Can Soft Tissues Structures Differentiate Between FAI And Dysplasia?

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Introduction:
Radiographic measurements are the gold standard in defining structural abnormalities of the hip joint. Having said that, the use of absolute cut off values may be insufficient in some cases in differentiating between cam type femoro-acetabular impingement (FAI), dysplasia, and isolated labral tear pathologies. This study aimed to determine whether MRI assessment of the soft tissue structures of the hip can provide additional information that could preoperatively predict the underlying etiology of joint derangement in a group of patients with surgically documented pathology.

Methods:
Prior to commencing the study, ethics approval was obtained from our Institutional Research Ethics Board. Using a database of pre-op MR arthrograms images of hips, we retrospectively identified 45 patients who had undergone corrective surgery between January 2006 and December 2010 to form three study groups. Fifteen patients were in each group: Peri-acetabular Osteotomy (PAO) for Dysplasia: 10 females, 5 males, mean age of 29.68 (range 17.64-53.65); Cam resection for FAI: 6 females, 9 males, mean age of 41.13 (range 18.88-56.27); Labral Repair/Debridement for Isolated Labral Tear: 12 females, 3 males, mean age of 38.14 (range 15.17-62.06). Inclusion criteria were: (1) Center-edge angle less than 20 degrees for PAO group, (2) clinical and (3) typical radiological findings for cam FAI (alpha angle >55 degrees) for FAI group, and (4) normal CE and alpha angle for the isolated labral tear group (LT). We excluded patients older than 60 and those presenting with other known hip disorder (eg, prior surgery, Legg-Calvé-Perthes disease and neuromuscular disorders). Using MR arthrogram images, the hip capsular thickness was measured superiorly on an oblique coronal image at mid acetabulum, and anteriorly on an oblique axial image through mid femoral neck [4]. The superior width was measured on same respective slices as was the capsular thickness. Several muscle dimensions were measured: psoas measured at level of mid acetabulum, rectus femoris at the level of the inferior rim of acetabulum and the gluteus muscles at level of acetabular roof. Intraobserver and interobserver reliability were assessed using the intraclass correlation coefficient (ICC). Descriptive data (mean, standard deviation, range) were
calculated for each group with analysis of variance (ANOVA) performed using SPSS.

**Results:**
All three groups showed similar capsular thickness and superior labral width with no significant difference identified (Table 1) except for rectus femoris which was significant difference larger in the isolated labral tear group compared to the PAO group. In addition, there was a general trend in labrum being larger in the PAO group compared to the isolated labral tear group.

**Discussion:**
MRI is the gold standard for detecting labral disorder [1-3]. However, recent evidence has shown that the majority of labral tears (>80%) are secondary to bony abnormalities. Consequently improving our capacity to better identify the various structural abnormalities can guide surgical decision making. In this study, we found significant difference in the size of the rectus femoris between the dysplasia patients and those with an isolated labral tear. As shown by others, the superior labral width is larger in patients with underlying dysplasia. In contrast, the rectus is smaller in dysplasia than in both the FAI and isolated labral tear group.

**Significance:**
The use of additional soft tissue parameters around the hip joint can help the physician differentiate borderline hip deformities further enhancing the optimal surgical treatment option.

<table>
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<tr>
<th>TABLE 1. MRI Measurements</th>
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<tr>
<td><strong>Group</strong></td>
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<tr>
<td>PAO (mean ± SD)²</td>
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<tr>
<td>FAI (mean ± SD)²</td>
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<tr>
<td>LT (mean ± SD)²</td>
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CAP = Capsular thickness (mm), SLW = Superior labral width (mm), Rectus femoris transverse dimension (mm)
Fig. 1 (a) An oblique axial MR image shows anterior measurements for the capsule (white squares) and the labrum (7.5 mm).

Fig. 1 (b) An oblique coronal MR image shows measurements of the superior capsule (yellow arrow) and superior labrum (4.6 mm).

Fig. 2(a) An axial PD-FS MR image shows maximal thickness measurements.

Fig. 2(b) An axial PD-FS MR image shows localisation of the sartorius (SART), rectus femoris (RF), tensor fasciae latae (TFL) and iliopsoas (IS). IS was measured at level of mid acetabulum. RF was measured at level of inferior rim of acetabulum.

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