Assessment of Acetabular Labral Blood Flow Using Laser Doppler Flowmetry Before and After Arthroscopic Capsular Autograft Labral Reconstruction

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Summary: The use of capsular augmentation enables preservation of the donor-tissue blood supply with local tissue transfer, suggesting that current labral repair techniques can preserve labral perfusion.

Data: INTRODUCTION: All-arthroscopic capsular autograft labral reconstruction has been proposed to repair complex or irreparable tears. Cadaveric studies have suggested that the acetabular labrum receives its blood supply from branches of the periacetabular periosteal vascular ring, with perfusion remaining intact in most hips exhibiting labral tears. Despite this, little is known about the exact course of blood flow to labral tissue or how surgical reconstruction affects microvasculature during hip arthroscopy. The purpose of this study was to examine the effects of all-arthroscopic capsular autograft labral reconstruction on labral blood flow in vivo using laser doppler flowmetry (LDF) to measure microvascular perfusion. METHODS: Patients aged 18 years old undergoing arthroscopic repair of the acetabular labrum by a single surgeon. Labral repair was performed via a previously published capsular autograft labral reconstruction technique. A LDF probe (Moor Instruments) measured microvascular blood flow flux (perfusion units [PU]) within 1 mm3 of surrounding labral tissue. LDF measurements were taken medial and lateral to the region of the tear before/after labral reconstruction and before/after labral elevation from the acetabular rim. The mean of flux measurements was expressed as a percent change from each patient’s baseline measurements. The change in labral perfusion was analyzed using student t-tests, one-way ANOVA using Tukey’s method for multiple comparisons, and multiple regression analyses. Lending from previous literature, flux decreases ≥50% were considered clinically significant. RESULTS: This study included 41 patients (24 males [58.5%]; 17 females [41.5%]) undergoing arthroscopic labral repair with capsular autograft reconstruction with mean [SD] age 31.3 [8.4] years, BMI 24.8 [3.3] kg/m2, lateral center edge angle (LCEA) 35.3 [4.9] degrees, Tonnis grade 5.8 [5.8] degrees, and mean arterial pressure 96.0 [10.9] mmHg. The mean [95% CI] percent change in blood flow following labral elevation was -9.24% [-0.04] to (-18.1)]. Following labral reconstruction, the mean [95% CI] percent change in blood flow medially was -22.3% [-11.9] to (-32.7]) and laterally -32.5% [-23.6] to (-41.5]). There was no significant difference between medial versus lateral perfusion (p = 0.136) following repair. Unadjusted analyses stratifying for age, BMI, sex, type of impingement, Tonnis/Outerbridge class, amount of capsule used for augmentation, and suture technique were not found to be correlated with differences in labral perfusion median (p < 0.05) or laterally (p = 0.05). Multiple regression analyses controlling for BMI, LCEA, suture technique, age, mean arterial pressure (95% CI) percent change in blood flow following labral reconstruction was not found to be correlated with changes in medial (p > 0.05) or lateral (p > 0.05) labral perfusion. Finally, all changes in flux were found to be significantly less than the 50% threshold, when comparing decreases following labral elevation (p < 0.001) and labral reconstruction medially (p < 0.001) and laterally (p < 0.001). DISCUSSION: While the vascular nature of the acetabular labrum has been described in literature, preservation of labral blood flow following arthroscopic labral repair has not yet been objectively reported. This study found that techniques to preserve native hip anatomy and vascular supply may adequately maintain perfusion to labral tissue and promote healing. Although this study cannot be generalized to all variations of labral repair/reconstruction, these results suggest that surgeons can employ techniques that preserve microvascular tissue perfusion.

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