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Total hip arthroplasty with femoral subtrochanteric osteotomy after Schanz osteotomy

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ABSTRACT

Background: Schanz osteotomy is one of the options for the management of hip instability caused by congenital or septic arthritis. Following Schanz osteotomy, there is risk of hip pain secondary to hip arthritis. It may be necessary to perform subtrochanteric femoral osteotomy in conjunction with total hip arthroplasty (THA). This study evaluates the outcomes and complications associated with THA.

Methods: We performed 36 THA after Schanz osteotomy. Patients were divided into three groups: (1) successful Schanz osteotomy, (2) highly dislocated hip with contact between the femoral head and pelvis, and (3) completely dislocated hip without contact between the femur and pelvis. Clinical and radiological evaluations were completed for each group.

Results: In all three groups, hip function improved significantly ($p < 0.01$). There were four types of complications: transient paralysis, femoral fracture, dislocation, and non-union. Complications occurred frequently in the completely dislocated hip group.

Conclusions: Our study shows that acceptable results may be obtained from THA with subtrochanteric femoral osteotomy after Schanz osteotomy. However, this procedure is a technically demanding treatment option, and there were characteristic complications intra and after surgery. Therefore, surgeons should treat hip osteoarthritis after Schanz operation with utmost care, especially completely dislocated hip.

1. Introduction

Femoral osteotomy for patients with developmental dysplasia of the hip joint (DDH) indicates the following two situations: patients do not want to undergo total hip arthroplasty (THA) or they are not indicated for THA. Femoral osteotomy for patients with DDH has the potential to change the natural history of hip disease. Additionally, several lines of evidence indicate good clinical results following femoral osteotomy [1–4]. Unfortunately, some patients do not achieve full recovery after osteotomy and must undergo further treatment with THA for hip osteoarthritis following femoral osteotomy.

THA for patients who have had previous undergone femoral osteotomy is technically difficult due to a deformed canal, residual cortical defect, the incidence of positive tissue cultures from the osteotomy site, difficulty in removing implants, and adhesion. As a result, there are more complications associated with the procedure than conventional THA. Moreover, poor clinical results have been observed after THA for patients who have previous undergone osteotomy [5].

In 1922, Schanzfirst described the technique of pelvic support osteotomy using subtrochanteric osteotomy of the femur for young adults with high hip joint dislocation [6]. The purpose of the technique was to reduce severe limping and achieve a pain-free hip.

In conversion to THA, there are two major challenges associated with Schanz osteotomy: insertion of the femoral straight stem, and placement of the cup in its true anatomical position.

Namely corrective osteotomy requires insertion of the straight stem into the deformed femur and subtrochanteric shortening osteotomy requires the cup to be placed in its true anatomical position [7–13].

There are some reports of THA patients who previously underwent Schanz osteotomy. However, patients undergoing previous Schanz osteotomy represented only a small subgroup of the population in these studies [7,9–13]. The only large case series (68 hips) of THA using step-cut osteotomy was reported by Eskelinen et al. [8].

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In this study, we describe the clinical and radiographic outcomes of THA combined with V-shaped or double-chevron subtrochanteric corrective shortening osteotomy for 36 hips of 28 patients previously treated with Schanz osteotomy.

The study protocol adhered to the ethical guidelines of the 1975 Declaration of Helsinki, and the institutional review board of the Faculty of Medicine of Saga University in Saga, Japan, approved the study design.

2. Materials and methods

Between February 1999 and January 2010, we performed 58 THA combined with V-shaped (1999–2002) or double-chevron (2003-) subtrochanteric corrective shortening osteotomy on47 patients who had previously undergone Schanz osteotomy of the femur.

We excluded 19 patients (22 hips) who we were unable to monitor for more than five years. The remaining 36 hips of 28 patients were included in the study (Table 1).

Ten hips underwent THA combined with subtrochanteric double-chevron osteotomy according to the procedure described by Sonohata [7], and 24 hips underwent THA combined with subtrochanteric V-shaped osteotomy according to the procedure described by Hotokebuchi [9] (Figs. 1 and 2). Only two hips received THA without subtrochanteric osteotomy.

The indications for the procedure were severe hip pain and/or considerable difficulty in walking and performing daily activities.

All operations were performed using a cementless femoral and pelvic component (Kyocera, Kyoto, Japan).

All hips were evaluated using the Japanese Orthopaedic Association (JOA) hip scoring system. The JOA score covers four categories using a 100-point scale: pain (40 points), range of motion (20 points), walking ability (20 points), and activities of daily living (20 points).

Routine radiographic examinations included anteroposterior and frog-leg lateral radiographs. The acetabular components were evaluated at the most recent follow-up assessment for evidence of migration, in accordance with the method of Carlsson and Gentz [14]. The bone–metal interface was evaluated at the most recent follow-up assessment for the presence and progression of radiolucent lines in the three zones described by DeLee and Charnley [15]. The femoral component was evaluated for changes in position, subsidence, and radiolucency in the seven zones described by Gruen et al. [16]. The stability of the femoral component was assessed for bone ingrowth fixation, stable fixation, or unstable fixation in accordance with the fixation/stability score described by Engh et al. [17].

All hips were divided into three groups according to the preoperative radiographs. Group A achieved pelvic support osteotomy as the aim of Schanz osteotomy, Group B included highly dislocated hips with contact between the femoral head and pelvis, and Group C included completely dislocated hips without contact between the femur and pelvis (Fig. 3 and Table 1).

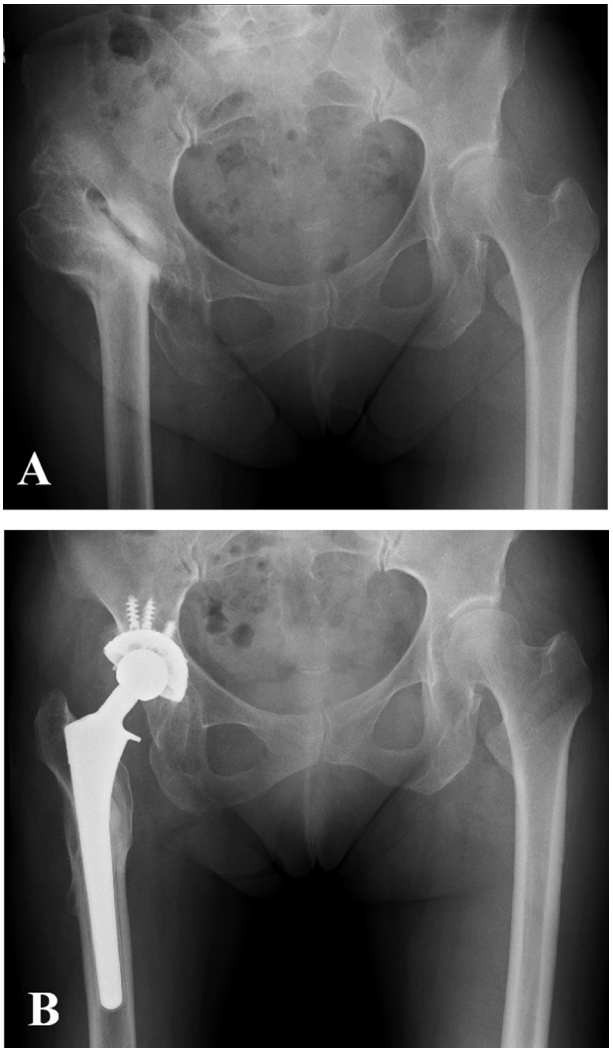

Fig. 1. Pre- and postoperative radiographs of the right hip joint of a 61-year-old woman. (A) After Schanz osteotomy of the right femur. (B) Five years after total hip arthroplasty combined with subtrochanteric corrective shortening femoral osteotomy.

The operation time, total blood loss, Harris hip score before surgery and at the most recent follow-up assessment, and radiographic evaluations were compared between the three groups.

2.1. Statistical analysis

The mean age, follow-up period, operation time, total blood loss, and the JOA hip score before surgery and at the most recent follow-up assessment were compared among the three groups using one-way analysis of variance (ANOVA) with Fisher's

Table 1
Clinical characteristics.

	Total	Group A	Group B	Group C
Number of patients	28	6	11	14
Number of hips	36	6	12	18
Sex Male (patients, hips)	2,3	0, 0	0, 0	2, 3
Female (patients, hips)	26,33	6, 6	10, 12	11, 15
Age (year) (mean ± SD, range)	58 ± 8, 39–77	65 ± 5, 58–74	58 ± 10, 41–77	57 ± 7, 39–67[a]
Follow-up period (year) (mean ± SD, range)	7.3 ± 2.4, 5–13	8.0 ± 1.3, 6–9	7.5 ± 2.4, 5–12	6.8 ± 2.6, 5–13

There is a discrepancy of number of patients, because 3 patients belong in 2 groups.
[a] Significant difference to group A and C ($p < 0.05$).

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