EFFECT OF POSTURE ON FEMORACETABULAR IMPINGEMENT


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INTRODUCTION: Cam-type femoroacetabular impingement (FAI) is associated with abnormal concavity at the femoral head/neck junction. The cam deformity is thought to damage the acetabular labrum and cartilage during some hip movements, which leads to hip pain and ultimately to hip osteoarthritis. The alpha angle describes the location of the cam deformity but does not describe its interaction with the acetabulum. Determining which postures cause impingement between the femoral deformity and the acetabulum is a key step in determining the mechanism of joint damage in FAI, assessing the effectiveness of surgery, and designing effective physical therapy and activity modification programs.

OBJECTIVE: Determine how posture affects direct impingement in patients with cam deformity.

METHODS: We assessed impingement between the cam deformity and the acetabulum in 11 participants imaged in different postures within a vertical open MR scanner. We recruited 6 males and 5 females (mean age 45 (range 29-52)) with cam FAI from a larger, population-based sample of subjects with hip pain. Each participant was scanned within the 58cm gap of a 0.5T vertical open MRI scanner (MROpen, Paramed, Genoa, Italy). The postures included supine as well as combined hip flexion, adduction and internal rotation (FADIR) in standing, seated and supine postures. Images were taken in the plane passing through the femoral neck axis and perpendicular to the coronal plane of the femur with a slice thickness of 5mm and a gap of 1mm using a 2-channel RF send-receive flex coil and the following pulse sequence: T1 weighted GFE with TR/TE=333/12ms, FA=60°, FOV 220 × 220 mm², matrix = 256 × 256, imaging time 133s. We measured the beta angle (Wyss, Clin Orth Rel Res 2007;460:152-8) to describe clearance between the first asphericity on the femur and the most prominent part of the acetabulum (Figure 1). We tested the hypothesis that posture affects beta angle using a repeated measures ANOVA and Tukey’s HSD test. We also assessed inter- and intra-reader variability for 3 trials each of 2 readers.

RESULTS: Beta angles for the four postures were all significantly different from each other (p<0.05) (Table 1). The sitting FADIR posture moved the deformity closest to the acetabular rim (lowest beta angle). Inter and intra-reader ICCs were above 0.87 for all measures.

CONCLUSIONS: All FADIR positions move the cam deformity closer to the acetabular rim than the supine position, as reflected by a reduced beta angle. Hips with cam deformities have reduced range of motion in the FADIR position, and our finding of small beta angles at limits of motion in the FADIR position suggests the posture causes interaction between the cam deformity and acetabulum. Sitting FADIR is the posture that moved the deformity closest to the acetabulum, which suggests that this posture may be useful for future imaging studies assessing the risk and mechanism of impingement.

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