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CORR Insights

CORR Insights®: Acetabular Wall Indices Help to Distinguish Acetabular Coverage in Asymptomatic Adults with Varying Morphologies

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Where Are We Now?

The cross-sectional study by Anderson and colleagues examined radiographic acetabular morphology in asymptomatic senior athletes. The authors evaluated anterior and posterior femoral head coverage in "normal" hips using the anterior wall index (AWI) and posterior wall index (PWI) [10].

Siebenrock and colleagues [10] introduced the concept of AWI and PWI as a measurement on plain films to quantify the contribution of anterior and posterior wall coverage in acetabular pathomorphology of symptomatic patients. Numerous radiographic angles, indices, and ratios—including the lateral center-edge angle, ACM angle, sharp angle, acetabular and extrusion indices, cranio-caudal acetabular coverage, AP acetabular coverage, and crossover and posterior wall sign—also describe the acetabular anatomic morphology projected on the AP pelvic radiograph [11]. However, none of these parameters provide quantification of AP acetabular coverage, which is essential to distinguish between normal and abnormal hips. AP acetabular coverage quantification also can serve as a guide in clinical decision-making.

Reliable measurements are indispensable to monitor intraoperative correction in the treatment of acetabular overcoverage (such as pincer type femoroacetabular impingement [FAI]) and undercoverage (developmental dysplasia of the hip). Although at the end of the spectrum all osteoarthritis may appear similar, the mechanics behind these two distinct acetabular morphologies are entirely different. Acetabular undercoverage may cause increased joint contact (static overload), while overcoverage may lead to increased contact between the acetabulum and the femoral head-neck junction (dynamic FAI conflict) [6, 12, 13].

Where Do We Need To Go?

A challenge in the treatment of acetabular overcoverage is to ascertain

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the limits of resection of the acetabular rim to assure resolution of symptoms and at the same time avoid iatrogenic acetabular dysplasia. On the contrary, for the treatment of acetabular undercoverage, the degree of correction needs to be guided by a referenced normal value, and an accurate method to measure it.

Standard, reproducible, and cost-effective approaches must be developed to elucidate acetabular coverage and its clinical implications. Although acetabular morphology can be quantified accurately with the aid of CT scans or specialized computer software [1, 2, 5, 8, 9], an affordable and intraoperative reproducible method is a valuable resource. More-recently introduced radiographic parameters like AWI and PWI may help overcome the limitations of current parameters. The lateral center-edge angle [14], which only assesses the amount of lateral coverage of the femoral head, or the crossover sign, which only assesses one portion of the rim relative to another, may be complemented with the assessment of the acetabular-wall coverage both anteriorly and posteriorly (AWI and PWI).

Anderson and colleagues establish AWI and PWI normal ranges for asymptomatic patients with a mean age of 67 years (range 50–91 years). However, we need further research to establish normal ranges in asymptomatic younger cohorts. Developing these normal reference range values is of real importance for guiding surgical corrections. In addition to normal reference values, we need reference-range values both for acetabular overcoverage and undercoverage. However, abnormal acetabular morphology is common among asymptomatic subjects [3, 4, 7, 8], so we will depend on future studies to compare differences in acetabular morphology between asymptomatic and symptomatic hips. Only after ascertaining normal ranges, normal variants, and pathologic variations, would both the AWI and PWI be incorporated as a diagnosis and intraoperative aid tool. The utility of these parameters as an intraoperative reference guide, to assess the extent of correction in patients undergoing surgery, should also be tested.

How Do We Get There?

Further research is needed to integrate and correlate different acetabular morphology measurements, providing an enhanced representation and understanding of the underlying normal anatomy to guide our patient treatments. Future studies should assess acetabular anterior and posterior wall coverage by comparing radiographic methods with other complex but accurate imaging techniques such as CT scans or specialized computer software. This type of study could potentially validate the use of AWI and PWI measurements.

Likewise, a better understanding of how these indices behave in morphologic variance (acetabular undercoverage and overcoverage) in both symptomatic and asymptomatic hips are mandatory. Future studies should evaluate both the AWI and PWI in larger cohorts in the previously mentioned conditions to better establish the role of these measurements in the diagnosis and treatment of patients.

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