Periprosthetic Fractures Around THA

Thomas Moore Jr., MD
Assistant Professor of Ortho Surgery
Emory University at Grady Memorial Hospital
• 2030 primary THA performed annually will grow 174% to 572,000

• Periprosthetic Fracture is the third most common reason for revision surgery after THA

Kurtz et. al. JBJS 2007
Incidence of PostOperative Fx

- 1969-1999 Mayo Clinic Joint Registry:
  - Incidence of postoperative periprosthetic fractures
    - 1.1% for primary THA
    - 4.0% for revision THA
Incidence of PostOperative Fx

- Swedish National Hip Arthroplasty Registry
- Average time to fracture
  - 7.4 years in primary THA
  - 3.9 years in revision THA

- 70% had a loose component
Incidence of PostOperative Fx

• Swedish National Hip Arthroplasty Registry
• Average time to fracture
  • 7.4 years in primary THA
  • 3.9 years in revision THA

• 70% had a loose component
Risk Factors

• Female Gender
• Rheumatoid Arthritis
• Osteoporosis
• Revision Surgery
• Age

Pike, JAAOS, 2009
Work Up

• Obtain pre injury XRs
• Compare prosthesis positioning

• History of joint pain prior to injury???

• ESR/CRP/WBC have low predictive value in these patients
  • Get PreOp hip aspirate + IntraOp cultures if concerned
Classification

• 11 classification systems proposed based on:
  • Fracture location
  • Implant stability
  • Type of implant: cemented vs uncemented
  • Surrounding bone stock
Classification

- Vancouver Classification
  - Developed in 1995
  - Classifies Periprosthetic femur fracture as A, B, C
  - High interobserver and intraobserver reliability

Naqvi et. al., J. of Arthroplasty 2012
Vancouver $A_G$

- Proximal metaphysis
  - Greater Troch
Vancouver $A_L$

- Proximal metaphysis
  - Lesser Troch
Vancouver B₁

- Proximal diaphysis
  - At the tip of the stem

- Stable femoral component
Vancouver B₂

- Proximal diaphysis
  - At the tip of the stem

- Unstable femoral component

- Suitable bone stock
Vancouver B₃

- Proximal diaphysis
  - At the tip of the stem
- Unstable femoral component
- Sig Osteolysis and bone loss
Vancouver C

- Diaphysis or distal metaphysis
- Well distal to the stem
  - Assumes stable stem
Treatment

**Vancouver A**

- Treated according to degree of displacement and chronicity of injury as well as the stability of the femoral stem
- Nondisplaced- protected weightbearing 6-12 weeks with limited abduction
Treatment

Vancouver\textsubscript{AG}

- Operative – displaced more than 2cm
- Claw plates/Cerclage wiring
- >5yr postoperative – likely due to osteolysis
  - Liner exchange
  - possible impaction grafting with fixation of trochanter
Treatment

**Vancouver A**

- Treated according to stability of the femoral prosthesis
- Stable implant with minimal displacement -> nonop
- Operative if continued pain or if fracture fragment is displaced and involves the calcar region
- Cerclage wires
Treatment B1

• Open Reduction and Internal Fixation
• Type of fixation is controversial
• Extremely important to confirm the stability of stem

• Lindahl et. al., JBJS 2006 59% failure of ORIF B1
  • Thought due to misinterpretation of B2 fractures as B1
Treatment B₁

- Lateral Plating
- Cable plate systems
- Locked plating
- Lateral plate and strut allograft
- Double plating
Treatment B₁

• Corten et al, JBJS 2009
• 45 B₁ fractures
• Joint dislocated and stability of the femoral component evaluated
  • Found B₂ in 20% of cases originally thought to be B₁
• Single plate and cable
• Union 29/30 at avg 6.4 months
Treatment $B_1$

Ricci et al, JBJS, 2006
50 pts 41 with f/u
- Plating with indirect reduction
  - No allograft
  - No bone graft

Average time to union= 3 months
One deep infection
30/41 returned to baseline ambulatory status
Treatment $B_1$

- Wood et al, J Arthroplasty, 2011
  - Locked plates in 16 patients

- 14/16 union by 6 months
- 13/16 ambulatory at 6 months

- Recommend 10 cortices on each side of fx
- Cortical struts when there is failed hardware or revision fixation cases
• Allograft strut use
  • no difference in healing rates
  • increased infxn rate.
Treatment B2

• Requires a long stem revision component that bypasses the most distal aspect of the fracture by at least two femoral diameters.
  • Fluted modular diaphysis-engaging uncemented stem
  • A long porous coated revision stem
  • (A cemented stem) narrow indications

• Additional fixation with cable, plates, and or struts may be necessary.
Treatment $B_2$

- Monoblock extensively porous coated noncemented prosthesis
- Bypass the fracture and achieve distal diaphyseal fixation
- Straight or bowed
- Disadvantage of bowed stem, is limitations regarding the ability to change anteversion
Treatment $B_2$

Sheth et al. J Arthroplasty 2013

- 20 patients with B2
- Extensively coated diaphyseal engaging implant
- Complications 7/21 requiring four reoperations
  - One dislocation with greater trochanter fracture
  - Femoral component subsided requiring a second revision
  - Two deep infections
Treatment B2

Tapered Modular Stems
• Allow for diaphyseal fixation
• Rotational stability through splines
• Independent control of anteversion
Modular Tapered Stem

Munro et al., Clin Orthop Relat Res 2014

- 55 B2 or B3 pts
- Two femoral stems revised: subsidence, deep infection
- one nonunion
- Subsidence in 24% of patients (most less than 3mm without clinical correlation)
Long Stem Cemented Prosthesis

• RARE

• When surgeon predicts low likelihood of biologic fixation
  • Postradiation therapy
  • Severe osteoporosis

• Selected elderly for immediate fixation and allowance of weightbearing
Vancouver B3

Treatment Options

• Depending on severity of bone loss, selected fractures may be treated similarly to B2 fractures either monoblock or modular tapered stem

• Proximal femoral replacement

• Allograft Prosthesis Composite
Vancouver C

• Open Reduction and internal fixation
• Plating system with proximal cerclage and distal screws
• Failures commonly occur in compression/medial side of femur
• Avoid creating stress risers
  • between the end of the plate and the tip of the stem
• Plates should be inserted sub-muscularly and extraperiosteally
Vancouver C

• Locking Plates
• Biomechanical advantage in osteoporotic bone

• O’Toole et al., Clin Orthop Relat Res 2006
• Uneventful healing in 11/12 fractures
Complications

• Lindahl et al., Overall complication rate of 18%

• Reasons for reoperation:
  • Nonunion
  • Re-fracture
  • Aseptic loosening
  • Recurrent dislocation
Mortality

- Bhattacharyya et al., JBJS 2007
  - Patients undergoing primary joint replacement is 2.9%
- Periprosthetic fractures one year mortality of 11%
- Hip fracture one year mortality of 16.5%
Thank You