



Femoral Neck Fractures

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TOPIC
Review Topic

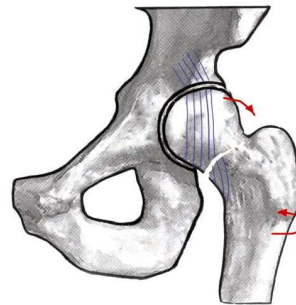
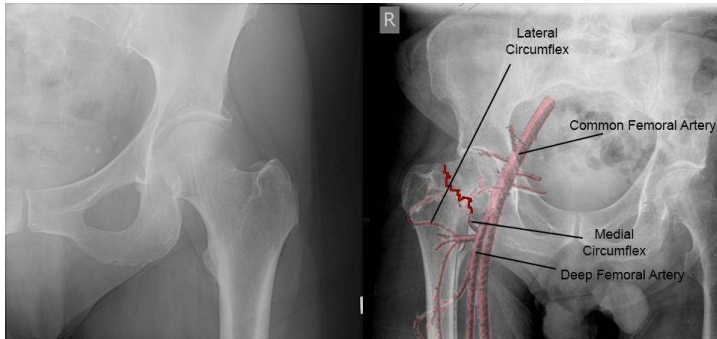
QUESTIONS
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TECHNIQUES
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Introduction

- Epidemiology
 - increasingly common due to [aging population](#)
 - women > men
 - whites > blacks
 - United states has highest incidence of hip fx rates worldwide
 - most expensive fracture to treat on per-person basis
- Mechanism
 - high energy in young patients
 - low energy falls in older patients
- Pathophysiology
 - healing potential
 - femoral neck is intracapsular, bathed in synovial fluid
 - lacks periosteal layer
 - callus formation limited, which affects healing
- Associated injuries
 - [femoral shaft fractures](#)
 - 6-9% associated with femoral neck fractures
 - treat femoral neck first followed by shaft
- Prognosis
 - mortality
 - ~25-30% at one year (higher than vertebral compression fractures)
 - predictors of mortality
 - pre-injury mobility is the most significant determinant for post-operative survival
 - in patients with chronic renal failure, rates of mortality at 2 years postoperatively, are close to 45%



- Osteology
 - normal neck shaft-angle **130 +/- 7** degrees
 - normal anteversion **10 +/- 7** degrees
- Blood supply to femoral head
 - major contributor is **medial femoral circumflex** (lateral epiphyseal artery)
 - some contribution to anterior and inferior head from lateral femoral circumflex
 - some contribution from inferior gluteal artery
 - small and insignificant supply from artery of ligamentum teres
 - displacement of femoral neck fracture will **disrupt the blood supply** and cause an intracapsular hematoma (effect is controversial)

Classification

Garden Classification		
(based on AP radiographs and does not consider lateral or sagittal plane alignment)		
Type I	Incomplete, ie. valgus impacted	
Type II	Complete fx. nondisplaced	
Type III	Complete, partially displaced	
Type IV	Complete, fully displaced	
Posterior roll-off and/or angulation of femoral head leads to increased reoperation rates		

Simplified Garden Classification		
Nondisplaced	Includes Garden I and II	
Displaced	Includes Garden III and IV	

Pauwels Classification		
(based on vertical orientation of fracture line)		
Type I	< 30 deg from horizontal	
Type II	30 to 50 deg from horizontal	
Type III	> 50 deg from horizontal (most unstable with highest risk of nonunion and AVN)	

Presentation

- Symptoms
 - impacted and stress fractures
 - slight pain in the groin or pain referred along the medial side of the thigh and knee
 - displaced fractures
 - pain in the entire hip region
- Physical exam
 - impacted and stress fractures
 - no obvious clinical deformity



- leg in external rotation and abduction, with shortening

Imaging

- Radiographs
 - Recommended views
 - AP
 - traction-internal rotation AP hip is best for defining fracture type
 - cross-table lateral
 - full-length femur
 - Optional views
 - consider obtaining dedicated imaging of uninjured hip to use as template intraop
- CT
 - helpful in determining displacement and degree of comminution in some patients
- MRI
 - helpful to rule out occult fracture
 - not helpful in reliably assessing viability of femoral head after fracture
- Bone scan
 - helpful to rule out occult fracture
 - not helpful in reliably assessing viability of femoral head after fracture
- Duplex Scanning
 - indication
 - rule out DVT if delayed presentation to hospital after hip fracture

Treatment

- Nonoperative
 - [observation alone](#)
 - indications
 - may be considered in some patients who are non-ambulators, have minimal pain, and who are at high risk for surgical intervention
- Operative
 - **ORIF**
 - indications
 - displaced fractures in young or physiologically young patients
 - ORIF indicated for most pts <65 years of age
 - **cannulated screw fixation**
 - indications
 - nondisplaced transcervical fx
 - Garden I or II in the physiologically elderly
 - displaced transcervical fx in young patient
 - considered a surgical emergency
 - achieve reduction to limit vascular insult
 - reduction must be anatomic, so open if necessary
 - **sliding hip screw**



superior)

- consider placement of additional cannulated screw above sliding hip screw to prevent rotation
- **hemiarthroplasty** ? ? ?
 - indications
 - controversial
 - debilitated elderly patients
 - metabolic bone disease
- **total hip arthroplasty** ? ? ? ? ? ?
 - indications
 - controversial
 - older active patients
 - patients with preexisting hip osteoarthritis
 - more **predictable pain relief** and **better functional outcome** than hemiarthroplasty
 - Garden III or IV in patient < 85 years

Techniques

- **General Surgical Consideration**

- time to surgery
 - controversial
 - reduction method and quality has more pronounced effect on healing than surgical timing
 - elderly patients with hip fractures should be brought to surgery **as soon as medically optimal** ?
 - the benefits of early mobilization cannot be overemphasized
 - improved outcomes in medically fit patients if surgically treated less than 4 days from injury ?
- treatment approach based on
 - degree of displacement
 - physiologic age of the patient (young is < than 50)
 - ipsilateral femoral neck and shaft fractures ?
 - priority goes to fixing femoral neck because anatomic reduction is necessary to avoid complications of AVN and nonunion
- fixation with implants that allow sliding
 - permit dynamic compression at fx site during axial loading
 - can cause shortening of femoral neck
 - prominent implants
 - affects biomechanics of hip joint
 - lower physical function on SF-36
 - decreased quality of life
 - anatomic reduction with intraop compression and placement of length stable devices decrease shortening
- open versus closed reduction ?



of the femoral head

- **ORIF**

- approach

- limited anterior Smith-Peterson
 - 10cm skin incision made beginning just distal to AHS
 - incise deep fascia
 - develop interval between sartorius and TFL
 - external rotation of thigh accentuates dissection plane
 - LFCN is identified and retracted medially with sartorius
 - identify tendinous portion of rectus femoris, elevate off hip capsule
 - open capsule to identify femoral neck
 - Watson-Jones
 - used to gain improved exposure of lower femoral neck fractures
 - skin incision approx 2cm posterior and distal to ASIS, down toward tip of greater trochanter
 - incision curved distally and extended 10cm along anterior portion of femur
 - incise deep fascia
 - develop interval between TFL and gluteus medius
 - anterior aspect of gluteus medius and minimus is retracted posteriorly to visualize anterior hip capsule
 - capsule sharply incised with Z-shape incision
 - capsulotomy must remain anterior to lesser trochanter at all times to avoid injury to medial femoral circumflex artery
 - reduction (method may vary)
 - evacuate hematoma
 - place A to P k-wires into femoral neck/head proximal to fracture to use as joysticks for reduction
 - insert starting k-wire (for either cannulated screw or sliding hip screw) into appropriate position laterally, up to but not across the fracture
 - once reduction obtained, drive starting k-wire across fracture
 - insert second threaded tipped k-wire if adding additional fixation

- **Cannulated Screw Fixation**

- technique

- **three screws if noncomminuted** (3 screw inverted triangle shown to be superior to two screws)
 - order of screw placement (this varies)
 - 1-inferior screw along calcar
 - 2-posterior/superior screw
 - 3-anterior/superior screw
 - obtain as much screw spread as possible in femoral neck
 - inverted triangle along the calcar (not central in the neck) has stronger fixation and higher load to failure
 - four screws considered for posterior comminution
 - clear advantage of additional screws not proven in literature
 - starting point at or above level of lesser trochanter to avoid fracture



- [posterior approach has increased risk of dislocations](#) ?
 - anterolateral approach has increased abductor weakness
 - technique
 - cemented superior to uncemented
 - unipolar vs. bipolar
- **Total Hip Replacement**
 - technique
 - should consider using the [anterolateral approach](#) and selective use of larger heads in the setting of a femoral neck fracture
 - advantages
 - improved functional hip scores and lower re-operation rates compared to hemiarthroplasty ?
 - complications
 - higher rate of [dislocation](#) with THA (~ 10%)
 - about five times higher than hemiarthroplasty ?

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
 - treatment
 - major symptoms not always present when AVN develops
 - young patient
 - > 50% involvement then treat with [FVFG](#) vs THA
 - older patient
 - prosthetic replacement (hemiarthroplasty vs THA)
- [Nonunion](#)
 - incidence of 5 to 30%
 - increased incidence in displaced fractures
 - no correlation between age, gender, and rate of nonunion
 - [varus malreduction](#) most closely correlates with failure of fixation after reduction and cannulated screw fixation. ?
 - treatment
 - [valgus intertrochanteric osteotomy](#) ? ?
 - indicated in patients after femoral neck nonunion
 - can be done even in presence of AVN, as long as not severely collapsed



- **arthroplasty**
 - indicated in older patients or when the femoral head is not viable
 - also an option in younger patient with a nonviable femoral head as opposed to FVFG
 - **revision ORIF**
- **Dislocation**
 - higher rate of **dislocation** with THA (~ 10%)
 - about seven times higher than hemiarthroplasty
- **Failure rates**
 - high early failure rates in fixation group, which stabilizes after 2 years
 - 2-year follow-up (elderly population >70 years) with displaced femoral neck fractures
 - 46% with fixation techniques
 - 8% with arthroplasty techniques
 - 2-to-10 year follow-up
 - failure rate approx. 2-4%, respectively
 - overall failure rates still higher in fixation vs. arthroplasty at 10-year follow-up
 - sliding hip screw with lower reoperation rates compared to cannulated screws:
 - displaced femoral neck fractures
 - basicervical femoral neck fractures
 - current smokers
- **Reducing complications with co-management service**
 - orthopaedic geriatric co-management of trauma patients has been demonstrated to yield
 - decreased mortality, post-operative complications, time to surgery, length of stay (though conflicting results on length of stay)
 - improved post-operative mobility at 4 months

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Average 4.4 of 111 Ratings



TECHNIQUE GUIDES (4)



Femoral Neck Fracture Cemented Bipolar Hemiarthroplasty

Andrew Hsu | Joshua Blomberg

Trauma - Femoral Neck Fractures





Femoral Neck Fracture ORIF with Dynamic Hip Screw

Orthobullets Team

Trauma - Femoral Neck Fractures



Femoral Neck Fracture Closed Reduction and Percutaneous Pinning

Orthobullets Team

Trauma - Femoral Neck Fractures



Femoral Neck Fractures ORIF with Cannulated Screws

Team Orthobullets (D)

Trauma - Femoral Neck Fractures

? QUESTIONS (46)



QUESTIONS

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(OBQ15.123) A 72-year-old woman falls onto her left hip after tripping over a curb during her daily 3-mile walk. An injury radiograph is shown in Figure A. What is the best long term solution? Review

Topic | Tested Concept

QID: 5808

FIGURES: A

- 1 Cannulated screws
- 2 Valgus intertrochanteric osteotomy
- 3 Unipolar hemiarthroplasty
- 4 Bipolar hemiarthroplasty
- 5 Total hip arthroplasty

SHOW EVIDENCE

POSTS (2)

Femoral neck fracture in older patient: ORIF vs. THA

0 views

Trauma - Femoral Neck Fractures



Evidence

Timing and type of fixation of ipsilateral femoral neck and shaft fractures

0 views

Trauma - Femoral Neck Fractures

VIDEOS (11)

All Videos (11) Podcasts (4)

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2018 Orthopaedic Summit Evolving Techniques

8/12/2019

Pro: Minimal Is The Way To Go: 3 Screws, Let Me Tell You In What Direction - Michael D. McKee, MD, FRCS (OSET 2018)

668 views

Michael D. McKee

Trauma - Femoral Neck Fractures

★★★★★ (1)

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8/12/2019

Evolving Technique Update: OMG! The Femoral Head Crumbled - How To Avoid Hip Fracture

356 views

2019 California Orthopaedic Association Annual Meeting 7/22/2019

Creating Hip Fracture Care: It takes a Village - Adam Sassoon, MD (COA 2019) 589 views

Adam Sassoon

Trauma - Femoral Neck Fractures ★★★★★ (2)

Question Session | Femoral Neck Fractures & Tibial Tubercle Fractures 11/11/2019

Orthobullets Team 67 plays

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Listen Now 20:18 min ★★★★★ (1)

Question Session | Femoral Neck Fractures & Pediatric Femoral Shaft Fractures 11/6/2019

Orthobullets Team 33 plays

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Trauma | Femoral Neck Fractures 10/31/2019

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Trauma | Femoral Neck Fractures (ft. Dr. Bohannon Mason) 10/18/2019

Team Orthobullets 4 75 plays

Trauma - Femoral Neck Fractures

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Femoral neck fracture due to GSW (C101504)

Omar H. Atassi

38

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B

0

Femoral neck fracture in 94F (C101495)

6/10/2020

Matthew J Steffes

491

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13



B

4

Femoral Neck Fracture in 76F (C101423)

4/10/2020

Shaun Patel

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A

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