Hip Fractures: Continuum of Care

Anthony J. Ferretti, D.O., MHSA
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Background

- Hip fractures very common in today’s medical community
- 1.5 million osteoporotic fractures annually in US
  - 300,000 of these hip fractures
- Incidence of hip fracture significantly increases with age
  - Age 50 - M:F 22.5:23.9 per 100K
  - Age 80 - M:F 630:1289 per 100K
Background

- Mortality secondary to hip fracture in a study of 2660 patients was found to be:
  - 9% at thirty days
  - 19% at ninety days
  - 30% at twelve months

- Pts with medical comorbidities that subsequently caused a delay in surgery
  - 2.5x greater risk of dying within 30 days following surgery when compared to pts not delayed

Background

- Incidence of intertrochanteric hip fracture roughly the same as femoral neck fractures
- Demographics of female: male ratio
  - Between 2:1 and 8:1
- Proximal humerus fractures increase risk of hip fracture for 1 year
A retrospective study analyzed 341 hip fracture patients from 2005-2009 for patient characteristics

- Average admission cost: $24,770
- Average length of stay: 6.4 days
- Average age of patient: 83yo
Osteoporosis

- 10 million Americans have osteoporosis
- 1.5 million osteoporotic fractures occur each year
  - Location of fractures
    - Vertebral body > hip > wrist fractures
  - 300,000 hip fracture each year in US

FRAX SCORE

- WHO fracture risk assessment tool that calculates
  - 10-year risk of hip fracture
  - 10-year risk of major osteoporotic-related fracture
- Factors include
  - Age, sex, personal history of fracture
  - Low BMI
  - Oral steroid use
  - Secondary osteoporosis
  - Parental history of hip fracture
  - Smoking status
  - Alcohol intake
Osteoporosis

- Diagnosis confirmed by DEXA scan
  - Dual Energy X-ray Absorptiometry
  - T-score < -2.5 (osteoporosis)

- 2008 National Osteoporosis Foundation Guidelines for Pharmacologic Treatment of Osteoporosis
  - Suggests pharmacologic treatment be considered for postmenopausal women and men >= 50yo with:
    - Hip/vertebral fracture
    - T score between -1.0 and -2.5 and 10-year risk of hip fracture >= 3%
    - 10-year risk of major osteoporosis-related fracture >= 20% by FRAX calculation
    - T score <= -2.5

Pathophysiology

- Elderly
  - Low energy falls in osteoporotic patients
  - Osteoporotic hip fractures most commonly 70-80 years of age
  - Trabecular thinning of bone

- Young
  - High energy trauma
    - Motor vehicle accident
Presentation

- Physical Exam
  - Hip and thigh painful
  - Lower extremity shortened and externally rotated
  - Inability to weight bear

Radiographs

- Recommended views
  - AP pelvis
  - AP of hip, cross table lateral
  - Full length femur radiographs
Radiographs

- CT or MRI
  - useful if radiographs are negative but physical exam consistent with fracture
  - MRI has highest sensitivity with an ability to show bony edema representing fracture

Diagnosis

- 3 main hip fracture patterns
  - Femoral neck fracture
  - Intertrochanteric fracture
  - Subtrochanteric fracture
The Hip Fracture Patient

- Beginning appropriate volume replacement in the ED with IV fluids is critical
- Elderly patients may have blunted compensatory response to hypovolemia
  - Beta blockers will prevent tachycardia
- 1-1.5 liters of blood can be lost into the thigh
  - Anticoagulant medications can result in persistent bleeding into thigh compartments
- Many elderly patients are volume contracted at baseline

Femoral Neck Fracture

- Associated injuries
  - Femoral shaft fractures 6-9% associated with femoral neck fractures
  - Distal radius fractures
  - Thoracic and lumbar compression fractures
  - Closed head injuries
  - Rib fractures
Femoral Neck Fracture

- **Anatomy**
  - Blood supply to femoral head
    - Major contributor is medial femoral circumflex artery
    - Minor contributor is lateral femoral circumflex artery
    - Insignificant supply from artery of ligamentum teres
  - Displacement of femoral neck fracture will disrupt the blood supply to the femoral head

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### Garden Classification

(based on AP radiographs and does not consider lateral plane alignment)

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Incomplete, valgus impacted</td>
</tr>
<tr>
<td>Type II</td>
<td>Complete fracture, nondisplaced</td>
</tr>
<tr>
<td>Type III</td>
<td>Complete, displaced &lt; 50%</td>
</tr>
<tr>
<td>Type IV</td>
<td>Complete, displaced</td>
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</tbody>
</table>
Nonoperative Treatment

- Nonweightbearing with early out of bed to chair
  - Indications
    - Nonambulatory patients
    - Patients at high risk for perioperative mortality
  - Outcomes
    - High rates of pneumonia, urinary tract infections, decubiti, and DVT

Operative Treatment

- Cannulated screw fixation
  - Indications
    - Garden I and II fracture patterns in elderly
    - Displaced transcervical fracture in young patient
      - Considered a surgical emergency
      - Achieve reduction to limit vascular insult
Operative Treatment

- **Sliding hip screw or cephalomedullary nail**
  - Indications
    - Basicervical fracture pattern in a young patient
      - Biomechanically superior to cannulated screws
    - Consider placement of additional cannulated screw above sliding hip screw to prevent rotation

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Operative Treatment

- **Hemiarthroplasty**
  - Replacement of the femoral head
  - Indications
    - Garden III and IV Classification
  - Unipolar vs Bipolar components

- **Total hip arthroplasty**
  - Replacement of the femoral head and acetabulum
  - Indications
    - Garden III and IV Classification
    - Older active patients
    - Patients with preexisting hip osteoarthritis
    - Recent studies show more predictable pain relief and better functional outcome than hemiarthroplasty
Femoral Neck Fracture

Complications
- Osteonecrosis incidence of 10-45%
- Recent studies fail to demonstrate association between time to fracture reduction and subsequent AVN
- Increased risk with
  - Increase initial displacement
    - AVN can still develop in nondisplaced injuries
  - Nonanatomical reduction

Complications
- Nonunion incidence of 5 to 30%
  - Increased incidence in displaced fractures
- Varus malreduction most closely correlates with failure of fixation after reduction and cannulated screw fixation
Operative technique often based on hip fracture pattern:
- Femoral neck
- **Intertrochanteric**
- Subtrochanteric

**Intertrochanteric Hip Fracture**

- **Sliding hip compression screw**
  - Indications
    - stable intertrochanteric fractures
  - Outcomes
    - equal outcomes when compared to intramedullary hip screws for stable fracture patterns
Intramedullary (cephalomedullary) nail

- Indications
  - Stable/unstable fracture patterns
  - Reverse obliquity fractures
    - 56% failure when treated with sliding hip screw
  - Subtrochanteric extension
  - Lack of integrity of lateral femoral wall
    - Associated with increased displacement and collapse when treated with sliding hip screw
  - Nearly replaced the sliding hip screws in the last decade

Complications

- Implant failure and cutout
  - Most common complication
  - Usually occurs within first 3 months
  - Tip-apex distance >45mm associated with 60% failure rate
  - Optimal tip-apex distance <25mm
Intertrochanteric Hip Fracture

Complications
- Anterior perforation of the distal femur
  - Mismatch of the radius of curvature of the femur (shorter) and implant (longer)
- Nonunion
  - Incidence <2%
- Malunion
  - Varus and rotational deformities are common

Intertrochanteric Hip Fracture

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Hip Fractures

- 3 main hip fracture patterns
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Subtrochanteric Hip Fracture

- Subtrochanteric is defined as level of lesser trochanter to 5cm distal fractures
- Associated intertrochanteric component may be termed:
  - Intertrochanteric fracture with subtrochanteric extension
  - Peritrochanteric fracture
Subtrochanteric Hip Fracture

Intramedullary (cephalomedullary) nailing

- Indications
  - Subtrochanteric fractures
  - Long cephalomedullary nail components with distal locking screws

- May represent an atypical femur fracture
  - Associated with bisphosphonate use
  - Bisphosphonate fractures
    - Increased risk of iatrogenic fracture and nonunion
Subtrochanteric Hip Fracture

- Radiographic findings associated with bisphosphonate hip fractures
  - Lateral cortical thickening
  - Transverse fracture orientation
  - Medial spike
  - Lack of comminution

Postoperative Management

- DVT has been reported as high as 80% of patients with hip fractures
- Mechanical and chemical prophylaxis should be used to prevent DVT
- Exact type of prophylaxis and duration remain controversial
Prognosis

- **20-30% mortality risk** in the 1st year following hip fracture.
- Factors that increase mortality:
  - Male gender (25-30% mortality) vs female (20% mortality).
  - Higher in intertrochanteric fracture (vs femoral neck fracture).
  - Operative delay of >2 days.
  - Age >85 years.
  - 2 or more pre-existing medical conditions.
  - ASA classification (ASA III and IV increases mortality).

Zuckerman et al. reviewed mortality associated with operative delay in older patients with hip fractures.

They found that operative delay of 3 or more calendar days results in greater 1 year mortality.
Prognosis

- This same study documented the mortality of 367 hip fracture patients at 3 intervals:

![Bar chart showing hip fracture patients mortality over time](chart.png)

- This study showed that an operative delay greater than 3 calendar days doubles the risk of the patient dying before reaching the 1 year follow-up visit.
Switzer et al. reviewed perioperative considerations in the geriatric patient. They showed that hip fracture repair after 2 days results in decreased independent living, increased pressure sores, and longer hospital stays. They found with early surgery, pain, length of hospital stay and 1-month mortality was reduced.

Holt et al is a prospective review of 1000 hip fractures and reported that pre-injury mobility to be the most significant determinant for post-operative survival.
This was a prospective study of 1000 femoral neck fractures (476 intertrochanteric and 524 subcapital).

Other findings of the study included the following information:

- The in-hospital mortality of the 975 surgically treated fractures was 11%.
- Non-operatively treated fractures had a mortality of 60 percent.
- Internal fixation produced a lower mortality than uncemented hemiarthroplasty.
- The use of acrylic cement was associated with an increased morbidity and mortality rate in hemiarthroplasties.
References

References