

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
- Hannouche, Zaoui, Zadegan, Sedel & Nizard. International Orthopaedics (SICOT) (2011) 35:207–213
- Jeffers & Walter, Ceramic-on-Ceramic bearings in hip arthroplasty JBJS-Br. 2012;94-B:735–45.

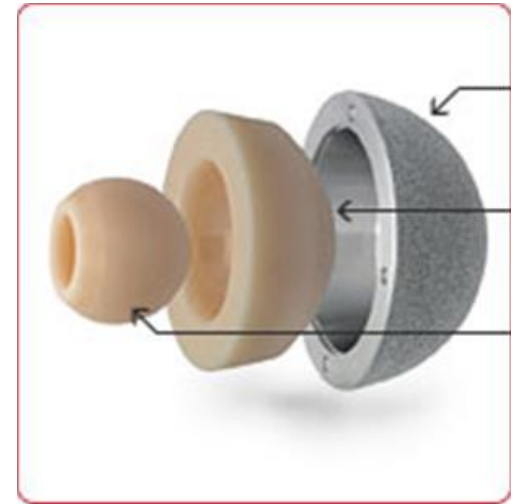
Revision of Fractured Ceramic

- ◆ **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



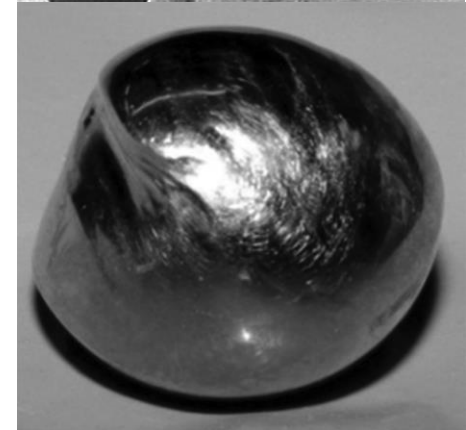
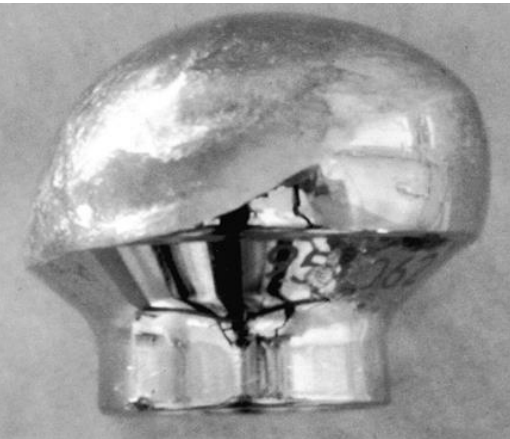
Ceramic History

- ◆ **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 total hip arthroplasty performed after fracture of a ceramic femoral head. A multicenter survivorship study. Allain et al, JBJS 85-A:825, 2003
- ◆ Fracture of a ceramic component in total hip replacement. Whittingham-Jones, et al, JBJS 94-B:570, 2011



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 metallosis 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

Rizzoli: Meta-analysis 2013

Bearing selection
Stem and Shell taper damage

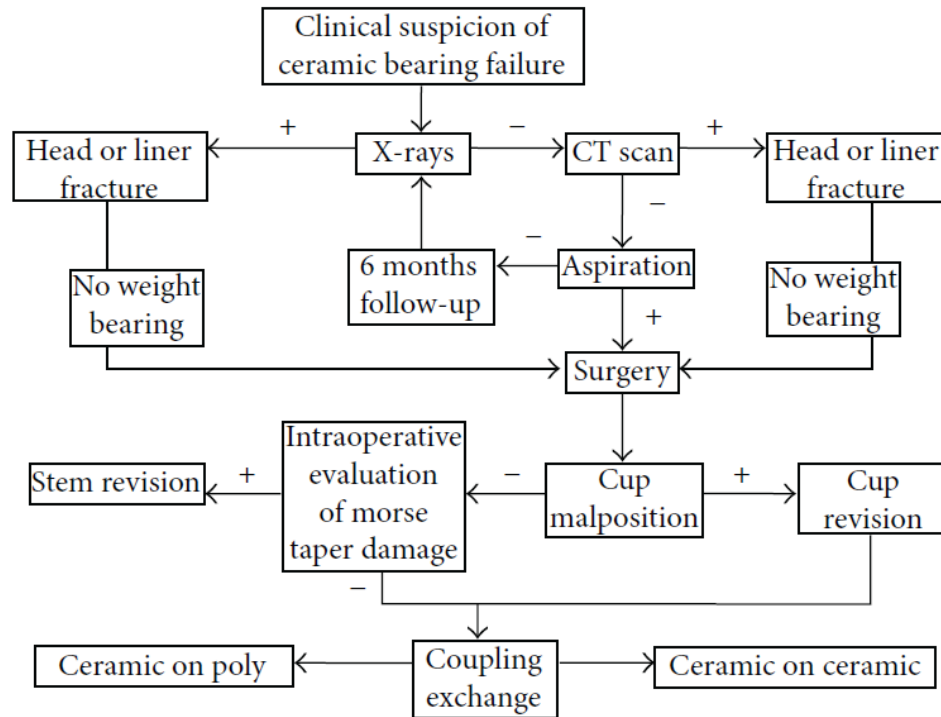


FIGURE 3: Algorithm with guidelines for the diagnosis and treatment of fractured ceramic bearings following THR.

Fracture of ceramic bearing surfaces following total hip replacement: a systematic review.

Traina F, De Fine M, Di Martino A, Faldini C. Biomed Res Int. 2013;2013:157247

COC or COP couplings are viable options to reduce the risk of third body wear of revised implants

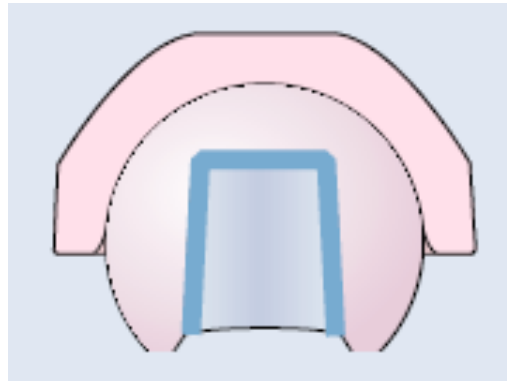
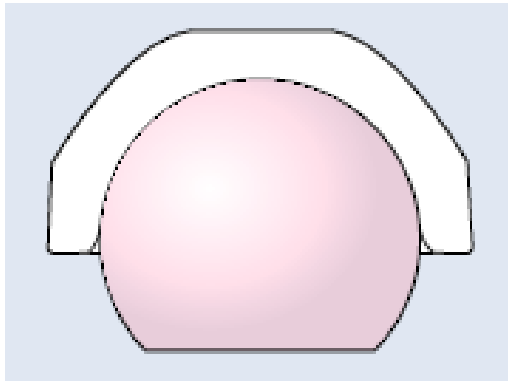
Option head: alumina delta with Ti thimble

- ◆ **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

