Hemiarthroplasty or Reverse Shoulder Arthroplasty for Proximal Humerus Fractures

Pascal Boileau, MD
France

Charles S. Neer, 1955

"... results of hemiarthroplasty for acute proximal humerus fractures are good ..."

HA for Fx = Unpredictable Results

Boileau et al., JSES 2002

No average results (Rule of 'all or nothing?')
The Problems

- Improper Prosthesis Positioning
- Poor Prosthetic Design
- Poor Suture Fixation Technique
- Improper Post-op Management
Prothesis Malpositioning

Too Proud → GT pull out / migration

Restoration of the Gothic arch

Krishnan et al., TSES 2005

Prothesis Malpositioning

Too Retroverted → GT pull out / migration

Boileau et al., JSES 2002

Tuberosity Malpositioning

GT pull out / migration

GT = Too High ... or too Low

Boileau et al., JSES 2002
Bulky Prostheses Don’t Help!

Excess of Metal+++ = Obstacle to GT positioning

= Barrier for bone healing ...}

Type of Prosthesis Does matter!

• Loew et al., JBJS Br 2006
  Tuberousity healing:
  50% with a Fracture Prosthesis vs
  29% with a Standard prosthesis

• Krishnan et al., CORR 2011
  58 Conventional Prostheses
  112 Fracture Prostheses

→ Use of fracture-specific stems did improve
  shoulder function and tuberosity healing
  compared with conventional stems

Poor Tuberosity Fixation

→ Separate fixation of GT & LT +++

Boileau et al, TSES 2002
Poor Tuberosity Fixation

- Cerclages + Tension-Band
- 4 Horizontal Cerclages
- 2 Vertical Tension Band Sutures

Boileau et al., TSES 2002

Over Agressive Rehabilitation

- GT fragment Detachment!!

Protection of GT Repair

- Neutral Rotation brace++

Pendulum exercises ONLY for the first 4 weeks

P. Boileau-Hemiarthroplasty or Reverse Shoulder Arthroplasty for Proximal Humerus Fractures
HA for Fractures

How to maximize outcomes?...
Does the prosthesis matter?...

Can surgeons predict what makes a good hemiarthroplasty for fracture?

Pascal Boileau, MD*, Matthias Winter, MD, Alec Cikes, MD, Yong Han, MD, Michel Carles, MD, PhD, Gilles Walch, MD, Daniel G. Schwartz, MD

61 Fractures
Two Types of Implants

Standard stem
N = 31
(1991-1997)

Fracture stem
N = 30
(1998-2006)

Type of implant does matter!

Use of a Standard (bulky) Implant

- decreased GT adequate positioning 52% vs 97% p=0.0001
- decreased GT healing+++ 45% vs 87% p=0.0001
- decreased Functional outcome++ AAE 115° vs 136° CS 58 vs 68 p<0.0001
Patients over 75 years & Women have:
- Higher rate of tuberosity complications
- Lower functional results
(Regardless of the type of implant used)

Reverse prosthesis is probably a better option in the elderly (>75yo) female patients.

In Summary: HA for Acute Fractures

- Still unpredictable results
  "All or Nothing"
- Prosthesis / GT malpositioning
- Poor technique & prosthetic design
  "Low Profile" fracture Prosthesis
- Influence of patient's age & Gender: poor results in the elderly women

Can RSA be an alternative to HA in elderly patients?...
Prospective Randomized Study

Patients > 70 y
Reverse / Aequalis-Fx
> 12 months FU
38 cases

Sirveaux & Molé, Nice Shoulder Course 2008

Functional Outcomes

RSA
20 Cases

HA
23

 RSA: More Predictable Results

Sirveaux & Molé, Nice Shoulder Course 2008
RSA: More Predictable Results

Do Tuberosities Heal better in RSA?...

GT Healing in HA / RSA

Greater Tuberosity healing
(Hemi = 61%
RSA = 83%)

- Lower influence of tuberosity healing
  (compared to HEMI)
Comparative Study: HA vs RSA
Hemiarthroplasty versus reverse shoulder arthroplasty in 4-part displaced fractures of the proximal humerus: Multicenter retrospective study

<table>
<thead>
<tr>
<th></th>
<th>HA (N=57)</th>
<th>RSA (N=41)</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Constant</td>
<td>54</td>
<td>57</td>
<td>NS</td>
</tr>
<tr>
<td>Adj. Constant</td>
<td>73%</td>
<td>83%</td>
<td>0.02</td>
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<tr>
<td>AFE</td>
<td>112°</td>
<td>130°</td>
<td>0.01</td>
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<tr>
<td>AER</td>
<td>28°</td>
<td>23°</td>
<td>NS</td>
</tr>
<tr>
<td>AIR</td>
<td>L3</td>
<td>Sacrum</td>
<td>0.03</td>
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<tr>
<td>GT Healing</td>
<td>70%</td>
<td>70%</td>
<td>NS</td>
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<tr>
<td>Complications</td>
<td>24%</td>
<td>10%</td>
<td>0.01</td>
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<tr>
<td>SSV</td>
<td>66%</td>
<td>75%</td>
<td>NS</td>
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Is Absence of Tuberosity Healing a Problem in RSA for Fracture?

The Importance of GT Healing

Sirveaux & Molé, Nice Shoulder Course 2008

Sirveaux & Molé, Nice Shoulder Course 2008
Absence of GT Tuberosity Healing in RSA

- Poor External Rotation
- Decreased ADLs
- Decreased patient’s satisfaction

Evidence

- RSA outcomes are more predictable
- Rotator cuff is not essential for proper function of a RSA, the deltoid function is sufficient
- Improved ER when tuberosities reconstructed
- Preservation of the rotator cuff can help maintain stability and ultimately improve shoulder function

Sufficient arguments for NOT Excising tuberosities in RSA

Are Results better in RSA?...
Comparative Study: HA vs RSA

Reverse Total Shoulder Arthroplasty Versus Hemiarthroplasty for Proximal Humerus Fractures: A Systematic Review

Meta-analysis: 30 studies (2004-2014, min. 1y FU)

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<th>RSA</th>
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<tr>
<td>ASES</td>
<td>63</td>
<td>65</td>
</tr>
<tr>
<td>Constant score</td>
<td>58</td>
<td>55</td>
</tr>
<tr>
<td>Active AE</td>
<td>108°</td>
<td>118°</td>
</tr>
<tr>
<td>Active ER</td>
<td>30°</td>
<td>20°</td>
</tr>
<tr>
<td>Complications</td>
<td>30% (20% tub)</td>
<td>10%</td>
</tr>
<tr>
<td>Reoperation</td>
<td>5.7%</td>
<td>10%</td>
</tr>
<tr>
<td>Reoperation</td>
<td>5%</td>
<td>10%</td>
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In Summary

RSA for Acute Fractures

- AFE is more predictable in RSA than in HA, and complication rate is lower
- But, IR is decreased in RSA
- GT healing is needed to restore active ER and improves ADL++
- Tuberosities in RSA should NOT be excised, but repaired+++

Take-Home Messages

- AFE is more predictable in RSA than in HA, and complication rate is lower
- But, IR is decreased in RSA
- GT healing is needed to restore active ER and improves ADL++
- Tuberosities in RSA should NOT be excised, but repaired+++
GT Healing is Needed in HA
In order to get good functional outcomes
Preop 3y po

Absence of GT Healing in HA
is catastrophic!!....

GT Healing is Not Needed in RSA
But, tuberosity healing improves:
- Constant score
- Active ER++
- ADLs
Three Postop Situations

HEMI with tuberosity problems

HEMI with tuberosity OK

RSA

A RSA without ER muscles is a bad RSA!

Absence of GT fixation/healing:
- Hornblower sign/ Lag Sign
- Decreased ADLs
- Increased Humeral loosening

⇒ NO Tuberosity excision+++

Prosthesis Design & Surgical Technique

Do matter for both HA / RSA
# Indications for RSA in Acute Fractures

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<th>Patient's Age (&gt;75)</th>
<th>Women (osteopenia+++)</th>
<th>Poor blood supply (Diabetes, smoking)</th>
<th>Poor compliance with Rehabilitation (Dementia)</th>
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<td>Greater Tuberosity comminution</td>
<td>Poor bone quality (cortical thickness)</td>
<td>Combined Humerus &amp; Glenoid fracture</td>
<td>Precisely Rotator Cuff pathology (up to 5%)</td>
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<td>Severe Fatty infiltration of RC muscles (Goutallier stage 3 or 4)</td>
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**Indications for RSA in Acute Fractures**

- Patient's Age (>75)
- Women (osteopenia+++)
- Poor blood supply (Diabetes, smoking)
- Poor compliance with Rehabilitation (Dementia)
- Greater Tuberosity comminution
- Poor bone quality (cortical thickness)
- Combined Humerus & Glenoid fracture
- Preexisting Rotator Cuff patholgy (up to 5%)
- Severe Fatty infiltration of RC muscles (Goutallier stage 3 or 4)