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Original Research Article

A Study on Lesser Trochanter Displacement in Inter Trochanteric Fractures of Femur Influencing Functional Outcomes

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Abstract:

Inter trochanteric fractures have become common fractures among the fractures of proximal femur. Lesser trochanter being a principle insertin point for flexors of hip joint often can get involved in the fracture pattern resulting in separation of this bony prominence. All such lesser trochanter displacement in the inter trochanteric fractures are studied to know how far it can influence the functional outcome when treated with Proximal Femoral Nail. The functional results of such fractures are followed up with three month interval with Parker Mobility Score and Salvati and Wilson scoring system. These functional outcomes are analysed with statistical values how far the lesser trochanter avulsion can influence the treatment outcomes for Proximal Femoral Nailing.

Keywords: Inter trochanteric fracture, Lesser trochanter Avulsion – functional outcomes – hip fractures.

Introduction

The lesser trochanter of the femur is a conical, posteromedial, bony projection from the proximal shaft of the femur. This bony prominence serves as the principal insertion site of the iliopsoas muscle. This point of insertion is crucial in various postures and movements for standing or sitting lumbar posture, stabilizing the coxofemoral joint, and is crucial during walking and running. Lesser trochanter, an important structure of the femoral posteromedial wall proximally, it can provide stress distribution as well as stability in trochanteric fracture. However, the necessity of reducing and fixing LT fragments is not feasible for many reasons.[1]

As the population aging increasingly, the incidence of hip fractures in senile people is obviously elevated [1]. Owing to the strong muscle pull over the lesser trochanter, it has got the tendency to get avulsed and displaced in the event of fracture, especially when the fracture line is passing through the intertrochanteric line. The bony fragment shows propensity for detachment in more than 50% of cases with a high lesser trochanter detachment ratio of over 50% in trochanteric fractures [2,3]. The incidence of inter trochanteric fractures has definitely increased as the living standards and life expectancy are increased.

All the practiced fixation techniques in the present times, will not include the reduction steps in the fixation technique per se even though the reduced lesser trochanter provides postero medial stability for the fracture. [4,5] Moreover, the displaced lesser trochanter fragment can hitch on the ischium, can become reason for pain subsequently [6]. Therefore, the position of the displaced lesser trochanter may affect clinical outcome in the treatment of unstable trochanteric fractures. Trochanteric fractures contribute for a major proportion of hip fractures, from 45 to 50%, in which 50–60% are

classified unstable. The stress distribution occurs through the lesser trochanter at the postero medial wall in the proximal end of femur. The degree of displacement of a lesser trochanter is usually predicts whether it can gain pre-injury functional status or not.

Quite often the avulsed lesser trochanter is associated with variable breech of medial cortex. Based on novel classification (Figure 1) for medial wall fragments in trochanteric fractures they can be classified into three types based on the degree of posterior cortex involvement: type 1: LT fragment with fracture line not exceeding base of the LT; type 2: a larger LT fragment

and posterior cortex involved near the base of LT with fracture line not reaching the midline of the posterior wall; type 3: a much larger LT fragment and large posterior cortex involved with fracture line reaching or exceeding the midline of the posterior wall.[6]

The available and most commonly used fracture fixation devices for inter trochanteric fractures are extra medullary fixation devices [e.g., dynamic hip screw (DHS)], intramedullary fixation devices[e.g., proximal femoral nail anti-rotation (PFNA)], and hip arthroplasty (e.g., hemiarthroplasty) [7], the very design of these devices can neither accommodate reduction nor fixation of avulsed lesser trochanter. In fact none of them are designed to fix the displaced lesser trochanter.

The necessary stratification of the avulsed lesser trochanter is not taken into consideration by the widely popular classifications viz., AO/OTA (1990), revised AO/OTA (2018), Evans, and Evans/Jensen. Unstable intertrochanteric femoral fractures (A3 and probably many A2 fractures) are better treated with an intramedullary implant.

The Parker Mobility Score considers patient's mobility indoors, outdoors and during social activities, which measures the difficulty and dependence for mobility. The score can be applied to measure the functional status after the inter trochanteric fracture fixation with involvement of lesser trochanter.[8]

The Salvati and Wilson scoring system considers Pain, Walking, Muscle power and motion, Function for the assessment of post operative functional status. The present study is done with an aim to correlate the functional recovery in the post operative period of intertrochanteric fracture presenting with avulsion of lesser trochanter, treated with Proximal Femoral Nailing

Materials and Methods

The present study is done during the period from Nov 2018 to Oct 2022 in our institute with inter trochanteric fractures of femur. Our study has icluded68 cases of inter trochanteric fractures. The inclusion criterion for our study are taken as patients of age 55 and above, no concomitant injuries, no preexisting arthritis of any of the joints in both lower limbs. The exclusion criterion are taken as ages below 55 years, concomitant injuries, preexisting arthritis of any of the lower limb joints. The study has been designed to evaluate the reduction achieved in treating the inter trochanteric fractures with varying degrees of lesser trochanter displacement and its influence on functional recovery. The patients are initially evaluated for any life threatening and limb threatening injuries.

The patients with inter trochanteric fractures are admitted and subjected to evaluation for their fitness to undergo fracture fixation procedure with an informed consent. A pre anesthetic check has been carried out to establish the feasibility of anaesthetizing the patients.

After establishing the fitness to undergo the surgical procedure, these patients are posted for fracture fixation surgeries. The anaesthetized patient is kept on fracture table with sufficient padding for protecting bony prominences. The fracture is manipulated with gradual traction, internal rotation and adduction. After thorough scrubbing, the limb and vicinity are drapped. A slightly curved incision is given proximally from the tip of greater trochanter to a length of 5 cm. The same plane of incision is extended in the deeper planes to split the gluteal muscles. The dissected planes are widened with blunt dissection. A dent is created on the medial wall of greater trochanter near the tip of the trochanter. The dent will secure the bone awl while creating an entry point and avoids slipping of the sharp bone awl into tissue planes in the vicinity and also to minimize the displacement of the reduction achieved at the fracture site. The entry point is made by confirming the track to reach exact centre of the medullary canal under image intensifier control. The awl is advanced till the tip breaches the cancellous bone in the sub trochanteric region. The awl is withdrawn, and a guide wire is introduced through the entry point. Graded reaming is done upto more than 1 mm beyond the diameter which first produces the bone clutter sound. A proximal femoral nail of diameter 1 mm less than the highest reamer used to ream, is mounted on a jig and introduced over the guide wire. The level of the proximal neck screws is verified to be at the level close to the of inferior cortex of the neck of the femur through the vastus lateralis ridge and derotation screw close to the superior cortex of the neck. The length of the proximal screw and the derotaion screws are measured to be within 2.5 cm to maintain TAD. The distal locking is done through the Jig. Wouns are closed in layers after securing haemostasis. The traction is gradually released. Our study has included 68 cases of the inter trochanteric fractures with varying degrees of displacement of

lesser trochanter. The direct reduction techniques are not attempted going by the perils associated with closely arranged neurovascular structures and more so with the displacement of lesser trochanter.

Results and Analysis

The patients in our study who have undergone the fracture fixation for their inter trochanteric frature with proximal femoral nailing are followed up with toe touch, leh weight bearing as soon as they tolerate the pain, and slight deferment if the fracture is comminuted. They are all encouraged to do quadriceps drill and active ankle toe movements. Partial assisted weight bearing is allowed from third post operative weakness and full weight bearing from sixth post operative weak onwards. The follow up visits further with three months gap are done up to one year where in the Parker Mobility Score and Salvati and Wilson scoring system are used to assess the functional recovery.

The 68 inter trochanteric fractures in our study are segregated into three groups basing on the displacement of lesser trochanter for which the criterion of quantity of comminuted lesser trochanter fragments, range of lesser trochanter fragment in medial wall are considered to be influential factors on the outcomes.

Out of 68 cases included in the study, 24 cases were of type 1: LT fragment with fracture line not exceeding base of the LT; 30 cases are of type 2: a larger LT fragment and posterior cortex involved near the base of LT with fracture line not reaching the midline of the posterior wall; and 14 cases are type 3: a much larger LT fragment and large posterior cortex involved with fracture line reaching or exceeding the midline of the posterior wall.

The post operative assessment of functional recovery has started after the patients are allowed full weight bearing i.e., around 3 months in the post operative period and continued for three visits, i.e., up to 9 months. The functional recovery is plotted against the fracture with displacement of lesser trochanter. The results are follows, The Parker Mobility score assessed during the three successive follow up visits for Lesser Trochanter Fracture Type 1 are 4.79, 6.76, 8.8. For Lesser Trochanter Fracture Type 2 are 3.16, 5.38, 7.709. For Lesser Trochanter Fracture Type 3 are 2.25, 3.92, 5.98. The highest score in the Parker Mobility score is 9.

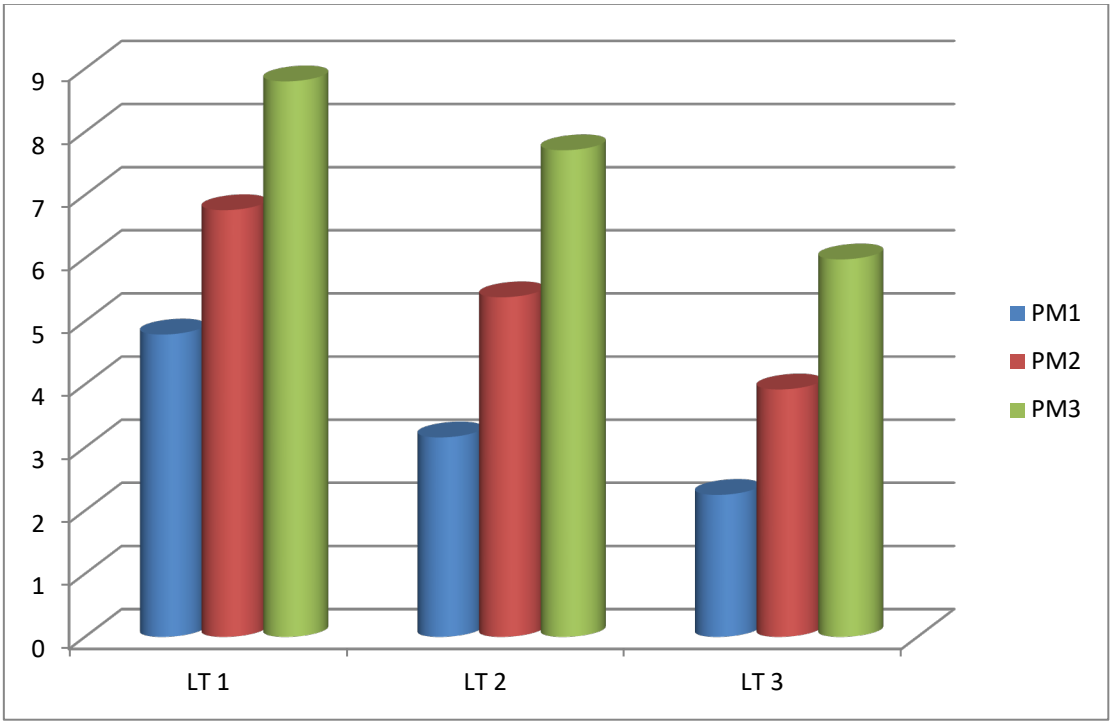

Figure 1:

The Salvati and Wilson scoring system assessed during the three successive follow up visits for Lesser Trochanter Fracture Type 1 are 30, 35,39. For Lesser Trochanter Fracture Type 2 are 24, 31, 37 . For Lesser Trochanter Fracture Type 3 are 20,26,32. The highest score in the Salvati and Wilson scoring system score is 40.

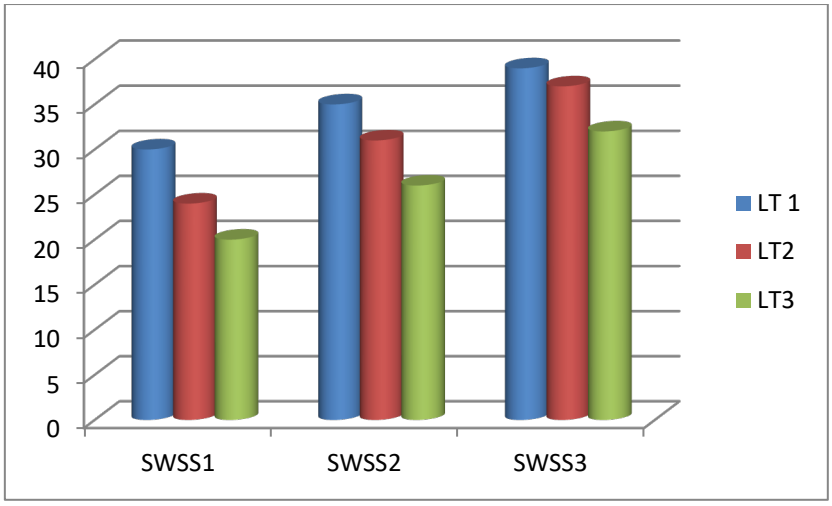

Figure 2:

The standard Deviation of Lesser trochnter Type 1 fracture recovery with Parker mobility score during the three successive follow ups are 1.102533, 1.09014, 0.380693. For Lesser trochnter Type 2 fracture are 0.714384, 0.937102, 0.833908. For Lesser trochnter Type 3 fracture are 0.828742, 0.82542, 0.974961.

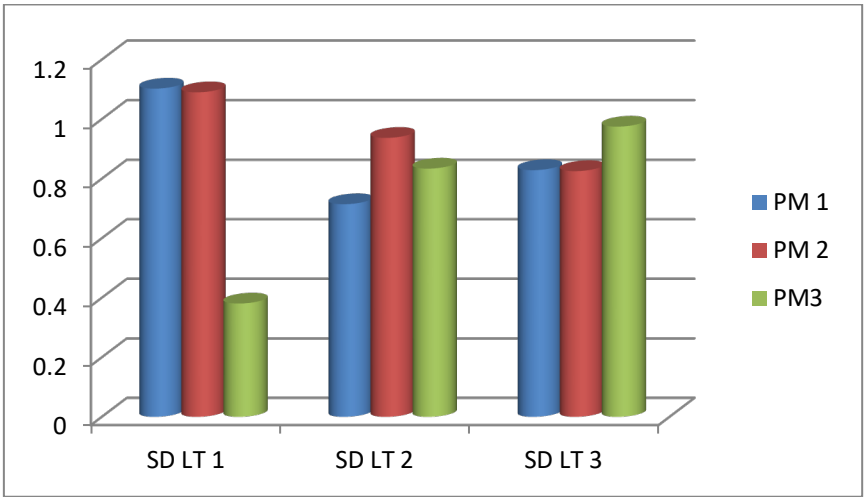

Figure 3:

The standard Deviation of Lesser trochanter Type 1 fracture recovery with Salvati and Wilson scoring system during the three successive follow ups are 3.512916, 2.519489, 0.761387. For Lesser trochanter Type 2 fracture are 2.55603, 2.765967, 1.814374. For Lesser trochanter Type 3 fracture are 3.31496, 2.62280, 2.874672.

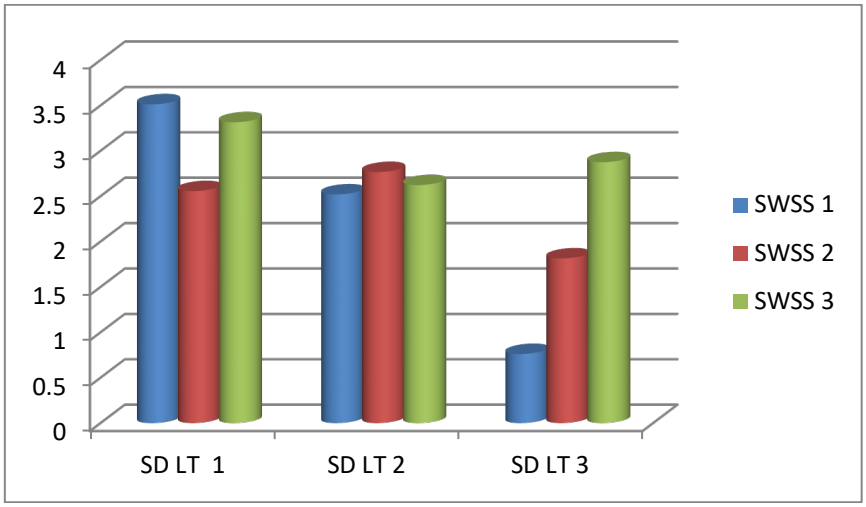

Figure 4:

Conclusion

After the assessing the functional outcomes with Parker mobility score and Salvati and Wilson scoring system the average and standard deviation of the functional score of lesser trochanter fracture Type 1,2,3 are analysed. The amount of variation and dispersion of the values indicate that there is association between the degree of displacement of lesser trochanter and functional outcomes are established. As the better functional outcomes are regained the standard deviation is coming close to 1 or less than 1. Low standard deviation means functional outcome in the above said functional scores are data are clustered around the mean and the spread out of the values is not observed.

The functional outcomes in our study are directly proportional to the lesser displacement of the lesser trochanter. The displaced lesser trochanters need to be addressed to regain the pre-injury functional capacity.

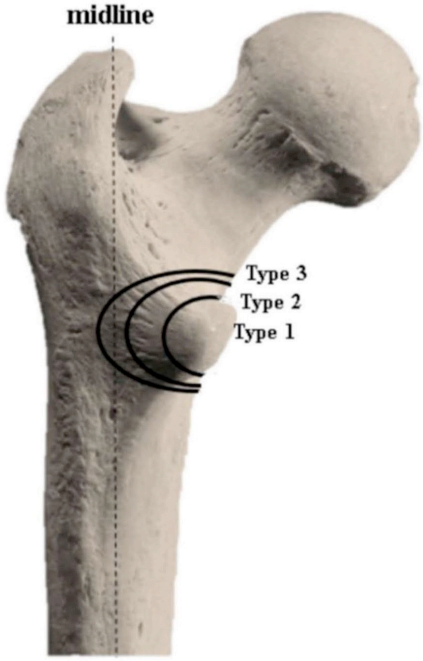

Figure 5:

Classification of lesser trochanter avulsion

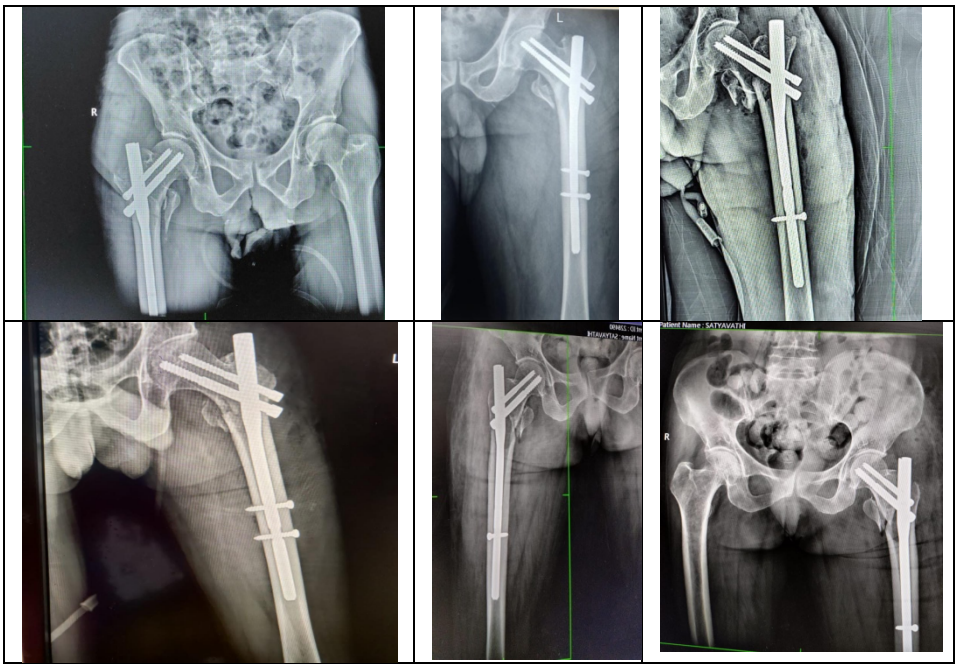

Figure 6: Chart with persisting displacement of Lesser Trochanter

References

1. Ao-Lei Yang, Wei Mao, Jun-Guo Wu1, Yi-Qun He, Hao-Fei Ni, Hai-Long Li and You-Hai Dong. When to Reduce and Fix Displaced Lesser Trochanter in Treatment of Trochanteric Fracture: A Systematic Review. Systematic Review. published: 25 March 2022.
2. Schenkel M, Kaniewska M, Bühler T, Anderson S, Eid K. No difference in flexion power despite iliopsoas fatty degeneration in healed hip fractures with large lesser trochanter displacement. Eur J Orthop Surg Traumatol. 2018; 28:1313–9.
3. Montoli C, Pasquali C, Paiusco E, Pellecchia V, Vulcano E. Lesser trochanter migration following intramedullary fixation of an intertrochanteric femur fracture. Case Rep Orthop. 2016:9348032.
4. Wu HF, Chang CH, Wang GJ, Lai KA, Chen CH. Biomechanical investigation of dynamic hip screw and wire fixation on an unstable intertrochanteric fracture. Biomed Eng Online. 2019; 18:49.
5. Jensen JS. Classification of trochanteric fractures. Acta Orthop Scand. 1980; 51:803–10.
6. Li P, Lv Y, Zhou F, Tian Y, Ji H, Zhang Z, et al. Medial wall fragment involving large posterior cortex in pertrochanteric femur fractures: a notable preoperative risk factor for implant failure. Injury. 2020; 51:683–7
7. Ehrnthaller C, Olivier AC, Gebhard F, Dürselen L. The role of lesser trochanter fragment in unstable pertrochanteric A2 proximal femur fractures – is prefixation of the lesser trochanter worth the effort? Clin Biomech. 2017; 42:31–7.
8. Stijn C Voeten, Wieke S Nijmeijer, Marloes Vermeer, Inger B Schipper, J H Hegeman; DHFA Taskforce study group- Validation of the Fracture Mobility Score against the Parker Mobility Score in hip fracture patients Collaborators, PMID: 31668574
9. Jatinkumar Vakhariya, Rajiv V Kulkarni- Surgical Management of Intertrochanteric Fracture Femur by Sliding Hip Screw and Its Assessment Using Salavati-Wilson Criteria - J Orthop Trauma Surg Rel Res. 2022; 17(2).