

Difference in Anterior and Posterior Glenoid Morphology Affects Bone Graft Dimensions for Glenoid Reconstruction

Michael John Steflik¹, Branum Gage Griswold², Dhara Patel, Andrew Robert Murphy, Joseph W Galvin, Matthew T Provencher, Stephen A Parada

¹Orthopaedic Surgery, Medical College of Georgia at Augusta University, ²Augusta University

INTRODUCTION: The osseous morphology of the native anterior glenoid is often a gradual slope from the corner of the anterior glenoid to the glenoid vault, whereas the posterior glenoid has a much more acute angle before merging into the glenoid vault. This difference in morphology becomes clinically significant when considering the available surface area of the anterior and posterior glenoid for bone grafting procedures in the setting of recurrent instability. The purpose of this study is to define the area available for bone graft placement in a control cohort of age and gender matched controls with simulated 20% glenoid bone loss (GBL) to a cohort of patients who have undergone bony reconstruction procedures. We hypothesize there will be a greater area available for graft placement on the anterior glenoid with simulated 20% bone loss compared to the posterior glenoid.

METHODS:

After IRB approval, a retrospective review of identified patients age (± 1 year) and gender matched to a cohort of patients who had a bony reconstruction procedure of either the anterior or posterior glenoid was performed. These individuals had computed tomography (CT), magnetic resonance imaging (MRI), or magnetic resonance arthrography (MRA) imaging available and presented to a subspecialty shoulder clinic from 7/2/2018 to 5/5/2021. CT scans were the preferred imaging to use in this study; however, if no CT was available, MRI or MRA were utilized. To measure glenoid diameter and simulated GBL, an axial cut corresponding to the mid-height of the glenoid was used to measure glenoid width and define a line from the midpoint of the glenoid width to the center of the glenoid vault. At the glenoid width that corresponded with 20% bone loss for the anterior and posterior glenoid, the depth was measured along the mid-glenoid line, which correlated to the area available for bone graft (Figure 1). Measurements were taken by two investigators and assessed for interrater reliability using intraclass correlation coefficient.

RESULTS:

33 patient images were included in the analysis. There were 26 males and 7 females, with an average age of 27.9 years. CT scans were utilized in 5 measurements, MRI on 10, and MRA on 18. The average glenoid width for the entire cohort was 29.05 mm, with an average 20% bone loss measurement of the glenoid face being 5.95 mm. There was a statistically significant amount of area available for graft placement with simulated anterior GBL compared to posterior GBL (17.82 mm vs 10.15 mm, respectively; $p < 0.01$) (Table 1). Interrater reliability was very good, with an intraclass correlation coefficient of 0.945, 0.843, and 0.891 for glenoid width, depth of posterior GBL, and depth of anterior GBL, respectively.

DISCUSSION AND CONCLUSION: This study suggests that patients with anterior GBL have an increased surface area for bone graft placement compared to patients with posterior GBL. Surgeons need to be aware of this discrepancy as it could pertain to the union rates of anterior versus posterior bone graft procedures, as well as assisting surgeons in recreating normal glenoid morphology in the setting of glenoid reconstruction.



Figure 1. Right shoulder magnetic resonance imaging axial cut demonstrating the technique used to measure simulated glenoid bone loss for the anterior and posterior glenoid. Anterior and posterior glenoid bone loss was found to be 20.8 and 12.4 mm in this figure, respectively.

Table 1. Final measurement outcomes.

Measurement	Mean	Std Dev	Min	Max	Range
Glenoid width (mm)	29.05	3.18	21.80	34.90	13.10
20% Bone loss (mm)	5.95	1.08	4.36	10.80	6.44
Depth Anterior bone loss (mm)	17.82	3.03	11.10	24.50	13.40
Depth posterior bone loss (mm)	10.15	1.72	7.00	13.30	6.30
Difference of anterior:posterior (%)	180.82	44.42	94.87	291.67	196.79