



RCSI

The Hip Fractures:



Joint meeting IBEC & RCSI.
Cappagh National Orthopaedic Hospital.

Dr. Aamir Shaikh.
Clinical Lecturer of Orthopedics RCSI &
UCD.

15th December 2010.

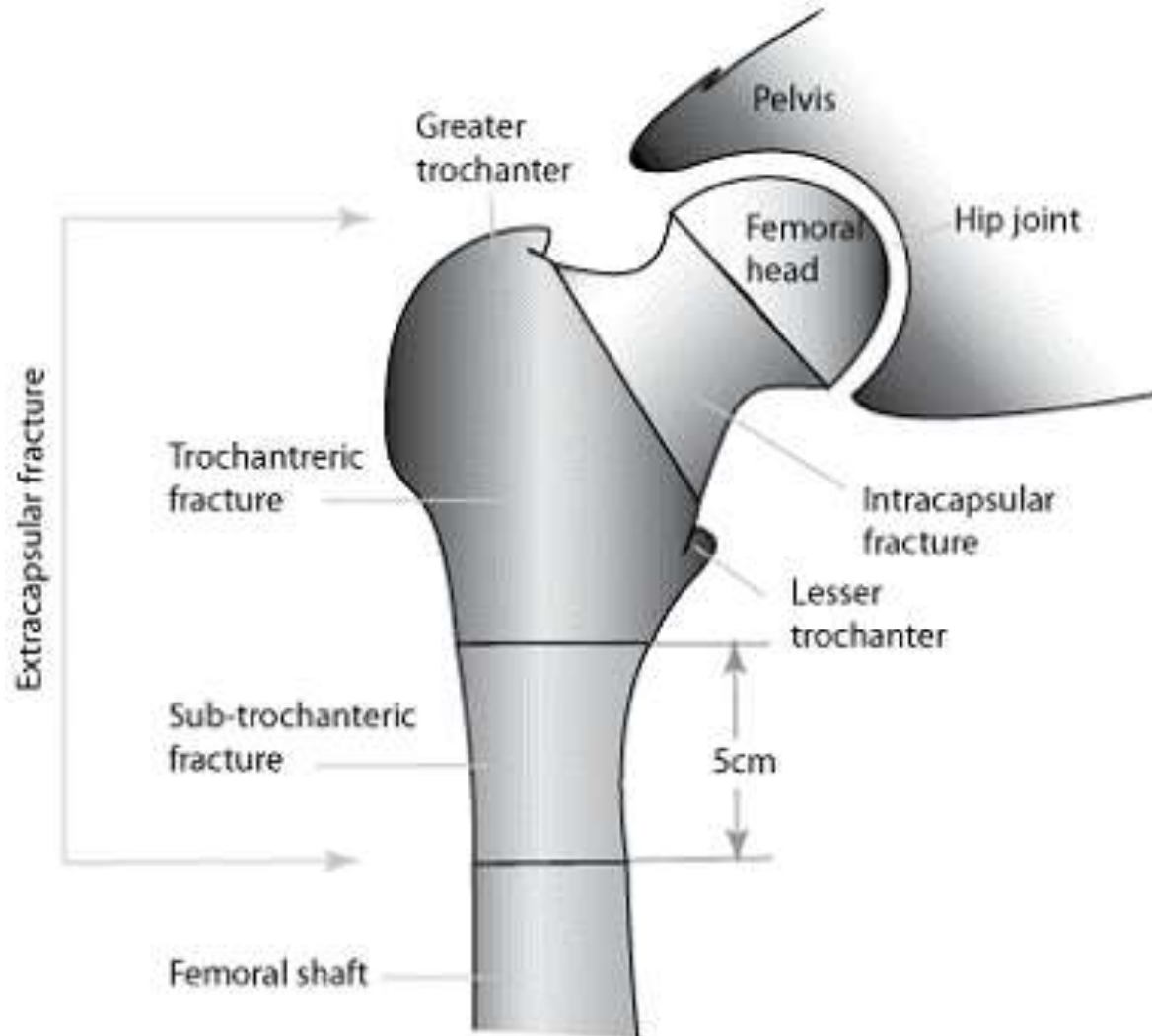


Irish Medical
Devices Association

Overview

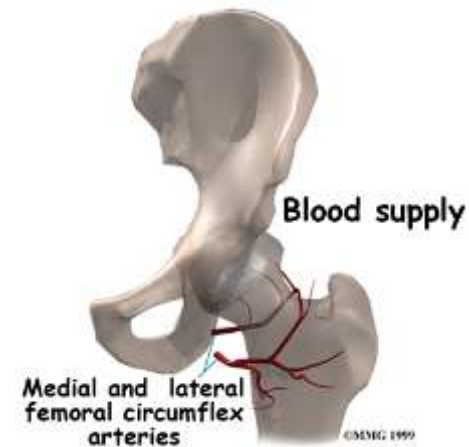
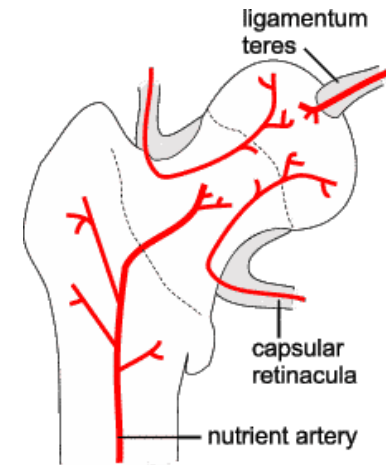
- Incidence is highest in >65 years of age but also in young adults due to RTA
- 320,000 admission in the US each year
- 15-20% die within 1 year of fracture
- $F > M$
- Two types: intracapsular and extracapsular

Anatomy



Blood Supply

- intracapsular are at risk of non union and avascular necrosis due to interruption of the blood supply to the femoral head
 - Via cruciate (med and lat circumflex) and intramedullary
- Garden classification



Anatomy of Femur

- Valgus reduction:
 - Reduction should leave neck shaft angle between 130-150 deg
 - Acceptable reduction may have up to 15 deg of valgus
 - >185 deg at risk of AVN
- Varus reduction:
 - Results in higher non-union rate
 - Not an anatomical reduction
 - may lead to post op displacement (Weinrobe 1998)
- Angulation: reduction should be between 0-15 deg of anteversion

Risk Factors

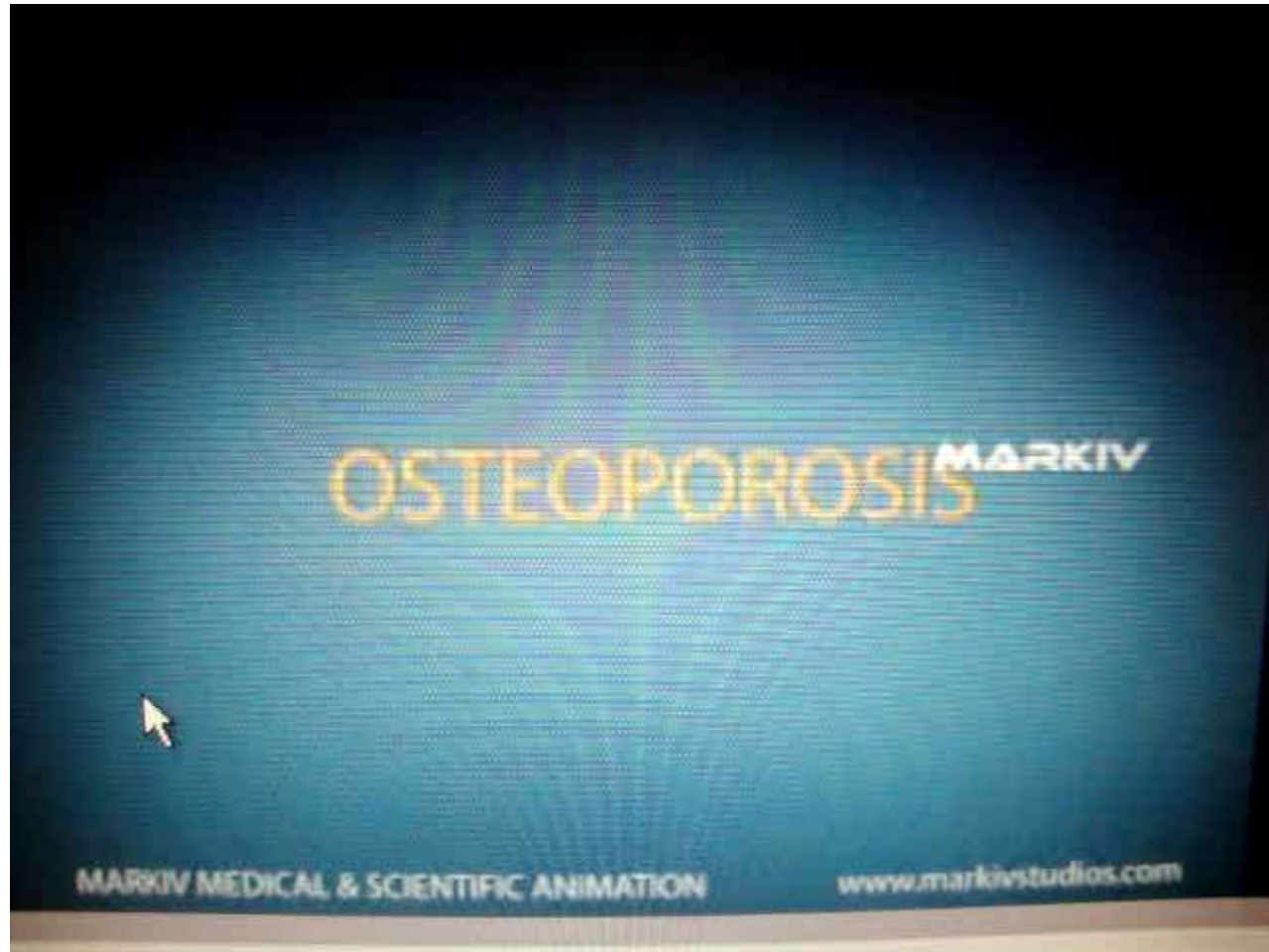
- Age: >65 years
- Co-morbid factors: osteoporosis, endocrine disorders (hyperthyroidism, hypogonadism), GIT disorders interfering with calcium/ Vit D absorption, neurological disorders (Parkinsons, MS)
- Gender: F
- RTA



Risk Factors

- **Nutrition:** lack of calcium and Vit D in diet, eating disorders (anorexia), high caffeine intake
- **Smoking**
- **Alcohol**
- **Medication:** steroids, anticonvulsants, diuretics
- **Environmental factors:** loose rugs, dim lighting, cluttered floors

Osteoporosis:



Presentation

- P/C: severe pain, bruising, swelling
- unable to weight bear on that leg.
- O/E: may have shortened leg with external rotation

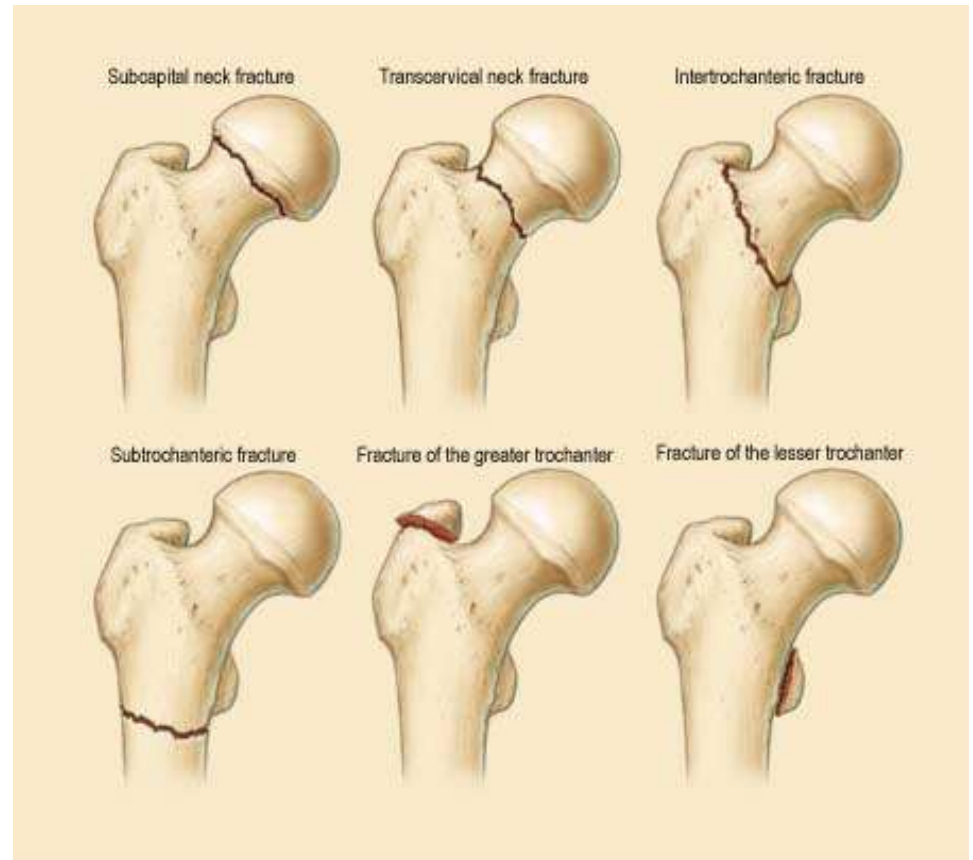


Investigations

- Full history and physical exam
- Assess patient as per ATLS protocol
- X-rays AP and lateral, CT, MRI, bone scan
- Routine bloods, group and hold
- ECG, CXR

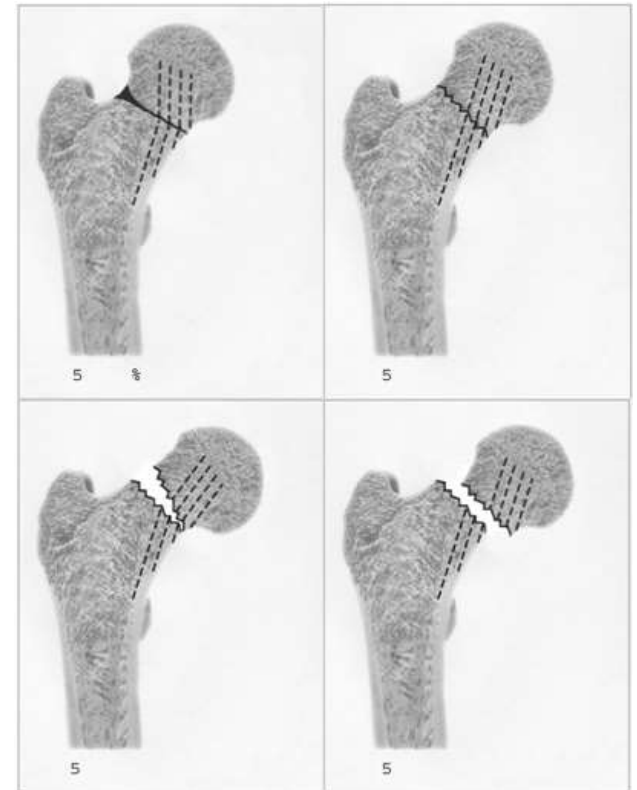
Classification

- Classified on geographical position:
 - **intracapsular:**
 - Subcapital
 - Transcervical
 - basicervical
 - **Extracapsular:**
 - Intertrochanteric
 - subtrochanteric



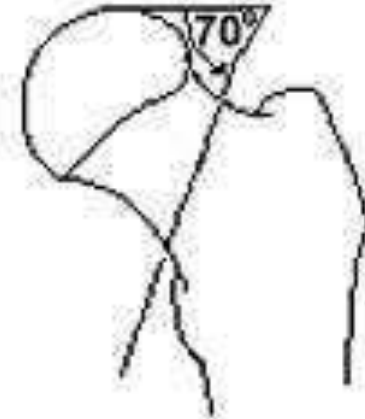
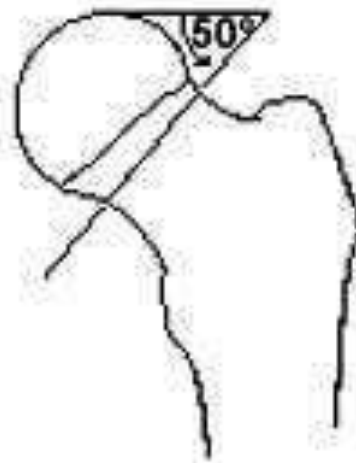
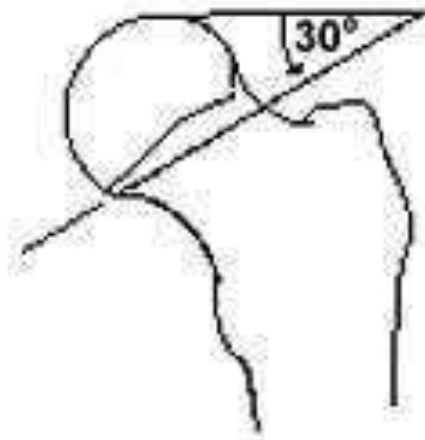
Garden Classification

- **Garden I:** incomplete fracture of the femoral neck
- **Garden II:** complete fracture without displacement
- **Garden III:** complete fracture with partial displacement
- **Garden IV:** complete fracture with full displacement



Pauwels Classification

- The more vertical the line the greater the risk of non union because increased shear stresses across the fracture



Subcapital Fracture:

- Most common intracapsular fracture of the hip
- X-ray: white line of increased density of impacted bone may be seen at base of femoral head



Transcervical Fracture

- Occurs across neck of femur
- Easy to view when hip x-ray obtained in internal rotation
- a/w varus deformity



Basicervical Fracture

- Base of femoral neck
- Are Intracapsular two part fractures with fracture plane running along line of capsular insertion



Management of Femoral Neck Fracture

- **Conservative:** analgesia, bed rest, traction
 - if pt not willing to consent for surgery or if not expected to survive surgery
- **Surgical:** **Manninger et al** showed significant reduction in osteonecrosis and segmental collapse if performed within 6 hr
 - **Head sparing:** screws, DHS
 - **Head sacrificing:** hemi, THR

Young Patients

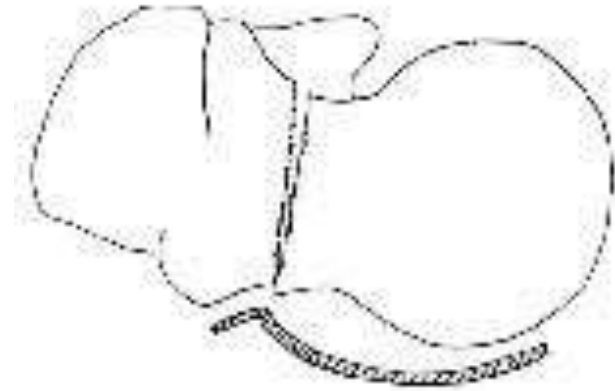
- Non-displaced fractures
 - At risk for secondary displacement
 - Urgent ORIF recommended
- Displaced fractures
 - Patients native femoral head best
 - AVN related to duration and degree of displacement
 - Irreversible cell death after 6-12 hours
 - Emergent ORIF recommended

Elderly Patients

- Operative vs. Non-operative
 - Displaced fractures
 - Unacceptable rates of mortality, morbidity, and poor outcome with non-operative treatment [Koval 1994]
 - Non-displaced fractures
 - Unpredictable risk of secondary displacement
 - AVN rate 2X
 - Standard of care is operative for all femoral neck fractures
 - Non-operative tx may have developing role in select patients with impacted/ non-displaced fractures [Raaymakers 2001]

Acceptable Reduction of femoral Neck Fracture

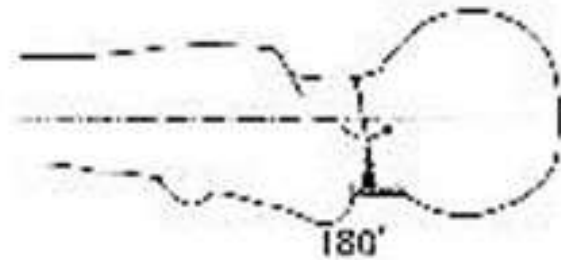
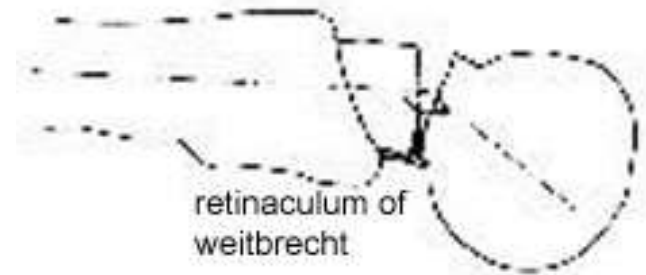
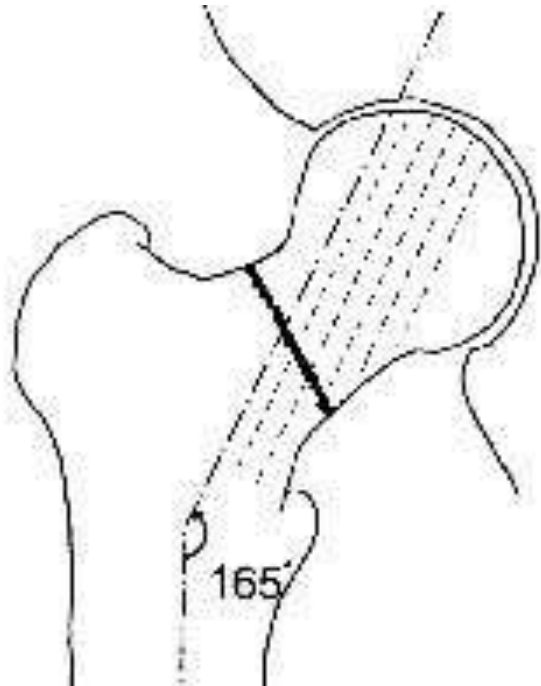
- Lowell's Alignment theory
 - outline of femoral head & neck junction will have convex outline of femoral head meeting concave outline of femoral neck regardless on all views
 - Image should produce an S or reverse S
 - If image is a C fracture is not reduced



Garden's Alignment Index:

- Refers to angle of compression trabeculae on AP relative to longitudinal axis of femoral shaft and angle of the compression trabeculae on lateral to the femoral shaft
- Acceptable range of 155-180 deg on both views
- If $>/<$ higher incidence of AVN

Garden Alignment Index



Treatment choices:

- 1: Cannulated Hip screws.
- 2: Dynamic Hip Screw.
- 3: Cephalo-medullary device.
- 4: Hemiarthroplasty Hip.
- 5: Total Hip Replacement.

Cannulated Screws.



Cannulated Screws (Richard)

- Used for undisplaced femoral neck fractures
- Good for fracture which are more horizontal
- Krastman (2004):
 - 112 pt study had 95% consolidation rate with 2 cannulated screws in intracapsular stable fracture
 - Position of screw did not interfere w consolidation
 - Rates negatively affected by inadequate anatomical reduction and unstable fractures

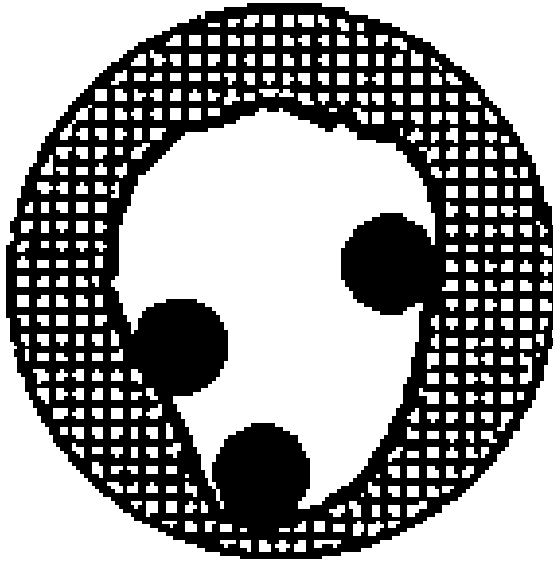
Cannulated Screws.

- Fixation: Multiple screws in parallel
 - No advantage to > 3 screws
 - Uniform compression across fracture
 - Fixation most dependent on bone density
- Screw location
 - Avoid posterior/ superior quadrant
 - Blood supply
 - Cut-out
 - Biomechanical advantage to inferior/ calcaneal screw

(Booth 98)

Cannulated Screws.

Posterior



Calcaneus



Anterior

Central

Dynamic Hip Screw

- Good for fracture with more vertical fracture line
- Problem w this is that cannulated screw will prevent fracture impaction → non union
- Sacrifices large amount of bone
- Anti-rotation screw often needed



Hemiarthroplasty Hip:

- Indications:

- Poor general health
- Pathological hip fracture
- Severe osteoporosis
- Physiological age >70
- Inadequate closed reduction
- Pre-existing hip disease

- Contraindication:

- Pre existing sepsis
- Young patient
- Failure of internal fixation device
- Pre-existing disease of the acetabulum

Hemiarthroplasty Hip:

- Hemi associated with (Luyao 1994, Iorio 2001)
 - Lower reoperation rate (6-18% vs. 20-36%)
 - Improved functional scores
 - Less pain
 - More cost-effective
 - Slightly increased short term mortality

Bipolar

- Bipolar theoretical advantages
 - Lower dislocation rate
 - Less acetabular wear/ protrusion
 - Less Pain
 - More motion
- Bipolar Disadvantages
 - Cost
 - Dislocation often requires open reduction
 - Loss of motion interface (effectively unipolar)



Bipolar Vs. Unipolar

- Raia et al 2003
 - Results of this prospective randomized study suggest that the bipolar endoprosthesis provides no advantage in the treatment of displaced femoral neck fractures in elderly patients regarding quality of life and functional outcomes

Hemi Vs. THR

- Dislocation rates:
 - Hemi 2-3% vs. THR 11% (short term)
 - 2.5% THR recurrent dislocation (Cabanela 1999)
- Reoperation:
 - THR 4% vs. Hemi 6-18%
- DVT / PE / Mortality
 - No difference
- Pain / Function / Survivorship / Cost-effectiveness
 - THR better than Hemi (Lu –Yao 1994)
(Iorio 2001)

Femoral Neck Fracture Complications

- Failure of Fixation
 - Inadequate / unstable reduction
 - Poor bone quality
 - Poor choice of implant
- Treatment
 - Elderly: Arthroplasty
 - Young: Repeat ORIF
 - Valgus-producing osteotomy
 - Arthroplasty

Femoral Neck AVN

- 5-8% Non-displaced fractures
- 20-45% Displaced fractures
- Increased incidence with
 - INADEQUATE REDUCTION
 - Delayed reduction
 - Initial displacement
 - associated hip dislocation



Femoral AVN

- Treatment
 - Elderly patients
 - Only 30-37% patients require reoperation
 - Arthroplasty
 - Results not as good as primary elective arthroplasty
 - Girdlestone Resection Arthroplasty



Femoral AVN

- Treatment
 - Young Patients
 - NO good option exists
 - Proximal Osteotomy
 - Less than 50% head collapse
 - Arthroplasty
 - Significant early failure
 - Arthrodesis
 - Significant functional limitations

**** Prevention is the Key ****

Extracapsular Fractures

Inter-trochanteric fracture NOF.

Sub-trochanteric fracture NOF.

Intertrochanteric Fracture

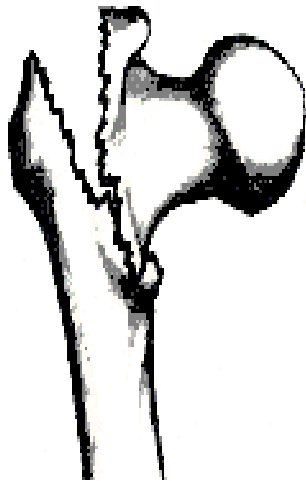
- Most common extracapsular hip fracture
- a/w varus deformity
- Classified by Evans as stable or unstable
- Most commonly used classification is Jensen where type 1&2 are stable and 3-5 are unstable



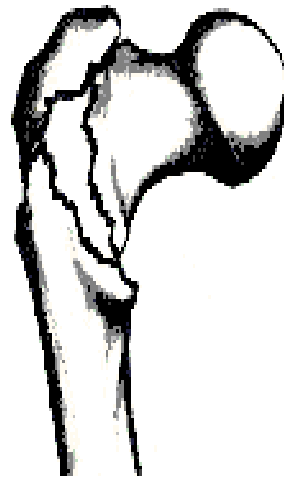
Jensen Classification



Type 1
Two part
undisplaced



Type 2
Two part
displaced



Type 3
Three part, loss of
posterolateral support



Type 4
Three part, loss of
medial support



Type 5
Four part

Subtrochanteric Fracture

- Classified by Seinsheimer: divided into undisplaced, two part, and comminuted



Seinsheimer classification



Grade 1
Any fracture with less than 2mm displacement



Grade 2a
Two part transverse



Grade 2b
Two part spiral with lesser trochanter in proximal fragment



Grade 2c
Two part spiral with lesser trochanter in distal fragment



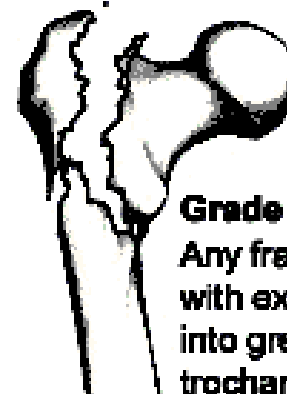
Grade 3a
Three part spiral. Third fragment is lesser trochanter



Grade 3b
Three part. Third fragment is a butterfly fragment



Grade 4
Four or more fragments



Grade 5
Any fracture with extension into greater trochanter

Isolated fracture of Greater Trochanter:

- Occurs mainly in osteoporotic females
- Result of a fall on the greater trochanter or avulsion type fracture from pull of gluteus medius insertion



Management of Extra-capsular Fractures:

- DCS
- DHS
- IM nailing



Compression Hip Screw W Plate

- Compression hip screws with a plate have gained increased popularity for the treatment of intertrochanteric fractures
- These implants provide secure fixation and controlled impaction of the fracture
- The rate of complications is relatively low with most frequent mode of failure being cut out of the screw from the femoral head (Davis 1990)



Percutaneous Compression Pate

- Inserted at parallel to femoral diaphysis through a small incision therefore less blood loss
- Shorter operating time compared to DHS (30 min)
- Neck screws are telescopic and provide double axis fixation in femoral neck → increases rotational stability by fracture compression and preventing collapse of neck (Giancola 2004)



Percutaneous compression plate Vs. DHS

- A decreased trend in overall mortality was seen in the PCCP group [95% CI, 0.48-1.47, Chi-square = 1.36, P = 51]
- Similar trends favouring the PCCP technique were seen with the other outcomes
- PCCP has the potential to become the gold standard in the repair of intertrochanteric hip fractures ([Panesar 2008](#))

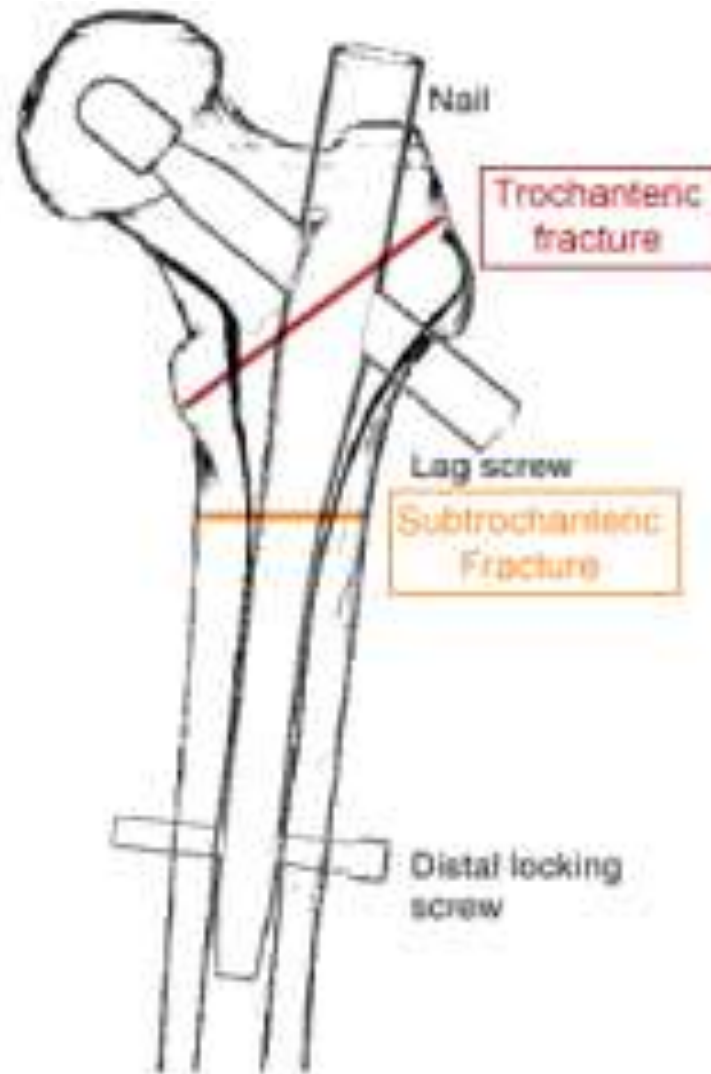
Percutaneous Compression Plate Vs DHS

- Mean operation time was 69.2 min for DHS and 46.6 min for PCCP
- Blood transfusion given to 73% (n=24) of DHS patients and 16% (n=6) of PCCP patients (p=0.000)
- Haematomas occurred in 27 DHS patients and 8 PCCP patients (p=0.000)
- Fracture healing rates and functional outcomes were not significantly different for DHS or PCCP (p=0.767) (Brandt 2002)

IM Nailing

- intramedullary nails combine the advantages of intramedullary fixation with those of a sliding screw
- Mechanically, the shorter lever arm of the intramedullary nail decreases the tensile strain on the implant and reduces the risk of failure of the implant (**Kaufer medline**)
- Rates of clinical failure range from 0-4.5% (**Dean 2004**)
- Has a better mobility score at 1 year when compared to sliding hip screw (**Hardy 1998**)

IM Nail



IM nailing Vs DHS

- There is no advantage to an intramedullary nail versus a sliding compression hip screw for low-energy pertrochanteric fractures, specifically with its increased cost and lack of evidence to show decreased complications or improved patient outcome (Saudan 2002)
- Two trials (n = 65 with reverse and transverse fractures at the level of the lesser trochanter) found intramedullary nails (Gamma nail or PFN) were associated with better intraoperative results and fewer fracture fixation complications than extramedullary implants (a 90-degree blade plate or dynamic condylar screw) (Parker 2008)

Thank- you