

# Acetabular component placement using imageless navigation with the concept of combined anteversion – comparison with non-navigated total hip arthroplasty

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**Purpose:** The position of the acetabular component is the key to a good clinical outcome of total hip arthroplasty (THA). Malposition of the acetabular component is a common surgical problem and can lead to hip dislocation and impingement causing limited range of motion and increased wear. Various aids have been developed to support the surgeon during acetabular implant placement. Imageless navigation systems may reduce positional errors. The combined anteversion technique may provide more accurate mating of the femoral head and acetabular cup into a correct anteversion position when using a cementless stem. The purpose of the study is to evaluate acetabular component placement using imageless navigation with the concept of combined anteversion and to compare it with non-navigated total hip arthroplasty.

**Materials & Methods:** We retrospectively analyzed the anteversion and inclination of 100 cementless acetabular cups (90 patients; 52 men and 38 women). They underwent a cementless THA using a imageless navigation system (BrainLAB, Heimstetten, Germany) between March 2007 and November 2009. The mean patient age was 54.9 years (range 20–87 years), mean height was 163.4 cm (range 147–183 cm), mean weight was 62.4 kg (range 35–89 kg), and mean BMI was 23.3 (range 13.9–29.1). Preoperative diagnosis was osteonecrosis in 56, osteoarthritis in 17, others in 27 patients. 51 femoral heads were 28mm and 49 were 32 mm in diameter. The mean follow-up was 40.6months (range: 26–57). The registration of the anterior plane of pelvis was done using manual pointer based probe in supine position. All patients were operated in lateral decubitus position, through posterolateral approach. Intra-operatively, the femoral anteversion was evaluated first. The concept of combined anteversion was applied in cup positioning based on Widmer's equation. Post-operatively, the evaluation of the cup inclination and anteversion was done on the standard AP view and the cross table lateral view, respectively. In radiographic evaluation of the cup position,  $40^\circ \pm 10^\circ$  in inclination and  $20^\circ \pm 10^\circ$  in anteversion were regarded as within the safe zone. The Harris Hip Score and the complications were evaluated. Also we compared the radiological results of above patients with of non - navigated conventional THA group (100 hips, 90 patients; 52 men and 38 women). In the non-navigated group, the mean age was 55.7 years, mean height was 163.0 cm, mean weight was 60 kg, and mean BMI was 22.7. There was no significant difference between the 2 groups in age, weight, height and BMI of the patients.

**Results:** The average inclination and anteversion were  $43.3^\circ \pm 4.2^\circ$  (range  $35.3^\circ$ – $49.4^\circ$ ) and  $21.9^\circ \pm 5.1^\circ$  (range  $10.1^\circ$ – $29.5^\circ$ ), respectively in imageless navigated THA group. In terms of accuracy, there were no outliers in anteversion and inclination of the cup. The mean post-operative Harris Hip Score was 94.7. There was no case with dislocation, component migration, and other major complication. In non- navigated THA group, the average inclination and anteversion were  $43.4^\circ \pm 5.9^\circ$  (range  $22.3^\circ$ – $55.1^\circ$ ) and  $19.2^\circ \pm 6.3^\circ$  (range  $5.1^\circ$ – $30^\circ$ ) respectively. There were 10 outliers in non- navigated THA group (4 in anteversion, 7 in inclination, and 1 in both). There was no statistically significant difference in inclination ( $p=.96$ ) between the 2 groups, however there was a statistically significant difference in the anteversion ( $p=.001$ ) between the 2 groups.

**Conclusion:** The imageless navigation is useful for applying the concept of combined anteversion in cementless THA. This study demonstrated that the results of acetabular component placement using imageless navigation with the concept of combined anteversion are favorable in cementless THA.