

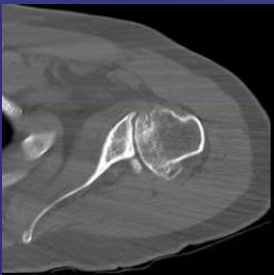
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Posterior glenoid bone loss. Ream, augment, or graft?

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The Problem



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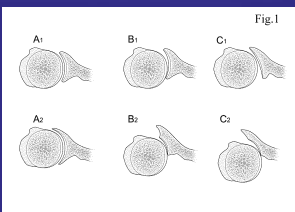
Introduction

- TSA highly successful surgical procedure for glenohumeral arthritis
- Preoperative recognition of glenoid morphology and proper surgical planning = successful outcomes
- Management of severe posterior glenoid bone loss remains controversial.

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Walch Classification


- **Type A1**
 - Humeral head is centered, minor central glenoid erosion
- **Type A2**
 - Humeral head is centered, major central glenoid erosion
- **Type B1**
 - Humeral head subluxated posteriorly without glenoid erosion
- **Type B2**
 - Humeral head subluxated posteriorly with biconcave glenoid
- **Type C**
 - Glenoid dysplasia with or without posterior wear



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Lines and Angles

- Line ED - Friedman Line from medial scapular tip to center of glenoid
- Line AB - Native (paleo) glenoid
- Angle between ED and AB is native glenoid angle
- Line AC - Intermediate glenoid
- Line BC - Neoglenoid



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Purpose

- Address present operative strategies for B2 and C glenoids

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R Why Correct It?

- High shear forces on glenoid component
- Increased glenoid rim loading
- Increased post operative instability and glenoid component loosening
- Increased revision rates



Sanchez-Sotelo JBJS 2003, Moeckel JBJS 1993, Hasan JSES 2002 and many others.

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R Surgical Treatment for B2 Glenoid

- *Asymmetric reaming*
- *Bone grafting*
- *Augmented components*
- *Reverse total shoulder arthroplasty*

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R High Side Takedown

- Most common technique used
 - 15° may be the limit of correction possible
- Limited by bone stock
- Medializing joint line
- Narrowing face
- Downsizing ultimate glenoid
- Medial perforation by device

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R **Asymmetric Reaming and Glenoid Resurfacing**

- Difficult to recreate normal glenoid version in cases of severe glenoid retroversion without removing substantial anterior bone
- Sabesan et al.
 - correction of moderate to severe glenoid retroversion by asymmetric reaming cannot always be done with use of a standard component, and if it is done, it will result in greater medialization of the joint line
- Clavert et al
 - correction of greater than 15 degrees of retroversion is not possible without violating the anterior subchondral bone
- Gilliespie et al
 - 15° deformity has only a 50% chance of successful correction by anterior, eccentric reaming in a cadaveric model

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R **Asymmetric Reaming and Glenoid Resurfacing**

- Walch et al
 - violation of subchondral bone can lead to early glenoid radiolucency and failure

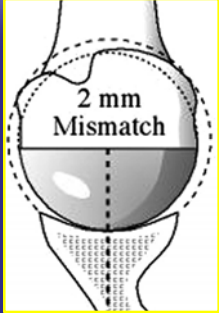
Positive studies

- Gerber et al
 - asymmetric reaming resulted in correction of posterior humeral subluxation in 21 of 23 patients (91%).
- Habermeyer et al
 - Following asymmetric reaming and soft-tissue balancing, the humeral head was maintained in a recentered position

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R **Ream and Run**


- Active patient
 - humeral arthroplasty
 - concentric reaming of glenoid bone to spherical concavity with diameter of curvature 2 mm greater than that of prosthetic humeral head.
- Clinton et al
 - ream and run can offer similar functional recovery to patients with total shoulder arthroplasty
 - longer time to recovery
- Matsen et al
 - ream and run substantially corrected glenoid type in conjunction with B2 glenoid on the axially view radiographs . 13 % revision rate
- Gilmer et al
 - best suited for older male with reasonable preoperative shoulder function without prior shoulder surgery



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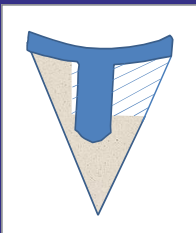
R **Grafting**

- Very uncommonly done
- Large defects (>30 degree)



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R **Critical for Grafting**



- Sufficient implantation into native bone
- Most of central peg (or medial component) at minimum
- Floating implant in graft risks early failure

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R **Bone Grafting**

- Mixed results
- Neer and Morrison
 - excellent results in 16 patients and satisfactory results in 3 patients, and no revision surgeries
 - No glenoid loosening or migration at 2 year follow up
- Steinmann and Cofield
 - 82% had satisfactory results at 5 year follow up
 - 54% demonstrated radiolucency, 3 were radiographically loose
- Hill and Norris
 - 29% of grafts failed, 2 required revision
- Sabesan et al
 - ten of the twelve patients had graft incorporation without any resorption and two had minor bone graft resorption
 - 2 required revision

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Augmented Glenoid

- Indication: posterior bone loss is between 3 and 9 mm on the axial view
- Can allow correction of retroversion and minimize effect of medialization
- Retroversion greater or equal to 20° difficult to place a pegged glenoid component perpendicular to plane of scapula by asymmetric reaming without center peg perforation
- **B2 glenoid with between 3mm and 9mm of posterior bone loss**
- No long term data



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Reverse Shoulder Arthroplasty (RSA)

- *Mizuno et al*
 - *successful clinical and radiographic results for RSA for biconcave glenoid/intact rotator cuff*
- More data is required to determine indications of RSA in patients with posterior subluxation and posterior glenoid bone loss with intact rotator cuff

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Surgical Treatment for Type C glenoids

- *Glenoid retroversion of >25 degrees*
- Most commonly seen as congenital or dysplastic development
- Bonneville et al
 - Improvement in clinical measure at 2 year follow up in patients treated with hemiarthroplasty
- Sperling et al
 - 3 out of 4 patient underwent revision to TSA
- Edwards et al
 - Improvement in outcome measures in 15 patients treated with hemi or TSA at a mean of 37 month follow up
- **Using inset bone-sparing glenoid component with a single, short peg may be helpful to avoid cortical penetration**

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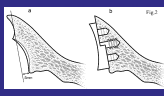
C2 Glenoid

- Type C glenoid with uncentered humeral head posteriorly subluxated
- Posterior rotator cuff is shortened
 - May lose internal rotation if retroversion is corrected to neutral version
- **Re-center humeral head without correcting the version to neutral**
- *If ≤ 9 mm of posterior bone loss, augmented component can be used*

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My Current Surgical Approach

- ≤ 3 mm of posterior wear
 - Assymetric reaming of anterior glenoid
- 5mm of posterior wear
 - Anterior reaming of 2 mm with 3 mm stepped component
- 9 mm of posterior wear
 - Anterior reaming of 2 mm with 5 mm stepped component
- > 9 mm
 - Bone grating. Stepped component may not be appropriate

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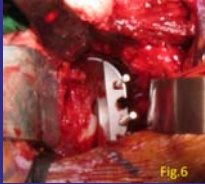
Concerns

- Surgeons require optimal operative planning and technique, especially in terms of properly sizing and determining the height of components.
- Challenging to place guide pin in a location that avoids peg perforation and to accurately place glenoid component
- Multiple software options available to guide surgeons

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R **Summary**

- Unsolved problem with reason for concern over the long term
- Augments bring a new set of tools to the table
- Reverse for serious wear in the elderly may be a big help



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- Thanks to Dr. Routman for assistance with some slides for this talk.

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THANK YOU.

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