Hip fractures in the younger patient

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Challenges

- Femoral head osteonecrosis
- Non-union
- Salvage operations have high failure rate
- Important factors are debatable

Ly & Swiontkowski
JBJS Am 2008
Blood Supply –
Proposed impairing factors

- Damage to vascular supply at time of injury
- Inadequate reduction fails to restore flow
- Elevated intracapsular pressure
Mechanisms of injury

- Older
  - Fall from standing height
  - Osteoporotic
  - Falls risks

- Younger
  - High energy impact
  - Fall from height
  - Metastases
  - Stress fractures
  - Ipsilateral shaft & neck #
Fracture Patterns

- Older
  - Intertrochanteric
  - Transverse subcapital, impacted

- Younger
  - Basi-cervical
  - Distal neck, vertical
Classification

Angle describes vertical shear vector

Pauwels 1935
Classification
Classification
Treatment Goals

- Older
  - Restore mobility
  - Weight bear
  - Minimise complications from bed rest

- Younger
  - Preserve femoral head
  - Avoid AVN
  - Achieve union
Achieving treatment goals

- Anatomic reduction
- Stable fixation

- Open or closed reduction?
- Capsulotomy?
- Timing of surgery?
Approach For Open Reduction

Smith-Peterson

- Anterior approach
- Best for transcervical and subcapital fractures
- Fixation is performed through a second approach
Approach For Open Reduction

Watson-Jones

- Anterolateral exposure
- Best for basal neck and intertrochanteric patterns
- Allows placement of sliding hip screw through same incision
What Reduction Is Acceptable?

- Ideal reduction is Anatomic
  - Acceptable:
    - $\leq 15^\circ$ valgus
    - $\leq 10^\circ$ AP angulation
- Any varus is unacceptable
Screw Fixation

- Multiple screws in parallel
  - No advantage to > 3 screws
    - Unless posterior comminution
  - Uniform compression across fracture
  - Avoid posterior/ superior quadrant
    - Blood supply
    - Cut-out
- Biomechanical advantage to inferior/ calcar screw
  - [Booth 1998]
Sliding Compression Screw Fixation

- Compression Hip Screws
  - Sacrifices large amount of bone
  - May injure blood supply
  - Biomechanically superior in cadavers
  - Anti-rotation screw often needed
  - Increased cost and operative time

- No clinical advantage over parallel screws
  * May have role in high energy/vertical shear fractures
Intracapsular haematoma

- 75% have some raised intra-capsular pressure
  - no difference with displacement
- sensitive to leg position
  - extension + internal rotation = bad
- animal models and some clinical evidence:
  - raised intracapsular pressure = impaired perfusion
  - Release haematoma = improved perfusion
Intracapsular haematoma - capsular decompression?

- Theoretical benefit to release, but with NO clinical proof

- Pooled evidence – probably plays a part in 15% of pts
Early fixation?

- Early fixation (<12hrs post-injury) associated with lower rate of AVN in young NoF fracture patients

- Early fixation does not influence functional result, whether or not AVN occurs

Jain et al
JBJS Am 2002
Surgical Recommendations

- Urgent surgery (within 24 hours)
- Anatomic reduction (open thru WJ or SP approach)
- Stable fixation (3 screws or DHS plus screw)
- Capsulotomy
- Early TWB mobilisation
Post-operative care

- Antibiotic prophylaxis
- DVT prophylaxis
- Rapid mobilisation Touch Weight-Bearing for 12 wks
- Imaging for AVN
  - Clinical – persistent groin pain
  - Monthly X-rays
  - Spect
  - MRI(?)
Case Example 42 yo male, RTA
Open reduction via Smith-Pete approach, screw fixation placed through separate incision
Osteonecrosis (AVN) Femoral Neck Fractures

- 5-8% Non-displaced fractures
- 20-30% Displaced fractures
- Possible increased incidence with
  - INADEQUATE REDUCTION
  - Delayed reduction
  - Initial displacement
  - Associated hip dislocation
  - Sliding hip screw / plate devices
Osteonecrosis (AVN) Femoral Neck Fractures

- Clinical presentation
  - Groin / buttock / prox thigh pain
  - May not limit function
  - Onset usually later than nonunion
  - Need 2 year follow up to detect 80% of cases

- Imaging
  - Plain radiographs: segmental collapse / arthritis
  - Bone Scan: “cold” spots
  - MRI: diagnostic
Treatment of AVN

- Pre-collapse
  - Vascularised free fibula graft preserves 86%
  - Non-vascularised fibula graft preserves 30%

- Post-collapse, pre-arthritis
  - Vascularised free fibula preserves 65% of native hips at 5 years

- Results of hip arthroplasty after free fibula grafting are less good

References:
- Plakseychuk JBJS Am 2003
- Aldridge JBJS Am 2004
- Davis et al JBJS Am 2006
Femoral Neck Nonunion

- Clinical presentation
  - Groin or buttock pain
  - Activity / weight bearing related
  - Symptoms
    - more severe / occur earlier than AVN

- Imaging
  - Radiographs: lucent zones
  - CT: lack of healing
  - Bone Scan: high uptake
  - MRI: assess femoral head viability
Treatment of Femoral Neck Nonunion

- Young patients
  - (must have viable femoral head)
  - Varus alignment or limb shortened
    - Valgus-producing osteotomy
  - Normal alignment
    - Bone graft / muscle-pedicle graft
    - Repeat ORIF
Non-union of femoral neck fractures

- Free vascularised fibula bone grafting
- 90% heal, but associated AVN is common
- Head salvaged and preserved in 90%

LeCroy
JOT 2002
Young hip fractures

- Femoral head AVN 20-40%
- Non-union 10%
- Salvage operations have high failure rate
  - Bone graft might help
- Important factors are:
  - Fix early, reduce well, capsulotomy

Ly & Swiontkowski
JBJS Am 2008