanteric fractures with lateral wall comminution. Additional anti-rotation screw provides enhanced rotational stability to the proximal fragment. Lateral wall buttress effect reduces the

chance of varus collapse and screw cut-out. The operative technique being similar to sliding hip screw, it has a small learning curve. Overall, in patients with unstable intertrochanteric fractures with lateral wall comminution, trochanteric stabilization plate can give a superior functional and radiological outcome.

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