Reverse Shoulder Arthroplasty
Indications and Results

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Current Concepts Shoulder and Elbow Surgery
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Disclosures: Biomet Inc., VuMed Inc.

Reverse TSA for CTA

- Grammont 1991
- CTA
- Nothing else works
- Dramatic functional improvements

Presentation will not include discussion of off label or investigational use of products or treatments
Newer Designs

- Improved technology and understanding
- Still remain true to principles of Grammont
- Diminishing Complications
  - Scapular notching
  - Instability
  - Component failure
- Increasing indications and younger age groups

RSA increasing indications and lower age limit

- Yamaguchi JSES 2011
- Gulotta et al JSES 2015
- Hetterich et al 2016
- Shoulder arthroplasty exponential growth
- RSA>>TSA>>>HA
- Younger Patients

RSA
- Expanded indications
- Younger
- Large S not RC
- Revision substantial
- RC ( ) OA
- Glenoid Deformity

Can we expect more revisions?

Recognition of Deformity

Patient specific guides and components

Lead to better results

- Imaging: CT/3D
- Patient Specific Guides
- Patient specific implants
- Expect better outcomes in more difficult pathologic situations
Historic Indications

- Primary
  - CTA 'pseudo-paralysis'
  - RA
- Trauma
  - Sequelae of Fracture
- Revision
- Tumor

Emerging Indications

- Acute trauma
- Chronic instability
  - Walch B2
  - Chronic Anterior Dislocation
  - Chronic Rotator Cuff Failure
  - RA as primary choice-younger
  - Primary Osteoarthritis

Each new indication has its own unique issues to be considered

RSA for Acute Trauma; It's still all about tuberosity reconstruction

Transverse and longitudinal fixation
RSA for Walch B2

Technique options

- Neoglenoid retroversion >27 degrees and subluxation >80%
  - Standard Eccentric Reaming for Baseplate
  - Humeral Head Allograft and Baseplate fixation
  - Augmented Baseplate
  
Tom Wright MD

RSA for Massive/ Irreparable RCT

Risk vs.. Reward vs.. Recovery

- Uncertain healing
- Prolonged recovery/ immobilization
- Limited activity

- More invasive
- More predictable results
- Still need ER
- More possible Cx
- Faster (easier?) recovery

Younger
  - Durability
  - Allowed Activity

RSA

It’s certainly not just CTA anymore!!

- Increasing indications
- Younger patients
- Hopefully much greater longevity!!!
Materials and Methods

- 198 patients
- Ave age 69 (49-93)
- F/u 34mos (21-72)
- Female 123 Male 75

Indications
- CTA 124
  - RCT irreparable 13
  - TRAUMA 24
    - Acute 13
    - Chronic 11
    - Revision 32
- OA glenoid deformity/poor cuff 18

<table>
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<th>Dx</th>
<th>#</th>
<th>UCLA</th>
<th>FE</th>
<th>ER</th>
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<td>112</td>
<td>22</td>
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Complications (n=23) 11.5%

- Infection 2
  - Revision primary TSA
  - P. acnes Instability 2
  - Both late and traumatic
  - Acromial Fx / Deltoide 3
  - Humeral Tray Failure 3
  - Humeral Component Looseing 2
  - Scapular Notching 1 (4.5%)
  - Periprosthetic Fx 1
  - Traumatic Glenoid losseing 1
  - Prostate cancer mets to scapula
Results RSA

- Sperling et al JBJS 2014
  - Retro 44 pts
  - 76(59-92);
- Indications
  - CTA 33
  - TRAUMA 2
  - AVN 6
  - RA 3

- Results
  - NEER LIMITED
  - GOALS E 27, S 15, F 2
  - NONE LOOSE
  - SCAP NOTCH 6.8%

Results of RSA in Emerging Indications

COMPARISON RESULTS-RSA V HA for Fx

- Ferrel et al J Orth Trauma 2015
  - Systematic review
  - No PPTG
  - RSA: CT-GC, More Cx
- Acevedo (Williams) et al JSES 2014
  - RSA may be better recovery, longevity
- Sebastia et al JSES 2014
  - RSA resulted in better pain and function and lower revision rate. Revision from RSA to RSA does not appear to improve
  - Cazenueve et al JBJS 2010/11
  - 10 year FDI
  - Reverse better constant score, more Cx
- Reverse overall slightly better outcome
- HA better if tuberosity healed
- Reverse more complications
- notching and long term outlook?
RSA for OA with Biconcave Glenoid

- Wall et al JBJS 2007
- Mizuno, Denard, Raiss Walch JBJS (AUG13)
- Younger Patients
- Better ROM and Constant scores
- Cx and Scapular notching
- Durability???

\[ \text{Conclusion: viable option in Walch B2 with severe instability and glenoid retroversion} \]

Results of RSA for Massive RCT

Mulieri et al (Frankle) JBJS 2010
- RSA in 60 pts. Massive RCT without OA
- 3 groups:
  - pseudoparalytic without anterosuperior escape
  - pseudoparalytic with anterosuperior escape
  - >90 degrees fwd elevation
- Improved pain and function in all 3 groups

Ek et al. JSES 2013
- 35 pts ≤ 65 years old
- Irreparable RC tears (w/ and w/o Arthritis)
- Subjective and objective outcomes improved
- 38% complication rate

Results of RSA for Massive RCT

- RSA for CTA best cohort group results
  (Boileau, Walch, Favard, Gerber, Frankle)
- RSA results equal in CTA and Massive RCT without arthropathy
  (Werner et al. JBJS 2005)
- Primary RSA better than RSA after failed repair in both groups
  (Cuff et al JBJS 2008, Wall et al. JBJS 2007)
Results of RSA for Massive RCT
But!!!

- Reverse shoulder arthroplasty for massive rotator cuff tear: risk factors for poor functional improvement
  Hartzier et al (Frankle) JSES 2015

- Young age
- Preoperative function
- Neurologic dysfunction

BE WARY OF COPERS!

- Boileau et al
  - No difference in outcome RSA for CTA or Massive RCT without arthropathy
  - Those with “preserved preoperative motion had poorer outcomes”
    - FE 146 degrees vs. 132 degrees
    - Lower CS
    - Not as satisfied

Conclusions

- RSA indications increasing
- Results have improved with better technology and understanding
- Complications have diminished in medium-term F/U
- Durability still issue as younger patients with more active lifestyles are being indicated for RSA more frequently
Thank you!

Glenosphere

- Base-plate design
  - 2 diameters CTA Females
  - Central 6.5 Screw
  - Peripheral Screws
- Glenosphere Size and lateralizing options
  - 36/41 mm in 0, +3, +6 offset
  - Eccentricity 0-4 mm

Humeral Components

- Humeral Stems
- Convertible
- Micro, mini, standard Fx and Long
- Proximal porous ingrowth- smooth distal
How We Prevent Scapular

- Inferior glenosphere tilt
- Inferior glenoid position
- Larger glenosphere
- Lateralization of glenosphere (or BIO RSA)
- Eccentric glenosphere
- Increased inclination angle
- Humeral tray
- Combined lateralization (glenosphere and humeral component)

Design Concepts—Ideal System

- Most advantageous sizing
  - prevent instability
  - deal with bone loss
- Stability Without Cement
- Glenosphere and baseplate
  - Minimize Potential For Loosening
  - Minimize Scapular notching
- System Flexibility and Interchangeability

A Platform System—Builds From

- All Stems, Glenoids, Heads Interchangeable
Flexibility to Handle All Options, All Anatomy

Must Recognize Bone Deformity
CTA
E3-Severe postero-superior glenoid bone loss

Be prepared to deal with it!

- Imaging: CT/3D
- Patient Specific Guides
- Still a function of surgical technique
- Recognition of deformity
- Exposure
- Clear all soft tissue without damage
- Exposure and retractors cannot block instrument
RSA Technique

- Guide wire placement
- Ream over guide
- Baseplate implantation

RSA for Walch B2

* RSA + Bone graft if cannot correct retroversion to 10 degrees
* Amenable with baseplate fixation in compression
  - ALLOGRAFT
  - AUTOGRAFT

Courtesy Tom Norris
BIO-RSA Technique for Walch B2 Glenoid

RSA Technique

- Glenosphere
- Inferior offset
- Inferior tilt
- Lateral offset
- Press-fit humeral component in anatomic retroversion "Convertible"
- On-lay Humeral tray
- Subscapularis repair

Avoid scapular notching
Bone graft if glenoid deficient

* Great stresses
* Graft balanced and secure - cortical surfaces - Norris

Humeral Head graft reversed and placed in superior glenoid defect

Reverse Shoulder Arthroplasty

* Many different designs
* Humeral component and polyethylene Cup designs
  * Intramedullary designs
    * Most cemented
    * Some convertible
    * Centralized
  * On-lay Extramedullary design
    * Most cementless
    * Convertible
    * Alternative humeral biomechanics