How best to Identify Acetabular Retroversion on Radiographs - Thresholds to guide clinical practice.

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Background

Cross-over sign (COS) has been associated with presence of acetabular retroversion. Anterior and posterior wall index (AWI & PWI) assess anteroposterior (AP) acetabular coverage. Appearance of the acetabulum on radiographs is sensitive to pelvic tilt (PT), which differs between supine and standing positions, and a low anterior-inferior iliac spine (AIIS). The aims of this study were to 1. Identify differences in acetabular appearance between supine and standing amongst patients; 2. Determine factors (acetabular version, AIIS morphology and spinopelvic characteristics) associated with cross-over ratio (COR), AWI and PWI; and 3. Define relevant clinical thresholds to guide management.

Methods

This was a prospective, consecutive study among patients who presented in a hip preservation surgery unit (n=134) (age: 35±8 years, 58% females, BMI 27±6 kg/m^2). All participants underwent supine and standing AP pelvic radiographs to assess COS, COR, AWI and PWI, and standing lateral spinopelvic radiographs to determine standing PT. Computed Tomography (CT) was used to measure supine PT, acetabular version, and AIIS morphology. Acetabular version was

measured at three transverse levels, corresponding to the 1-, 2 and 3 o'clock positions. The mean was calculated.

Results

COS was present in 55% of all hips on supine radiographs, and 30% on standing radiographs, with a mean difference in cross-over ratio of 12%. COR (rho -0.661) and AWI/PWI (rho -0.612) ratios supine strongly correlated with acetabular version. COS was more prevalent among patients with AIIS type 2 (69%) than among those with AIIS type 1 (43%) (p=0.003). COR thresholds of 23% and 28% could identify acetabular version <5° (sensitivity 81%, specificity 80%) and <0° (sensitivity 88%; specificity 85%) respectively. AWI/PWI ratio above 0.6 could reliably identify version <0° (sensitivity 83%; specificity 84%). In the presence of COR>30% and AWI/PWI>0.6, specificity to detect retroversion is significantly increased (>90%).

Discussion

The presence of the COS is very common amongst patients with hip pain. False positives (high COR/normal version) may occur due to AIIS morphology/low PT. Relevant thresholds of COR>30% and AWI/PWI>0.6 can help diagnostic accuracy. In cases where either COR or AWI/PWI is high, axial cross-sectional imaging can further help to avoid false positives.

Level of evidence: III, prospective cohort study