INTERTROCHANTERIC HIP FRACTURES

Abstract

Unstable intertrochanteric hip fractures account for approximately one quarter of all hip fractures in the elderly and are increasing in frequency.

Treatment goals include immediate mobilization while limiting complications. Preoperatively, medical comorbidities should be identified and managed. More unstable fracture patterns, problems with compression hip screw fixation, such as excessive fracture collapse and implant cutout, increase.

For these fractures, adding a trochanteric stabilizing plate or using an axial compression hip screw or intramedullary hip screw is warranted.

Demographic

1. More commonly with increased age and low bone mineral density.
2. Women who suffer intertrochanteric fractures tend to be more older than women who sustain femoral neck fractures.
3. Same frequency as fracture neck of femur
4. 60/100000 in Women and 35/100000 in men per year
5. Can be associated with OA [cf. #NOF]
6. Osteoporosis: 1 S.D : 2.3 fold increase in hip fracture and 2.6 in Spine fracture
7. PFN: Best suitable for reverse oblique or subtrochanteric fracture. Nonunion rate 35% with 90 dynamic compression screw Vs 5% with PFN
8. Mayo clinic: Mortality is 6%
   Stable: Implant related failure <3%
   Unstable: " up to 15%
9. Gamma to PFN: complication reduced from 25% to 5%
10. 12.5% is associated with OA of the hip. Fracture in such situation may decrease pain.

History

1930	Jewett fixed traflanged; Smith Peterson nail and plate
Osteotomy	Sarmiento and Dimon Hughston
Sliding screw	Pugh Nail
Now popular	Synthes DHS
Medoff sliding plate	

Unstable fractures

1. Have a greater bony injury
2. Greater displacement after fixation is expected.
3. Comminution of the posteromedial buttress

Although consistently good results have been achieved over the past 20 years with the use of the compression hip screw in stable fracture patterns, the results in unstable fractures are less reliable. Failure rates are higher (8% to 25%) with unstable fracture. The goal of management of any hip fracture in the elderly is to restore mobility safely and efficiently while minimizing the risk of medical complications and technical failure.

Kaufer described six variables that affect the biomechanical strength of repair.

1. Bone quality osteoporosis
2. Age
3. Fracture pattern or fracture stability
4. Implant choice
5. Quality of fracture reduction
6. Positioning of the implant

Etiology

The elderly are unable to dissipate this energy the way young persons do whilst falling. Ambulatory speed is diminished in the elderly, so they tend to fall to the side rather than forward; thus, the impact is on the hip.
Second, their protective responses are diminished because of slowed reaction times, weakness, and disorientation or by the side effects of medications.
In addition, elderly patients may lack shock absorbers, such as fat or muscle, that can absorb and dissipate the energy applied to the hip. Finally, diminished bone strength because of osteopenia allows fractures to occur with smaller amounts of energy.

Evaluation

1. Medical comorbidities
2. Assess cause for the fall [Details]
3. NOF Vs intertrochanteric
   Stable Vs Unstable
   Pathological Vs nonpathological
4. Assessment for Osteoporosis

Anteroposterior pelvis and cross-table lateral radiographs should be obtained routinely in all patients with intertrochanteric hip fractures. Identifying unstable intertrochanteric hip fractures rarely requires more elaborate radiologic studies. The number of fracture fragments and the geometry of the fracture lines (eg, reverse obliquity) should be noted.

OTA classification [Region 31

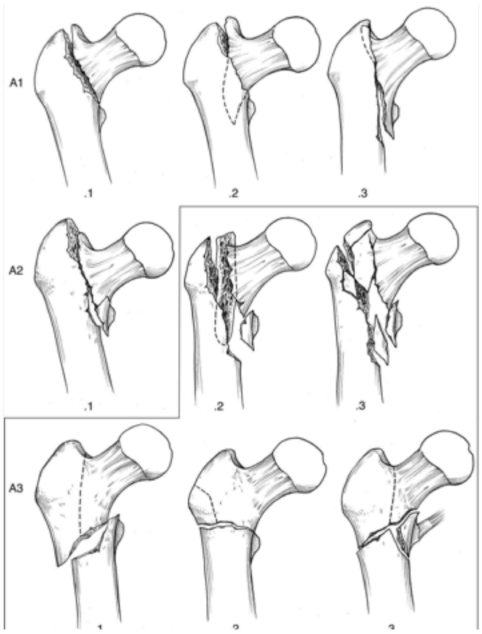
A1 single fracture in usual direction [no comminution]

A2 “ with posteromedial communition

A3 “ Reverse oblique fracture

Each has further 3 types

OTA classification



Timing of surgery

When a geriatric patient with hip fracture should undergo surgery is a matter of debate.
Most studies have noted increased mortality when surgery was delayed either 48 or 72 hours.
The optimal time for intervention appears to be after the patient is evaluated medically and any transient medical ailments (ie, electrolyte imbalances, fluid imbalance) have been corrected; however, it should not be delayed more 72 hours.

Technique

Surgical Management

1. Spinal or GA:

Recent study of 642 elderly patients undergoing hip fracture fixation whose anesthesia was not determined by medical condition, the type of anesthesia made no difference in inpatient mortality, inpatient morbidity, or 1-year mortality.

The most common means of surgical management is reduction followed by fixation with a compression hip screw and side plate. Other fixation options include the dynamic axial compression plate, the compression hip screw augmented with a trochanteric stabilizing plate, and intramedullary sliding hip screws. In some select situations, prosthetic replacement may be preferred.

Compression Hip Screw and Side Plate

Fracture Reduction:

Patient positioned supine on a fracture table.

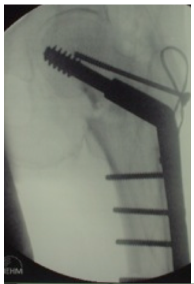
The well leg is usually flexed and abducted in a holder.

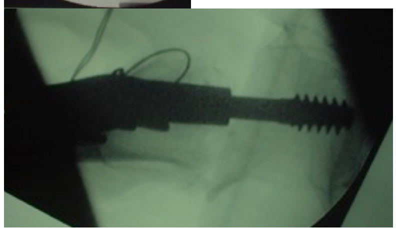
The injured leg is secured using a heel cup, and fracture reduction is performed. Axial traction is applied to regain length, correct the varus deformity, and disengage the fragments.

Internal rotation and slight abduction allow many unstable intertrochanteric fractures to be reduced.

Traction is applied through a well-padded perineal post and should be released as soon as fracture fixation is achieved.

When the proximal fragment remains externally rotated, the distal limb should be externally rotated to match. Residual posterior sag of the femoral shaft or apex posterior angulation of the fragments can be improved with use of an external support (eg, a crutch) outside the surgical field to lift the femoral shaft.





An acceptable range

Neck-shaft angulation is between 5° of varus (compared with the patient's anatomic neck shaft angle) and 20° of valgus.

Angulation >10° on the lateral view should not be accepted.

Posterior sag should be < 30°

Posteromedial comminution that includes the lesser trochanter is rarely aligned by closed methods; direct open reduction of these fragments is usually unnecessary.

Open reduction sometimes: Reverse oblique fractures may have proximal fragments with all of the gluteus medius and minimus muscle attachments and no opposing muscle forces. These fractures can have an abducted, flexed, and internally rotated proximal fragment that is very difficult to control by closed manipulation of the distal extremity.

Osteotomies attempt to achieve stability: not required. Recent studies have shown increased surgical times and blood loss with osteotomy but no difference in outcomes between osteotomies and anatomic reduction.

Implant Placement

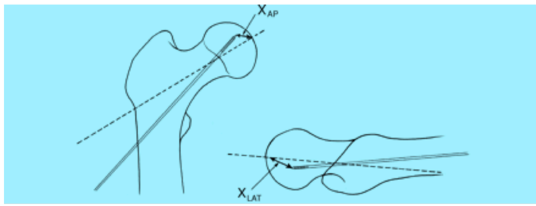
The **entry level for** 135° side plates is usually at the mid level of the lesser trochanter.

The **tip of the guide pin** should be positioned in the "apex" of the femoral head (where a line centered and parallel to the femoral neck intersects the subchondral bone).

The **position of the compression screw** within the femoral head is critical for successful fixation. Central position is preferred in AP and Lateral. The superior and anterior screw placement should be avoided.

Baumgaertner devised a method to measure the **distance of the screw tip** from the apex of the femoral head.

Tip-Apex Distance



An increasingly greater tip-to-apex distance was associated with increased risk of hardware failure.

The tip-apex distance: the tip of the lag screw to the apex of the femoral head on the AP and Lateral views <25 mm = less chance of fixation failure. Less failure if the screw tip is 5 mm from the subchondral bone A TAD <25 mm should be achieved.

In severely osteoporotic bone, the use of cement augmentation of proximal fixation has been recommended. If the lag screw does not attain purchase within the femoral head, the screw can be removed, polymethylmethacrylate cement injected into the head, and the screw reintroduced.

Although **four-hole side plates h**ave been most commonly chosen for fixation of most intertrochanteric fractures, clinical and biomechanical studies have shown equivalent results with two-hole plates in both stable and unstable fractures.

Trochanteric Stabilizing Plate

The trochanteric stabilizing plate is an adjunct to compression hip screw fixation. Twenty percent of fractures treated with compression side plates had "massive" sliding and medialization, whereas only 3.5% of those treated with compression hip screws and trochanteric stabilizing plates had such displacement.

95° Fixed-Angle Screw Plate

Used frequently in younger patients and for reverse obliquity fracture patterns, is applied by open reduction and achieves proximal fixation with either a compression screw or blade plate.

Intramedullary Sliding Hip Screws

Intramedullary sliding hip screws combine the sliding compression screw with an intramedullary nail.

Proponents of this technique note that its advantage over compression hip screws with side-plate fixation is that implant insertion can be done in a closed, percutaneous manner to minimize fracture zone insult and reduce perioperative blood loss.

Prosthetic Replacement

Acute prosthetic replacement for intertrochanteric fractures is not routinely done.

Recommendations for acute prosthetic replacement currently are limited to unstable fractures in patients with rheumatoid arthritis or pathologic fractures.

The surgical procedure for arthroplasty is more technically demanding than conventional open reduction and internal fixation because it frequently requires calcar-replacing prostheses and longer surgical times. Requires calcar replacing prosthesis.

Postoperative Care

A primary goal is immediate mobilization.

Koval studied postoperative ambulation with force plates and demonstrated that patients without cognitive impairment limit their own weight bearing over the course of several weeks.

Functional Outcome

In one study of 336 patients who were community ambulators before their fractures, only 41% regained their pre-injury walking ability, another 40% had decreased ambulation ability, 12% became household ambulators, and 8% became nonambulatory. Results were similar for activities of daily living or living arrangements. Only about 50% of patients can be expected to regain their preinjury function; the other half becomes more dependent in some manner.

Medical Complications

Medical complications: myocardial infarction, pneumonia, and urinary tract infections are the most common.

Reported mortality rates for the first postoperative year are between 20% and 25%. Approximately 5% of the deaths occur during the initial hospitalization.

Infection rate is 1-5%; Pulmonary embolism 4%

Mechanical Complications

1. Loss of Proximal Fixation

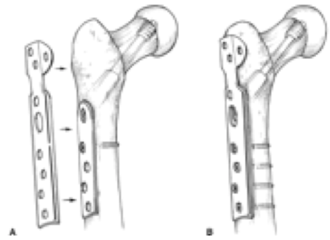
An increasing tip-to-apex distance of the hip screw predicted a screw cutout. No cutouts were seen in patients with a tip-to-apex distance of <28 mm, and the likelihood of failure increased exponentially to >60% when the tip-to-apex distance was >45 mm.

A review of severe unstable fractures revealed a 56% failure rate (cutout and nonunion [9/16]) for compression hip screw fixation.

2. Femoral Shaft Fracture following intertrochanteric fracture

Almost all of the reported fractures occurred with the earliest intramedullary device, the Gamma nail, which was manufactured with a 10° valgus offset. Surgical femoral fracture rates of 0% to 12%.

Newer devices, such as the Intramedullary Hip Screw (Smith & Nephew, Memphis, TN) and Proximal Femoral Nail (Synthes [USA], Paoli, PA), were designed with less valgus curvature. Results of their use have shown markedly lower femoral fracture rates, from 2% to 3%. Medoff plates



3. Nonunion

Nonunion after unstable intertrochanteric fracture is a less frequent complication than hardware cutout. The well-vascularized metaphyseal bone makes nonunion less likely than in femoral neck fractures. Most reports place nonunion rates at 1% to 2%.

1. The radiographic signs that predict failure in patients with internally fixed femoral neck fractures; they considered 3 months to be the critical time for prognosis.

2. Radiological signs:
   a. Change in fracture position by 10 mm
   b. change in screw position by 5%
   c. Backing out of the screws by 20 mm
   d. Perforation of the femoral head results in a high rate of revision

3. When plain radiography is equivocal, computed tomography (CT) IS useful

4. Always suspect infected in a failed internal fixation of a hip fracture

5. Consider valgus osteotomy but prepared with Girdlestone + Gentamycin beads in event there is infection at the time of exploration.

4. P**ainful Hardware**

Painful hardware after open reduction and internal fixation is probably underreported in studies of hip fracture. The pain is often thought to result from a backed-out compression screw irritating femoral musculature, but nonunion must be actively excluded as a cause of residual pain.

How much sliding occurs?

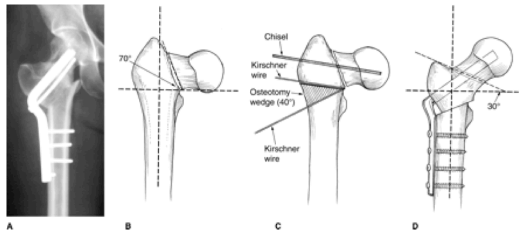
In stable Fracture: 5 mm back out

Unstable Fracture: 15 mm back out

>15 mm slide = high rate of fixation failure

5. Malunion

Although fracture union: in most patients, a persistent limp was common, probably caused by loss of femoral offset and abductor moment arm



Failed internal fixation requiring THR

102 THR after failed internal fixation of a prior hip fracture. There were 39 intertrochanteric fractures and 63 femoral neck fractures.

Etiology of failure included 35 cases of osteonecrosis, 32 cases of arthritis, 25 cases of early failure of fixation, and 10 cases of nonunion. T

Early surgical complications related to the procedure 12%

These included

Dislocations 5

Periprosthetic fractures 4

Hematomas 2%

Infection 1%.

Use of Hip Pads

Elderly patients may lack shock absorbers. NOF more common in lean.

Fall in a lean person: can absorb and dissipate the energy applied to the hip.

Osteopenia allows fractures to occur with smaller amounts of energy.

A recent study showing that the use of hip pads decreases the rate of hip fractures by more than 50% supports this hypothesis. Not been validated

In addition, the fracture rate increases markedly as people age, in excess of the mild increase in the rate of falls. The risk of fracture per fall increases with age.

REFERENCE

1. Baumgaertner,A J Am Acad Orthop Surg 2004;12:179-190

2. Koval: Hip fracture in the elderly: The effect of anesthetic technique. Orthopedics 1999;22:31-34.

3. Baumgaertner: The value of the tip-apex distance in predicting failure of fixation of peritrochanteric fractures of the hip. *J Bone Joint Surg Am* 1995;77: 1058-1064.

4. Bolhofner: A 135-degree sliding screw with a two-hole side plate. *J Orthop Trauma* 1999;13:5-
5. Koval : Ambulatory ability after hip fracture: A prospective study in geriatric patients. *Clin Orthop* 1995;310:150-159.
6. Simison. Benificial effect of ITF on coexisting hip arthritis. Acta Orthop Beligica 61:2 [1995]; 84
7. Archibeck. The Journal of Arthroplasty Vol. 00 No. 0 2012