The Biomechanical Basis For Soft Tissue Anterior Inferior Iliac Spine Impingement

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Summary: AIIS morphology has a direct impact on space available for labrum, capsule, and indirect head of rectus during hip flexion.

Purpose: The anterior inferior iliac spine (AIIS) is a potential component of femoroacetabular impingement (FAI), and a novel AIIS classification system has been proposed: Type I - bony surface between the AIIS and acetabular rim is concave; Type II - the same surface is convex or flat; Type III - AIIS crosses caudad to anterior-superior acetabular rim. Even in the absence of direct bone to bone contact, soft tissue impingement between the sub-spine region and femoral neck is a source of anterior hip pain. The purpose of this study was to determine maximal flexion and space available for labrum, capsule, and indirect rectus head in Type I, II, and III AIIS morphologies.

Methods: 3D models were created from CT scans of 5 patients of each AIIS subtype. Femurs were flexed until bony impingement. The space available for soft tissue between the AIIS and the surface of the femoral neck was quantified. To control for variable proximal femoral anatomy, the type I models were then converted to type II and type II to I, respectively.

Results: Type I and II had average maximal flexion of 109 degrees and 110 degrees, while the type III had 98 degrees (p=.004) The average space available for soft tissue was almost 50% less in the type II group, compared to type I (p=.002). The volume in type III could not be evaluated because of direct contact of the AIIS tip and femoral neck during flexion. When the type I hips were converted to type II in the same patients, the volume decreased by 25% (p=.016) Conversely, when the type II hips were converted to type I, the volume increased by 38% (p=.002)

Conclusion: Varying AIIS morphologies result in significantly different space available for the labrum, capsule, and indirect head of rectus during straight flexion. After virtual AIIS decompression, space available for soft tissue is significantly increased. Preoperative planning and potential AIIS decompression based on AIIS morphology may optimize the results of FAI surgery.