Introduction

Direct anterior approach (DAA, modified Smith-Peterson approach) is an inter-muscular approach that needs no muscle detached. In THA through DAA approach, post-operative recovery can be accelerated. Exposure of the acetabulum is facilitated, while the key points of this approach are femoral lift-up and hip extension to get sufficient access to the femoral canal. Enough capsule release and extension-adduction-external rotation of the femur are recommended, however the strategy for femoral lift-up is not well recognized.

To investigate the strategy for femoral lift-up, we released the capsule step by step and measured the distance of femoral lift-up at each step in cadavers and clinical cases. The effects of capsule release and hip extension were evaluated.

Materials and Methods

Cadaver study

Three fresh frozen cadavers (6 hips) without previous hip or pelvic surgery were used. They were female. In supine position, the hip joint was exposed through DAA by two experienced surgeons. After anterior capsulotomy, femoral neck was osteotomized in situ and femoral head was removed. Then, posterior capsule release was performed followed by superior capsule release in one side, and superior release was followed by posterior release in the other side (Fig. 1). Finally, internal obturator muscle was released. At each step, the distance of femoral lift-up was measured under the traction force of 70N. To investigate the effects of hip extension, the distance was measured in 0, 15 and 25 degrees hyper-extension.

Clinical cases

Thirty-nine THA were performed through DAA. Posterior capsule release was performed followed by superior capsule release in 13 hips, and superior release was followed by posterior release in 26 hips. The average age at operation was 72.0 years old. Thirty-five patients were osteoarthritis, 2 were osteonecrosis, one was femoral neck fracture and one was RA. At each step, the distance of femoral lift-up was measured under the traction force of 70N in neutral position same as the cadaver study. The distance of femoral lift-up was analyzed using an unpaired t-test in each step.

Results

Cadaver study

In 0 degree extension, anterior capsulotomy and posterior capsule release affected little the femoral lift-up (Fig. 2). The distance increased after superior capsular release. The distance decreased by hip hyper-extension unless the superior capsule was released (Fig. 3). The effect of internal obturator muscle release was not observed.

Clinical cases

The same tendency was observed in clinical cases (Fig. 4). Superior capsule release was the most effective for the femoral lift-up.

Discussion

In other approaches for THA, sufficient exposures of both acetabulum and femur can be obtained by elongation of skin incision, while femoral lift-up can not be facilitated simply by elongation of skin incision in DAA. Thus, the strategy of femoral lift-up should be established. This study indicated that superior capsule release is the first step for the femoral lift-up. The second step is hip extension to get access to the femoral canal. The internal obturator muscle release did not affect the femoral lift-up. By performing these procedures step by step, rasping and stem insertion can be achieved with minimal soft tissue release.