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.
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

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

Purpose

- Address present operative strategies for B2 and C glenoids
Why Correct It?

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


Surgical Treatment for B2 Glenoid

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

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
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 mediolateralization 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

A study by Gerber et al. asymmetric reaming resulted in correction of posterior humeral subluxation in 21 of 23 patients (91%).

Following asymmetric reaming and soft-tissue balancing, the humeral head was maintained in a recentered position.

Positive studies

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

Asymmetric Reaming and Glenoid Resurfacing

- Active patient
  - Humeral arthroplasty
  - Concave-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

- Matsu et al
  - Ream and run substantially corrected glenoid type, as confirmed with 2D glenoid on the axially view radiographs, 23% revision rate

- Gilmer et al
  - Best suited for older male with reasonable preoperative shoulder function without prior shoulder surgery

Ream and Run
Grafting

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

Critical for Grafting

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

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
  - 42% 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
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 pegged glenoid component perpendicular to plane of scapula by asymmetric reaming without center peg perforation
- B2 glenoid with between 3 mm and 9 mm of posterior bone loss
- No long term data

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

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
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

My Current Surgical Approach

≤ 3 mm of posterior wear
- Assymmetric reaming of anterior glenoid

5 mm 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

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
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

THANK YOU.