Disclosures and Potential Conflict of Interest

- **Consultant:**
  - **LIMA Corporate**
  - **Conmed Linvatec**
  - **Tornier Biologics**
- **Royalties:**
  - **MD Services**

Complications of Uncemented Metalback Glenoid Implants: Personal Experience & Literature Analysis

A.Castagna, M.Borroni,
G.Delle Rose, C.F.De Biase

IRCCS CLINICAL INSTITUTE HUMANITAS
Milano - Italy

Background

Total shoulder arthroplasty is an effective procedure for:

- *Degenerative arthropathy*
- *Some inflamatory arthropathies*
- *Certain proximal humeral fractures*

TSA Vs. Hemi

The results of total shoulder arthroplasty are better than hemiarthroplasty

Shoulder Arthroplasty with or without Resurfacing of the Glenoid in Patients Who Have Osteoarthritis*

BY GARY M. GARTSMAN, M.D., TONI S. HODDEV, M.S., P.T., O.C.S., AND STEVEN M. HAMMERMAN, M.D., HOUSTON, TEXAS

JBJS 2000

Total shoulder replacement compared with humeral head replacement for the treatment of primary glenohumeral osteoarthritis: A systematic review

Craig S. Radnay, MD, MPH, Kevin J. Setter, MD, Locky Chambers, William N. Levine, MD, Louis U. Bigliani, MD, and Christopher S. Ahmad, MD, New York, NY

JSES 2007

... BUT ....

Glenoid Failure

- 60% of failed TSA is the result of loosening of the glenoid component

Characteristics of unsatisfactory shoulder arthroplasties

Samer S. Hasan, MD, PhD,[a] Jordan M. Leith, MD, FRCSC,[b] Barry Campbell, MS,[c] Ranjit Kapil,[c] Kevin L. Smith, MD,[c] and Frederick A. Matsen III, MD,[c] *Cincinnati, Ohio, Vancouver, British Columbia, Canada, and Seattle, Wash*

JSES 2002

Evolution

- 1975 English & McNab
- 1981 Smith & Nephew Cofield
- 1988 Biomet Biomodular
- Kirschner II C
- 1990 Zimmer Mark 2 Copeland
- 1993 Biomet Mark 3 Copeland
- 1994-1998 Biomet Nottingham I - II Wallace
- 1994 Aequalis Tornier
- 1994-2002 Randelli - SMR Lima Randelli
- 1998 Arthrex Univers 3D Habermeyer
- 2000 Zimmer Sulmesh Gerber

English & McNab 1975

- 21 glenoid
- FU 3 years
- 1 loosening

CORR 1987

Smith&Nephew Cofield I 1981

- 180 tissue ingrowth glenoid components
- **16%** complication of the glenoid component
- Conforming radius of curvature
- One small central peg
- Main Fixation: screw

Uncemented Total Shoulder Arthroplasty
A Review
Robert H. Cofield, MD

CORR 1994

Smith&Nephew Cofield II

- 83 ingrowth total shoulder
- Medium FU 9.5 years
- 33 (**39.7%**) glenoid loosening
- 26 (**31.3%**) glenoid revision

increased level of high-density polyethylene wear, subsequent metal wear, osteolysis, and component loosening. This failure mechanism does not stabilize but continues to accrue with time. These findings raise substantial concern for the use of this component, and perhaps other metal-backed bone-ingrowth glenoid components, other than for special situations. ■

Total Shoulder Arthroplasty with a Metal-Backed, Bone-Ingrowth Glenoid Component
Medium to Long-Term Results
By Michael J. Taunton, MD, Amy L. McIntosh, MD, John W. Sperling, MD, and Robert H. Cofield, MD
Investigation performed at the Department of Orthopedic Surgery, Mayo Graduate School of Medicine, Mayo Clinic, Rochester, Minnesota

JBJS 2008

Biomet Biomodular 1988

- 32 cemented and 26 MB glenoid
- FU 5 years
- High rate dissociation PE/MB
- Same clinical results
- Higher rate of radiolucent lines in cement group

Resurfacing of the Glenoid in Total Shoulder Arthroplasty

A Comparison, at a Mean of Five Years, of Prostheses Inserted with and without Cement*

By Andrew L. Wallace, M.B.B.S., Ph.D., F.R.A.C.S.†, Robert L. Phillips, M.B.B.S., F.R.A.C.R.†, Graeme A. MacDougal, M.B.B.S., F.R.A.C.S.†, William R. Walsh, Ph.D.†, and David H. Sonnabend, M.B.B.S., B.Sc.(Med), F.R.A.C.S.†, Sydney, Australia

Investigation performed at the Prince of Wales Hospital, University of New South Wales, Sydney.

JBJS 1999

Biomet Biomodular

- 36 TSA in Rheumatoid patients
- Mean FU 132 months (96-168)
- Survivorship: 89% at 10 years
- 1 (**2.7%**) glenoid loosening
- Cone peg
- Initial fixation: 2 screws

The metal-backed glenoid component in rheumatoid disease: Eight- to fourteen-year follow-up

Nicholas David Clement, MRCS Ed*, Keshav Mathur, FRCS Orth, Robert Colling, RCN, Allan N. Stirrat, FRCS Ed

Shoulder Unit, Department of Orthopaedics and Trauma, Sunderland Royal Hospital, Sunderland, United Kingdom

JSES 2010

Kirschner II C

140 uncemented glenoid;7.5 years FU

16 (**11%**) Clinical failures
21 (15%) Radiological failures
16 (11%) Fractured screws

53 (38%) Radiolucent line<1 mm
40 (29%) Radiolucent line 1> <2
2 (1.4%) Radiolucent line >2 mm

Uncemented Glenoid Component in Total Shoulder Arthroplasty

Survivorship and Outcomes

By Scott David Martin, MD, David Zurakowski, PhD, and Thomas S. Thornhill, MD

Investigation performed at the Department of Orthopedics, Brigham and Women's Hospital, Boston, Massachusetts

JBJS 2005

Zimmer Mark 2
1993

- 42 TSA
- FU 7.6 years
- 3 (7.1%) radiological loosening
- 3 glenoid revision
  - 1 PE/MB disassociation (Design change in Mark 3)
  - 1 traumatic loosening
  - 1 primamry glenoid lossoening

Cementless surface replacement arthroplasty (Copeland CSRA) for osteoarthritis of the shoulder

Ofer Levy, MD, MCh (Orth), and Stephen A. Copeland, FRCS,* *Reading, United Kingdom*

JSES 2004

Aequalis Tornier
1994

- 354 total shoulder arthroplasty with a cementless glenoid
- Primary fixation was granted by 2 expansion screw
- Flat glenoid
- Hydroxyapatite on the porous back
- Glenoid Complication **16,5%**
- Glenoid revision **6,4%**

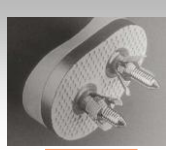
PROTHÈSE TOTALE D'ÉPAULE AVEC UN IMPLANT GLENOÏDIEN MÉTALLIQUE NON SCELLÉ : ETUDE PROSPECTIVE DE 354 IMPLANTS SUIVIS À PLUS DE 2 ANS

P. BOILEAU, C. AVIDOR, G. WALCH

2000

Aequalis Tornier

- 40 double blinded randomized TSA
- 20 PE cemented - 20 metal back
- FU minimum 3 years
- Radiolucent lines 85% PE - 25% MB
- Revision: 0 PE (0%) - 3 MB (**15%**)
- Failure between 1st-4th year



Cemented polyethylene versus uncemented metal-backed glenoid components in total shoulder arthroplasty: A prospective, double-blind, randomized study

Pascal Boileau, MD, Cyril Avidor, MD, Sumant G. Krishnan, MD, Gilles Walch, MD, Jean-François Kempf, MD, and Daniel Molé, MD, *Nice, France*

JSES 2002

Arthrex Univers 3D

1998

- 24 patients with cementless glenoid since 1998
- 26% associated with glenoid bone graft
- 95% no radiolucency
- 4% radiolucent line < 1 mm
- Cage screw
- No locked connection between cage and MB
- No loosening

Cementless glenoid resurfacing in concentric versus eccentric glenoid deformity. A prospective study

Witte D, Magosch P, Lichtenberg S, Habermeyer P

Dept. of Shoulder- and Elbow-Surgery, ATOS Clinic Heidelberg, Germany

SECEC 2003

Zimmer Sulmesh

- 22 TSA
- Mean FU 50.0 months (24-89)
- Multiple layers of highly porous titanium
- 3 (**13.6%**) failure but with broken peg
- No other loosening

Total shoulder arthroplasty with an uncemented soft-metal-backed glenoid component

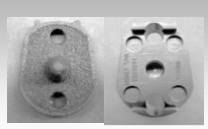
Sandro F. Fucentese, MD, John G. Costouros, MD, Stefanie-Peggy Kühnel, MD, Christian Gerber, MD*

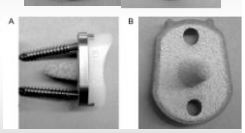
Department of Orthopaedics, University of Zurich, Balgrist University Hospital, Zurich, Switzerland

JSES 2010

Biomet Nottingham 1994/1998

- 90 Biomodular:
  - 75.6% (8y) 71.7% (11y)
- 103 Nottingham I
  - 81.8% (8y)
- Loosening mainly occured in the first 4 y
- 34 Nottingham II
  - 93.1% (4y)





Research article

Open Access

Improvements in survival of the uncemented Nottingham Total Shoulder prosthesis: a prospective comparative study

Nahum Rosenberg, Lars Neumann*, Amit Modi, Istvan J Mersich and Angus W Wallace

BMC Muskoloskeletal Disorders 2007

Our Experience

- We reviewed from 1996 to 2005, 35 consecutive TSA with SMR MB glenoid:
  - 27 (77.1%) primary arthritis
  - 5 (14.2%) post traumatic arthritis
  - 3 (8.5%) rheumatoid arthritis
- Mean age : 62.7 years (53.9-70.8)

Titanium alloy shell with hydroxyapatite coating Convex back side of MB base-plate. Lima Lto

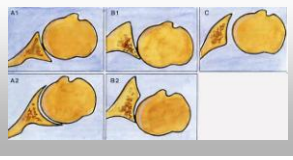
Mid-term results of a metal-backed glenoid component in total shoulder replacement

JBJS Br 2010

Our Experience

Pre Op: X ray and CT scan

- 77,1% A1-A2 (slightly or severe concave glenoid)
- 17,1% B1 (slightly biconcave glenoid)
- 5,7% B2 (severely biconcave glenoid)



Our Experience

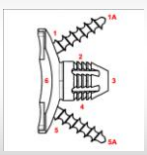
Mean follow-up of 6.2 years (48-154 months)

Clinical data:

- *Constant Score*
- *Vas*
- *SST*

Radiological data:

- *Implant position*
- *Radiolucent lines (Molè classification)*



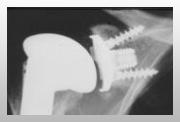
Our Experience

SCORE	PREOP	POSTOP
CS	35.2	70.8
VAS	7.8	3.1
SST	8.4	4.4

Our Experience

27 cases (77.1%)
no radiolucent lines

8 cases (22.8%)
radiolucent lines <2mm



Our Experience

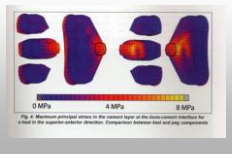
- No PE disassembly
- No glenoid revision or loosening

Why such different results?

- **Shape:** convex, not flat
- **Polyethylene:** material and sterilization
- **Stabilizing system:** central hollow peg, not only screws
- **HA** also on the peg (not only on the MB)
- **???**

Why such different results?

- Shape: convex, not flat
- Stabilizing system: central hollow peg, not only screws
- HA also on the peg (not only on the MB)
- ???



Glenoid Stabilization Elements

- 2 screws (first phase)
- Central hollow peg

3 poor positioning of the screws with no negative effect

Discussion

Open Issues

- *Component*
  - *Stability*
  - *Disassembly*
  - *Breakage*
- *Overstuffing*
  - *Soft tissue tension*
- Poliethilene wear

Polietilene wear
⇩
Metal wear
⇩
Osteolysis
⇩
Loosening

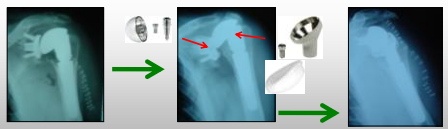
Take Home Message

Glenoid is still the weak point in TSA!

- Needs more investigation, new ideas
- Do not compare pears with apples

… On the other hand ..

- Revision surgery is every day more frequent
- Metal Back glenoid may help to face the revision problems



alex.castagna@tin.it

VuMedi Webinar

Avoiding Complications with Shoulder Arthroplasty
9-23-2013

Periprosthetic Humeral Fractures

Tom R Norris, MD

SAN FRANCISCO shoulder elbow & hand CLINIC

Disclosures: Tornier, Inc. consultant, design surgeon, royalties, stock

Risk Factors for PPF

- Osteopenia-older age, RA
- Soft tissue contractures
- Polyethylene osteolysis
- Cemented, on-growth, in-growth implant stems
- Stress riser with ipsilateral total elbow
- Technical factors
  - Reaming, oversize implant, forceful rotation

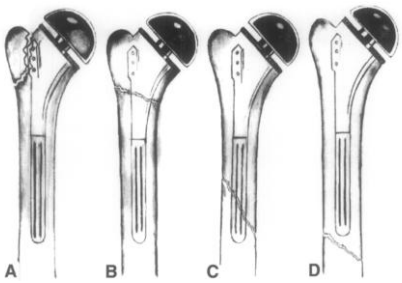
Campbell 1998, Wright, Cofield 1995, Bonutti, Hawkins 1992

Incidence: Humeral fractures in shoulder arthroplasty

- Intraoperative fractures occurs in 0.6-3%- Primary
- Intraoperative fractures 24.1% - Revision humeral stems
  - All intraoperative complications were fractures in RSA series
  - Occurred during prosthesis and/or cement removal in revisions.
  - Overall, this resulted in decreased patient function and satisfaction.
- Postoperative fractures occurred in 1.4% – Primary
  - All postoperative fractures, as found in most studies, were secondary to trauma

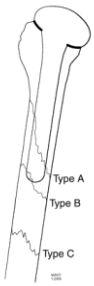
Zumstein, Pinedo, Old, Boileau. Problems, complications, reoperations, and revisions in 782 reverse total shoulder arthroplasty: JSES. 2011.
Wright, Cofield: Humeral fractures after shoulder arthroplasty. JBJS Am 1995.
Iannotti, Williams J Arthroplasty 2002
Campbell, Iannotti et al. JSES 1998

Multiple classification systems



Campbell et al 1998

Classification



Angulation
- 0-15°
- 16-30 °
- > 30 °

Displacement
- Mild < 1/3 shaft diameter
- Mod 1/3 to 2/3 shaft diameter
- Severe > 2/3 shaft diameter

Wright TW, Cofield RH: Humeral fractures after shoulder arthroplasty. *JBJS Am* 1995; 77:1340-1346.

Classifications of Humeral PPF Wright and Cofield-1995

Type	Description	Treatment
A	Above tip of stem	Conservative; functional splint
B	At tip of stem	Poor healing potential with conservative treatment. In low demand patients, if closed reduction can be obtained, trial of conservative management for max 90 days; if no evidence of union, surgical intervention. For healthy, active patients, immediate surgical intervention.
C	Distal to tip of stem	If closed reduction can be obtained, trial of conservative treatment for up to 90 days. If no evidence of healing, surgical intervention.

New category: Planned osteotomies in stem removal or exchange

Proximal humeral periprosthetic fracture classifications derive and expanded from the Johansson 1981 classifications of PPF in the femur

TABLE I Vancouver Classification System for Periprosthetic Fractures Around the Hip

Type	Fracture Location	Implant Status	Bone Quality
AG	Proximal greater trochanter	Stable	
AL	Proximal lesser trochanter	Stable	
B1	Around stem	Stable	
B2	Around stem	Loose	Good
B3	Around stem	Loose	Poor
C	Distal to stem	Stable	

George J. Haidukewych, MD, Joshua Langford, MD, and Frank A. Liporace, MD

THE JOURNAL OF BONE & JOINT SURGERY · JBJS.ORG
VOLUME 95-A · NUMBER 4 · FEBRUARY 20, 2013

REVISION FOR PERIPROSTHETIC FRACTURES OF THE HIP AND KNEE

Treatment options

- Non-operative B and C level fractures
  - prolonged healing and delay rehab up to 7 months
- Implant sparing
  - ORIF with plate/cables/screws
  - Strut allografts cable constructs
- Conversion to long stem
  - Biomechanically stronger
  - Removal well fixed implant problematic
- Alloprosthetic replacement

Kligman, Roffman 1999, Campbell et al 1998, Wirth, Rockwood 1996
Kelly, Purchase, Kam, Norris 2009, Norris, McElheney 1990

Avoiding Periprosthetic Fx in TSA

- Adequate capsular release
- Avoid forceful ER of the arm
- Proper patient positioning to allow exposure
- Avoid endosteal notching during canal preparation
- Avoid aggressive reaming—cortical breach
- Avoid underreaming followed by oversized prosthesis
- Preoperative templating to avoid overreaming
- Beware of patient factors
  - RA, osteoporosis/osteopenia, cortical thinning, previous fracture malunion with deformity
- Creation of humeral windows or humeral unicortical osteotomy parallel to long axis to facilitate controlled removal of well-fixed humeral stem during revisions

Considerations

- Will the fracture heal with non-operative treatment?
  - Fracture location, displacement, component fixation
- Does the humeral component need to be exchange for a different type?
- Is there bone support for the prosthesis, or is auto or allograft support/replacement necessary?

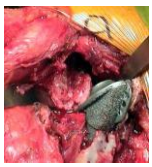
Stress Shielding + Osteolysis in implant for revision

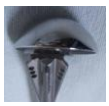
High implant, RCT, stress shielding, and osteolysis

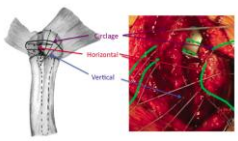
Meticulous use of flexible osteotomes around the posterior fin at the GT results successful stem removal without fracture and preservation of bone stock

Words of caution

- When working proximally, beware the tuberosities
- It can be easy with the sclerotic, thinned bone to causes fractures of GT and LT
- Cut notches for the fins
  - If tri-flange more likely to need osteotomy 83% vs. 8%
    - Phipatanakul J Shoulder Elbow Surg. 2009 Sep-Oct;18(5):724-7
- If they fracture/When they fracture
  - Tag the cuff
  - Prepare to fix it at stem implantation
  - Use same techniques as hemi for fx



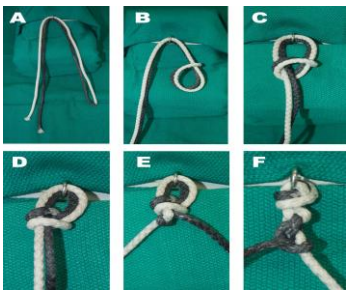


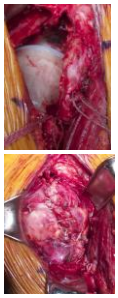


Tuberosity fixation

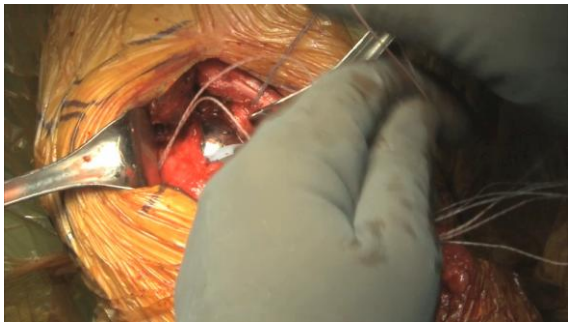
- Racking hitch heavy nonabsorable suture
- Place at cuff insertion to tuberosity
- Cerclage around humeral stem
- Tuberosity overlap shaft
- Then held with SS-rotator interval closure

Techniques for tuberosity reconstruction: Racking Hitch Knot





Racking hitch suture for tuberosity and cerclage shaft fracture fixation



Revision Surgery

10 x risk of fracture than primary!

- Much of revision is implant extraction!
- Inadvertent as well as planned controlled fractures run risks of unanticipated nerve injuries

Bone Preservation in Revision

- GOAL: preserve the humeral shaft circumferential integrity and muscle attachments during stem removal.
- TECHNIQUES:
  - Use flexible osteotomes around GT to loosen the implant sufficiently for an in-line extraction
  - Obtain implant specific extraction device to insert on the top of the humeral stem with an attachable slap hammer --OR–
  - stem extractor
  - gouges for in-line disimpaction
  - longitudinal controlled osteotomy or window

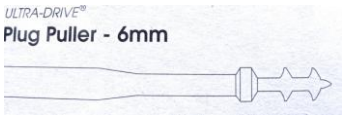
Revision Instruments be prepared!

- Wheel burr
- Sagittal saw
- Flexible osteotomes
- Rigid osteotomes
- Ultra Drive
- Drills (6-9mm)
- cement extraction sets

- System specific extraction devices
- Reverse cutting curettes
- Universal extraction gouges
- Fluoroscopy
- Cerclage cable system (metallic or polymer)

Cement Removal

distal to implant if long IM fixation needed



- 6mm Ultra-Drive plug puller is used to make a central perforation in the humeral cement mantle.
- ALT: use increasing size drills (6-9mm)
- Subsequent use of reverse cutting curettes
- Caution: cortical perforation can occur and cause injury to the radial nerve.
- Use table so fluoroscopy can be used
- Cement can deflect ultra drive and drills out thru weaker cortex!

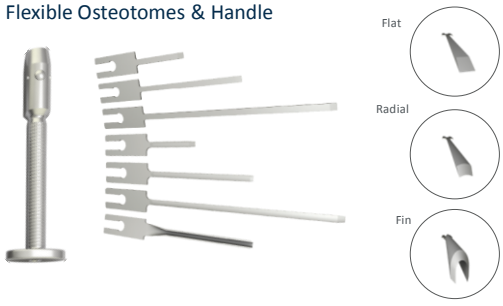
Shoulder Extraction
INSTRUMENTS

Component Removal/Utility Instruments

Cement Removal Instruments

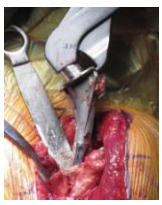
Shoulder Extraction
INSTRUMENTS

Flexible Osteotomes & Handle

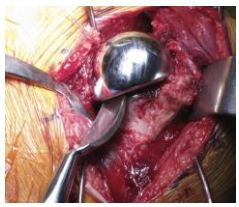


Revision strategies for implant removal

In-Line extraction to preserve shaft



Implant specific extraction device



gouge for in line disimpaction

Humeral Osteotomy or Window

-For stem removal, a high speed circular saw is used to make a controlled longitudinal humeral osteotomy.

-Make the early decision to osteotomize to preserve bone and avoid additional fractures and comminution

Preserve muscle attachments, especially the deltoid

Sperling JW, Cofield RH: Humeral windows in revision shoulder arthroplasty. JSES 2005; 14:258-263.
Increasingly popular: **Gohlke**, Nicholson, Romeo, Kelly G9MD, Tech Shoulder Elbow

Intra-Operative GT Fx

Posterior fin rests with greater tuberosity

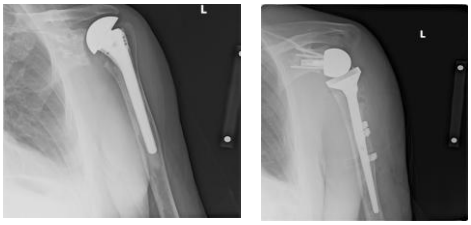
Inadvertent greater tuberosity fracture during disimpaction of a straight humeral stem with posterior fin. This can be avoided by either using flexible osteotomes to better expose the fin or with a controlled osteotomy in cases with poor bone stock.

Preserve GT

PF HHA for PHF →malunited greater tuberosity over HH and glenoid arthrosis

There is a malunion of the greater tuberosity; Despite the malunion, the patient has active FF to 115 degrees, and maintenance of ER.

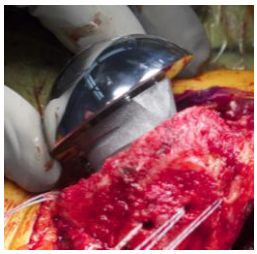
Intraoperative GT Fx, Humeral Osteotomy in revision



Removal of anatomic TSA with RCT, intraoperative greater tuberosity fracture, and humeral shaft controlled osteotomy, PMMA removal, placement of polymer cerclage cables and conversion to RSA with racking hitch GT fixation.

Avoid cx in prosthesis selection

No posterior fin-easier insertion and removal



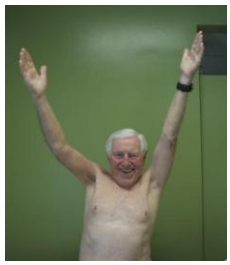
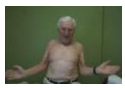
Short stem as ABX spacer removable with humeral preservation

Complications-PPF with short stem

Pre-op healed old humeral shaft fracture

81 yo skier 8 months post-op Periprosthetic fracture

Healed 3 m post closed rx

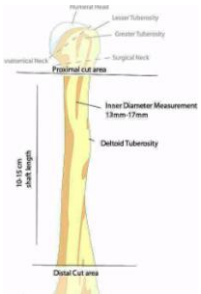



Short Stem TSAs

Bypass deformity in proximal humeral MU
Avoids new fracture

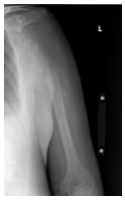
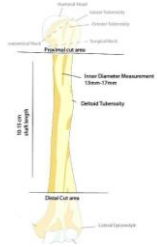

Be Prepared
Revision-bone replacement

- Allograft humerus
  - R and L available
- Tubular or can create struts
- Save native deltoid muscle attachment with bone and wrap around allograft prn



Management of Proximal bone loss

Tubular allograft for additional support and muscle attachments indicated for humeral deficiency


Humerus – less bow than femur to pass long straight stem
RSA preferred in revisions with cuff and bone loss

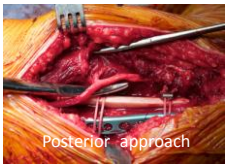
Risk of absent proximal bone support



Prosthesis removal for sepsis radial nerve palsy


Etiology radial nerve palsy

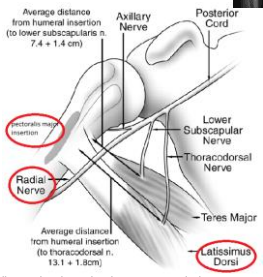
- Drill perforate humeral shaft
- Ultra drive- heat + shaft perforation
- Cerclage cable for fracture fixation
- Trephine-heat with retained stem removal
- Cement extrusion mid shaft
- D-P approach-radial nerve posterior at deltoid insertion
- Safest to isolate nerve posteriorly



Radial Nerve!

at risk with the humeral shaft procedures

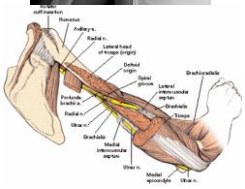
- In revisions, there is distorted, scarred anatomy; nerve can be difficult to identify in its normal location along the humerus.
- Release the pectoralis, the nerve can be traced from a normal area on the belly of the latissimus dorsi and follow it as it courses posterior to the humeral spiral groove, then lateral and distal.



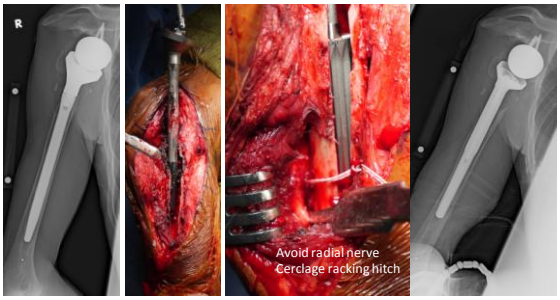
Radial nerve palsy after humeral revision in total elbow arthroplasty. Throckmorton TW, Zarkadas PC, Sanchez-Sotelo J, Morrey BF. JSES 2011. 20(2), 199-205.

Words of caution

- When making osteotomy be weary of the risks of
  - Uncontrolled extension of the fracture down the humerus
  - Nerve injury
    - Radial nerve is especially at risk when fixing the osteotomy/ placing cables
    - Radial nerve is straight posterior at the level of deltoid
  - Suggest getting full exposure before beginning osteotomy



Humeral component unscrewing due to lack of bone support



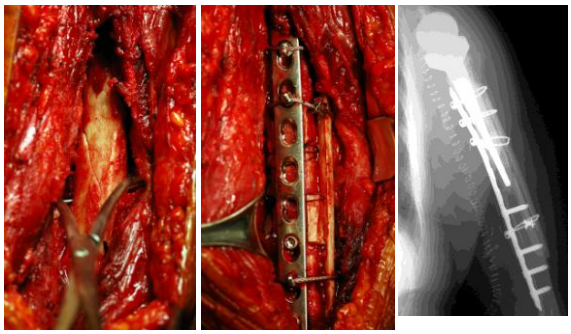
Post Operative PHF – Type B error to wait

Type B fx, obese body habitus

14 weeks after a fall, abundant callus, 15 degrees varus angulation.
The fracture site is not united.
New lucency formation around the humeral stem.

Early fixation of Type B fractures allow return to function sooner and lower chance of nonunion.
Also allow direct examination of stem stability.

ORIF-save the stable implant



ORIF cortical struts

- Allograft provides immediate bone support
- Ultimately increase bone stock
- Aids in load dispersal by increasing surface area

Chandler et. Al Semin Arthroplasty 93: 17/19 fracture treated with allograft struts & cables healed
Haddad et. Al. JBJS 2002: 40 fractures treated with allograft struts secured with cables or plates. 98% union

Longer stem for IM fixation

Post-Operative PPF

Type C displaced muscle interposition

ORIF -preserve prosthesis

Many of the problems begin with mid humeral length stems

Bone loss from revision humeral cemented stem, sepsis
Then humeral allograft, Longer IM stem fixation, PMMA
distal plate for more distal fracture

Periprosthetic Fractures and how to Avoid or Minimize Complications

Short stems or no stems will reduce complications with PPF

- Easy to insert/remove
- Press fit
- Convertible or exchangeable
- More proximal PPF
- Less interference with TER

Summary

- Periprosthetic fractures 1-3 % primary
- Up to 24% in revision surgery
- **Frequently associated with treatment to preserve or exchange standard humeral stems**
- PMMA and in-growth fixation complicate revisions
- Radial nerve at risk in humeral shaft
- More instruments and techniques needed for revisions-be prepared!
- Short stems will likely decrease potential complications associated with longer stems

Thank you

VuMedi Webseminar Sept 2013

DISCLOSURE

I receive

Royalties from TORNIER Inc

for patents on Shoulder Prosthesis

Complications in Reverse SA

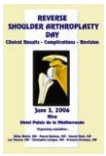
	Complic. rate
Dewilde	**60%**
Rittmeister	75%
Jacobs	14.3%
Boulahia	25%
Dewilde	46.2%
Delloye	80%
Vanhove	8.3%
Sirveaux	15%
Werner	50%
Frankle	17%
Our series	15.7%

About 516 cases, the average complication rate is 22%

Total rate of complications

(Intraop + postop)

Primary arthroplasty	Revision Arthroplasty
15.3%	64.7%



Intraoperative complications

Primary Arthroplasty:
2.7%

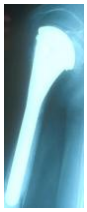
Intraoperative glenoid fracture

- no reaming
- cancellous graft

Intraoperative complications

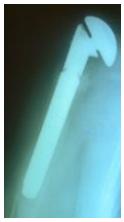
Revision Arthroplasty
30.9%

Humerus fracture: 28%



cement removal,
osteopenia,
old ladys…

a humeral window
is preferable



Postoperative complications

Primary Arthroplasty 12.6%

Revision Arthroplasty 33.8%

Postoperative complications

I^{ary} Reverse Arthroplasty	
Instability	3.3%
Infection	3%
PO hum fc	2.6%
Glen loose	1.3%
Neuro	0.8%
Hum loose	0.6%

Revision Arthroplasty	
Instability	10.6%
Hum pb	10.6%
Infection	6.4%
Hematoma	2.1%
Glen pb	1%

How to avoid **infections** ?

Reoperations are at risk +++

- Cement with Antibiotics (R Gobezie)
- Two stages surgery in case of doubt (cultures & spacer for 6 weeks)



How to avoid **infections** ?

Systematic cultures for any reoperation

if more than one positive

=> oral ATB for 6 weeks

How to avoid **instability** with DP approach

- Use a 42 mm glenosphere
- Correct deltoid tension
- Subscapularis repair and protection


What is deltoid « tension »?

An intraop subjective criteria (conjoint tendon's tension, difficult to reduce , no pistonning, complete adduction…..)

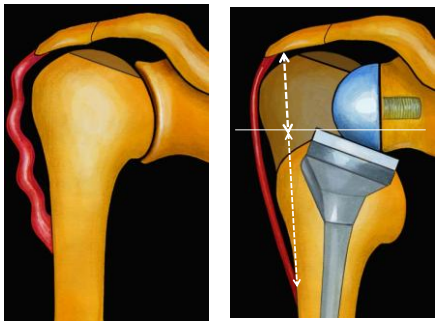
which depends on :

etiology (Post Trauma Arthr, Rev Arthrop…. are stiffer)
anesthesia (degree of sleep, interscalene block)

Therefore assessment of <u>deltoid length</u> is a better objective approach than deltoid tension

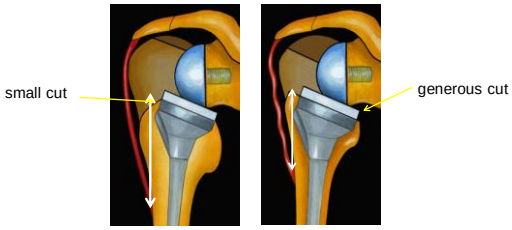
Deltoid length

-position of the glenosphere
-height of the stem



you really control only few factors !

- Position of the glenosphere in the vertical plan (you don't choose)
- Glenosphere size (3 § or 42 mm) (*arm > 300 mm = 1%)*
- Eccentric glenosphere (2 to 4 mm)
- Stem height (cut, spacer, poly) several cm: >10% → Key!

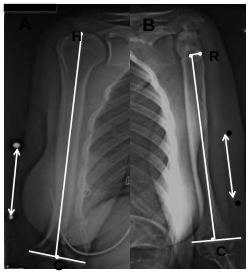


… if CH = CP, average arm lengthening is 2.4 cm
=> deltoid tension is OK

Laedermann - JSES 2008

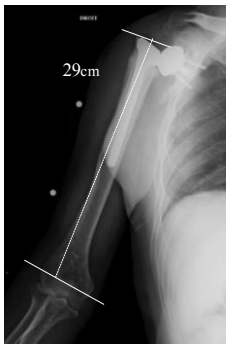
Ideally the metallic top of the prosthesis should be just above the GT

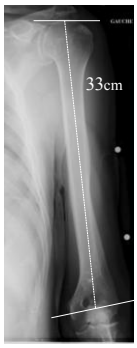
Rather than to check the « tension » of the deltoid,, better to respect the length of the Humerus.

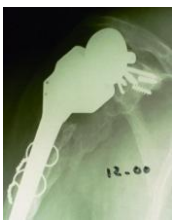


Laedermann
JSES 2008

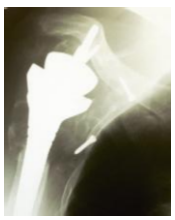
If deltoid length is insufficient => instability

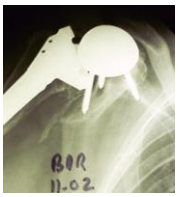






How
to avoid
glenoid
oosening





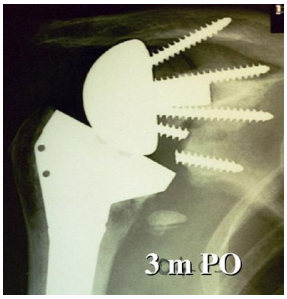
Glenoid loosening causes

- superior tilt, central post not in the native glenoid (technical error)

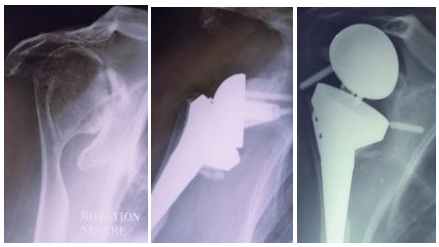
- insufficient glenoid bone stock (excessive indication)

Superior tilt

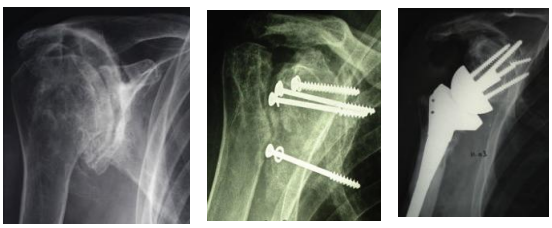
central Post not in the native glenoid



Insufficient glenoid bone stock



If insufficient glenoid bone stock
better to do 2 stage surgery



Influence of learning curve

- 2 consecutive cohorts of 240 Reverse SA implanted by the same two surgeons (LNJ & GW):

  - Sept 1995 -> June 2003 (8y) (J Bone Joint Surg Am. 2007).
  - July 2003 -> March 2007 (4y) (J Shoulder Elbow Surg. 2012)

To evaluate if surgeon's experience modifies complications ?

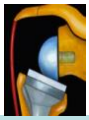
Avoiding complications: experience

	Cohort 1 1995-2003	Cohort 2 2003-2007
Infection	8	1
Dislocation	15	4
Glenoid loosening	2	2
Spine fracture	2	2
Neuro complic	5	7
Humeral loosening	0	1
TOTAL complic	32 = **16%**	17 = **9%**
Revisions	11 cases **4.5%**	7 cases **2.9%**

P= 0.07

Whatabout **Notching** ?

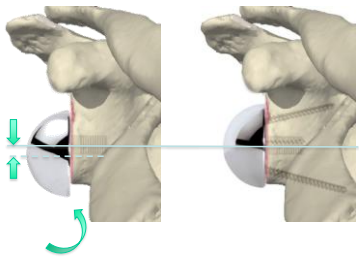
Position of the sphere influences notching

	cohort 1	cohort 2	P =
Notch Gr 0, 1	49.3%	82.3%	**p= 0.012**
Notch Gr 3,4	30%	8.7%	

lowering
the sphere

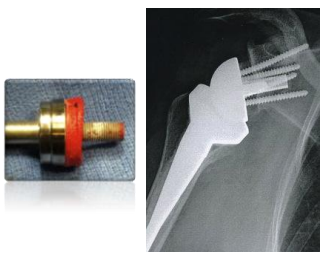
Excentric sphere gives
more inferior clearance

Influence of excentric sphere on notching

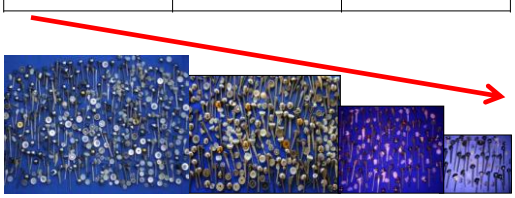
	Cohort 1 **95-03** 152 c; fu: 41m	Cohort 2 **03-07** 198 c; fu: 40m	**Cohort 3** **07-08** 52 c; fu: 30m
Notch 0-1	**49.3%**	**82.3%**	**85.7%**
Notch 3-4	**30%**	**8.7%**	**2.4%**

An other way to limit notching: glenoid lateralization (Boileau)



Revision Arthroplasty decreased (dramatically)

	First cohort	**Second cohort**
Revision Arthroplasty	22,5 % (54 cases)	7 % (17 cases)



Summary

The rate of complication depends on
definition, etiology, intra vs postop, surgeon experience

The main complications are: instability, infection intraoperative fracture and glenoid loosening

Although notching is not a real complication, it is a concern that can be addressed by improving surgical technique

Thank you