Dianna Nguyen
Benjamin Gill, DO, MBA
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AAP BRS podcast: Hip Fractures & Femoral Neck Stress Fractures

Femoral Neck Fracture

- Often called "hip fracture"
- Also consider femoral intertrochanteric fracture, hip dislocation, or pelvic fracture on differential

Risk factors:

- Non-Modifiable → age, sex, ethnicity
  - ***Age*** – approx. 60% occur in patients >75yo
  - ***Sex*** – higher incidence in females vs. males
  - ***Ethnicity*** – Among females, 2-3:1 ratio European American vs. African Americans
- Modifiable → alcohol/caffeine consumption, smoking, malnutrition, body weight < 90% of ideal, ***meds***: steroids, antipsychotics, benzodiazepines

On physical exam:

- May see ***ipsilateral leg shortened*** and held in ***external rotation***
  - Complete femoral neck fracture
    - Greater trochanteric muscles still attached
    - Abductors/external rotators have strong proximal pull, no longer constrained to acetabulum by femoral head/neck

X-ray views: 1) Hip/Pelvis AP, 2) hip AP with traction-internal rotation, 3) cross-table lateral, 4) full-length femur

Hip Fracture Classification:

- Hip fractures can be subcategorized anatomically: ***intracapsular*** (femoral head or femoral neck) and ***extracapsular*** (intertrochanteric and subtrochanteric)
  - Garden classification often used to describe fracture and guide treatment
    - Stage I: Incomplete, nondisplaced
    - Stage II: Complete, nondisplaced
    - Stage III: Partially displaced w/ hip joint capsule likely intact
    - Stage IV: Completely displaced w/ hip joint capsule likely disrupted

  Garden classification to guide treatment:
    - **Stages I and II**, ***nondisplaced***, may be treated with ***surgical pins*** across fracture site (e.g., inverted triangle) or ***cannulated hip screw***.
      - **Goal**: Create compression across fracture with sufficient stability to preserve native blood supply. (Patients likely cleared for early rehab w/ partial or full weightbearing.)
    - **Stages III and IV**, treatment typically involves ***hemi*** or ***total arthroplasty***. Higher concern for damaged blood supply and avascular necrosis.
      - (Patients can function similar to elective hip replacements with early ambulation, if stable arthroplasty and no associated acetabular fractures).

Blood supply to femoral head: Depends on patient's age.

- **At birth up to ~4 years old:** ***Artery of the ligamentum teres*** and ***lateral femoral circumflex artery***.
- **After age 4**: Contributions decrease, and main blood supply becomes posterosuperior and inferior retinacular branches of ***medial femoral circumflex artery.***

Post-hip fracture Repair Precautions:

- Venous thromboembolism (VTE) prevention:
  - Risk of pulmonary embolism tends to be highest 2nd and 3rd week post-operatively (or during the time the patient is likely admitted to inpatient rehabilitation!).
  - 2012 American College of Chest Physician guidelines: low molecular weight heparin or direct oral anticoagulants, at least 10-14 days following surgery (suggestion to extend **up to 35 days**).
- Post-operative rehab: **Anterior vs. Posterior Approach**
  - **Anterior approach**: precautions include ***no excessive hip extension or external rotation***
  - **Posterior approach**: higher risk of dislocation than anterior approach. Limit ***hip flexion > 90°, adduction past midline, hip internal rotation***. (No sitting on low chairs/toilets, flexing at waist to reach floor.)

Femoral Neck Stress Fracture

- Other differentials (e.g., for young runners): hip impingement, labral tear, adductor/hip flexor strain

Risk Factors/at-risk population: Malnutrition/osteoporosis, endurance athletes, military recruits, individuals w/ history of overuse or with recent increase in training program, "***Female athlete triad***" (disordered eating, amenorrhea, osteoporosis)

Imaging: ***MRI of the hip*** → MRI can detect marrow edema, low signal intensity on T1 and T2, and cortical fissures. (Similar to osseous stress fractures/vascular defects, radiographs will usually be negative early in course.

Two Types of Femoral Neck Stress Fractures:
Compression, inferior-medial aspect of neck (more stable) vs. ***Tension, superior-lateral aspect of neck*** (more unstable and greater chance needing percutaneous screw fixation). Both have risk for fracture progression w/ possible displacement, varus deformity, and avascular necrosis.

- Other high-risk stress fractures: anterior tibial (most common) patella, anterior cortex of tibia, medial malleolus, foot (talus, navicular, proximal 4th/5th metatarsals, great toe sesamoids). Don't forget lumbar pars interarticularis!

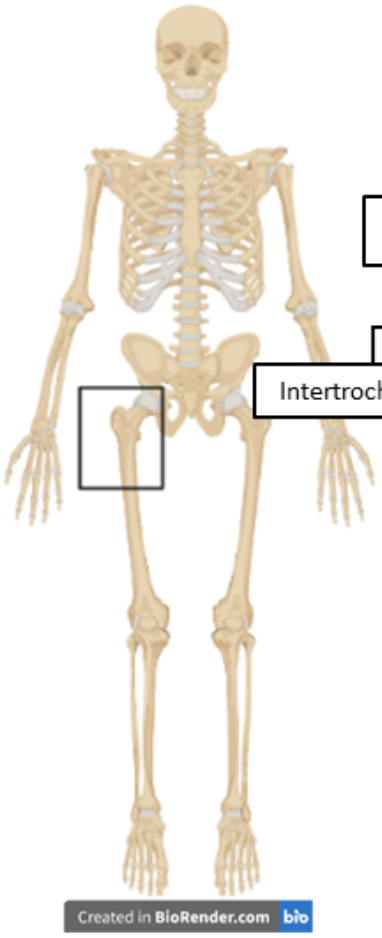
Stress fracture prevention: Educating proper training techniques and appropriate progression of frequency/intensity, proper bone health with adequate calories, calcium, vitamin D, regular weightbearing.

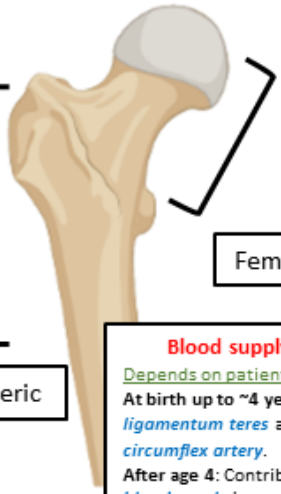
TAKEAWAYS!

- Quick identification of a hip fracture is important.
- Physical exam: Shortened, externally rotated if displaced
- **Suspicion rises with age** and those with **osteoporotic risk factors**, including **female**, alcohol, caffeine, or smoking, **meds** (e.g., steroids, antipsychotics, and benzodiazepines, malnutrition), and low body weight.
- Traumatic and stress hip fractures require urgent evaluation for surgical consideration. High risk of femoral head avascular necrosis. The head's **tenuous blood supply** is primarily through the medial femoral circumflex artery.
- **Don't forget VTE prophylaxis**! Chest physician guidelines are low molecular weight heparin or direct oral anticoagulants for up to 35 days post-operatively.
- **Femoral neck stress fractures** are categorized as **compression-type** (on the inferior-medial aspect), or **tension-type** (on the superior-lateral aspect of the neck). Tenson-type are considered more unstable.

Helpful Resources:

1) AAPMR Knowledge NOW: https://now.aapmr.org/stress-fracture-of-the-hip/
2) Dutton, R. A. (2021). Stress Fractures of the Hip and Pelvis. *Clinics in Sports Medicine*, *40*(2), 363-374. https://doi.org/10.1016/j.csm.2020.11.007
3) Kazley, J. M., Banerjee, S., Abousayed, M. M., & Rosenbaum, A. J. (2018). Classifications in brief: garden classification of femoral neck fractures. *Clinical orthopaedics and related research*, *476*(2), 441. https://doi.org/10.1007/s11999.0000000000000066
4) Robertson, G. A., & Wood, A. M. (2017). Femoral neck stress fractures in sport: a current concepts review. *Sports medicine international open*, *1*(02), E58-E68. https://dx.doi.org/10.1055%2Fs-0043-103946





Extracapsular

- Intertrochanteric
- Subtrochanteric

Intracapsular

- Femoral Head
- Femoral Neck

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- Abductors/external rotators have strong proximal pull on remainder of femur, no longer constrained to acetabulum by femoral head/neck

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Post-operative Rehabilitation

Anterior approach: precautions include ***no excessive hip extension or external rotation***

Posterior approach: ***higher risk of dislocation*** than anterior approach, ***greater risk of dislocation w/ hip flexion > 90°, adduction past midline, internally rotating hip***. (No sitting on low chairs/toilets, flexing at waist to reach floor.)