Imaging Choices in Occult Hip Fracture

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Introduction

- High dependence on the integrity of this structure for people to function in their daily lives
- A delay of just 2 days in surgical treatment for an acute hip fracture doubles mortality
- Unrecognized non-displaced fracture may displace, requiring surgery of much higher risk

Plain Radiography

- Occult fracture as the proximal femur
  - High percentage of trabecular bone
  - Difficult to detect than in cortical bone

Overall, 4.4% (95% confidence interval 3.0-6.5%) of patients with negative X-ray studies had an occult fracture, or 3.1% of all ED patients having hip X-ray studies.
Sensitivity of Radiographs

- Standard radiographic hip imaging
- Sensitivity of these projections for hip fracture between 90% and 98%
- Dominguez et al. noted a sensitivity of 90.1% of plain radiographs for hip fracture in the ED

Several factors could lead to the lower sensitivity in the ED (90.1%) relative to other settings (average = 95.5%)
- Emergently obtained \→ improper technique
- Re-imaged after coming to the specialists
- More views may have increased overall sensitivity of radiography
  - frog-leg view, internal rotation view, inlet and outlet, Judet, and traction views

Occult Hip Fracture Studies

- Three major characteristics are evident across the studies
  - Clinical presentations
  - Low-energy trauma
  - Elderly, women, or otherwise at risk for osteoporosis

Clinical Presentation

- New inability to bear weight, pain on axial loading, was found to be 73% sensitive for occult fracture
- Pain on range of motion
  - straight leg raise and internal and external rotation
  - 50% and 70%, sensitive
- History of pre-fracture mobility and independent living; 76% of occult fractures

Low-energy Trauma

- A fall from a standing height
- It does seem that a fall to the side with impact on the greater trochanter, the mechanism in 76% of the falls associated with fracture

Osteoporosis Risk

- Advanced age, and female gender
- Smoking, inactivity, rheumatoid arthritis, post-gastrectomy syndrome, a low percentage of body fat, poor calcium intake, excessive alcohol intake, and endocrine disorders such as diabetes, hyperthyroidism, hyperparathyroidism, and hypercortisolemia
- Alcoholism as a factor in osteoporosis was seen in a 45-year-old-patient
Supplemental Imaging

- Computed Tomography
- Bone Scanning
- Magnetic Resonance Imaging

Computed Tomography

- Addition of the third dimension with CT can often define a fracture when it is not seen on X-ray study
- Resolution of osteoporotic trabecular bone is limited and fracture can lie hidden within
- CT read as normal later found to have occult intertrochanteric fracture
  (the same patient from Figure 1, Figure 2, the same day as Figure 1)

Computed Tomography

- Evidence supporting the use of CT in hip fracture is scant
- The full extent of the damage was not appreciated
- Some highlight the correlation of lipohemarthrosis with fracture as an indirect way to detect fracture.

Computed Tomography

- There is scarce evidence to support the use of CT for occult hip fracture evaluation.

Bone Scanning

- Alternative to MRI if patients are admitted
- Sensitivity of 93.3% for scintigraphy
- Several unfavorable aspects to scintigraphy
  - Specificity is lower than other modalities
  - Poor spatial resolution of scintigraphy may not reveal the entire extent of a fracture (elderly)
Bone Scanning

- Scintigraphy relies on mechanisms that tend to degenerate with advancing age
  - perfusion, decrease by half from middle to old age
  - renal function, as good film quality depends on clearance of tissue radionuclide
- Overall bone radionuclide uptake is increased in the elderly owing to higher bone turnover, obscuring fractures
- The largest disadvantage: at least 72 h after injury

Magnetic Resonance Imaging

- Immediately after injury, bony trabecular disruption is evident on T1 imaging as low-density dark bands
- Sensitivity of MRI for fracture was 100% for both junior and senior radiologists. Specificity was 100% for senior radiologists but 93% for the junior radiologists
Summary

- Hip fracture has significant morbidity and mortality, which worsens as time from injury progresses.
- Plain radiographs → 90% sensitive for hip fracture.
- 3-4% of ED patients having hip X-ray studies who harbor an occult hip fracture.
- CT may not be accurate enough → reasonable to use in high-energy trauma.

Summary

- Bone scanning → low specificity and delayed results.
- MRI seems to be the modality of choice for the next step in evaluation of select patients.

Thanks for your attention!!