Spinal and Pelvic Motion after Hip Resurfacing Arthroplasty and Metal on Metal Total Hip Arthroplasty

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Introduction

In normal individuals, hip flexion involves combined motion of the femur with respect to the pelvis and flexion of the lumbar spine. Conflicting reports site insufficient head to neck diameter ratio and fear of instability as limiting factors of post-hip resurfacing (SRA) and total hip replacement (THR), respectively. Restoring anatomical range of motion is important for THR and SRA, especially for active patients or those with pre-existing co-morbidities or spondylitis. Distinguishing the femoral and spinal components of hip flexion will lend more insight to spinal and pelvic motion after hip arthroplasty. In this study we investigate the spinal, pelvic, and hip motion during flexion and extension in patients who had undergone resurfacing (SRA) and metal-on-metal total hip replacement (THR).

Methods

Sixteen patients participated in this radiological study with IRB approval at 2 months to 2 years post-SRA and metal-on-metal THR. The SRA group consisted of 8 patients (8 men) with a mean age of 58.4 years (range, 51.0-72.0 years). The large metal on metal THA group comprised of 8 patients (5 men and 3 women) with a mean age of 60.5 years (range, 46.0 to 71.0 years). Lateral radiographs of the hip and the lower lumbar spine were obtained in neutral, maximum flexion (squatting) and maximum extension (Figure 1). Spondyotic changes were also graded. Angles defining the flexion of the lower lumbar spine (L4-L5 angle, L5-S1 angle), pelvic tilt, femoral flexion and extension (relative to the anterior pelvic plane), clinical hip flexion, extension, and implant size were compared.

Results

Lumbar spondylotic changes were noted in 70% of the cases. After SRA, pelvic tilt increased by 7.8° and 21° during flexion and extension respectively, compared to 25.2° and 19.2° in the THR group (p=0.02, p<0.01) (Figure 2). During flexion, the L5-S1 angle decreased significantly in the SRA group (8.1°, p=0.02), but not in the THR group (4.2°, p=0.4).

Discussion

Despite lower lumbar degenerative changes, significant lumbar and pelvic motion occurs during hip flexion and extension after hip arthroplasty. The lower lumbar spine and pelvic tilt appear to play important roles in total thigh to trunk flexion. The increased spinal motion of the younger resurfacing patients may explain the difference in clinical hip flexion reported by some authors in comparing hip function in patients after SRA vs THR. The increased pelvic motion in the total hip arthroplasty group may be attributed to the greater head-neck ratio.

Figure 1. Spinal and pelvic angles in neutral posture. A- L4-L5 angle; B- L5-S1 angle; C- pelvic tilt angle.

Figure 2. Pelvic tilt angle in neutral position, extension and flexion for THR compared to SRA groups.

Figure 3. Lumbar spine L4-L5 angle in neutral position, extension and flexion for THR compared to SRA groups.