Reduction In Head-Neck-Ratio At Resurfacing Is Associated With Increased Wear


INTRODUCTION

Simulation and cadaveric studies have suggested that there is a reduction in head-neck-ratio (HNR) associated with MoMHRAs. A reduction in HNR at operation, due to femoral head downsizing, would decrease functional range of movement and increase impingement risk. Impingement could lead to edge loading, disturbing fluid-film lubrication, and increasing wear. Serum ion levels of Chromium (Cr) and Cobalt (Co) are surrogate markers of wear. Females and patients with small components are recognised risk factors for increased ion levels and pseudotumour (PT) development. Although acetabular component orientation has been shown to contribute to wear and PT development, the role of a decrease in HNR has only been highlighted in PT development. This study aimed to measure changes in HNR that occur at resurfacing and determine any gender- and component size-specific differences. In addition it aimed to determine whether changes in HNR could be associated with increased wear.

METHODS

84 patients (56M: 28F) with unilateral MoMHRAs were included. The mean age at surgery was 57 years (30-70). The mean femoral component was 48.7mm (38-58). Components were considered small if <45mm, average if between 45-50mm and large if >50mm. Three designs were implanted, BHR (n=39), Recap (n=43) and RecapCo (n=2). The mean follow up was 3.9 years (1.7-7). All patients had Cr/Co levels measured at follow up. Patients were considered to have high ions if Cr and Co levels were ≥5.1ppb and 4.4ppb respectively. All measurements were made by two observers with an interclass coefficient of 0.88 (95%CI: 0.7-0.96). Pre-operative HNR (HNRpre), based on the bony outline of the head on X-Ray, was measured using the method of Doherty. Measurements from the post-op X-Ray (HNRpost) were made with the femoral component being measured instead. Assuming a 2mm thick cartilage layer, the HNR based on the diameter of the articular cartilage pre-operatively (HNRart) was calculated. Inclination and anteverision of each cup were measured using EBRA. Cups were analysed as being within or outside the previously defined optimum-zone, with inclination 35°-55° and anteverision 10°-30°.

The immediate changes in HNR as a result of the operation were examined by Receiver Operating Characteristic (ROC) analysis. The area under the curve (AUC) is an indication of predictive power. The AUC for HNRpre downsize in predicting high ions was 0.81(95%CI, 0.68-0.94) and significantly more predictive (p<0.001) than chance. A threshold value of 9.6% downsizing gave 80% sensitivity and 80.6% specificity in predicting subsequent high ion levels. Component-size Differences. Patients with small components had higher ions (Cr/Co: p=0.048/0.032) but no difference in the number of cups within/outside of zone (χ²=0.59). Patients with small components had greater HNRart/HNRpre and were downsized more (p<0.001). Ion-group Differences. Twelve patients (4M: 8F) comprised the high ion group. High ion group patients had smaller components (p=0.004) and no difference in proportion of cups within zone (χ²=0.07). Patients in the high ion group had greater HNRart/HNRpre and were down-sized significantly more at resurfacing (p=0.001). Patients in the high ion group and cups within the optimum zone (n=4) were downsized more compared to cups within zone and low ions (p=0.005).

RESULTS

The changes in HNR at operation were significantly negatively correlated with HNRpre, (p<0.001), (rho = -0.77). (Figure 1) The mean cup inclination was 46.9° (range: 26°-64°) and anteverision was 14.7° (range: 3°-35°). Forty-eight cups were within optimum-zone.

DISCUSSION

This study highlights HNR changes that occur in resurfaced hips. The negative correlation seen between amount of downsizing of HNRpre reflects the surgical technique employed in hip resurfacing at our unit in order to preserve acetabular bone. Females, patients with small components and patients in the high ion group had higher pre-operative HNR and were downsized more; increasing impingement risk and probably contributing to greater incidence of wear related problems.

REFERENCES: