INTRODUCTION:
The hip labrum serves a vital role in hip joint stability and maintenance of articular cartilage health. The hip labrum enhances hip stability by increasing the effective surface area of the joint and serves as a fluid seal for the joint. Hip labral tears have been implicated in the development of hip osteoarthritis, presumably due to compromise of a joint fluid seal effect that allows for pressurization that protects the cartilage surfaces from degeneration[1]. Debate exists on whether the labral tear should be surgically repaired versus debrided and reconstructed. There are no studies that have shown a superior effect of joint fluid extravasation prevention with current hip labral repair techniques versus total debridement and reconstruction. Thus, the objective of this study is to determine whether standard, suture-anchor hip labral repairs outperform debridement and reconstruction in restoring the fluid seal properties of the hip labrum.

METHODS:
The cadaveric hemipelvis of each specimen was carefully dissected down to the hip capsule. There were five hip conditions, the hip labrum intact, labral tear, simple repair (standard, suture-anchor repair), complete debridement (100%), and reconstruction tested conditions in four, fresh-frozen cadaveric hip specimens from different individuals. An experienced fellowship trained attending orthopaedic surgeon performed all procedures. Using a mini C-arm (GE OEC Miniview™ 6800) to visualize placement of a BD Insyte™ Autoguard™ Shielded I.V. Catheter (20 GA), a line was opened, connecting to a container holding the saline solution, which opened into the capsular potential space, with careful prevention of damage to the labrum. This custom fluid infusion configuration, designed to deliver fluid at a constant pressure, has been validated in a prior study[2]. The ‘intact’ condition measurement was then recorded. A labral tear was then simulated by an incision on the anterosuperior portion of the hip-joint capsule. Subsequently, a simple capsular repair using 3 Smith and Nephew™ BioRaptor 2.3 PK Anchors was performed. After flow rate measurements were obtained, the labrum was completely debrided (100%) and the labrum was reconstructed using the cadaveric tensor fasciae latae. Measurements were again recorded post-debridement and post-reconstruction.

Joint-capsule fluid extravasation for each repair condition was measured as the flow rate of a saline solution from a container in which the mass of the saline solution was monitored. After a steady state flow was reached for each pressure and condition, the mass of the saline solution was measured at t = 0, 30, 60, 90, and 120 seconds. By subtracting the masses recorded at each respective time point, flow rate was determined. This process was repeated at pressures of 13.8 kPa, 20.7 kPa and 27.6 kPa. Pressure level was randomized for each repair condition. Flow rates were averaged over the 4 timed periods.

Statistical analyses were carried out using a 2-way, repeated-measures ANOVA with treatment as one factor with 5 levels and pressure as the second factor with 3 levels. Student-Newman-Keuls multiple comparison tests were used to determine differences between levels. Statistical difference for all tests was taken as an alpha level < 0.05.

RESULTS:
Surgical repair was found to have a significant effect on flow rate (p<0.0001) as did pressure (p<0.0002). The effect of surgical repair was found to be more pronounced at higher pressures (p<0.0001). As seen in Figure 1, flow rate was lowest in the intact state (0.006 ± 0.008 ml/sec), statistically higher for the simple repair (0.220 ± 0.243 ml/sec), and the greatest for the labral tear (0.563 ± 0.360 ml/sec), debridement (0.617 ± 0.368 ml/sec), and reconstruction states (0.572 ± 0.330 ml/sec). There was no difference in flow rates between the labral tear, debridement, and reconstruction states. Flow rates were significantly different for each applied pressures, increasing with increasing pressure; lowest at 13.790 kPa (0.287 ±0.276 ml/sec) intermediate at 20.684 kPa (0.396. ±0.365 ml/sec), and highest at 27.6 kPa (0.502 ± 0.449 ml/sec).

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REFERENCES: