

The Ischial Spine: A Radiographic Sign for Acetabular Retroversion

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Primary [osteoarthritis of the hip](#) appears to have a structural basis. It was hypothesized that acetabular retroversion could be associated with osteoarthritis of the hip by Murray¹ and Stulberg² in the mid '60s and early '70s. They were the first to describe this association between abnormal hip anatomy and its possible role in the development of osteoarthritis (OA).

In the past few years, femoroacetabular impingement (FAI) has become recognized as a cause of OA in adults. Much has been written about this entity and most clinicians are now aware of FAI. Because of its association with FAI, it's important to recognize acetabular retroversion when it presents clinically.

In the normal hip, the acetabular opening is anterior. In the retroverted condition, the superior aspect of the acetabulum is tilted posteriorly. On the AP X-ray in a normal acetabulum, the anterior rim of acetabulum should always project medial to the posterior wall. In cranial acetabular retroversion, the anterior rim will project lateral to the posterior wall in the superior aspect of the acetabulum.



Figure 1: Edge of anterior acetabular wall (yellow line) is medial to the edge of posterior wall (red line), even in superior aspect of acetabulum. Note that these lines never cross. Green line is rim of the pelvis, iliopectineal line. Blue line is acetabular teardrop.

One of the subtle anatomic abnormalities linked with femoroacetabular impingement is acetabular retroversion. It is now recognized that this anatomic abnormality results in cartilage degeneration secondary to femoroacetabular impingement, resulting in OA of the hip.³⁻⁴ Retroversion of the acetabulum is described as an abnormal morphologic feature involving a posteriorly oriented cranial acetabular opening in the sagittal plane, which is seen as the crossover sign (COS) on standard radiographs. The COS as seen on standard AP radiographs indicates the presence of acetabular retroversion. Jamali⁵ confirmed that COS indicates retroversion of the acetabulum, which primarily affects the cranial portion of the acetabulum.



Figure 2: Edge of anterior wall (white arrow) is medial to the edge of posterior wall (black arrow) in inferior segment of the hip, but in the superior segment, this relationship reverses. This leads to the "crossover sign."

Interpreting the AP pelvic radiographs, however, can be difficult, and observing the anterior and posterior margins of the acetabulum is not always possible due to technique and quality of the radiograph. It has been observed that along with the crossover sign, the **ischial spine** is commonly projected into the pelvic cavity. This finding is easier to observe even when the crossover sign is not visible. Kalverer⁶ confirms that the crossover sign and the prominence of the ischial spine into the pelvis are reliable findings confirming the presence of acetabular retroversion.

Retroversion of the acetabulum is also associated with an externally rotated hemipelvis, which leads to protrusion of the ischial spine into the pelvis on the AP projection. COS and PRIS signs can be used to evaluate patients with early symptomatic femoroacetabular impingement and can also be used to detect hips at risk when the condition is bilateral, but only one side is symptomatic. The PRIS can be used even in pediatric cases because the acetabular walls are not ossified, so the contours are not visible on an AP radiograph.



Figure 3: Ischial spine is projecting (PRIS) into the pelvis on both sides.

A recent study by Siebenrock, et al.,⁷ nicely demonstrates that hip impingement and decreased hip internal rotation in adolescent athletes exist more frequently compared to non-athletes. This suggests an important developmental etiology of hip impingement based on exposure to stresses during skeletal growth. Being able to recognize radiographic signs and clinical symptoms of FAI can help prevent the secondary changes associated with OA, especially in the younger patient. Further research is needed to determine the exact timing in skeletal age and features of repetitive stress that lead to pathologic changes.

References

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For more information on femoroacetabular impingement (FAI), review: [Tannast M, et al.](#)

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