Microvasculature of the Glenoid Labrum in an Age-Dependent Cadaveric Model

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INTRODUCTION: The glenoid labrum is a well-documented stabilizer of the glenohumeral joint. Injuries to the labrum can lead to clinical pathologies of complex shoulder pain. Specifically, superior labral anterior to posterior (SLAP) lesions can become an issue seen in overhead athletes, young laborers, and middle-aged laborers. Treatment of these lesions can be controversial as healing rates are widely variable. The success of these repairs is likely related to its vascular supply. However, the vascularity of the glenoid labrum has not been widely studied. Despite evidence that suggests that vascularity decreases with increasing age, existing studies examining the vasculature of the glenoid labrum solely include shoulder specimens from an older population. The literature currently lacks clear characterization of glenoid labrum vasculature in a younger population, as well as a description of how vascularization is affected by increasing age.

METHODS: Twenty-four cadaver shoulders were dissected to isolate the glenoid labrum. Twelve shoulders were young (patient age ≤ 40 years, mean 31.3 years) and 12 were old (age > 40, mean 66.8 years). Each labral specimen was fixed in 4% paraformaldehyde before undergoing sectioning into 6 distinct regions: anterosuperior (AS), anterior (Ant), anteroinferior (AI), posterosuperior (PS), posterior (Post), and posteroinferior (PI). The biceps anchor was included in the PS region for all shoulders. Immunohistochemical staining for the CD34 marker was performed to highlight vascular areas in the labral tissue. Microscopic analysis was performed to identify the vascular density of the outer, middle, and inner layers of each sectioned labral specimen. Vascular densities were compared by region and age using one-way ANOVA and Tukey HSD post-hoc tests. Statistical analysis and plotting were completed.

RESULTS:

The vascular density in the older shoulder cohort showed significant differences in penetration with more vasculature present in the outer layers compared to the inner layers ($p < 0.0001$). This pattern was mimicked in the younger shoulder cohort ($p < 0.00001$). Younger shoulders had significantly greater vascular density compared to older shoulders for every region ($p < 0.05$). In younger shoulders there were no significant differences in vascularization among the 6 regions. In the older shoulders the posterosuperior and anterosuperior regions had less vascularization in the outer layers compared to the other regions ($p = 0.041$).

DISCUSSION AND CONCLUSION:

The glenoid labrum is predominantly supplied by peripheral vasculature, demonstrated by increased vascular density in the outer layers; deeper penetration into the labral tissue is associated with decreasing vascular density. While prior studies on older shoulders demonstrated graded vascular density of the glenoid labrum, younger shoulders do not appear to have differences in vascular supply among the six regions. In younger shoulders, repair of all labral lesions may be successful due to its homogenous vascular supply among the regions. Increasing age is associated with decreased overall vascular density, and the posterosuperior and anterosuperior regions are most affected. This finding correlates with the clinical finding of degenerative SLAP tears and may explain the unsuccessful nature at repairing these lesions in the older population.