Management of Ceramic Fractures During Revision THA

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Conflict of Interest

- FDA IDE: Ceramic on Ceramic 1997-2003
- Single manufacturer of ceramic components
- Depuy CoC aftermarket study
Ceramic on Ceramic hip bearings

- **Very low rate of revision of CoC**
  - Small personal experience
  - Small literature series
  - One large series and meta-analysis from Rizzoli

- **Personal practice:**
  - IDE: April 1997 to February 2003: 132 CoC hips
  - February 2003 to date
    - CoC most younger than 60 yo
    - CoP most older than 70 yo
    - ? 60 to 70 yo physiological age and activity
CoC/P: Ounce of Prevention

♦ Ceramic benefits:
  • Durability: high
  • Osteolysis: minimal
  • Trunionosis: minimal
Ceramic: Ounce of prevention

- **Breakage**
  - 0.04% implant lifetime
  - 0.001% alumina delta ball heads

- **Squeaking**
  - Most series not important

- D’Antonio et al; Ceramic bearings for total hip arthroplasty have high survivorship at 10 years CORR. 2012 Feb;470(2):373-81
- Yeung et al; Mid-Term Results of Third-Generation Alumina-on-Alumina Ceramic Bearings JBJS 94:138-44 2012
Revision of Fractured Ceramic

- Ceramic debris is abrasive
  - Can damage existing taper, stem or shell
  - Can damage new revision bearing couple

- Considerations:
  - Material must resist abrasion:
    - Ceramic ball head
  - Remove abrasive debris:
    - Complete synovectomy
    - Remove original HMWPE liner
  - Retain stem and shell:
    - Stem & trunion in good condition
    - Shell in good condition
    - If not: Explant/revise: stem and/or shell
Ceramic History

- **Old ceramics**
  - Bad
- **Alumina forte**
  - Good
- **Alumina delta**
  - Very good
Ceramic debris failed revision Metal head

- Failure of a stainless-steel femoral head of a revision total hip arthroplasty performed after a fracture of a ceramic femoral head. A case report. Allain et al JBJS-A 80(9):1355, 1998


Revision Bearing Choice

- **CoC**
  - Pospischill & Knahr International Ortho (SCIOT) 2011
  - Jack et al, Bone Joint J 2013
  - Traina, ...., Toni Rizzoli JBJS 2011 selection AAOS exhibition
    - 1990 to 2009: 8022 primary ceramic hips Revised 40 for Fx: 16 head & 24 liner
      - 30 CoC & 2 CoP, no revisions or osteolysis
      - 8 MoP
        - 7 poor clinical outcomes with wear and osteolysis
        - 1 patient had good clinical and radiographic
  - Traina et al Rizzoli: Meta-analysis 2013 (slide latter)
  - Im C, et al Hip 6 CoC 10 y survival Pelvis. 2018

- **CoP**
  - Hannouche et al, CORR 2010, Internat Ortho 2011
    - Ceramic heads on used trunion, Aggressive synovectomy, Poly exchange

- **MoP**
  - Allain et al, JBJS 85A 2003
    - 53 metal heads > 8 severely worn
    - Severe metalosis at revision
    - Aggressive synovectomy & Poly exchange
  - Sharma, Ranawat et al, J Arthroplasty 2010
    - 8 patients MoP no osteolysis /aseptic loosening 10.5 years.
    - Aggressive synovectomy & Poly exchange
Fracture of ceramic bearing surfaces following total hip replacement: a systematic review.

COC or COP couplings are viable options to reduce the risk of third body wear of revised implants
Option head: alumina delta with Ti thimble

- **Trunion must be in good condition**
  - Scratches < 0.25mm
  - Minor corrosion
  - Minor deformity

- **Trunion specs must conform with thimble**
  - 8/10, 10/12, 12/14 vary by company
  - S, M, L, XL lengths
  - On PE, alumina forte or alumina delta liner
Shell and Liner: alumina delta or XPE

- Shell internal surface must be in good condition
  - Scratches < 0.25mm
  - Minor corrosion
  - Minor deformity
- Shell locking mechanism must conform with Ceramic or HMWPE
Summary: Revision of fracture ceramic

**Revision Principals:**
- Always remove original HMWPE liner (broken CoP)
- Always do complete synovectomy
- Always reimplant Ceramic head with thimble

**Revision Implant selection:**
- Stem retained if:
  - Well fixed, well aligned stem
  - Stem has good track record
  - Trunion in good condition
  - Head Implant: Option® with Ti thimble
- Shell retained if:
  - Well fixed, well aligned shell
  - Shell has good track record
  - Shell/liner locking mechanism in good condition
  - Liner Implant: shell locking mechanism:
    - Ceramic liner, if allowed
    - HMWPE liner, if ceramic not allowed
- Stem or Shell not retained
  - CoC is reimplant goal