Geriatric Hip Fractures

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Learning objectives

• 1. Differentiate between five main types of hip fractures and currently available treatments
• 2. Describe correct imaging modalities to identify acute and occult hip fractures
• 3. Recognize the roll of interdisciplinary care in the perioperative management of geriatric hip fracture patients
• 4. Define appropriate cardiac consultation criteria prior to operative intervention on geriatric hip fracture patients
• 5. Appreciate the need for increased focus on bone health for patients who have sustained fragility fractures
• Estimated 2,000,000 osteoporotic fractures each year in USA

• Hip fractures are 15-20% of all osteoporotic fractures
  • 72% of all osteoporotic fracture medical expenses are from hip fractures
  • Annual USA economic burden for treatment of hip fractures estimated at $17 - $20 billion

• CDC data estimates 340,000 hip fractures per year in USA
  • Estimates show number to rise to 500,000 by year 2040

• White females twice as likely to fracture compared to Black and Hispanic female cohort


Osteoporosis

• Fragility fractures account for more patients than stroke, heart attack, and breast cancer combined.
• 1 in 2 women and 1 in 5 men will have an osteoporosis related fracture in their lifetime.
Hip Fractures: Morbidity and Mortality

- 20-30% mortality rate in first year following fracture
  - 45% mortality at 2 years in chronic renal failure patients

Predictors of Mortality:
- Pre-injury mobility most significant determinant for postoperative survival
- Age > 85 years
- 2+ pre-existing medical conditions
- ASA classification 3 or 4

Outcomes improved by:
- Surgery within <48 hours (decreases 30 Day, 90 day, 1 year mortality)
- Co-management with medical hospitalists or geriatricians

Osteoporosis Screening

- **National Osteoporosis Foundation** recommendation to screen all men 70 years and older, based on the assumption that this group has a similar osteoporotic fracture risk and treatment effective as 65-year-old white women.

- **U.S. Preventive Services Task Force** Recommendation Statement
  - Recommends screening women 65 years and older and in younger women whose fracture risk is equal to or greater than that of a 65-year-old white woman who has no additional risk factors.
  - Current evidence is insufficient to assess the balance of benefits and harms of screening for osteoporosis in men.

Osteoporosis and DEXA

Bone density measured at the femoral neck by dual-energy x-ray absorptiometry (DXA) is the best predictor of hip fracture and is comparable to forearm measurements for predicting fractures at other sites.

- **T-score**: bone density compared with what is normally expected in a healthy young adult of same sex
  - T score -2.5 SD indicates likelihood of osteoporosis and increased risk of fracture

- **Z-score**: number of standard deviations above or below what is normally expected for someone of the same age, sex, weight, ethnic/racial origin
  - Z score -2 may suggest something other than aging is causing abnormal bone loss
• Pharmacologic treatment for osteoporosis should be considered if patients are postmenopausal women or men >50 yo AND meet one of the following criteria:
  • (1) prior hip or vertebral fracture
  • (2) T score -2.5 or less at the femoral neck or spine
  • (3) T score between -1.0 and -2.5 at the femoral neck or spine AND a
    • 10-year risk of hip fracture >3% or
    • 10-year risk of major osteoporosis-related fracture >20%.

https://www.sheffield.ac.uk/FRAX/
Case Study

- June 2019
  - 90 y M trips while stepping off of a curb and lands on his right side. Had immediate pain and inability to bear weight on RLE
  - Community ambulator, walks without assistive device
  - Had recently been seen by PCP and geriatrician within month prior to fall

- PMHx: HLD, HTN, BPH, Type II DM, OA, Mild Alzheimer's
- PSHx: Inguinal hernia repair

- Medications
  - Metformin 1000mg BID
  - Flomax 0.4 mg BID
  - Aricept 5mg
  - Vit B12 1000mg QD
• Patient admitted to medicine service
• Orthopedics consulted
• Taken to OR <24 hours after injury
• Undergoes cemented right hip hemiarthroplasty
Post operative Course

- Patient discharged to inpatient rehab on post operative day 3
- Patient spends two weeks in inpatient rehab
  - Started on calcium and Vitamin D
  - Recommendation made for outpatient follow up for DEXA and bone health evaluation
- Transferred from inpatient rehab to skilled nursing facility for continued rehabilitation
- Discharged from SNF to home in September 2019
- Seen by PCP, no discussion of bone health.

October 2019

- Patient has trip and fall in bathroom onto left side
- Taken by EMS to ED
• Patient admitted to medicine service
• Orthopedics consulted
• Patient undergoes left hip hemiarthroplasty <12 hours after injury
• Patient discharged on POD#4 to SNF
• As of February 2020 patient has yet to see bone health clinic or have discussion with geriatrician or PCP regarding further osteoporosis treatment
Do we do a good job treating osteoporosis?

- Approximately **80%** of patients do **not** receive recommended osteoporosis care following a **fracture**.

- **Men**, who account for 30% of fractures and 25% of costs, are particularly undertreated.

- Patients with a fragility fracture are at an **86%** higher risk of a **second** fracture.

- Based on Medicare data hip fracture rates were decreasing from **2002-2012**
- Between **2013-2015** hip fracture rates plateaued and began to climb
- Secondary to decreased diagnosis and treatment of osteoporosis
Clinical Guideline

Treatment of Low Bone Density or Osteoporosis to Prevent Fractures in Men and Women: A Clinical Practice Guideline Update From the American College of Physicians

Amir Gaseem, MD, PhD, MHA; Mary Ann Forciea, MD; Robert M. McLean, MD; and Thomas D. Denberg, MD, PhD; for the Clinical Guidelines Committee of the American College of Physicians*

Recommendation 1: ACP recommends that clinicians offer pharmacologic treatment with alendronate, risedronate, zoledronic acid, or denosumab to reduce the risk for hip and vertebral fractures in women who have known osteoporosis. (Grade: strong recommendation; high-quality evidence)

Recommendation 2: ACP recommends that clinicians treat osteoporotic women with pharmacologic therapy for 5 years. (Grade: weak recommendation; low-quality evidence)

Recommendation 3: ACP recommends that clinicians offer pharmacologic treatment with bisphosphonates to reduce the risk for vertebral fracture in men who have clinically recognized osteoporosis. (Grade: weak recommendation; low-quality evidence)

Recommendation 4: ACP recommends against bone density monitoring during the 5-year pharmacologic treatment period for osteoporosis in women. (Grade: weak recommendation; low-quality evidence)

Recommendation 5: ACP recommends against using menopausal estrogen therapy or menopausal estrogen plus progestogen therapy or raloxifene for the treatment of osteoporosis in women. (Grade: strong recommendation; moderate-quality evidence)

Recommendation 6: ACP recommends that clinicians should make the decision whether to treat osteoporotic women 65 years of age or older who are at a high risk for fracture based on a discussion of patient preferences, fracture risk profile, and benefits, harms, and costs of medications. (Grade: weak recommendation; low-quality evidence)

Management of Hip Fractures in the Elderly: Evidence-Based Clinical Practice Guideline

Adopted by the American Academy of Orthopaedic Surgeons (AAOS) Board of Directors
September 5, 2014

This Guideline has been endorsed by the following organizations:
Hip Fractures in the Elderly CPG: Interdisciplinary Team

- Strong evidence supports use of an interdisciplinary care program in those patients with mild to moderate dementia who have sustained a hip fracture to improve functional outcomes.

Hip Fractures in the Elderly CPG: Surgical Timing

- Hip fracture surgery within 48 hours of admission is associated with better outcomes at 30 days, 90 days, and 1 year.
Surgical Timing: Echocardiograms

Clinical Practice Guidelines Decrease Unnecessary Echocardiograms Before Hip Fracture Surgery

Hip Fractures in the Elderly CPG: Antiplatelet and Anticoagulants

- 2012 - Limited evidence supports not delaying hip fracture surgery for patients on aspirin and/or clopidogrel.
Hip Fractures in the Elderly CPG:
Preoperative Regional Analgesia

- Strong evidence supports regional analgesia to improve preoperative pain control in patients with hip fracture
  - Decreased use of narcotics associated with lower rates of delirium, pulmonary complications, GI complications
  - Can potentially be done in emergency department if trained personnel available
    - Ultrasound vs landmark guided

Fascia Iliaca Compartment Block
First described by Dalens et al.1

Nerves blocked:
- FEMORAL
- LATERAL CUTANEOUS
- OBTURATOR

Hip Fractures in the Elderly CPG:
Postoperative Multimodal Analgesia

- Strong evidence supports multimodal pain management after hip fracture surgery.
  - Local Anesthesia
  - Regional Anesthesia – Fascia Iliacus Block
  - Axial Anesthesia – Epidural/Spinal
  - Narcotics – avoid narcotics with active metabolites (Morphine & Codeine)
  - IV Tylemol
  - IV Toradol
  - Tramadol
  - Neuromodulators – Lyrica, Neurontin
- The multimodal approach results in pain control with lower doses of each individual agent, thereby reducing the deleterious side-effects seen at higher
Hip Fractures in the Elderly CPG: Postoperative Multimodal Analgesia

- 2019 Study University of Pennsylvania
- Patients who received post operative ofirmev (IV Tylenol)
  - Delirium 15.4% (vs. 32.8% in opioid alone)
  - Fewer doses of IV opioid on POD#1 (0.37 doses vs 1.19 doses)
  - Less likely to require 1 to 1 supervision (9.2% vs 24.1%)
  - Shorter lengths of hospital stay (6.37 vs 8.47 days)

Delirium Reduced With Intravenous Acetaminophen in Geriatric Hip Fracture Patients


Hip Fractures in the Elderly CPG: Transfusion Threshold

- Strong evidence supports a blood transfusion threshold of no higher than 8g/dl in asymptomatic postoperative hip fracture patients.
Hip Fractures in the Elderly CPG: Transfusion Threshold and Tranexamic acid

- 46% lower risk of blood transfusion in patients who received intravenous TXA perioperatively
- 0.5 to 0.8 g/dl increase in postoperative hemoglobin compared to controls
- No increase in rate of postoperative CVA, DVT, PE, or MI comparable with other orthopedic TXA studies

Classification of Hip Fractures

- Five main subgroups
  - Femoral Neck
  - Intertrochanteric
  - Subtrochanteric
  - Pathologic
  - Isolated greater or lesser trochanteric
Hip Anatomy

Femoral Neck Fractures

Garden Classification
Classified into two groups:

- Nondisplaced
- Displaced

Type I  Type II  Type III  Type IV

Images:
- a
- b
- c
- d
Nondisplaced / valgus impacted femoral neck fracture treatment

- Nonoperative
  - Maybe considered in patients who are high risk for surgical intervention with minimal pain or non ambulators
- Operative
  - Percutaneous cannulated screw fixation

Displaced Femoral Neck Fracture Treatment

- Current Algorithm
  - Age < 50y
    - Open Reduction Internal Fixation (Displaced & Non-displaced)
  - Age 65 – 85y (High demand/young physiologic age)
    - Total Hip Arthroplasty
  - Age > 85y (low demand; neuromuscular disease; cognitive impairment)
    - Hemiarthroplasty
• Published December 2019
• 1459 patients from 80 centers in 10 countries
• Randomized to total hip arthroplasty (THA) or hemiarthroplasty
• At 24 month f/u
  • THA had marginally better functional outcome scores (not clinically significant)
  • THA had 2.5x increased risk of dislocation and 5% higher risk of serious adverse events

Cemented vs. Press fit components

• Cemented Femoral Component = ideal for osteoporotic bone due to increased porosity
• Allows cement to interdigitate with bone creating a strong interface resistant to fracture
• Cement pressurization can result in bone cement pressurization syndrome
  • Mild hypotension and transient desaturation to cardiac dysrhythmias and cardiac arrest
• Press fit components have increased risk of iatrogenic intraoperative fracture
Intertrochanteric Hip Fractures

- Classification dictates treatment
- Stable
  - Standard obliquity
- Unstable
  - Comminution of posterior medial cortex (calcar)
  - Reverse obliquity
  - Subtrochanteric extension
  - Lateral wall comminution

Stable intertrochanteric hip fracture treatment

- Sliding / Dynamic Hip Screw
- Cephalomedullary Nail
Unstable intertrochanteric hip fracture treatment

- Cephalomedullary nail
  - Short or Long

Subtrochanteric Hip Fracture

- Subtrochanteric typically defined as area from lesser trochanter to 5cm distal
  - Intertrochanteric fractures may have subtrochanteric extension
- Treatment: Cephalomedullary Nail
Isolated greater / lesser trochanter fractures

- Extremely rare to occur in isolation
- Should raise suspicion for occult fracture extension
- 33% of isolated lesser trochanter fractures are associated with metastatic disease

Isolated Greater Trochanteric Fracture Case

- 83yo female falls from standing height. Exquisite tenderness over lateral aspect of right hip. Pain with logroll. Unable to weight bear on right lower extremity.
• Tenderness over lateral aspect of greater trochanter is c/w greater trochanter fracture
• Groin pain with logroll and inability to weight bear on ipsilateral lower extremity = suspicious for occult fracture extension.
• 44 pts w/ isolated GT fx on Xray
• All patients had negative extension of fracture on CT, MRI changed diagnosis in 27 cases

• Metanalysis of 110 pooled patients with “isolated” GT fx
• 99/110 (90%) demonstrated extension into intertrochanteric region on MRI
Pathologic Hip Fractures

- Bisphosphonate related fractures
  - Unique subtrochanteric fractures
    - Lateral cortical thickening
    - Increased diaphyseal cortical thickness
    - Transverse vs short oblique fracture orientation
  - Medial spike
  - Lack of comminution
- Obtain imaging of contralateral femur to evaluate
  - Approximately 30% of patients will have bilateral findings

Pathologic Hip Fractures

- Bony lesions in adults should be considered to be Mets / Myeloma / Lymphoma until proven otherwise
Pathologic Hip Fractures

- Five Cancers have a predilection to metastasize to bone
  - Prostate – Blastic
  - Breast – Blastic or Lytic
  - Renal – Lytic (extremely vascular)
  - Thyroid – Lytic
  - Lung – Lytic
- Mneomonic:
  - PB KTL (Lead Kettle)

- Median Survival in patients with metastatic bone disease
  - Thyroid: 48 months
  - Prostate: 40 months
  - Breast: 24 months
  - Kidney: Variable (as short as 6 months)
  - Lung: 6 months

Pathologic Hip Fractures

<table>
<thead>
<tr>
<th>Score</th>
<th>Site</th>
<th>Pain</th>
<th>Lesion</th>
<th>Size</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>upper limb</td>
<td>mild</td>
<td>blastic</td>
<td>&lt; 1/3</td>
</tr>
<tr>
<td>2</td>
<td>lower limb</td>
<td>moderate</td>
<td>mixed</td>
<td>1/3 to 2/3</td>
</tr>
<tr>
<td>3</td>
<td>peritrochanteric</td>
<td>functional</td>
<td>lytic</td>
<td>&gt; 2/3</td>
</tr>
</tbody>
</table>
Pathologic Fracture Case

- 53yo male s/p nephrectomy approximately 16 years ago for renal carcinoma. 3 weeks of progressively worse left hip pain. Now unable to ambulate.

Left hip lytic lesion
Erosion of Anterior Cortex

Extensive vascular supply required preoperative embolization
Long cephalomedullary nail to protect entire femur