

CAN SOFT TISSUE STRUCTURES DIFFERENTIATE BETWEEN DYSPLASIA AND CAM-FEMOROACETABULAR IMPINGEMENT OF THE HIP?

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BACKGROUND & PURPOSE

- Clinically, it may be challenging to differentiate various etiologies of hip dysfunction. Very few studies have looked at soft tissue structures as preoperative discriminators to better predict the underlying etiology of joint disease in various hip conditions.
- PURPOSE:** To determine whether MR arthrography [MRA] assessment of soft tissue structures of the hip can preoperatively predict the underlying etiology of joint disease.

METHODS

- Fifty-seven patients who underwent preoperative MRA and corrective hip surgery were retrospectively identified yielding three groups:
 - ✓ 17 with hip dysplasia [DDH] (11F, 6M; mean age 35.1 yrs, range 19.6-53.6);
 - ✓ 20 with isolated labral tears [LT] (17F, 3M; mean age 38.4 yrs, range 15.2-62.1);
 - ✓ 20 with cam-type femoroacetabular impingement [FAI] (11F, 9M; mean age 38.8yrs, range 18.9-51.2).
- Measurements of soft tissue structures were performed as follows:
 - ✓ Psoas was measured at level of mid acetabulum.
 - ✓ Rectus femoris was measured at level of inferior rim of acetabulum.
 - ✓ Gluteal muscles were measured at level of acetabular roof.
 - ✓ The hip capsule thickness and labral width were measured superiorly(12 o'clock) on the oblique coronal sequence through the mid acetabulum, and anteriorly(3 o'clock) on the oblique axial sequence through the mid-femoral neck.
- Each parameters recorded were then divided by respective femoral widths using the widest measurements on respective oblique axial slices for normalization in absolute values
- ANOVA was carried and significance set at P<0.05.

RESULTS

TABLE 1. Capsule and Labrum measures

GROUP	CAPS-sup	LABR-sup	CAPS-ant	LABR-ant
DDH (mean ± SD)	*0.24 ± 0.06	*0.31 ± 0.08	*0.18 ± 0.07	0.28 ± 0.05
LT (mean ± SD)	*0.15 ± 0.04	0.26 ± 0.05	*0.13 ± 0.03	0.24 ± 0.06
FAI (mean ± SD)	*0.16 ± 0.04	*0.25 ± 0.07	0.15 ± 0.05	0.24 ± 0.07

TABLE 2: Muscle Dimensions

GROUP	ILIOPSOAS		GLUTEAL MUSCLES			RECTUS FEMORIS	
	AP	TRANS	GLUT-min	GLUT-med	GLUT-max	AP	TRANS
DDH (mean ± SD)	1.04 ± 0.20	1.65 ± 0.29	0.80 ± 0.20	1.17 ± 0.22	1.58 ± 0.30	0.86 ± 0.29	*1.39 ± 0.32
LT (mean ± SD)	1.01 ± 0.19	1.67 ± 0.37	0.77 ± 0.15	1.04 ± 0.21	1.60 ± 0.25	0.88 ± 0.22	1.16 ± 0.23
FAI (mean ± SD)	1.05 ± 0.22	1.75 ± 0.23	0.72 ± 0.15	1.05 ± 0.25	1.62 ± 0.21	0.81 ± 0.19	*1.13 ± 0.34

Table 1 & 2. CAPS-sup: Superior Capsular thickness, CAPS-ant: Anterior Capsular thickness, LABR-sup: Superior Labral long axis, LABR-ant: Anterior Labral width. TRANS: Transverse axis, AP: Anteroposterior axis, GLUT-min: Gluteus minimus, GLUT-med: Gluteus medius, GLUT-max: Gluteus maximus. Bold & asterixed values are significantly different.

- ✓ The superior labral length was significantly greater in the DDH group (normalized value [NV]: 0.31) compared to the FAI group (NV: 0.25, p<0.05).
- ✓ The superior(12 o'clock) capsular thickness (NV: 0.24), was significantly greater compared to the LT group (NV: 0.15, p<0.05) and the FAI group (NV: 0.16, p<0.05).
- ✓ The DDH group also had a significantly greater anterior(3 o'clock) capsular thickness (NV: 0.18) compared to the LT group (NV: 0.13, p<0.05).
- ✓ The transverse dimension of the rectus femoris was larger in the DDH group (NV: 1.39) compared to the FAI group (NV: 1.13, p<0.05).

Figure 1. Labrum Width and Capsular Thickness - Superior

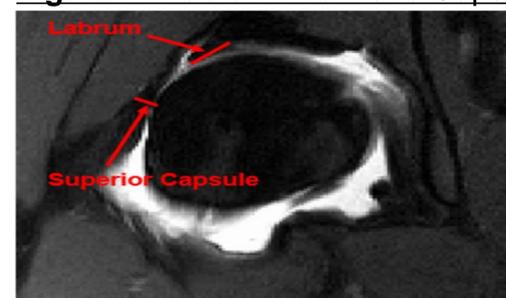


Fig.1 Zoomed Oblique coronal MRA sequence depicting an example of superior capsular thickness and superior labrum width measurements.

Figure 2. Labrum Width and Capsular Thickness – Anterior

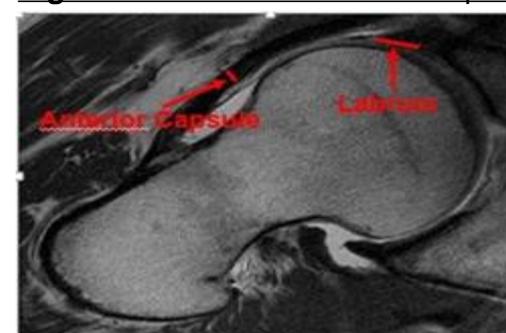


Fig.2 Zoomed Oblique axial MRA sequence depicting how anterior capsular thickness and anterior labrum width were measured.

Figure 3: Location for measurements of muscle dimensions

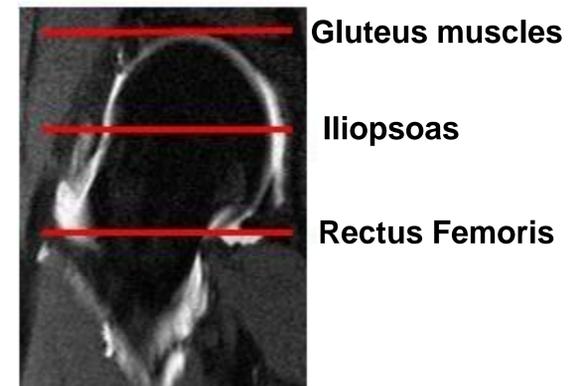


Fig. 3 Zoomed Oblique coronal MR sequence depicting respective locations for measurements of muscles.

CONCLUSIONS

- Use of additional parameters such as capsule thickness, labrum length and transverse rectus femoris are reasonable soft tissue parameters that could potentially help the surgeon better categorize hip deformities and permit further optimization of surgical management.
- Limitations:** The lack of differentiation in the soft tissue envelope between FAI and LT could be due to our relative small numbers but most likely reflective of the pathomechanism of over use in cam-FAI patients. Needle degradation anteriorly caused by contrast injection was a systemic issue across all subjects. No gender sub-analysis was possible due to limited sample size but normalization was performed using femoral neck width. Finally, the isolated LT group could still have subtle osseous abnormalities that were unrecognized by our current imaging modalities. Additional use of muscle measurements such as circumference and cross-section area could have provide better characterization of muscle dimensions.