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Case Report

Total hip arthroplasty with reconstruction of acetabulum through direct anterior approach for metastatic bone disease of acetabulum combined with pathological proximal femoral neck fracture: A case report

Hironori Ochi ^{a,*}, Tatsuya Takagi ^b, Tomonori Baba ^b, Masahiko Nozawa ^a,
Sung-Gon Kim ^a, Yuko Sakamoto ^a, Suguru Kato ^a, Yasuhiro Homma ^b,
Kazuo Kaneko ^b, Muneaki Ishijima ^b

^a Department of Orthopaedics Surgery, Juntendo University Nerima Hospital, Tokyo, Japan

^b Department of Orthopaedic Surgery, Juntendo University School of Medicine, Tokyo, Japan

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ABSTRACT

Most surgical treatment options for metastatic acetabular lesions involve variants of total hip arthroplasty (THA). However, these are technically complex reconstructions performed in very frail patients, and previous reports indicate complications such as dislocation, deep infection, aseptic loosening, and intraoperative death. A 73-year-old man presented to the emergency department at our hospital with right hip pain following a fall. He had undergone nephrectomy for the treatment of right kidney cancer at the age of 68 years. Four years after the nephrectomy, multiple lung metastases, pelvic bone metastases, and right femoral head and neck bone metastases were found. A radiograph of the hip joint showed a pathological proximal femoral fracture with a radiolucent lesion of the acetabulum. THA with acetabular reconstruction using a Kerboull-type (KT) plate through the direct anterior approach (DAA) was performed. After removal of the femoral head, curettage of the metastatic acetabular dome lesion was carefully performed under fluoroscopic guidance. After the KT plate was placed, cementation of the metastatic acetabular dome lesion was performed, and an optimally sized polyethylene liner was fixed with cement. A cemented stem was inserted after confirming the hip joint stability. At the 14-month follow-up, he could walk steadily without any complications and his modified Harris hip score was 100. The DAA conserves soft tissue because it is an intermuscular approach. Accordingly, postoperative recovery is fast and thus associated with a low dislocation rate and effective pain reduction. The acetabulum with metastatic disease was reconstructed using a KT plate for hip joint stability. Bone with metastatic disease that appears adequate at the time of THA may become incompetent after a few years. THA with acetabular reconstruction using a KT plate through the DAA was an effective treatment for metastatic bone disease of the acetabulum combined with pathological proximal femoral neck fracture.

* Corresponding author at: Department of Orthopaedics Surgery, Juntendo University Nerima Hospital, 3-1-1, Takanodai, Nerima-ku, Tokyo 117-8421, Japan.

E-mail address: hochi@juntendo.ac.jp (H. Ochi).

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Introduction

Metastatic disease of the acetabulum can be very painful and may severely limit function and activities of daily living [1]. Most surgical treatment options for metastatic acetabular lesions involve variants of total hip arthroplasty (THA) [1]. However, these are technically complex reconstructions performed in very frail patients, and previous reports indicate that dislocation may occur in up to 21% of patients, deep infection in 11%, revision for aseptic loosening in 7%, and intraoperative death in 6% [1,2].

Several studies have demonstrated the effectiveness of acetabular reconstruction using a Kerboull-type (KT) plate through the direct anterior approach (DAA), which is a minimally invasive surgical approach for extensive acetabular bone defects [3,4]. We performed THA with acetabular reconstruction through the DAA in a patient with metastatic bone disease of the acetabulum combined with pathological proximal femoral neck fracture.

Case report

A 73-year-old man presented to the emergency department at our hospital with right hip pain following a fall. He had undergone nephrectomy for the treatment of right kidney cancer at the age of 68 years. Four years after the nephrectomy, multiple lung metastases, pelvic bone metastases, and right femoral head and neck bone metastases were found. However, the patient refused chemotherapy and radiation therapy until he fell 5 years postoperatively. Before the fall, he had been able to walk independently. A radiograph of the hip joint showed a pathological proximal femoral fracture with a radiolucent lesion of the acetabulum on the right

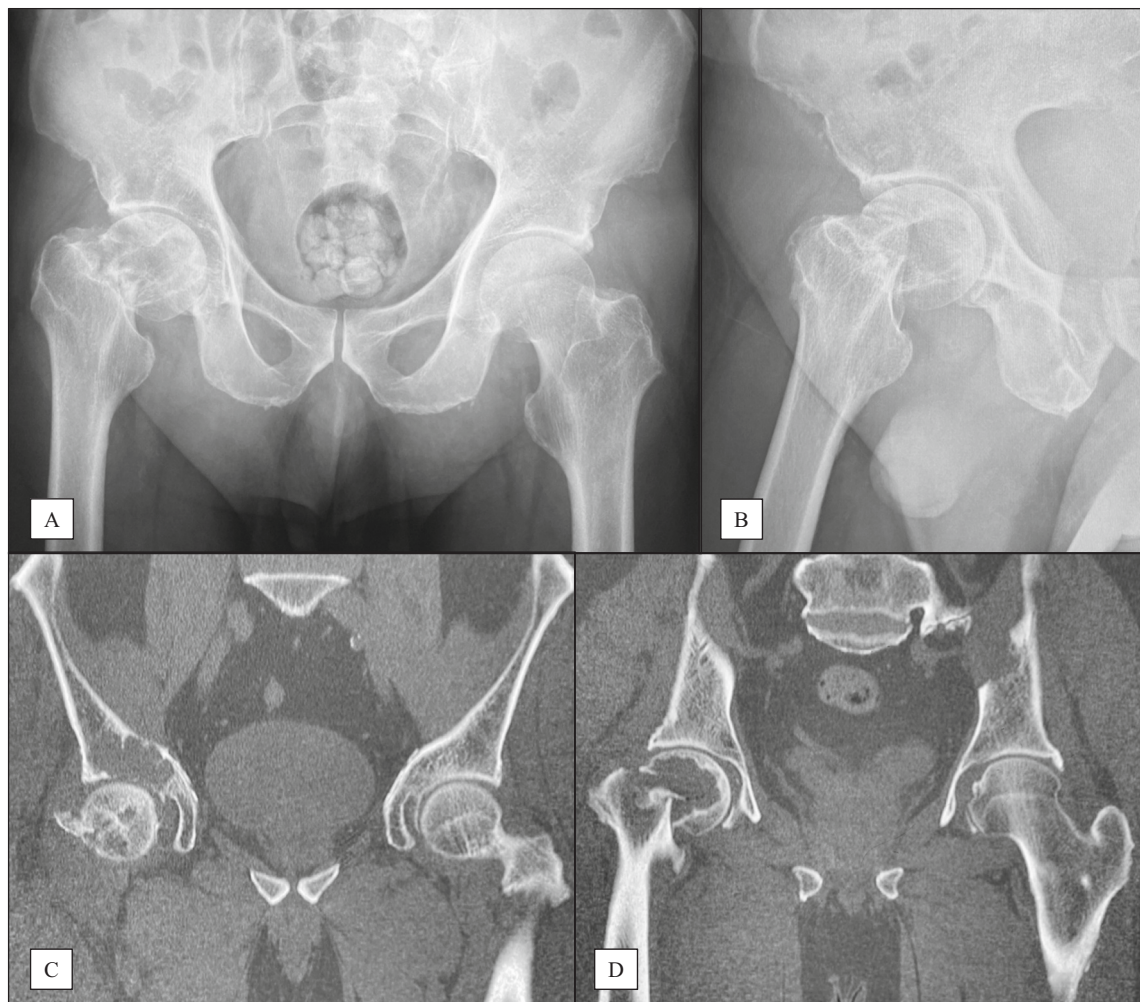


Fig. 1. (A) Anteroposterior and (B) Lowenstein lateral preoperative radiographs of the hip joint demonstrated a metastatic lesion of the acetabular dome and a pathological displaced femoral neck fracture on the right side. (C) Coronal computed tomography demonstrated that the articular surface of the right acetabulum was disrupted combined with insufficient supportive subchondral bone because of the metastatic lesion. (D) Coronal computed tomography also showed the displaced pathological proximal femur fracture with a large metastatic lesion in the right femoral head and neck bone.

side (Fig. 1A, B). Computed tomography showed that the articular surface of the acetabulum was disrupted and that insufficient supportive subchondral bone was present (Harrington class III defect) [5]; additionally, the displaced femoral neck fracture was associated with a large metastatic lesion extending from the femoral head to the femoral neck (Fig. 1C, D). Surgical reconstruction was scheduled considering that the patient had an expected life span of >3 months. Preoperative embolization was performed on the day of the surgery to reduce intraoperative blood loss (Fig. 2A, B). THA with acetabular reconstruction was performed using the following surgical technique.

Surgical technique

The DAA was used with the patient in the supine position on a traction table (LECURE®; Surgical Alliance, Tokyo, Japan) (Fig. 3A). Fluoroscopy was used intraoperatively. An approximately 10-cm skin incision was made parallel to a line drawn from the anterior superior iliac spine to the fibular head (Fig. 3B). The capsular ligament anterior to the hip joint was incised in a V-shape and inverted to expose the femoral head and neck. After removal of the femoral head, curettage of the metastatic acetabular dome lesion was carefully performed under fluoroscopic guidance. After confirming the optimum size of the KT plate (Kyocera Medical Corporation, Osaka, Japan), the true KT plate was placed in an appropriate position. Cementation of the metastatic acetabular dome lesion was then performed, and an optimally sized polyethylene liner (X3 RimFit cup; Stryker, Mahwah, NJ, USA) was fixed with cement targeting a lateral opening angle of 40° and an anterior opening angle of 20°. A cemented stem (Exeter Short Stem; Stryker) was inserted after confirming the hip joint stability, leg length, and femoral offset. Polymethylmethacrylate bone cement with a dose of 1 g of tobramycin per 40-g bag of cement (Simplex with Tobramycin; Stryker) was used on both the acetabular side and femoral side. A 32-mm-diameter ceramic femoral head was used. After confirming the stability of hip joint, the joint capsule was re-sutured, and the wound was closed. The operative time was 231 min, and the total blood loss was 830 ml.

Postoperative treatment

Rehabilitation was started with full weight bearing 1 day postoperatively. Denosumab and chemotherapy for the metastasis were also administered. The patient was able to walk with a cane at 3 weeks postoperatively. At the 14-month follow-up, he could walk steadily without any complications, such as dislocation, aseptic loosening, or infection, and his modified Harris hip score was 100. A postoperative radiograph of the hip joint demonstrated stable components without aseptic loosening (Fig. 4A, B).

Discussion

THA with acetabular reconstruction using a KT plate through the DAA was performed for metastatic bone disease of the acetabulum combined with pathological proximal femoral neck fracture. The patient regained his walking ability in the early postoperative period, and he was able to return to his pre-injury walking ability with no complications such as dislocation, loosening, or infection.

This patient had acetabular metastasis combined with pathological proximal femoral neck fracture. It was important for this elderly patient to achieve an early return to his activities of daily living; therefore, arthroplasty for the displaced femoral neck fracture through the DAA had advantages over other approaches. The DAA conserves soft tissue because it is an intermuscular approach [6].

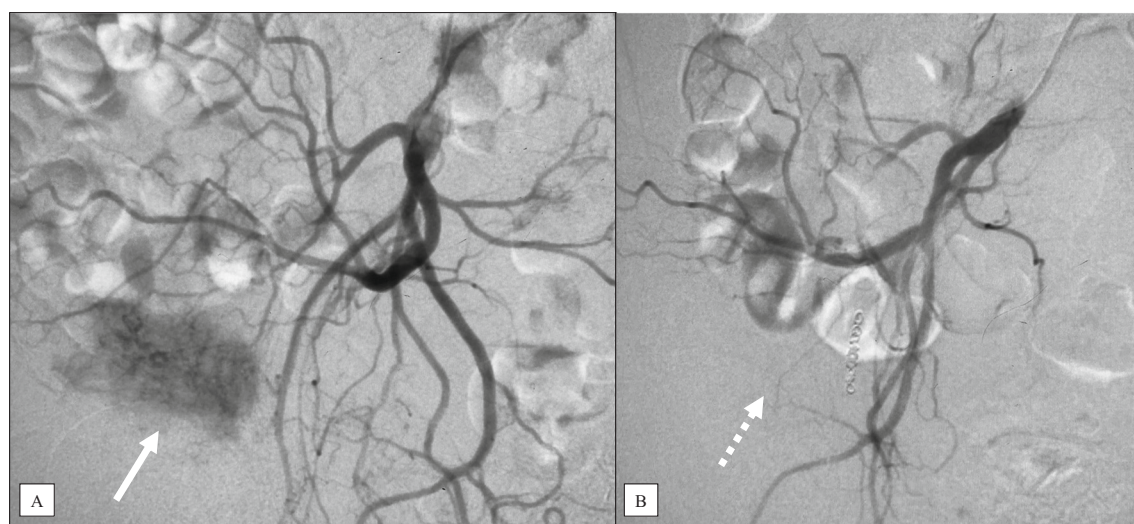


Fig. 2. (A) Pre-embolization arteriogram demonstrated the hypervascular metastatic lesion (arrow) related to renal cell carcinoma in the right acetabulum. (B) Post-embolization arteriogram demonstrated devascularization of the metastatic lesion (dashed arrow) following catheterization of the identified arterial feeders.

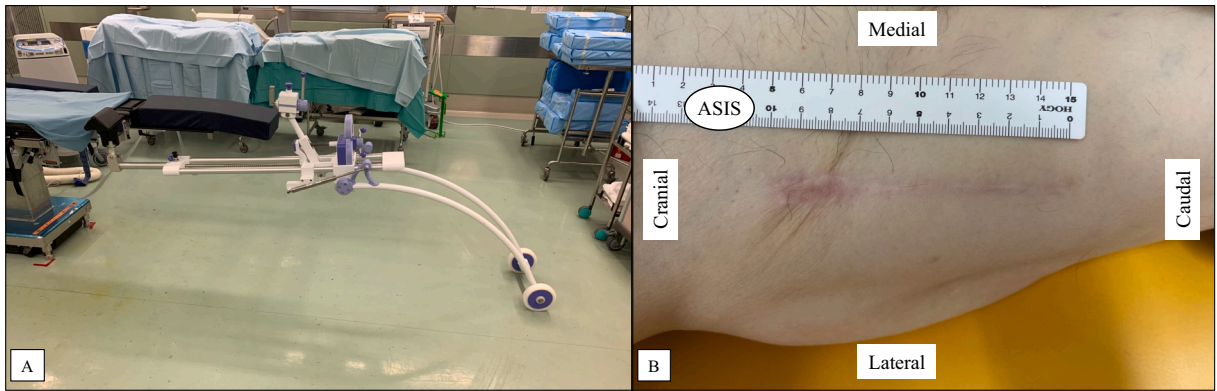


Fig. 3. (A) A traction table (LECURE®; Surgical Alliance, Tokyo, Japan) was used for intraoperative fluoroscopy. (B) An approximately 10-cm skin incision was made parallel to a line drawn from the anterior superior iliac spine to the fibular head. ASIS: anterior superior iliac spine.

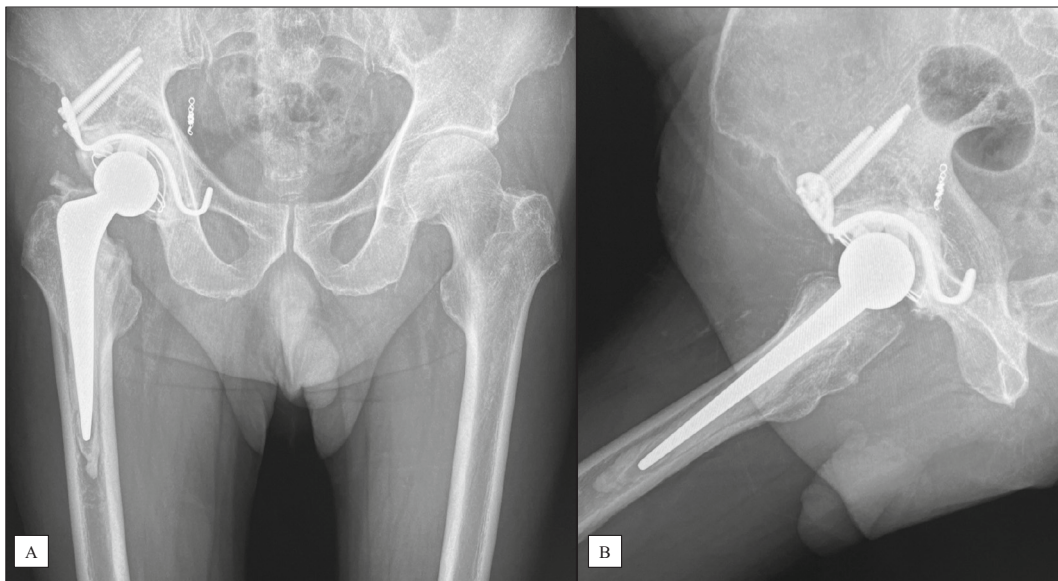


Fig. 4. (A) Anteroposterior and (B) Lowenstein lateral postoperative radiographs of the hip joint demonstrated stable components without aseptic loosening at 14 months postoperatively.

Accordingly, postoperative recovery is fast and thus associated with a low dislocation rate and effective pain reduction, and a favorable postoperative outcome can be expected [6]. In addition, fluoroscopy can be easily used during surgery through the DAA because the patient is placed in the supine position [4]. Appropriate use of fluoroscopy during surgery not only prevents improper implant placement but also enables accurate evaluation of leg length discrepancy and offset, thus further improving the postoperative outcome [4]. In this case, fluoroscopy was also useful to confirm the region of acetabular metastasis during curettage.

The acetabulum with metastatic disease in our patient was reconstructed using a KT plate for hip joint stability. Bone with metastatic disease that appears adequate at the time of THA may become incompetent after a few years [2,7]. Therefore, Wegrzyn et al. advocated reconstructing the acetabulum with the use of a Kerboull cross-plate, which does not rely on bone ingrowth for stability and reduces the mechanical forces applied to the periacetabular bone with fixation over a large surface area of intact pelvic bone, increasing the elasticity of the reconstruction [2]. Matsumoto et al. reported the details of surgical acetabular reconstruction using a KT plate through the DAA for patients with an extensive acetabular bone defect [3]. No serious complications, such as dislocation, infection, or periprosthetic femoral fracture, occurred in any patient after surgery [3]. Furthermore, in this case, antibiotic-laden bone cement was used at the time of definitive component implantation to prevent prosthetic joint infection. Gandhi et al. reported that the use of antibiotic-laden bone cement in cemented THA reduced the risk of deep prosthetic joint infection and potentially also decreased the rate of aseptic loosening [8].

In this case, the acetabular metastasis was related to renal cell carcinoma with a hypervascular histology. Preoperative embolization was performed on the day of the surgery to reduce intraoperative blood loss. Preoperative embolization is very helpful in

reducing intraoperative blood loss, the need for blood transfusion, and the surgical time [9]. A previous study showed a significant difference in blood loss and transfusion requirements in the embolized group than in the non-embolized control group of patients with pelvic metastases [9]. In the present case, serious intraoperative blood loss did not occur.

Conclusion

THA with acetabular reconstruction using a KT plate through the DAA was an effective treatment for metastatic bone disease of the acetabulum combined with pathological proximal femoral neck fracture. Good hip function and stable hip joint were acquired early without any complications.

Ethical approval

The study was carried out in accordance with the Declaration of Helsinki and the appropriate ethical framework.

Consent

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

Declaration of competing interest

The authors declare that they have no conflicts of interest.

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