

# Reconstructed bone fracture 28 years after hip rotationplasty for Ewing sarcoma: A case report

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**Abstract.** Hip rotationplasty is a surgical method used to treat malignant tumors of the proximal femur. A 52-year-old woman, who underwent hip rotationplasty for Ewing sarcoma of the proximal left femur at the age of 24, fell and hit the left buttock. The patient was then admitted to the Department of Orthopedic Surgery, Graduate School of Medicine, University of the Ryukyus. Radiography and computed tomography (CT) revealed a comminuted fracture of the reconstructed bone distally. The patient underwent open reduction and internal fixation (ORIF) and external fixator. External fixation was removed 1 month after the surgery. At two years after surgery, at the latest follow-up, bone union was confirmed by 3-dimensional CT. The combination of ORIF and temporal external fixation was effective for the reconstructed bone fractures after hip rotationplasty.

## Introduction

Hip rotationplasty was first reported by Winkelmann in 1986 as a hip reconstruction method for proximal femoral malignant tumors (1). It is a surgical method in which the remaining distal femur is rotated 180° after resection of the tumor and fixed to the outside of the pelvis. The knee joint functions as the hip joint and the ankle joint functions as the knee joint. A few reports of reconstructed bone fractures after rotationplasty following excision of femoral malignant tumors have been reported (2,3); however, to the best of the authors' knowledge there are no previous reports on detailed surgical interventions

in patients with a reconstructed bone fracture status after hip rotationplasty.

The present study presents a case of fracture of the reconstructed bone status after hip rotationplasty 28 years after surgery treated by open reduction and internal fixation (ORIF) and external fixation.

## Case report

A 52-year-old woman underwent hip rotationplasty for Ewing sarcoma of the proximal left femur at the age of 24 years and was followed up annually at the Department of Orthopedic Surgery, Graduate School of Medicine, University of the Ryukyus (Fig. 1A). Her crutches were caught in the step while climbing stairs at home, making her fall and hit her left buttock. The patient was transported to the hospital by ambulance because of severe pain and difficulty with mobility. Physical observations at the time of ambulance transport were as follows: A subcutaneous hematoma was found around the left buttock, no open wound was observed, the patient had pain in the left buttock when the patient moved and had difficulty walking even with a prosthetic leg. Radiography revealed a distal comminuted fracture of the reconstructed bone (Fig. 1B). Computed tomography (CT) revealed a comminuted fracture of the reconstructed bone, similar to the radiograph, and blood vessels flowed into the distal bone fragment (Fig. 2A and B).

The patient underwent ORIF and external fixator. Under general anesthesia, a pillow was placed under the left buttock, and the patient was placed in the right half-side-lying position. An approximately 20 cm longitudinal skin incision was made on the lateral side of the left buttock. The proximal and distal parts of the reconstructed bone were exposed without dissection of the fractured part to preserve the blood flow to the fracture site. Conformability of the distal femoral Locking Compression Plate® (DePuy Synthes) was confirmed using a fluoroscope. The interfering screws were removed. Four locking screws for the Locking Compression Plate® were inserted into the proximal bone fragment, and six locking screws into the distal bone fragment for the Locking Compression Plate®, respectively (Fig. 3A). Then, two half-pins for the external fixator were inserted into the proximal tibia and two half pins were inserted into the contralateral iliac crest (Fig. 3B). At two days following surgery, 10 sessions of hyperbaric oxygen therapy and low-intensity pulsed ultrasound therapy

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*Abbreviations:* CT, computed tomography; ORIF, open reduction and internal fixation

*Key words:* hip rotationplasty, fracture, open reduction and internal fixation, Ewing sarcoma, case report

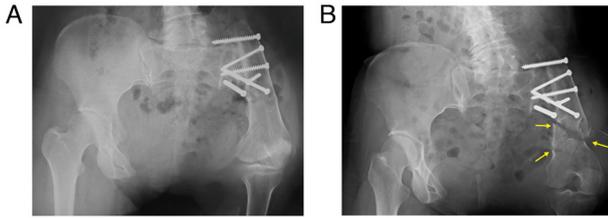


Figure 1. Preoperative radiographs. (A) A radiograph 28 years after hip rotationplasty before injury. (B) Radiograph showing comminuted fractures of distally reconstructed bone (arrows).

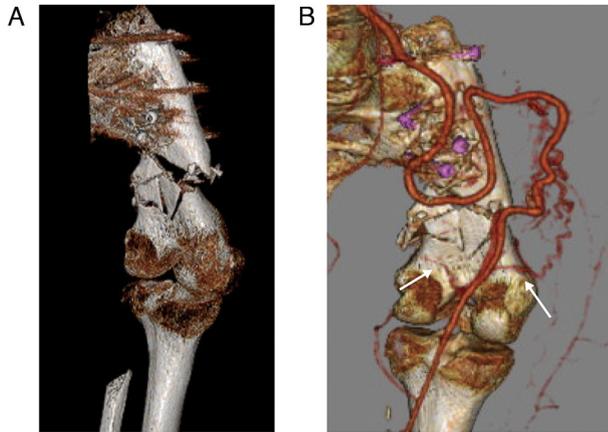


Figure 2. Preoperative computed tomographs. (A) CT showed similar observations as preoperative radiograph for restructured bone distally. (B) Inflow of blood vessels (arrows) into the distal fracture fragment is confirmed by angio-CT. CT, computed tomography.

were started to control excess soft tissue damage and reduce fracture healing time for six months (4). Denosumab (60 mg per six months) was administered for osteoporosis treatment after surgery. External fixation was removed 1 month after the surgery. Partial weight bearing with prosthetics was allowed 8 weeks after surgery and full weight bearing 15 weeks after surgery. After 24 months after the surgery at the latest follow-up, bone union was confirmed using 3-dimensional CT (Fig. 4A). The patient could walk with prosthetics and a T-cane and return to work as an architect (Fig. 4B).

## Discussion

Surgical methods for malignant tumors of the proximal femur include hip disarticulation (5,6), endoprosthetic arthroplasty (7,8), and hip rotationplasty (1-3). Hip rotationplasty was first reported by Winkelmann in 1986 in patients with malignant tumors of the proximal femur (1). Hip rotationplasty has several advantages and is an alternative to amputation or extendable endoprosthesis, resulting in good function. Therefore, it has been suitable for children with malignant bone tumor in lower limbs (2,9). This procedure has been performed as re-operation even after complications such as deep infection (10). Reports of complications of hip rotationplasty include loosening of osteosynthesis, venous thrombosis, arterial thrombosis, delayed wound healing, bone fractures, and compartment syndrome (2,3,11).

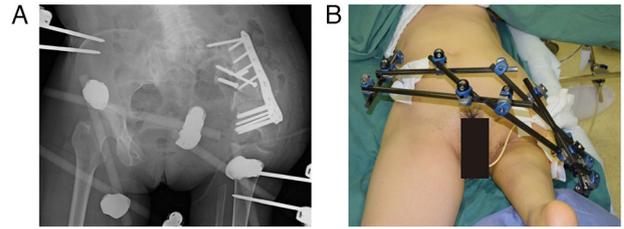


Figure 3. Postoperative radiograph and findings. (A) Postoperative radiograph. (B) External fixator is applied after open reduction and internal fixation.

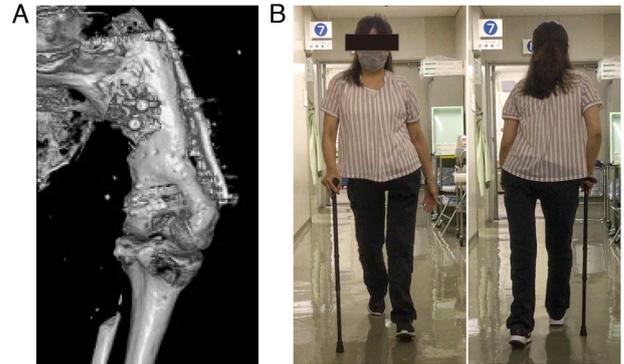


Figure 4. Postoperative 3-dimensional computed tomography and walking status. (A) Bone union is achieved 2 years after surgery. (B) Left, anterior walking status; Right, posterior walking status.

Postoperative complication rates of bone fractures after rotationplasty were 4-11% in previous reports, which occurred from 11 months to 12 years following surgery (2,3). Bone fractures occur in the proximal tibia, distal tibia, or tibial shaft. In previous reports, surgical intervention or conservative therapy has been performed for bone fractures after rotationplasty (2,3). ORIF or shortening osteotomy is performed for bone fractures after rotationplasty (2,3). However, there are no detailed reports on reconstruction. In the present case, the patient underwent a combination of ORIF and temporal external fixation for comminuted reconstructed bone fractures. At the last follow-up, bone union was achieved, and the patient recovered ambulatory ability.

In the present study, temporal external fixation was performed to achieve strong fixation for bone fracture after hip rotationplasty. Temporal external fixation was performed after hip transposition arthroplasty to stabilize bone and soft tissue, which was removed 6 weeks after first surgery (12-14). Hip transposition arthroplasty, also known as resection arthroplasty, is a procedure that resects malignant bone tumor of the pelvis or acetabulum and transfers the femoral head to the lateral surface of the resected sacrum or ilium (12-14). In a previous study, patients who underwent hip transposition arthroplasty with temporary external fixation were able to move the day after surgery, stand with partial weight-bearing seven days after surgery, and transfer to a wheelchair eight days after surgery (13). Additional temporal external fixation might enable early rehabilitation after surgery to achieve solid immobilization. In this study, ORIF and an external fixator were used to obtain strong fixation and perform early rehabilitation.

In conclusion, the present study described the case of comminuted reconstructed bone fracture 28 years after hip rotationplasty; the combination of ORIF and temporal external fixation effectively led to bone union and regain of ambulatory ability.

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#### Availability of data and materials

All data generated and analyzed during this study are included in this published article.

#### Authors' contributions

YuT, HO, KM, YaT, and KN contributed to conception of this study. YuT, HO, and KM contributed to acquisition of data. YuT, HO, KM, YaT, and KN wrote and edited the manuscript. HO and YaT performed surgery and postoperative management, respectively. YaT and KN conducted revision of the manuscript for important intellectual content. YuT and YaT confirm the authenticity of all the raw data. All authors have read and approved the final manuscript.

#### Ethics approval and consent to participate

Not applicable.

#### Patient consent for publication

Written informed consent for the publication and use of images was obtained from the patient.

#### Competing interests

YaT is on the editorial board for *Cancer Diagnosis and Prognosis*. KN is on the editorial board of *the Journal of Orthopaedic Research* and is a board member of the International Society for the Study of Lumbar Spine. The authors declare that they have no competing interests.

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