

# Borderline dysplasia causes capsular ligament injury

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# Introduction

The pathological conditions causing hip pain has range from those caused by instability represented by acetabular dysplasia to those caused by overcovering and bony prominence, such as femeroacetabular impingement. Even if the bone morphology is normal, it is often caused by soft tissue around the hip joint. Unstable acetabular dysplasia is an indication for osteotomy, however other pathological conditions are indications for arthroscopic surgery, and in recent years the demand for arthroscopic surgery has increased. However, in order to obtain stable postoperative results of hip arthroscopic surgery, it is important to evaluate the stability of each patient's hip joint. Bone, muscle, and labrum are not the only structures involved in hip stability. The capsular ligaments that make up the joint capsule are greatly involved in the stability of the hip joint. In hip arthroscopic surgery, a joint capsule incision is performed, so that invasion is applied to the iliofemoral ligament of the capsular ligament. The iliofemoral ligament is an important ligament that restrains external rotation and extension, and greatly contributes to the stability of the front of the hip joint. There are a few reports comparing the iliofemoral ligaments in patients who performed hip arthroscopic surgery, however there is no report refer to the intensity change. A high intensity change in the ligament means tissue damage. Therefore, in this study, we measured the thickness of the iliofemoral ligament in cases of hip labral tear, and alos examined whether there was a difference due to the difference in the hip morphology.

# Method

72 joints who were operated for hip labral tear from July 2016 to January 2019 were included.

Gender: 19 male 19 joints, 50 female 53 joints

Diagnosis: Borderline dysplasia (borderline: group B) 13 joints

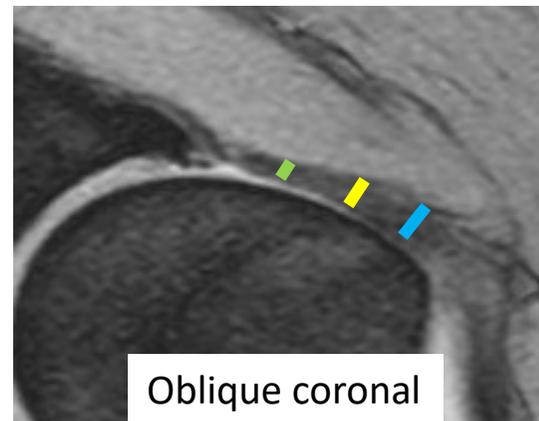
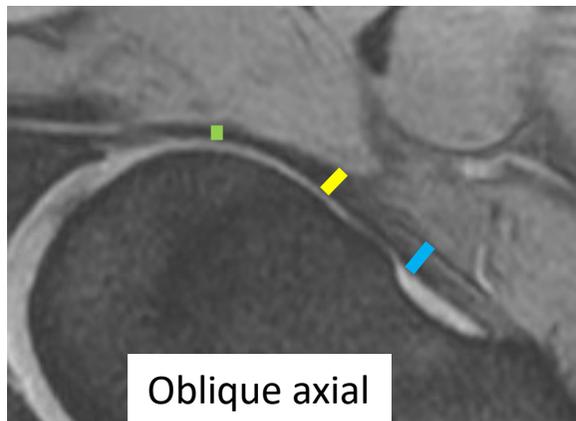
Femoroacetabular impingement (FAI: group F) 22 joints

Labral tear (no abnormal bone morphology: group T) 37 joints.

The thickness of the iliofemoral ligament was evaluated by 3T MRI with T2\* condition.

Measurements were made with an oblique axial slice along the femoral neck axis and an oblique coronal slice perpendicular to the acetabulum, both with a slice passing through the center of the femoral head. According to Strickland, thickness of iliofemoral ligament was measured at head-neck junction, the midpoint of labrum and head-neck junction, and the points of the equal distance toward the intertrochanteric line. We expressed each point as center, proximal and distal point.

The evaluation was made by comparing the thickness of the iliofemoral ligament for each diagnosis and for the high-intensity changes. Statistical evaluation was performed by Tukey-Kramer test, and  $p < 0.05$  was considered significant.

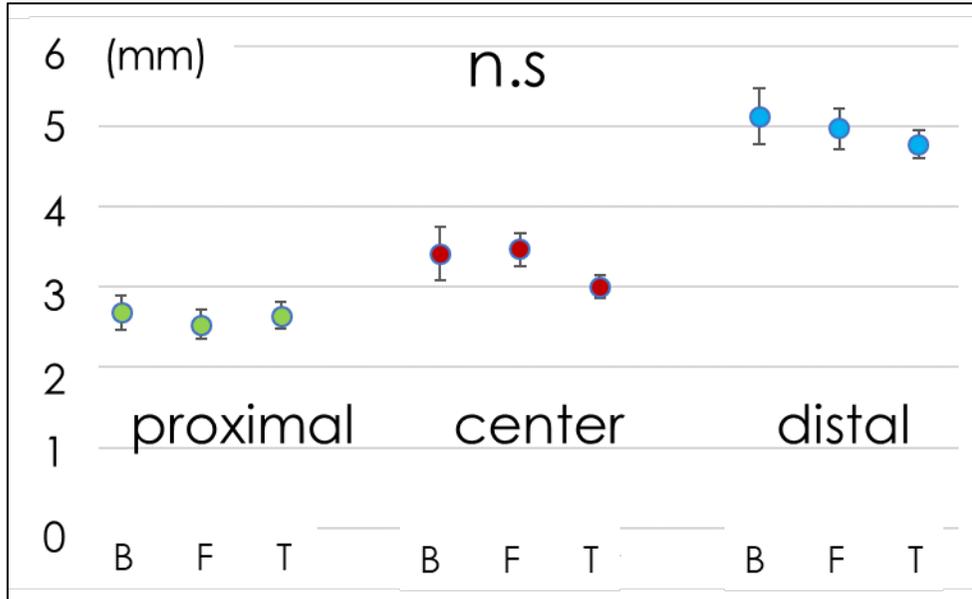


**Measurement point**  
proximal: green  
center: yellow  
distal: blue

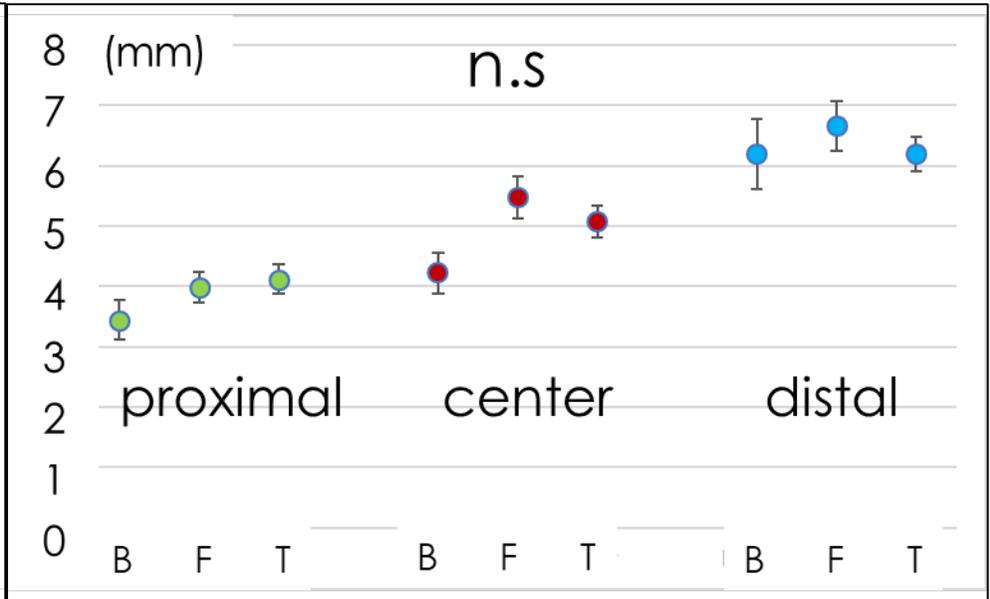
# Results

## Thickness of iliofemoral ligament: Overall result

### Oblique axial



### Oblique coronal



B: Borderline dysplasia  
F: FAI  
T: labral tear

The joint capsular ligament was 2 to 3 mm in the center in the oblique axial, about 5 mm in the distal, 3 to 4 mm in the center in the oblique coronal, and 6 to 7 mm in the distal, and became thicker toward the distal. However, there was no statistically significant difference between groups at each site.

# Results

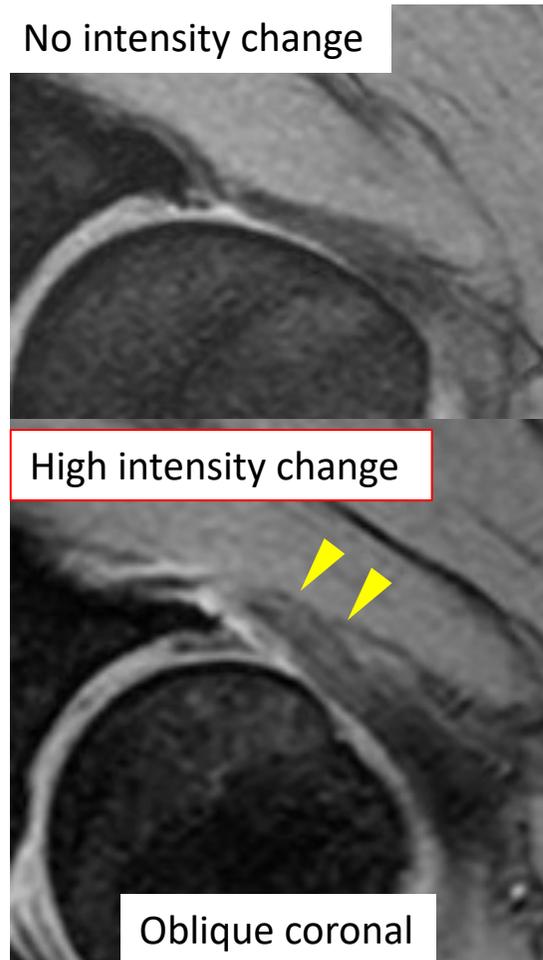
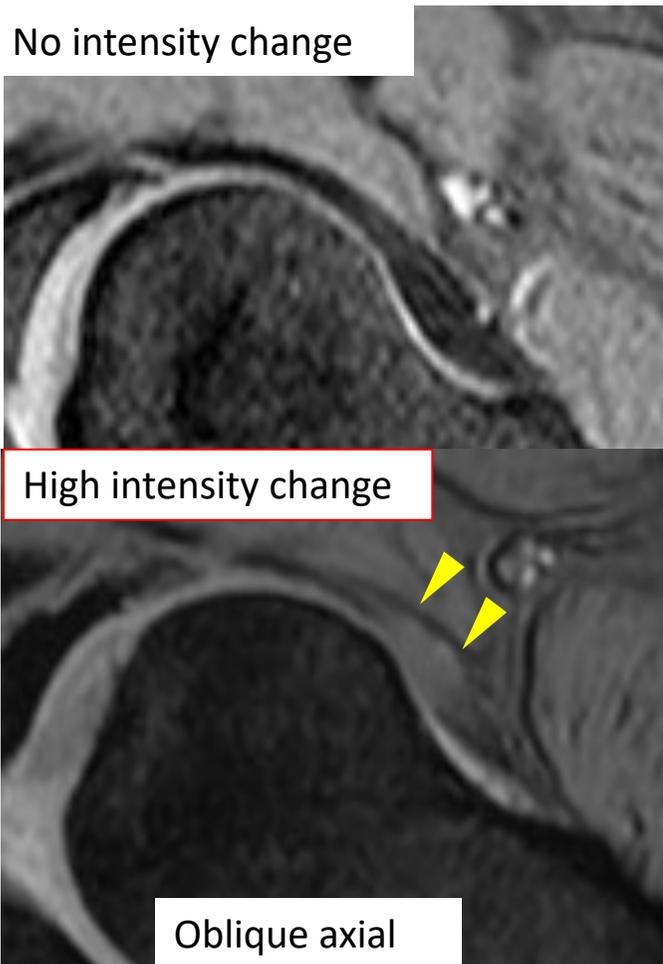
## High intensity change

Borderlyne dysplasia (group B) 7joints /13joints

Femoral acetabular impingement (Group F) 3joints /22 joints

Labral tear (T group) 9joints /37 joints

Tukey-Kramer test \*  $p < 0.05$



The iliofemoral ligament that exhibited high intensity changes was swollen.

▶ :High intensity change

# Results

## Site of high intensity change

Group B	<b>Number of joints</b>	<b>whole</b>	<b>Proximal</b>	<b>center</b>	<b>distal</b>
	Oblique axial	1	2	1	0
	Oblique coronal	2	3	1	0

Group F	<b>Number of joints</b>	<b>whole</b>	<b>Proximal</b>	<b>center</b>	<b>distal</b>
	Oblique axial	2	2	0	0
	Oblique coronal	2	0	0	0

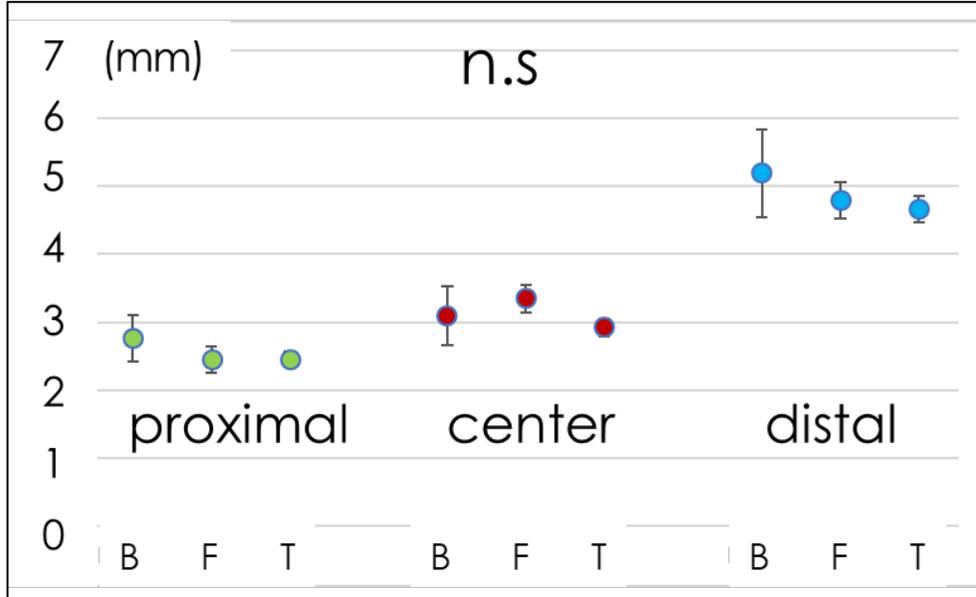
  

Group T	<b>Number of joints</b>	<b>whole</b>	<b>Proximal</b>	<b>center</b>	<b>distal</b>
	Oblique axial	1	2	0	3
	Oblique coronal	4	1	0	1

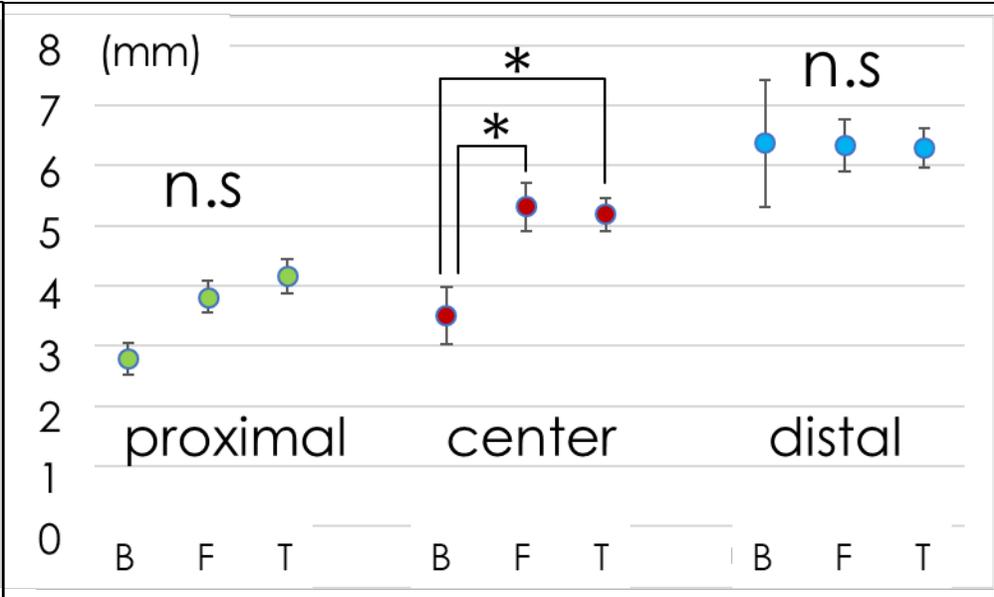
# Results

Thickness of iliofemoral ligament: Exclude high intensity change cases

Oblique axial



Oblique coronal



In the case of high intensity change, iliofemoral ligament was swollen. Therefore, the result of excluding them was shown. In oblique axial, no significant difference was recognized in each group. However, in oblique coronal, the group B was significantly thinner at 3.5mm in the center, and there was no significant difference at the proximal, however it had a tendency of thinner in the group B.

# Discussion

In recent years, there are some reports that measure the thickness of the anterior capsule, that is, the thickness of the iliofemoral ligament using MRI. Zang et al. measured the thickness of the iliofemoral ligament by performing arthrography with 1.5T MRI. They measured at head-neck junction in axial view. They reported that the cam type FAI was 5.3mm, the pincer type was 4.0mm, the mixed type was 6.2mm, and the pincer was significantly thinner. Wedner et al. also performed arthrography with 1.5T MRI and measured the thickest part on the clockface with radial MRI. They reported that the capsular thickness was 4.2mm in superior and 4.9mm in anterior in FAI patients. On the other hand, arthrography was not performed in the measurement using 3TMRI. Rakhra et al. used 3T MRI to measure thickness of iliofemoral ligament of Cam type FAI, labral tear, and normal. They measured the thickest part in oblique axial and oblique coronal view. Their report showed that the iliofemoral ligament was thicker in the cam type FAI and labral tear than in the normal hip. Stickland et al. also examined the thickness of the postoperative of capsular suture at the measurement points used in this study on coronal view. They reported a proximal 4.57mm, central 3.42mm, and distal 5.92mm at 24 weeks after repair. Thus, the slice and the measurement method used for measurement were not constant, and there was no description regarding the intensity change.

# Discussion

The oblique axial section used for the measurement in this study shows the vertical and horizontal band of the iliofemoral ligament, and the oblique coronal section shows the horizontal band. Borderline dysplasia that was significantly thinner in the oblique coronal image means that the horizontal band was thinner. In other words, it can be considered that in the case of borderline dysplasia, the horizontal band of the iliofemoral ligament is mechanically weak and easily damaged. In addition, the results that there were many cases showing high intensity changes in the borderline dysplasia cases may mean that there were many cases in which the ligament damage had already occurred in the borderline dysplasia cases. In such cases, microinstability may occur even when there is no obvious instability such as lateral shift of femoral head on X-ray. The limitation in this study was that we had not been able to show the changes in dynamics that are evidence of hip instability. And it was not the result with considering about distinguishing gender and age. However, as a treatment concept for patients with borderline dysplasia, we consider that it is possible to perform arthroscopic surgery for those without high intensity change and swelling of iliofemoral ligament. Therefore, It will be one of the indicator of decision the surgical indication.

# Conclusion

In conclusion, in cases of borderline dysplasia, the joint capsular ligament was thinned, and there were cases with high intensity changes and swelling that were thought to be damaged. The change in intensity and swelling of the iliofemoral ligament may have hip microinstability, and it was considered to be an indicator for decision the surgical indications.