

Preoperative Quantitative Imaging Use in Predicting Intraoperative Decision for Hip Labral Repair Versus Reconstruction

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BACKGROUND

Gold standard treatment of hip labral tears is arthroscopic labral repair; however, should the labral tissue be insufficient or of poor quality as to prohibit repair, reconstruction is a viable alternative option. Despite prior efforts to correlate preoperative risk factors such as radiographic (1, 2) or demographic data (3, 4) with repair vs reconstruction, it remains that labral tissue quality is most reliably determined based on arthroscopic intraoperative inspection (3, 5-10). Unfortunately, there exists few concrete data points to operationalize the viability of labral tissue and to assist with complex operative decision making. Siemen's T2 mapping technology has been shown to accurately evaluate tissue integrity and discriminate between healthy and damaged cartilage, with a higher T2 value corresponding to more tissue damage. Objective datapoints regarding labral tissue consistency from a preoperative T2 MRI could greatly assist decision making for labral reconstruction versus repair.

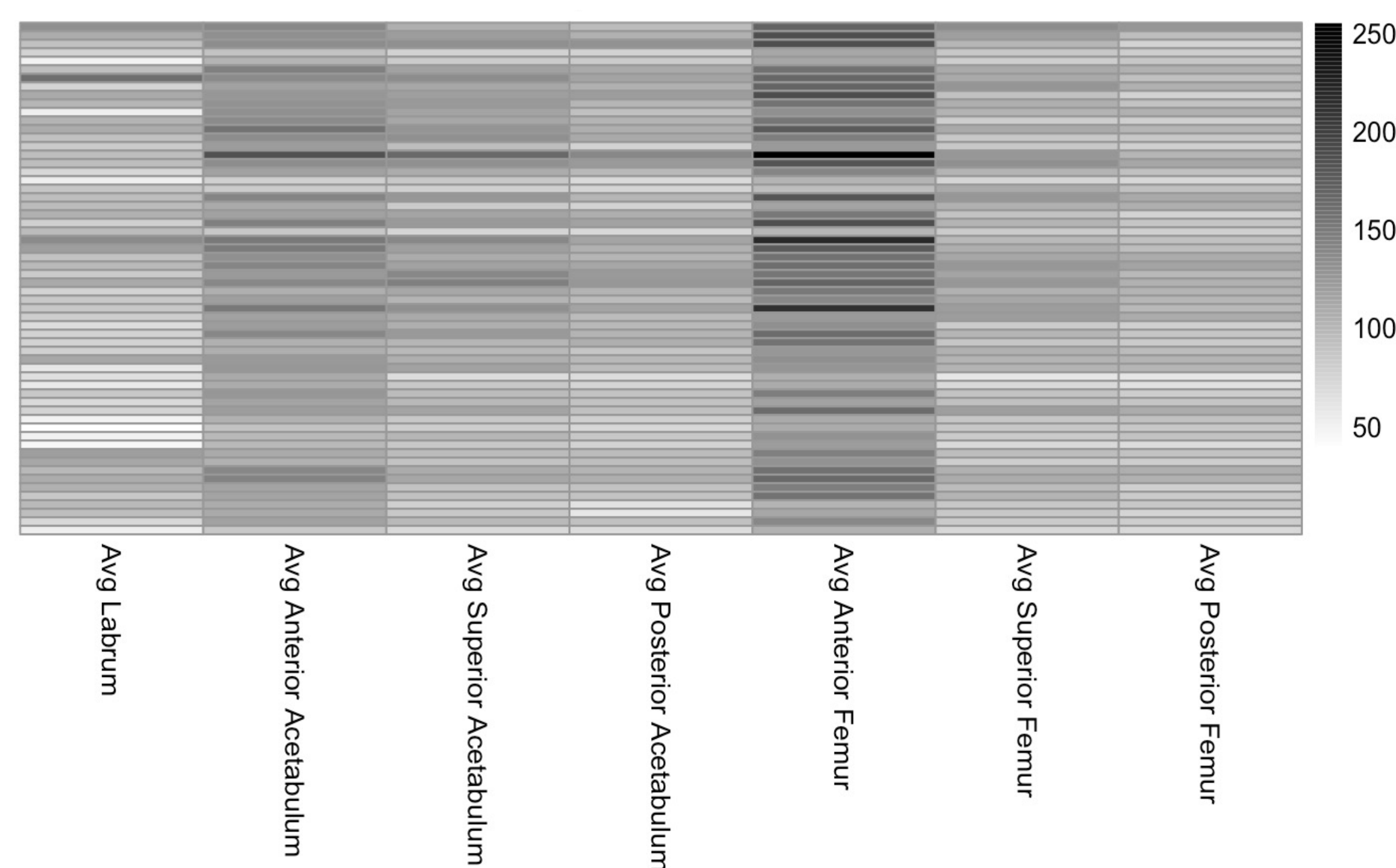
OBJECTIVE

Determine if quantitative MRI with T2 mapping can be utilized to help predict a labral repair versus reconstruction prior to performing hip arthroscopy.

HYPOTHESIS

We hypothesize that patients with labral reconstruction will have significantly higher T2 mapping values than patients who underwent labral repair

Heatmap of T2 Values for All Sequenced Structures



Wilcoxon Signed-Rank Test Statistic

	Labrum	Acetabulum Cartilage			Femoral Cartilage		
		Anterior	Superior	Posterior	Anterior	Superior	Posterior
Male	0.0167	Too few	0.001	Too few	0.005	0.005	0.040
Female		0.061	0.106	0.027	0.022	0.655	0.992
Repair	0.1195						
Recon							

Mean Recorded Values

	Labrum		Anterior Femoral Cartilage		Superior Femoral Cartilage	
	Repair	Recon	Repair	Recon	Repair	Recon
Male	84.66	64.95	142.11	111.61	93.68	104.87
Female	92.72	109.55	160.79	159.37	102.60	111.54

Females demonstrating higher T2 Labral values

Females demonstrating higher T2 anterior femoral head cartilage zones values

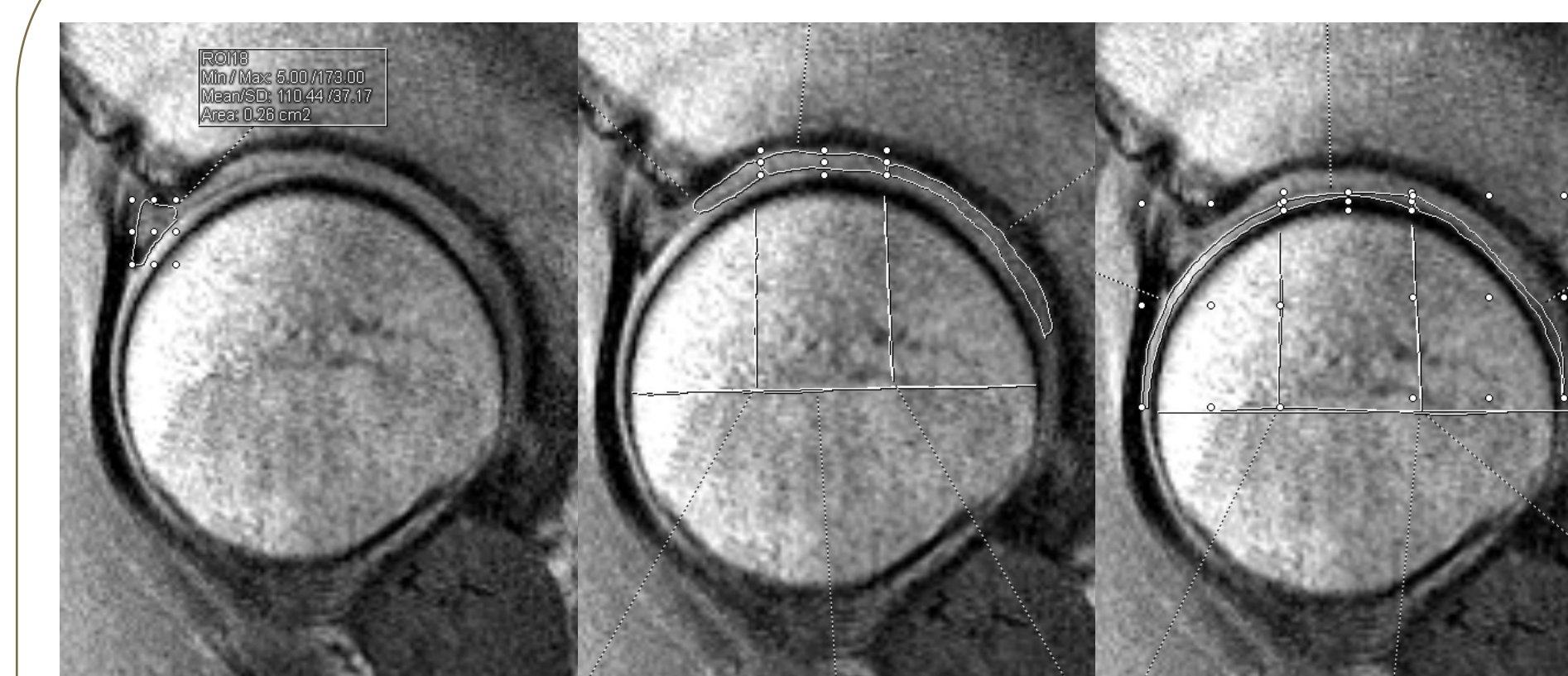
Females demonstrating higher T2 superior femoral head cartilage zones values

RESULTS

60 operations qualified for enrollment into the study which consisted of 10 labral reconstructions and 50 labral repairs with an average age of 31.08 years (SD 10.09 years) ranging of 14-50 years old. There were 33 females and 27 males total with 11 patients receiving arthroscopic procedures on bilateral extremities at different time periods during the interval of interest in this study. The ICC for all three evaluators' T2 mapping values for the labrum was 0.75 (moderate reliability). Mean T2 value for reconstructed labrum was 76.3ms compared to 89.3ms for repaired labrums with p-value of 0.1195.

METHODS

This was an IRB-approved, retrospective case-control study at a single institution between 3/2021-2/2023. Inclusion criteria: Patients who underwent hip labral repair or reconstruction between 18-80 y/o with preoperative 3.0T MRI within the institutional PACS. Exclusion criteria: Prior hip arthroscopy procedures, prior hip/labral trauma, inflammatory arthritis, recent intra-articular injection, lack of appropriate T2 mapping images. 3 reviewers blinded to patient information used Syngo.via T2 mapping software to each provide 3 separate sequencing analyses on optimal T2 sagittal cut. The average T2 mapping value was recorded for the labrum and anterior, superior, and posterior acetabular and femoral head zones. Statistical analysis was performed with inter-rater correlation coefficients (ICC) estimates and 95% confidence intervals calculated using Procedures for Psychological, Psychometric, and Personality package version 2.3.3 based on mean-rating, consistency, 2-way mixed-effects model.



Labrum Acetabular cartilage Femoral cartilage

Sample Labral sequence

DISCUSSION

T2 mapping with preoperative MRI does not appear to demonstrate significant differences regarding labral repair and reconstruction. The data revealed potential sex differences in the pattern of cartilage degeneration. Our study plans to look at further differences and other possible predictors/influences with reconstruction/repair outcomes during hip arthroscopy that could assist with preoperative decision making.