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Appendix

Statistical Methodology for Repeated-Measures Clustering

To investigate how the T1 values varied over the twenty regions defined by the bone (femur or acetabulum), region of interest (central or peripheral), and radial plane (anterior, anterior-superior, superior-anterior, superior, and superior-posterior), we plotted the mean T1 "profiles" illustrating variation across the radial planes for each of the four bone/region-of-interest combinations. We then used repeated-measures analysis of variance (ANOVA) with three factors (bone, region of interest, and radial plane). The clustered nature of the data, resulting from repeated measures within each subject, was accounted for by first choosing an appropriately patterned covariance matrix for each outcome variable (preoperative, one-year, and two-year values and the change scores across the time points). Starting with a saturated means model, we used likelihood ratio tests and the Akaike information criterion based on restricted maximum likelihood to evaluate possible covariance structures. Further modeling assumed an unstructured pattern for the four bone/region-of-interest combinations and either a compound symmetry or a first-order autoregressive pattern for the radial planes. An intercept-only model for the change score was used to test for the overall mean change over time. By constructing appropriate contrasts of parameters from the saturated means model, we tested whether the central and peripheral profiles were the same within the femur and within the acetabulum. These analyses utilized the full information gained by measuring T1 at twenty locations in each hip, while appropriately accounting for within-subject correlations.

A cumulative logit model was used to assess whether the three-level labrum and cartilage morphologic grades varied across the radial planes. Clustering by subject was accounted for by using generalized estimating equations. For presentation purposes, we combined the two abnormal grades and calculated the percentages with abnormal morphology, with 95% confidence intervals calculated from a logit model by using generalized estimating equations. Two-sided p values were reported, and all analyses were performed with SAS version 9.3 (SAS Institute, Cary, North Carolina), including the MIXED and GENMOD procedures. ■

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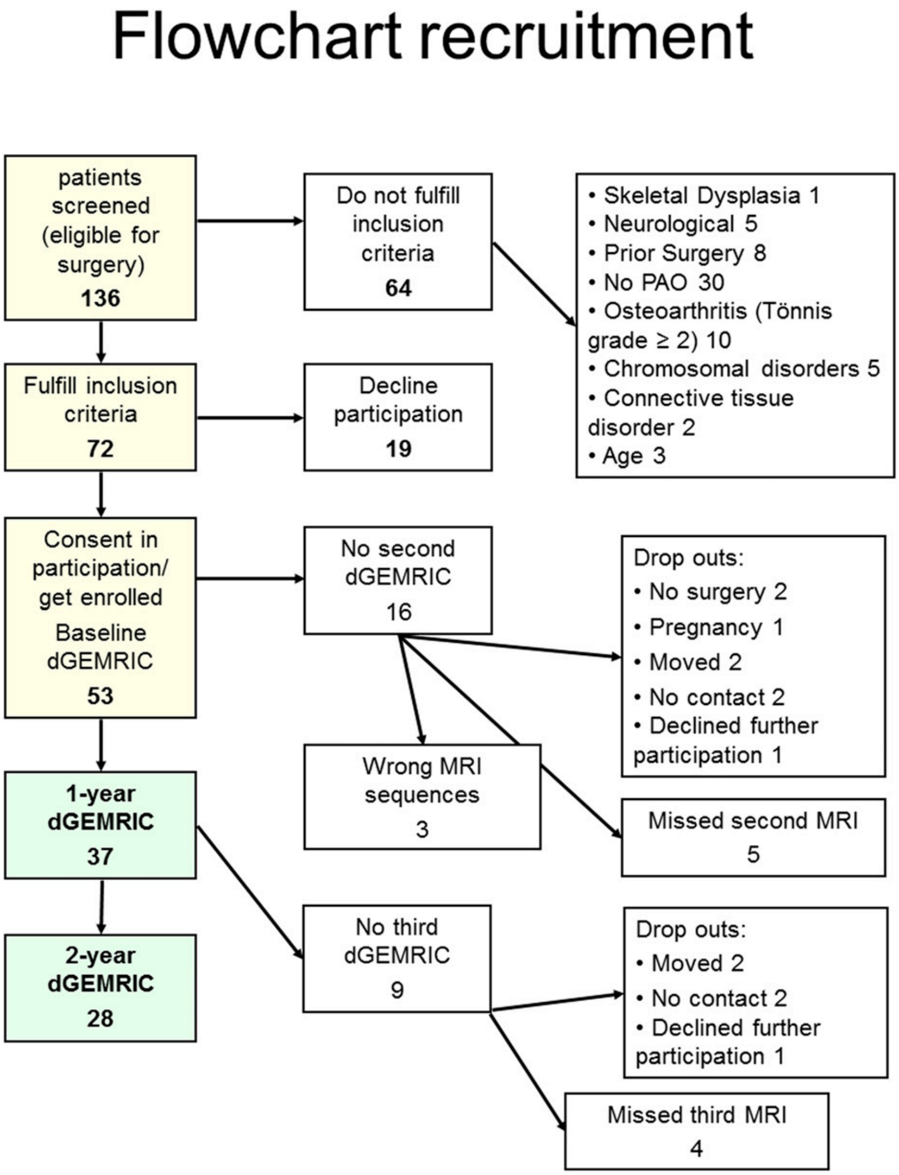

Fig. E-1

Flowchart of patient recruitment and follow-up. Thirty-seven of fifty-three enrolled patients were followed for at least one year and form the basis of this analysis. Twenty-eight patients were followed for two years. PAO = periacetabular osteotomy.

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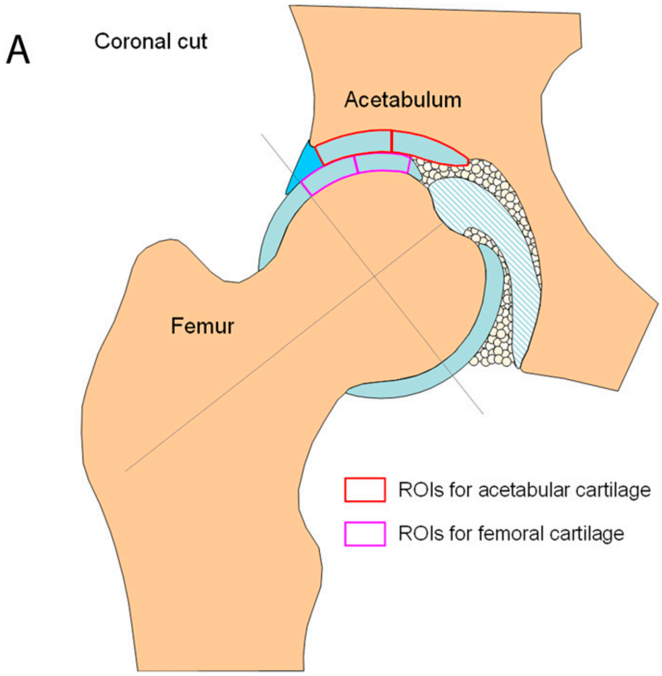

Fig. E-2A

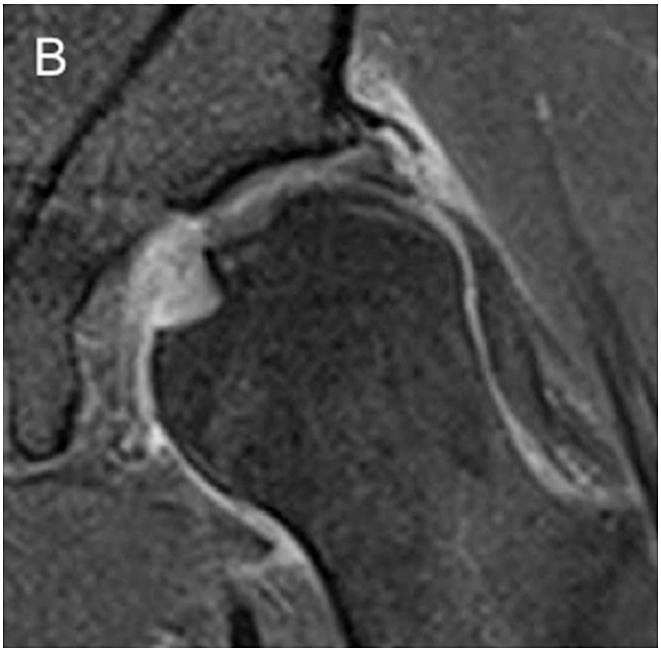

Fig. E-2B

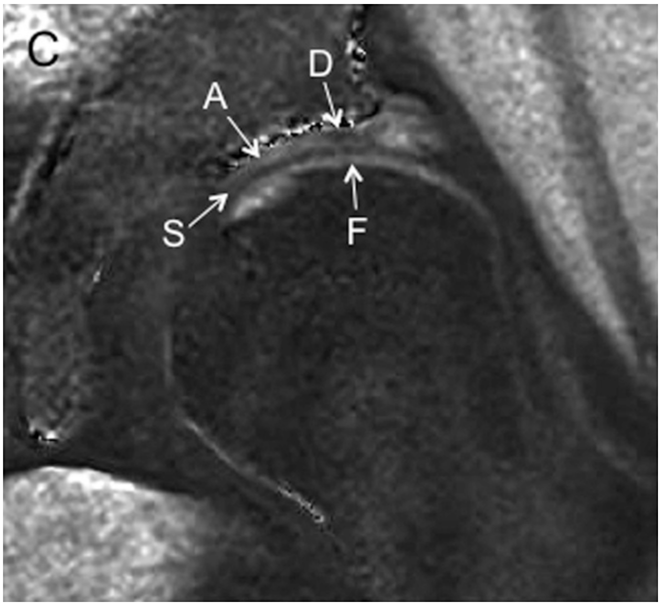

Fig. E-2C

Fig. E-2A Schematic illustration of the dGEMRIC regions of interest (ROIs) that were evaluated. **Fig. E-2B** Morphologic MRI of a dysplastic hip. **Fig. E-2C** A dGEMRIC scan showing the femoral (F) and acetabular (A) cartilage separated by the superficial layer (S). Some degenerative change in the acetabular cartilage is seen on the dGEMRIC image (D), but it is not clearly seen on the morphologic image (**Fig. E-2B**).

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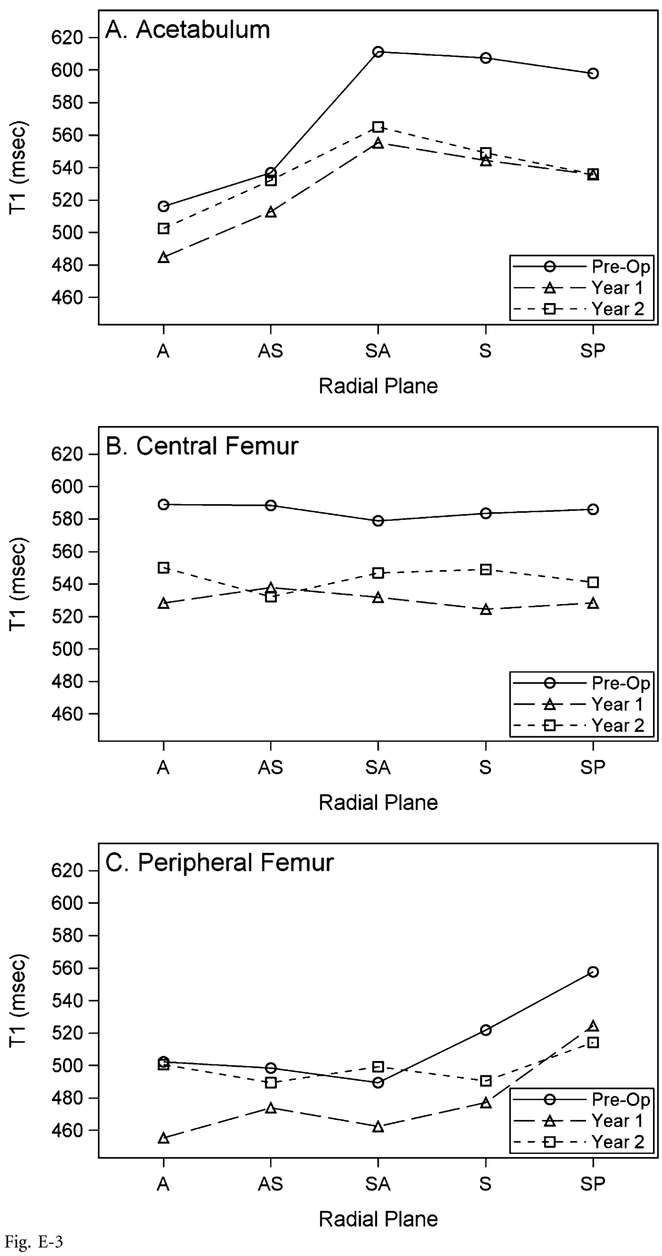

Fig. E-3

Preoperative, one-year, and two-year follow-up dGEMRIC indices (T1) plotted for the acetabulum (combined central and peripheral regions), central region of the femur, and peripheral region of the femur at the different radial reformats (A = anterior, AS = anterior-superior, SA = superior-anterior, S = superior, and SP = superior-posterior). The highest values in the acetabulum can be observed from superior-anterior to superior-posterior. The femoral side shows less radial variation.

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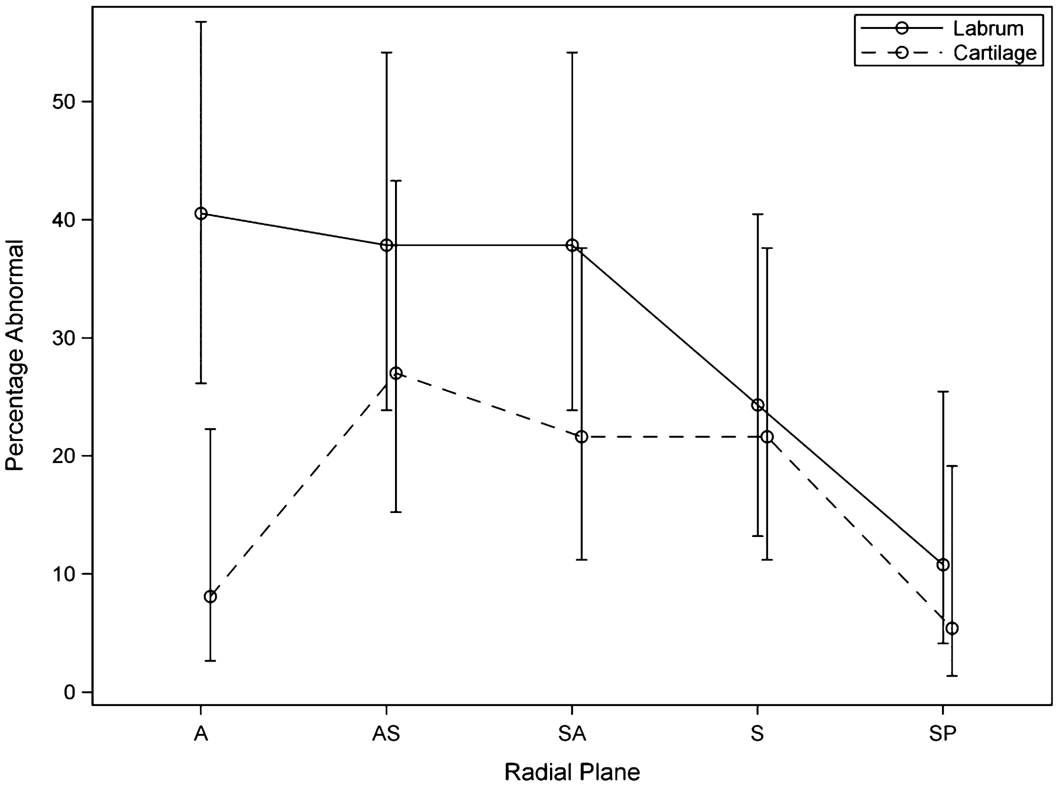

Fig. E-4
Percentage of abnormal grades at the cartilage and labrum across the radial planes (A = anterior, AS = anterior-superior, SA = superior-anterior, S = superior, and SP = superior-posterior). The error bars are 95% confidence intervals.