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An Overview of Management Options of Unstable Intertrochanteric Fractures

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Abstract

Background: Fractures of the Intertrochanteric (IT) region are some of the most common fractures encountered by an orthopaedic surgeon. The incidence of these fractures is also increasing with increase in life expectancy. There is an increased incidence of hip fractures with aging due to a decrease in muscle mass around the hip and osteoporosis and is becoming more common as the proportion of elderly people in the population increases, by 2040 the incidence is expected to have doubled. IT fractures account for approximately 45% to 50% of all hip fractures in the elderly and out of these, 50% to 60% are classified as unstable .The incidence of failure with unstable IT fractures is as high as 50% and the cut-out rate can be as high as 8% for D.H.S. The goal of treatment is restoring mobility safely and efficiently, while minimizing the risk of medical complications and technical failure. Restoration of mobility depends on the quality of bone and the type of implant used. Treatment with primary bipolar arthroplasty could perhaps return these patients to their preinjury level of activity more quickly, thus obviating the postoperative complications caused by immobilization or failure of the implant

Keywords: Unstable Intertrochanteric Fractures

Introduction

Unstable intertrochanteric fractures in the elderly constitute one of the major reasons for morbidity in this age group. Individuals in this age group usually have other systemic complications such as diabetes and cardiovascular diseases. The impact of these diseases leads to a rapid deterioration in the general condition of these patients if they are kept bed ridden. The main goals for the treatment of these fractures in elderly patients are to restore the prefracture activity status, to allow early full weight bearing, and to avoid possible reoperation. However, failure of fixation is reported up to 10% of patients. Hemiarthroplasty using bipolar prostheses for the unstable intertrochanteric fractures of the femur in elderly yields good clinical results in terms of early postoperative

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ambulation. This will have a direct effect on the general condition and postoperative rehabilitation **(1).**

Treatment Options

In elderly patients there is a risk in general complications. The main objective is to reduce bed ridden period and allow early mobility. The treatment of intertrochanteric hip fractures has evolved over the past years because of a better understanding of fracture anatomy, application of biomechanical principles, and novel technological advances. Surgical treatment of intertrochanteric hip fractures is the current gold standard, with short-term goals of fracture stabilization and early patient mobilization and the long-term objective of restoring patients to their previous level of independence and function **(2).**

I. Non-operative treatment:

Non-operative care indicated in very limited circumstances. it is suitable for patients that are unfit for anesthesia and surgery. Other patients have advanced dementia, current sepsis, severe chronic diseases, non-ambulatory bed ridden patients or incomplete fractures. Lyon and Nevins in 1977, proposed that non-operative treatment is used for patients with small chance to ever walk or unable to go through surgeries. The closed reduction could be divided into two categories; early mobilization with no attempt to preserve normal anatomy or stabilization of fracture with traction to try to achieve anatomy. This treatment involves traction rehabilitation program which usually takes from 8 to12 weeks, pain management with femoral nerve block or small doses of narcotics and routine nursing care. Disadvantages in this method involve bed ridden complications like pneumonia, DVT, UTI, joint contraction and degree of deformity may vary **(3).**

II. Operative treatment:

The goal of operative treatment of intertrochanteric femur fractures is quite different for young and elderly patients. The overarching goal is the restoration of length, correction of deformity and internal fixation that allows for early mobilization and weight-bearing with adequate pain control. When more than 48 hours have elapsed from injury; there is a progressive increase in the risk of healing complications after internal fixation. Intertrochanteric osteotomy emphasizes the restoration of medial stability and to increase success of internal fixation especially in 3 and 4 fragments fracture. The Dimon-Hughston osteotomy displaced the shaft medially, forcing the neck into the shaft **(4).**

[A] Internal fixation:

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Internal fixation has less morbidity, but a higher risk of revision and less cost-effectiveness and so a relatively successful outcome. Internal fixation can be divided into intra- and extra-medullary fixation **(5).**

Intra-medullary fixation:

Intra-medullary nails can be categorized as centro-medullary, condylo-cephalic or cephalo-medullary. Centromedullary nails are contained within the medullary canal and are usually inserted from the piriformis fossa; if of interlocking design, the screws are inserted into the metaphyseal-diaphyseal area proximally and distally. Condylocephalic nails (e.g., Ender nails) are inserted into the femoral condyle and extend into the femoral head and neck. Cephalomedullary nails are inserted into the femoral head and neck, such as the reconstruction nails and similar devices inserted through a piriformis portal **(6).**

Extra-medullary fixation:

Dynamic hip screw (DHS) fixation is widely used to surgically treat intertrochanteric femoral fractures via extramedullary fixation. This device is considered to be the good option for management of such fractures in the elderly. However, the DHS often fails to yield good results when used to treat unstable and reverse/oblique fractures, limiting the clinical utility thereof **(7).**

The proximal femur locking compression plate (PF-LCP) is a limited contact, angular-stable plate designed for treatment of complex, comminuted trochanteric fractures. The PF-LCP offers greater degree of adjustment in plate placement, decreasing the common flexion or extension deformity frequently seen with blade plate placement. The PF-LCP represents a feasible alternative for the treatment of unstable intertrochanteric fractures **(8).**

[B] External fixation:

External fixation represents an interesting alternative for stabilizing fractures especially 31-A1 and 31-A2. The various assemblies available all begin with reduction on the fracture table, followed by fitting two series of pins. Infection is the main complication and it’s not suitable for elderly **(9).**

[C] Arthroplasty:

Arthroplasty yields better functional results than internal fixation because it allows early mobilization with less reoperations and it avoids the complications associated with internal fixation so arthroplasty. Internal fixation complication involved implant migration, implant failure; fracture non-union and mal union are avoided. Prosthetic options following intertrochanteric fracture can be divided into three categories:

1. Unipolar hemiarthroplasty.
2. Bipolar hemiarthoplasty.

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3. Total hip arthoplasty**(10).**

1. Unipolar hemiarthroplasty:

The original design of the unipolar hemiarthroplasty used for proximal femoral fractures had the following features: a solid polished unipolar head with a collared, straight, fenestrated stem designed for noncemented use. The best-known design of this type was the Austin Moore prosthesis. A second design was the Thompson prosthesis, characterized by a solid unipolar head and a collared, shorter, curved, non-fenestrated stem. The original design was for use without cement, the cement fixation was developed in the late 1960s and it was applied to the Thompson prosthesis because of its curved, non-fenestrated stem **(11).**

2. Bipolar hemiarthroplasty:

The development of the bipolar hemiarthroplasty was based on the clinical experience with unipolar prosthesis in which success was limited by progressive acetabular wear and concomitant pain. Over time, this erosion/migration often resulted in acetabular protrusion which is decreased using bipolar prosthesis **(11).**

The bipolar models consisted of three parts :(12)

- A femoral head and stem unit, with varying size heads.
- An ultrahigh molecular weight polyethylene (ceramic) bearing insert, which locks over the femoral head component.
- An outer metallic head that press fits onto the inner bearing surface and articulates with the acetabulum. The bipolar hemiarthroplasty allows for easier conversion to total hip arthroplasty when necessary.

Figure (1): Bipolar hip prosthesis**(12)**

In intertrochanteric fracture the deficient proximal postero-medial cortex should be augmented. Augmentation is either by calcar replacing prosthesis or the calcar should be reconstructed. Also, the greater trochanter should be reattached to restore both limb length and abductor function. Calcar reconstruction applied using standard femoral stem

and retaining lesser and greater trochanters with cerclage wires. The potential advantage of calcar replacing prosthesis is that deficient medial femoral cortex is compensated biomechanically by the extramedullary portion of the prosthesis. demonstrates Calcar replacement prosthesis **(12).**

3. Total hip arthroplasty:

THA is a rarely used in intertrochanteric fractures in elderly. It has an increased risk of dislocations plus an increased magnitude of surgery with increased blood loss. Total hip replacement is mainly reserved for the treatment of complications such as nonunion or avascular necrosis of the femoral head or a patient with previous rheumatoid arthritis and osteoarthritis. Also, failure of the previous lines of treatment may indicate THR **(10).**

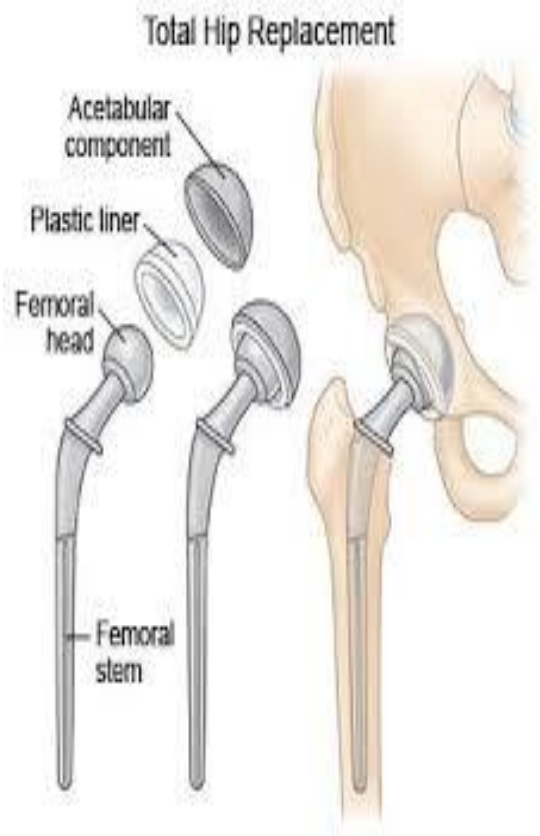

Figure (2): THR prosthesis. **(10)**

Surgical Approach:

There are a many of approaches to the hip joint and proximal femur, as Anterior, Anterio-lateral, Lateral, Posterior and Medial approaches. Mainly the Anterio-lateral, modified lateral and posterior approaches are fundamental when it comes to hip hemiarthroplasty. The main aim is to accomplish an easy and safe exposure to the hip joint and proximal femur **(4).**

Antero-lateral Approach:

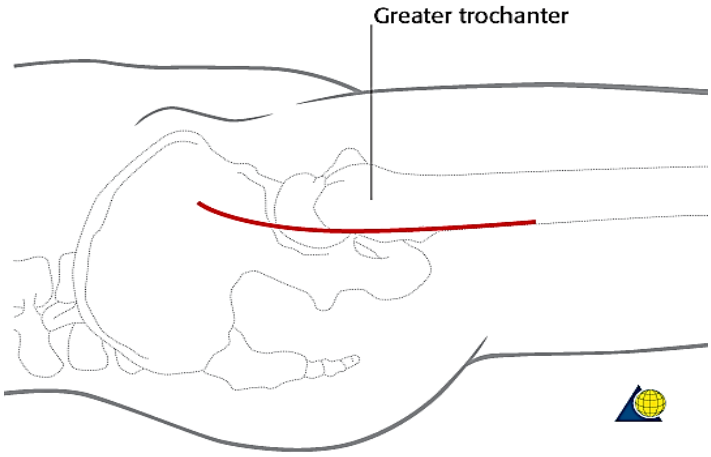

Figure (3): Antero-lateral Incision. **(13).**

The Antero-lateral approach was derived from the Watson-Jones approach that was described for hip fracture surgeries. Mainly the approach uses the intermuscular plane between tensor fascia lata and the gluteus medius, while no true internervous plane. The patient is placed in the lateral decubitus position with the operative limb is draped free. The tensor Fascia lata is moved anteriorly by flexing the leg 30 degrees. The skin incision is around 15 cm and should be centered over the tip of the greater trochanter. The subcutaneous fat is incised in line with the skin incision to reach deep fascia. At the tip of greater trochanter by its posterior margin the fascia lata is incised in line with the shaft of the femur. The gluteus medius fibers are bluntly separated in line with the skin incision. It's of importance to identify anterior and posterior borders of gluteus medius, a split is made proximally in line of its muscle fibers for 3 to 4cm. Further dissection is averted in order to avoid injury to superior gluteal nerve. The limb is then flexed, adducted and externally rotated to place the capsule anteriorly and stretched making easier to identify and dissect. This allows a good exposure to the hip joint with limited access to the proximal femur in order not to injure superior gluteal nerve **(13). Structures at risk in this approach:**

Femoral nerve, Femoral artery and Femoral vein **(13).**

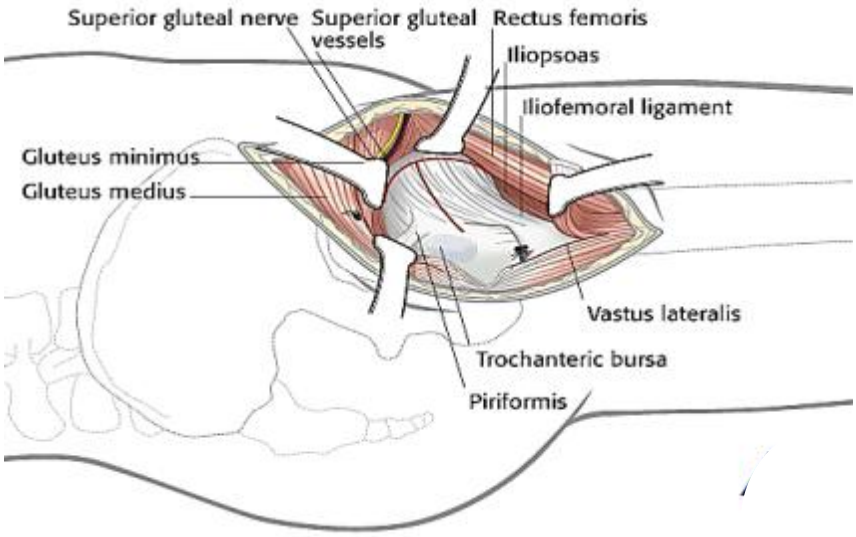

Figure (4): Antero-lateral approach **(13).**

Modified Lateral Approach (Hardinge, Ttansgluteal) (14):

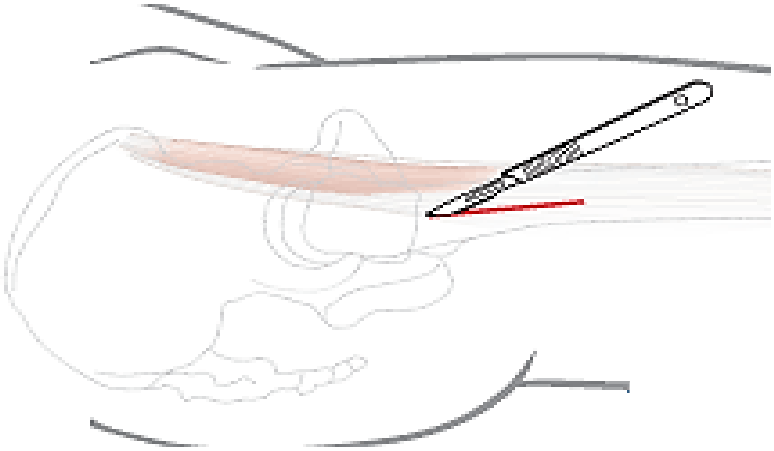

Figure (5): Modified Lateral incision**(14).**

This approach was modified by Hardinge and it is most commonly used in treatment of intertochanteric fractures using bipolar hemiarthroplasty. The approach stressed on the advantages of the preserving the attachment of the thick posterior portion of the gluteus medius tendon to the greater trochanter **(11).**

The superficial exposure of the Hardinge approach is similar to the antero-lateral approach as discussed above. As well there is no internervous plane in this approach. The deep exposure begins by splitting of gluteus medius longitudinally starting at the middle of greater trochanter. Extending would not be more than 3 to 4cm above the greater trochanter to avoid superior gluteal nerve injury. Extending the incision inferiorly through the fibers of vastus lateralis is performed. The anterior flap will contain the anterior aspect of gluteus medius with underlying gluteus minimus and anterior part of vastus lateralis. Then dissecting anteriorly along greater trochanter and onto femoral neck to reach the capsule as seen in. This approach allows good access to hip joint and proximal femur **(14).**

Structures at risk in this approach:

Superior gluteal nerve and Femoral nerve **(14).**

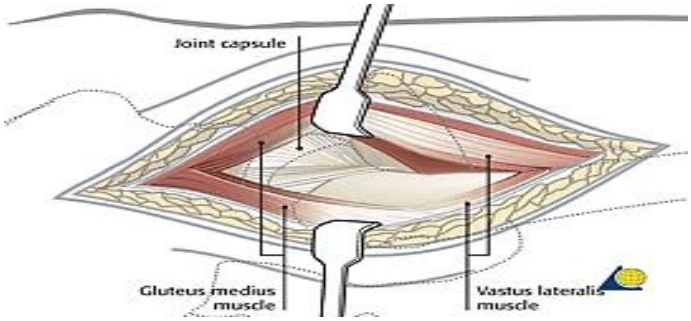

Figure (6): Modified lateral approach**(14).**

Posterior Approach (Langenbeck):

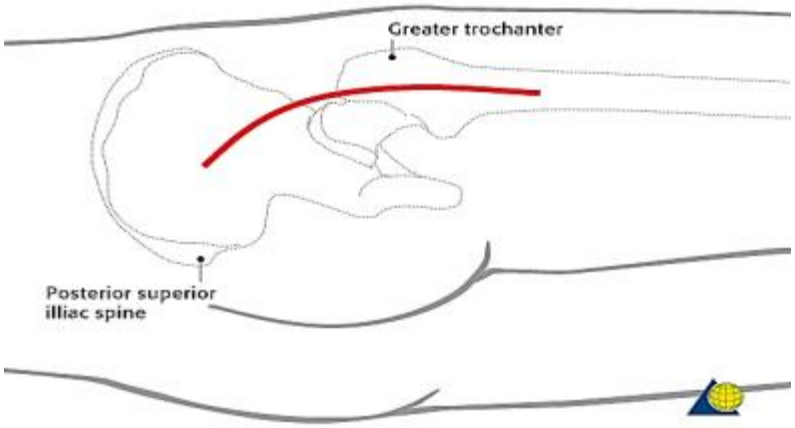

Figure (7): Langenbeck incision**(15).**

This approach involves incision extending from the posterior superior iliac spine to the posterior border of the greater trochanter. Kocher later described shifting the incision to the anterior aspect of the trochanter and continuing distally 10 to 12cm along the axis of the femoral shaft. This is known as Moore or southern exposure. There is no true internervous plane. Patient placed in the lateral decubitus position **(15).**

It provides good exposure to the acetabulum and proximal femur. The incision is made around 15cm curved, one inch posterior to the posterior edge of greater trochanter. Begins 7cm above and posterior to greater trochanter, and then continues down the shaft of the femur. Incision in fascia lata is made to expose vastus lateralis distally. Splitting the fibers of gluteus maximus with proximal incision. Deep dissection while require the short extensor rotators to be stretched by internally rotating the hip. Piriformis and obturator internus tendons should be marked, reflect backwards to avoid sciatic nerve injury. **(15).**

Structures at risk:

Sciatic nerve, Inferior gluteal artery, First perforating branch of profunda femoris, Femoral vessels and Superior gluteal artery and nerve **(15).**

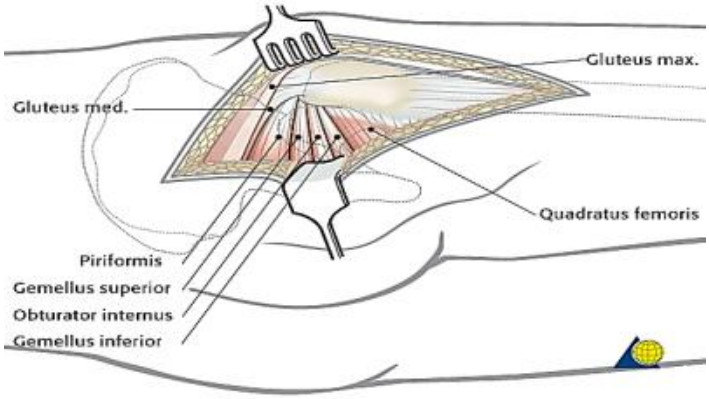

Figure (8): Langenbeck approach**(15).**

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