

# Case Study:

## HipAlign® Utilized to Treat Patient with Lumbar Vertebrae Deformity and Pelvic Retroversion

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### Introduction

The patient was a 73-year-old woman with osteoarthritis of the hip joint. She had a lumbar vertebrae deformity. Her pelvic tilt was retroverted; this retroversion became particularly marked when the patient was standing. She started to feel persistent pain on her left hip joint one year prior to presenting, which worsened. She experienced difficulty in walking because of the hip joint pain. Consequently, she decided to have total hip arthroplasty. She was still working as a ceramist and hopes to continue her work as a ceramist in the future.

### Presentation

The patient was treated for osteoporosis in our hospital. At the time, the lumbar vertebrae showed by kyphosis transformation from a vertebral fracture and scoliosis. She first felt symptoms of lumbago, but she gradually experienced symptoms of left coxalgia. X-rays revealed that the joint space at the left hip joint was narrowing. The patient complained strongly about her left coxalgia. The range of motion of her left hip joint was 100° flexion, -10° extension and 30° abduction.

Therefore, we planned total hip arthroplasty. However, a pelvic retroversion in the anterior-posterior X-ray of the hip was found when the patient was in the decubitus position. Furthermore, pelvic retroversion was clearer in the anterior-posterior X-ray when the patient was standing. The sacral slope was 22.6° in the pelvic lateral view in the decubitus position and 11.1° when standing. We planned total hip arthroplasty operation with care regarding the pelvic retroversion.



Fig 1. Pre-op clinical photo



Fig 2. Pre-op AP decubitus position



Fig 3. Pre-op AP standing position

### Pre-op Plan

We planned total hip arthroplasty using a direct anterior approach. Usually, we perform an acetabular cup with an anteversion angle of 15° and inclination angle of 43° relative to the Functional Pelvic Plane (FPP) standard supine position. The FPP adjusts the APP to account for pelvic tilt and be parallel with the spine. While the cup angle in the APP is always the same, the cup angle in the FPP will be affected by the pelvic tilt that can change from supine to standing. We used HipAlign navigation technology for the procedure. HipAlign can measure angles in the APP and the supine FPP.

### Operative Findings and Approach

We performed this operation using a direct anterior approach. HipAlign navigation was used for cup positioning. After reaming, we set up the cup with an impactor. We then used HipAlign navigation. The inclination angle and anteversion angle were 39° and 11° in the functional pelvic plane, respectively. At that time, to our surprise, the anteversion angle was -15° in the anterior pelvic plane. Furthermore, the inclination angle was 39° and anteversion angle was 20° during the operation according to fluoroscopy.

### Follow-up

The patient did not experience clinical complications such as dislocation or infection after the operation and became ambulant without pain. In postoperative decubitus position, the inclination angle was 39.63° and anteversion angle was 12.08° in the FPP standard supine position as measured using the 3D template (ZedHip;

Lexi, Tokyo). The measurement error of perioperative HipAlign was 1.08° for the inclination angle and 0.63° for the anteversion angle. The measurement error using HipAlign was less than that in perioperative transparent image. Because HipAlign calculates cup angles in FPP, and not only APP, we were able to navigate to cup angles that will match the X-ray and achieve the preoperative plan.



**Fig 4. Post-op AP decubitus position**



**Fig 5. Post-op AP standing position**

## Tell Us Why You Believe in OrthAlign Technology

In Japan, we note that pelvic tilt greatly changes between standing and the decubitus position and incorporate this into the pre-op plan. Therefore, it is important to achieve an accurate cup angle when operating, otherwise, the risk of wear and dislocation increases because the cup anteversion increases when standing. HipAlign can help solve the problem of navigating the cup to the goal.

## Discussion

In total hip arthroplasty, the excessive anteversion angle causes the risk of dislocation and excessive wear. We noticed preoperative pelvic retroversion in the hip joint anterior-posterior X-ray in the decubitus position and pelvic retroversion progression in the hip joint anterior-posterior X-ray when standing. This continued after the operation. The sacral slope was 31.3° in the pelvic lateral X-ray in the decubitus position and 18.6° when standing. The sacral slope difference between standing and the decubitus position was 12.7°. When pelvic tilt changes 1°, the cup anteversion angle changes by 0.7°. The cup anteversion angle in the standing position was  $12.7 \times 0.7 + 12.08 = 20.97$ °. If pelvic tilt changes according to the patient's position, even if in both the decubitus and standing positions, we must use an accurate cup angle in Lewinnek's Safe Zone when operating.

A surgeon must always rely on his or her own professional clinical judgment when deciding whether to use a particular product in treatment of a particular patient. The information presented herein is intended to educate the surgeon community on OrthAlign's technologies and applications. A surgeon must always refer to the product labeling and instructions for use before using any OrthAlign Product. The products depicted are only to be used by a trained licensed physician. Please refer to the product's instructions for use for complete important safety information. Prescription Only (Rx): Federal Law restricts this device to sale by or on the order of a physician. The author was a paid consultant of the Company at the time that this case study was prepared.



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