Historical background for metal back glenoid implant in anatomical TSA

Denis Katz
1973 NEER

1993

40 years of cemented implants

2011

glenoid problems+++

M. Wirth, C. Rockwood JBJS 2006
P Collin JSES 2011
G Walch JSES 2011

John Brems JSES 1993

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Summary of reported results of total shoulder arthroplasty</th>
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<tr>
<td>Physician</td>
<td>No. TSR</td>
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<tr>
<td>Neer</td>
<td>194</td>
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<tr>
<td>Cofield</td>
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<td>O’Driscoll</td>
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<td>Totals</td>
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</table>

TSR, Total shoulder arthroplasty.
At 10 yrs:

- 76% of RLL
- 40% of loosenings
- With clinical involvement

Modularity did not change anything
The radiological analysis of RLL is difficult

- Bad reproducibility of the X-rays:
  Kelleher and co  
  (JSES 1992;1:306-11)

- Specially with retroverted glenoids:
  Havig and co  
  (JBJS 1997,79A;3:428-32)
« Only 5% of revision »!!!

BUT:

- **Matsen**: *(JSES 2005; 14:368-74)*

  144 self assessments of patient satisfaction:
  Correlation of bad results with glenoid loosenings in 59% of the cases

- Glenoid loosenings = 25% of failures
Metal back glenoid device

cemented  non cemented
Cemented Metal back
Neer II
Did the cemented MB change the rate of RLL?

**Barrett and co:** *(J of Arthroplasty 1989;1:91-6)*

- 140 TSA in RA
- 12 Neer 2
- 5 loosenings
- But indications for cemented MB = badest cases
  - Bad bony support
  - Cuff tears
Alternatives

- Hemi arthroplasties (Rockwood):
  
  * **Garstman**: randomised study *(JBJS Am 2000;1:26-34)*
    - More pain on the beginning
    - Lower final score

  * **Matsen** *(JSES 2007;16:241S-247S)* :
    - « Ream and Run »
Alternatives

Williams and co (*J. SES* 2005;14:122S-128S)

- Small glenoids
- Big glenoids
- Assymetric glenoids
- Centered keel or not
- One peg or more
- Quality of the polyethylene
- Uncemented fluted peg
Uncemented Metal back

- Burkhead
- **Cofield 1 et 2**
- Copeland
- Gristina
- English-MacNab
- Habermeyer (arthrex)
- Martin (Kirschner)
- Roper-Day
- **Aequalis**
- Gerber
- Castagna
Cofield

= The first to think that MB could be a solution for primary fixation not only for fragilous cases

• 1994: 5 dissociations / 180 cases

• 2007: 12 revisions for dissociations or PE wear / 264 cases *(JSES 2007; 16: 574-78)*
Uncemented Cofield

Wallace (JBJS 1999)

- 32 cemented / 31 uncemented Cofield, 4 years
- 41% of RLL for cemented
- 23% of RLL for non cemented
Uncemented Cofield

WALLACE

- less RLL
- more complications

BUT

- no mismatch
- thickness +++
Hervé Thomazeau

(Ann Orthop Ouest 2004 ; 36)

- 15 MB Cofield (cemented), 10 yrs of FU
- 12 centered OA-3 excentered
- 9 without RLL
- 4 PE wear
- 5 sup migrations +++ after 6 yrs
**Uncemented Metal back**

**Aequalis** *(mismatch)*

**Boileau* *(JSES 2002)*

- 40 randomised shoulders *(20CG/20MB).*
- FU 38 mths
- RLL = 25%/ 85% *(25% progressive !!!)*
- Lower survival rate for MB *(4 revisions)*
Aequalis

- Flat glenoid
- Expansion screw
- More wear on type b glenoids?:

More revisions for type b
Metal back implants

- PE-Metal dissociation
- Early PE wear
- Rotator cuff tear
- Stress shielding

Cheung and Co, JSES 2007
Tammachote and Co, JBJS Am 2009

Implant thickness
Why is it so difficult to create a feasible glenoid device?
1) A glenoid implant will never be a normal glenoid

**Matsen (JSES 2007):**
- Glenoid = « soft side » of the joint
- Labrum = shock absorber
- Poor and fragilous bone stock
2) The humeral stem will never be a normal humerus

Hsu *(JSES 1993)*

Roberts *(JBJS Br 1991)*

Iannotti *(JSES 2005)*

-normal version of the humerus?

Bad positioning

= more stress on the glenoid implant
3) Forces in the GH joint

- Poppen NK, Walker PS (*Clin Orthop 1978*)
- Fukuda K and co (*Orthopedics 1988*)

- Compressive force is high
- Reaction force is not constant in direction
- Rocking horse effect:
  Francklin and co (*J Arthroplasty 1988;3:39-46*)

- Post op translations:
  increase the local stresses
  Collins (*JBJS 1992*)
  Friedman (*JSES 1992*)
Mismatch or not?

- Neer: « full conformity increases stability »

  But

- Full conformity increases the risk of rocking horse effect

- Less conformity increases local stress

  *(Severt Clin Orthop 1993)*
Biomechanics

finite element analysis

- ORR (*clin orthop* 1988)
- FRIEDMAN (*JSES* 1992)
- STONE (*JSES* 1999):
  - Less stress under the MB = stress shielding?
  - Major constraint between PE and metal = wear-synovitis-dismantling

All studies on old and/or debatable implants
GUPTA S et Al
(clinical Biomech 2004)

- « The cement-bone interface appears more likely to fail with a cemented device »

- Stresses are reduced in the PE cup of metal back glenoids
A. Castagna \textit{(JBJS Br 2010)}

- 35 TSR, 75 mths of FU (48-154)
- No loosenings
- No PE wear
- No dissociations

**Nottingham TSA \textit{(BMC Musculoskeletal disorders 2007)}**

- 93% survival rate with the last modification

**Clement \textit{(JSES 2010)}**

- 89% survival rate at 10 yrs
non cemented glenoid

1) Insure a good primary fixation

2) Facilitate revisions for glenoid loosenings
64 years old
type a2 glenoid

- FU=50 mths
- Cst 81(115%)
Thank you for your attention