Change in pelvic tilt angle two to four years after total hip arthroplasty.

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Introduction: Total hip arthroplasty (THA) is an established and excellent treatment for patients suffering from osteoarthritis (OA) of the hip. In this aging society, the number of hip OA patients is increasing, in particular the number of elderly patients. Generally, pelvic inclination tilts posteriorly when people become old [1] because of the loss of lumbar lordosis, flexion contracture of the knee, and weakness of the back muscels, etc. Among these patients, some show different radiographic pelvic tilt in the sagittal plane between the standing and supine positions. This difference alters the relationship between cup and stem with different posture after THA. It may cause impingement between cup and stem, and therefore lead to dislocation of the joint. However, the change in pelvic tilt after THA has not been clarified.

The purpose of this study was to evaluate the change in pelvic tilt angle (PA) in sagittal plane in the standing and supine positions for two to four years after THA.

Materials and methods: Seventy-seven patients, 19 males and 58 females, who had primary THA were included in this study. Sixty-five patients had OA and 12 had osteonecrosis of the femoral head. Mean age at surgery was 64±9 years (mean±SD) with a range of 39 to 85 years. Mean BMI was 24.8±4.5 kg/m². Standardized anteroposterior radiographs were obtained in supine and standing positions before surgery and every year after. Forty-nine patients were evaluated for three years and 21 patients for four years after surgery. PA was calculated from these radiographs in accordance with the method described in a previous report [1]. Briefly, transverse diameter (T) and longitudinal diameter (L) of the pelvis were measured from the digital image (Fig. 1). PA was calculated using the following formula: -67 x L/T + 55.7 for males and –69 x L/T + 61.6 for females. Reported mean PA was 20 degrees. Statistical analysis was performed using Stat Mate III (ATMS, Tokyo, Japan). The mean values of all the subgroups were compared with Mann-Whitney U test. Correlations were analyzed with Pearson correlation analysis.

Results: Mean PA before THA was 21.9±9.9 degrees in the standing position and 18.1±8.1 degrees in the supine position. Mean PA one year after THA was 26.6±10.6 in the standing position and 21.5±7.6 in the supine position. The change in PA was the largest one year after THA. PA gradually increased (posteriorly tilted) after surgery. The PA at each time point showed a correlation to age at surgery (p<0.001). The change in PA appears to plateau after one year. However, the mean difference in PA between the standing and supine positions gradually increased yearly (Fig. 2). In addition, the percentage of patients who showed more than 10 degrees difference in PA between the two positions was 7.8 before THA, 16.9 at one year, and 23.8 at four years after THA (Fig. 3).

Discussion: In this study, we demonstrated that PA changes before and after THA. In some cases, the difference in PA between standing and supine positions increases after THA for four years. Nishihara reported that preoperative pelvic position was maintained after THA for five years [3]. The difference in our findings might be due to the difference in the age of the patients. On average, the patients in our study were about 10 years older than those in Nishihara’s study. PA of elder patients tends to show a posterior tilt. For the patients who showed a great difference in PA between the two positions before THA, if the cup is placed with high anteverision, anterior dislocation may occur after THA, because of posterior tilt of the pelvis in the standing position. Therefore, when surgeons perform THA in these cases, they have to consider the cup anteverision to avoid the chance of dislocation.

Fig. 1: measurement of diameter of the pelvis and PA

Fig. 2: Change in PA after THA

Fig. 3: Percentage of patients who showed more than ten degrees difference in PA between the standing and supine positions