Clinical Case Report

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Subtrochanteric femoral shortening osteotomy concomitantly performed with revision total hip arthroplasty

A case report

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Abstract

Rationale: Total hip arthroplasty (THA) concomitant with subtrochanteric femoral shortening osteotomy for Crowe type IV dysplastic hip has been reported. However, the combination of subtrochanteric femoral osteotomy and revision THA has only been mentioned in one case report.

Patient concerns: A 67-year-old female had a history of congenital dislocation of both hips.

Diagnoses: Right hip was diagnosed the aseptic loosening of THA with extremely high replacement of the acetabular component.

Interventions: Revision THA concomitant with subtrochanteric femoral shortening osteotomy using a cement stem was performed. Before the revision surgery, primary THA with subtrochanteric shortening osteotomy was performed on the opposite side. Regarding leg length, the actual leg length of the affected side was 9 mm longer, and the subjective leg length discrepancy was 45 mm shorter in the affected limb due to pelvic obliquity. Subtrochanteric osteotomy was performed with an amount of osteotomy equal to the amount of distal translation of the hip center to the original acetabulum.

Outcomes: As a result, pelvic obliquity improved, and the subjective leg length discrepancy disappeared after revision surgery.

Lessons: The combination of subtrochanteric femoral shortening osteotomy with revision THA resulted in a satisfactory outcome.

Abbreviations: 3DCT = 3-dimensional computed tomography, THA = total hip arthroplasty.

Keywords: leg length discrepancy, revision total hip arthroplasty, subtrochanteric femoral shortening osteotomy

1. Introduction

Total hip arthroplasty concomitant with subtrochanteric femoral shortening osteotomy for Crowe type IV dysplastic hip has been reported to have good postoperative outcomes as a surgical option to enable stable hip reconstruction by placing the cup into the original acetabulum.[1–7] On the other hand, postoperative leg length discrepancy is an important factor of patient satisfaction in THA. Major postoperative leg length discrepancy is contributed to gait asymmetry, low back pain, adjacent articular symptom, and nerve palsy.[8] Furthermore, in the case of revision THA, the leg length is often longer in order to avoid postoperative dislocation. However, attempting to keep the leg length discrepancy as minimal as possible could reduce postoperative complications.

We report a case of revision THA combined with subtrochanteric femoral shortening osteotomy using a cement stem to revise the aseptic loosening of THA with extremely high replacement of the acetabular component during a previous surgery.

2. Case report

Informed written consent was obtained from the patient for publication of this case report and accompanying images.

A 67-year-old female had a history of congenital dislocation of both hips. The patient underwent Schanz osteotomy for the left hip and Chiari osteotomy for the right hip at the age of 21 years, cup arthroplasty for the right hip at 24 years, and revision THA for the right hip at 47 years. At 66 years the patient came to our clinic for an initial consultation for left hip pain. At the initial visit, the patient complained of gait disorder due to severe left hip pain, and a plain radiograph was showing Crowe type IV dysplasia in the left hip (Fig. 1A,B). The surgical treatment performed was THA with subtrochanteric femoral shortening osteotomy at 7 cm distal translation of the hip center to the original acetabulum, and there was 4 cm of femoral resection and 3 cm of actual leg length lengthening. On the other hand, for THA of the right side, a plain radiograph had been showing the radiolucent line around the acetabular component at the time of left hip surgery (Fig. 1A). However, the patient had no complaints about the right hip.

Left hip pain had improved after THA; however, 1 year after surgery, right hip pain with gait asymmetry emerged due to

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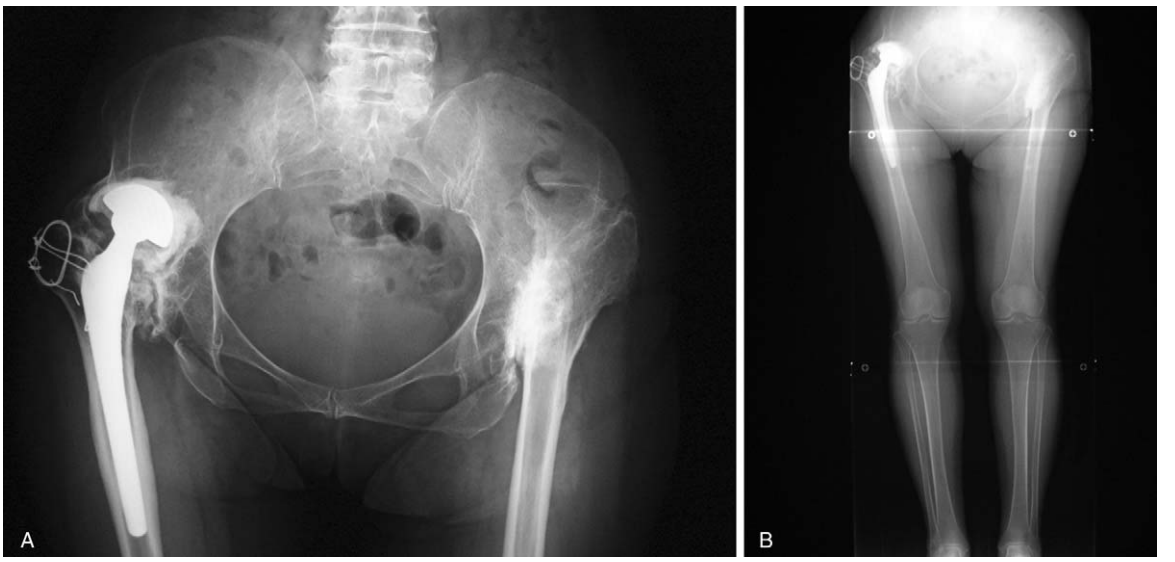

Figure 1. A 67-year-old female. Radiograph at the time of initial visit. A radiograph was showing Crowe type IV dysplasia after Schanz osteotomy in the left hip and showing a radiolucent line around the acetabular component in right THA. A, Anterior-posterior radiograph of the both hips. B, Plain radiograph with whole lower extremities in standing position.

improved left hip pain and the patient's daily activity. Revision surgery was then planned for the right hip. The modified Harris hip score for the right hip was 28.6 points, and the range of motion was limited to flection 40°, abduction −5°, external rotation 10°, adduction 0°, and internal rotation 10°. Regarding leg length, the subjective leg length discrepancy was 45 mm shorter in the right limb.

The preoperative planning was considered using plain radiograph with whole lower extremities in the standing position and 3-dimensional computed tomography (3DCT). In the radiograph with the whole lower extremities, severe pelvic obliquity on the left was revealed. As for right THA, the acetabular component was placed at an extremely high hip center, and loosening of the acetabular component was identified (Fig. 2A,B). In determining the leg length discrepancy, the minor trochanter in the left femur was unclear due to the effect from the previous surgery, so the leg length discrepancy was evaluated by measuring the distance from the anterior-superior iliac spine to the intercondylar notch of the femur using a 3D Template system (ZedHip, Lexi, Tokyo, Japan). The subjective leg length discrepancy was 45 mm shorter in the right limb; however, the actual leg length of the affected side (right) was 9 mm longer. It was hypothesized that subjective leg length discrepancy might have resulted from severe pelvic obliquity to the intact side. During the preoperative planning in this case, the patient was not diagnosed with degenerative scoliosis; therefore, the improvement of pelvic obliquity was anticipated after hip surgery. Postoperative actual leg length was planned to be equal before

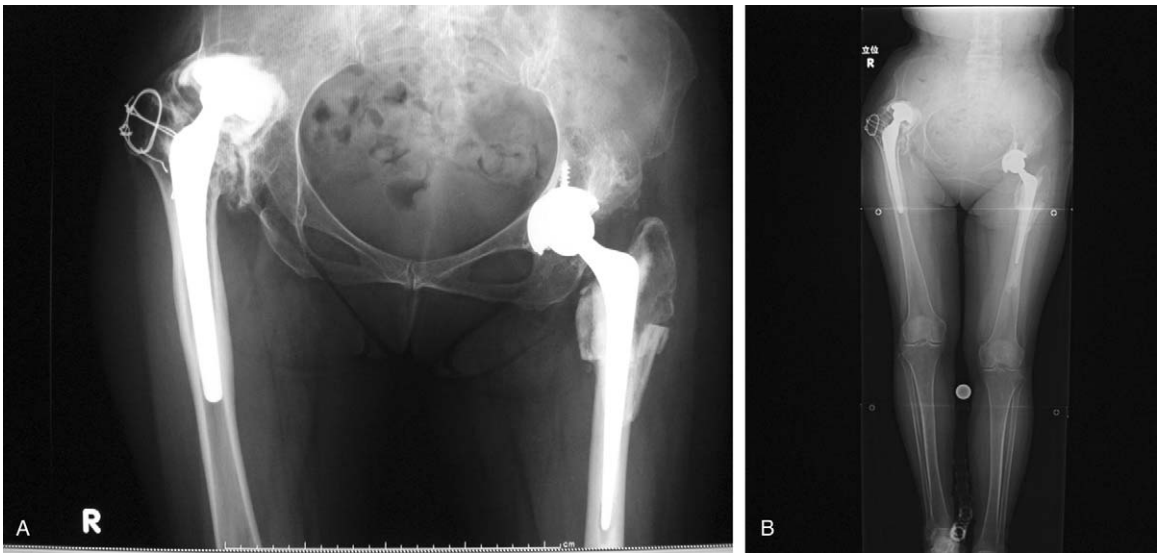

Figure 2. Radiograph after left THA with subtrochanteric shortening osteotomy. Severe pelvic obliquity on the left was revealed in the radiograph. A, Anterior-posterior radiograph of the both hips. B, Plain radiograph with whole lower extremities in standing position.

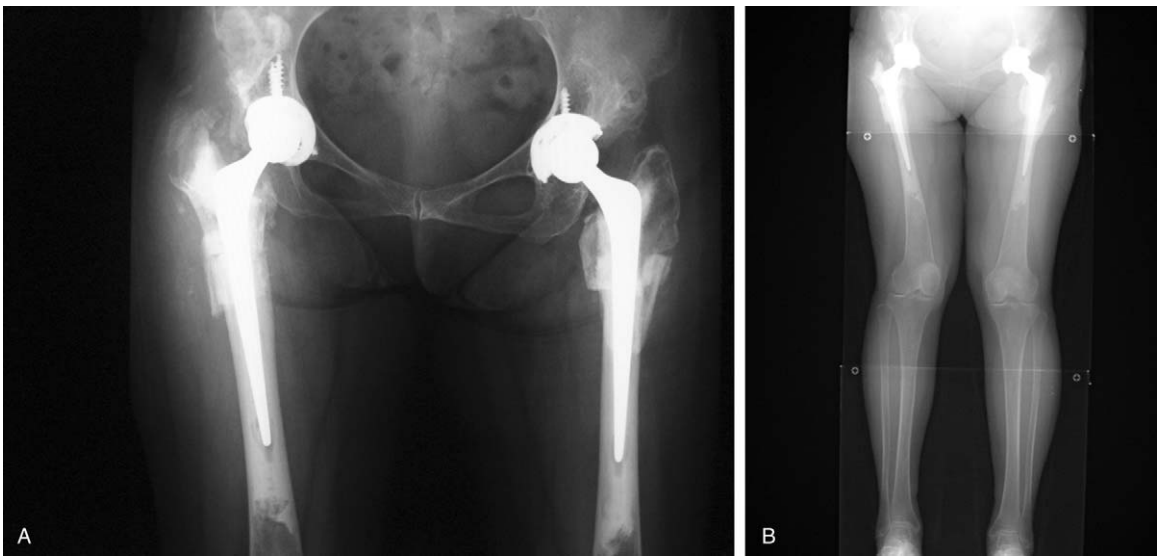

Figure 3. Radiograph after right revision THA with subtrochanteric shortening osteotomy. The improvement of the pelvic obliquity was showing in the postoperative radiograph. A, Anterior-posterior radiograph of the both hips. B, Plain radiograph with whole lower extremities in standing position.

surgery, which should be the target leg length. In the details of the preoperative planning, distal translation of the hip center was 45 mm when the cup was placed at the original acetabulum. Therefore, the amount of subtrochanteric femoral osteotomy was determined to be 45 mm in order to prevent further leg length lengthening.

During surgery, on the acetabular side, a cementless cup was placed at the original acetabulum and fixed with 3 screws. Removal of the well-fixed stem was relatively easy and minimally invasively from the proximal side before subtrochanteric femoral osteotomy. Subtrochanteric femoral osteotomy was performed with a 45 mm resection 10 mm distal from the minor trochanter according to the preoperative plan. A cemented stem (Exeter V40 Femoral Stem, Stryker Orthopedics, NJ) was used, and the strut bone graft from the resected bone was fixed with ultra high molecular weight polyethylene fiber cable (Alfresa Pharma Co., Tokyo, Japan) in the osteotomy site.

The gradual improvement of the pelvic obliquity was confirmed in the postoperative radiograph of the lower extremities (Fig. 3A,B), and the 3DCT measured the postoperative leg length discrepancy to be +9 mm on the affected side. However, the subjective leg length discrepancy disappeared. After revision surgery, the patient could walk without a cane. The gait asymmetry and Trendelenburg's sign were not showing. The modified Harris hip score improved from 28.6 points to 84.7 points. At the time of the final follow-up period of 2 years after surgery, complete boney fusion at the osteotomy site was confirmed, and there were no complications with postoperative dislocation, infection, or thrombosis.

3. Discussion

Recently, there have been several reports for the combined application of primary THA and subtrochanteric femoral shortening osteotomy for hips with Crowe type IV dysplastic hip.[1–7] There have been various types of osteotomies, such as V-shaped osteotomy,[6] step-cut osteotomy,[4,5] and chevron osteotomy,[3] to avoid non-union and to obtain stability of the distal femur. Furthermore, various types of stems have been used, including reports using a cementless stem with mainly an S-ROM stem[5,7] as well as reports using a cement stem.[1,2] In the present case, loosening of the cementless stem from the previous surgery was not found. There was a concern for difficult removal for the well-fixed stem and intra-operative femoral fracture during revision surgery; therefore, transverse osteotomy was selected, which is a simpler surgical option for femoral shortening. Furthermore, a cement stem was chosen based on the possible difficulty in achieving rotational stability at the distal femur with a cementless stem due to the fragility of the femur.

Transverse shortening osteotomy is a major and convenient way of operation to determine the rotation of the femur at the osteotomy site. However, the contact area at the osteotomy site becomes small.[1,2,7,9] Additionally, by using a cement stem, the cement might be interposed at the osteotomy site and could potentially cause non-union. However, Charity et al[1] and Kawai et al[2] reported a procedure similar to the present case and proposed a good result using a cemented stem combined with transverse osteotomy for 18 hips and 19 hips with an average follow-up of 114 months and 42 months. On the other hand, the combination of subtrochanteric femoral osteotomy and revision THA has only been mentioned in one case report by Sonohata et al.[10] Sonohata et al[10] has reported satisfactory results for the combination of subtrochanteric femoral osteotomy and revision THA with a cementless stem with a follow-up period of 4 years.

In the present case, the right THA performed with previous surgery was an extremely high replacement of the cup due to following multiple previous operations. During the revision THA, placement of the cup in the original acetabulum was needed to be implemented with subtrochanteric femoral shortening osteotomy. Furthermore, in devising a preoperative plan, it was difficult to determine the amount of osteotomy when considering the difference between the patient's subjective leg length discrepancy due to severe pelvic obliquity and the actual leg length.[11] The actual leg length was prioritized, it was decided that the amount of osteotomy would be equal to the amount of distal translation to the original hip center. As a result, pelvic obliquity improved, and the subjective leg length discrepancy disappeared after surgery.

In the present case, left THA with subtrochanteric femoral shortening osteotomy was performed for the first surgery in our hospital. Due to the result of the first surgery, severe pelvic obliquity developed. This may have resulted in an abduction contracture of the left hip after surgery. Zhou et al[12] proposed that abduction contracture could be a major factor for the pre and post-operative severe pelvic obliquity. Therefore, preoperative planning of the right hip for leg length discrepancy has become complicated. Oe et al[13] and Rollo et al[14] reported the clinical results for the one-stage bilateral THA with subtrochanteric femoral shortening osteotomy for Crowe type IV dysplastic hips. It was expected that preoperative planning of equal leg length could be performed more easily with 1-stage bilateral THA for these cases. In the present case, however, the right hip underwent multiple surgeries and required revision THA with subtrochanteric femoral shortening osteotomy. Compared with common one-stage surgery, a higher probability of intra and post-operative complications was expected. One-stage bilateral THA for the present case is not recommended.

Limitations associated with this report include the fact that the postoperative follow-up period was quite short, and that future observation of progress is necessary. Second, other surgical approaches for the present case, such as high hip replacement of the acetabular component, were not mentioned. This is because our general surgical strategy for cup position in THA for DDH patients was based on the cup placed them in original acetabulum. Third, depending on the case, pelvic obliquity may not improve postoperatively, and it is necessary to consider multiple factors, such as degenerative scoliosis and hip contracture, when devising preoperative plans regarding leg length.[15]

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