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Total Femoral Replacement as a Salvage Procedure for a Periprosthetic Fracture After Multiple Previous Femoral Reconstructions: A Case Report

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Patient: Female, 77-year-old
Final Diagnosis: Periprosthetic fracture of the left proximal femur around a distal femoral megaprosthesis
Symptoms: External rotation of the left lower extremity • inability to ambulate • left limb pain • limb shortening • limited range of motion of the left hip and knee • recurrent hip instability/dislocations • swelling of the left limb • tenderness on palpation
Clinical Procedure: Antibiotics • blood transfusion • hip revision • Internal fixation • open reduction and internal fixation • rehabilitation • revision surgery with removal of failed Biomet OSS prosthesis • total femoral replacement
Specialty: Orthopedics and Traumatology

Objective: Unusual clinical course

Background: Periprosthetic femoral fractures and complications after joint replacement pose serious therapeutic challenges, especially in older patients with multiple comorbidities. In cases where conventional stabilization and revision procedures fail, implantation of a total femoral replacement (TFR) prosthesis may provide a limb-salvage option.

Case Report: We present the case of a 77-year-old woman with multiple comorbidities who underwent repeated treatment for fractures and complications involving the left femur over a 20-year period. Due to poor bone quality resulting from multiple previous fractures, she underwent implantation of an oncologic knee resection prosthesis (megaprosthesis), which was complicated by a periprosthetic fracture 19 years later, requiring emergency treatment. Following failure of proximal femoral plate fixation (approximately 4 months after emergency treatment), a total femoral prosthesis was implanted. Postoperatively, recurrent hip dislocations were managed with implantation of a dual-mobility acetabular cup followed by further revision surgery to restore hip stability and optimize biomechanics. Despite numerous complications, the patient regained mobility and is able to ambulate independently with a rehabilitation walker. TFR can be an effective limb-salvage option in complex cases of periprosthetic fractures.

Conclusions: In this case, TFR restored mobility, enabled the patient to regain lower limb function, and improved overall quality of life by eliminating chronic leg pain. At the 12-month follow-up, the patient was able to ambulate independently with a walker. These findings suggest that TFR can be an effective limb-salvage procedure in older patients with a history of multiple fractures.

Keywords: Case Reports • Femur • Orthopedics • Periprosthetic Fractures • Prosthesis Implantation • Reoperation
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Introduction

Over the last few decades, the number of hip and knee replacement surgeries has steadily increased [1,2]. Advances in surgical techniques, implant materials, and perioperative care have established arthroplasty as a routine and effective treatment for osteoarthritis and other musculoskeletal disorders [3]. With the increasing incidence of arthroplasty, there is a growing number of complications that require reoperation. These include periprosthetic fractures, which are often associated with poor bone quality and quantity, the presence of implants, and comorbidities in older patients [4,5].

Total femoral replacement (TFR) is among the most advanced reconstructive procedures in orthopedics. Originally developed for the treatment of malignant femoral tumors, it is now also used in cases of multiple failed previous operations, extensive bone defects, and periprosthetic fractures that cannot be managed with conventional stabilization methods [3,4]. This procedure avoids lower extremity amputation, preserves limb function, and allows patients to maintain a degree of mobility [6]. However, it is associated with a high risk of complications, including periprosthetic joint infection, postoperative wound infection, hip dislocation, limb-length discrepancy, and implant loosening; thus, it requires management by an experienced multidisciplinary team [3,7,8].

Reports describing the use of TFR as a limb-salvage procedure in non-oncologic cases after multiple failed revision procedures remain limited. This case contributes to the existing literature and illustrates potential strategies for managing such a complex clinical situation. The aim of this article is to present a rare case of TFR as a limb-salvage procedure in a 77-year-old patient with multiple comorbidities and a history of repeated femoral surgeries who sustained a complex periprosthetic fracture. Particular emphasis is placed on the decision-making process, complications encountered, and management strategies in the context of the current literature, providing valuable insights for orthopedic surgeons who manage similar cases.

Case Report

A 77-year-old woman was admitted to the Emergency Department at the District Hospital (Krotoszyn, Poland) in December 2024 with a left lower extremity injury sustained while sitting down. She reported thigh pain, swelling, and inability to ambulate. Before the injury, she was independently mobile using elbow crutches. Her medical history included hypertension; osteoporosis; obesity (body mass index 30.08 kg/m^2); impaired glucose tolerance; hypothyroidism; an ascending aortic aneurysm; and previous mastectomy, cholecystectomy, and thyroidectomy. Her orthopedic history was significant for multiple fractures of the left femur. Twenty years before presentation, she sustained a displaced comminuted fracture of the distal left femur following a ground-level fall. Despite surgical treatment, the fracture healed in malalignment, resulting in a 5-cm limb-length discrepancy. Nineteen years before the present case, she underwent implantation of a modular post-resection prosthesis (OSS Biomet) due to previous left femoral fractures and poor bone quality. The procedure yielded satisfactory results. Sixteen years before the present case, she underwent right total knee arthroplasty with a Stryker prosthesis for advanced degenerative joint disease. Eight years before the present case, she sustained a periprosthetic fracture of the right femur, which was treated with plate-and-screw fixation. The patient had no known allergies and denied tobacco, alcohol, or other substance use.

On the day of admission, physical examination revealed swelling and tenderness of the left thigh, shortening and external rotation of the affected extremity, and limited range of motion of the left hip and knee, with preserved distal vascular supply and sensation. Radiographs demonstrated a displaced proximal periprosthetic fracture of the left femur in the subtrochanteric region at the proximal end of the megaprosthetic knee stem. The fracture pattern was consistent with Seinsheimer type IIB.

According to the Unified Classification System, the injury was classified as 31A3.1[VB]. Although the implant appeared radiographically stable, suggesting features consistent with a type B1 fracture, the greatly compromised bone stock and significant fracture displacement were more characteristic of a type B3 pattern and posed considerable reconstructive challenges (**Figure 1**). Because of low hemoglobin levels, 2 units of packed red blood cells were administered before surgery. The fracture was stabilized using a proximal femoral locking plate (ChM 7). Fixation was achieved with 2 screws inserted into the femoral neck and 3 cerclage wires passed around the bone and the distal portion of the plate. The construct was further augmented with allogeneic bone grafts (**Figure 2**). After the procedure, routine thromboprophylaxis with subcutaneous enoxaparin (40 mg daily) and multimodal pain management were initiated. Toe-touch weight-bearing was recommended. The early postoperative course was uneventful, and the patient was subsequently discharged home.

Two months after presentation, follow-up evaluation revealed nonunion of the left femur and fracture of the proximal fixation screws (**Figure 3**). During hospitalization, the patient remained bedridden. She was discharged home in good general condition with instructions to avoid weight-bearing on the affected limb. A follow-up appointment was scheduled at the tertiary care center where the initial surgery had been performed.

Four months after presentation, pseudarthrosis of the proximal left femur was diagnosed, and the patient was referred to

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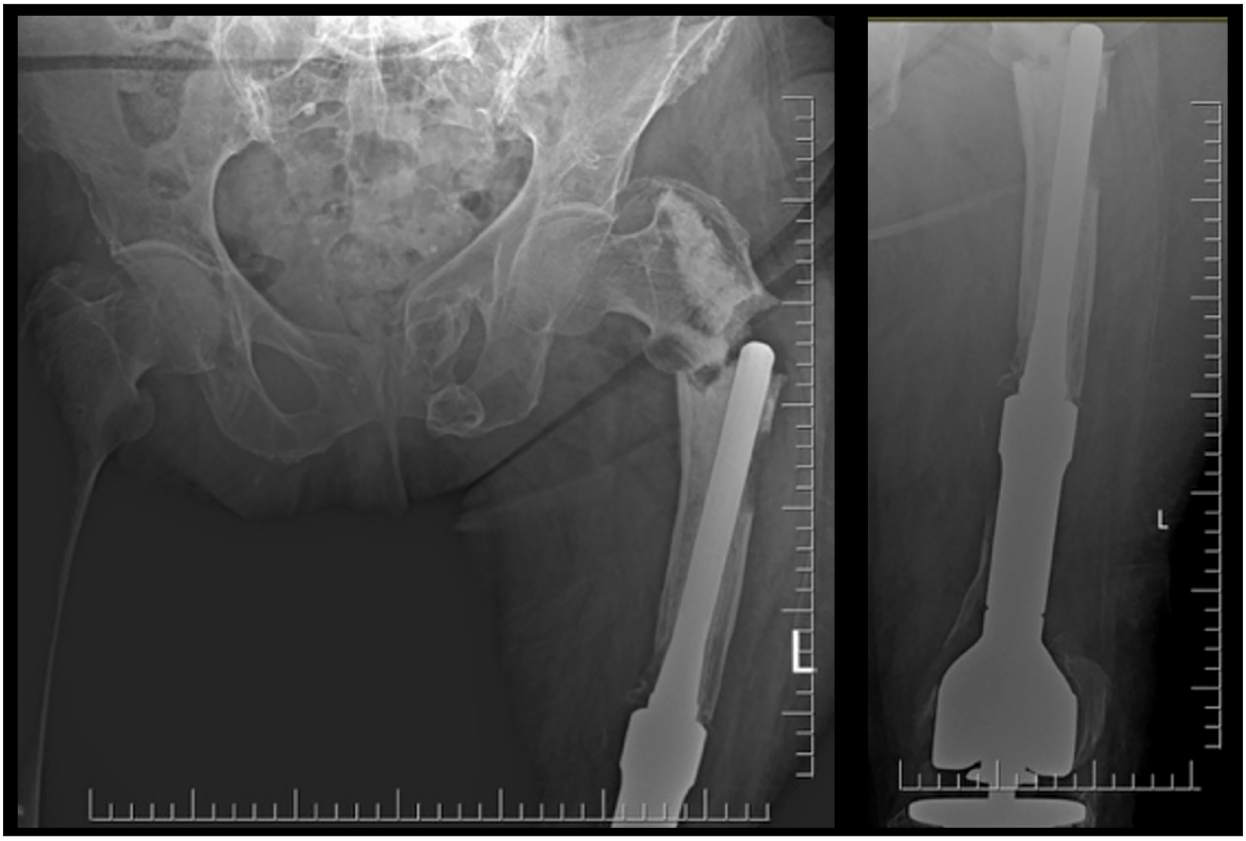

Figure 1. Admission radiograph demonstrating a displaced subtrochanteric periprosthetic femoral fracture. The tip of the knee prosthesis stem is visible.

Figure 2. Postoperative radiograph after fixation of the subtrochanteric femoral fracture. Fracture fragments are well aligned, with the fixation plate and cerclage wires in place (during the index hospitalization).

Figure 3. Nonunion of the left femur with fracture of a proximal fixation screw (2 months after presentation).

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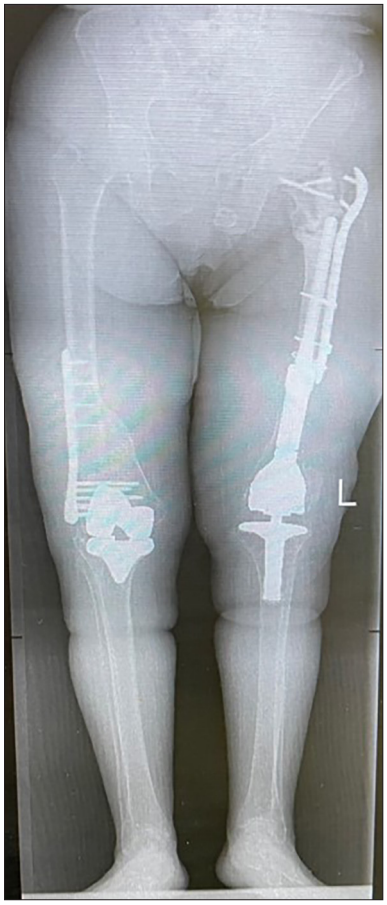

Figure 4. Radiograph of both lower extremities. The right knee prosthesis and healed right femoral fracture with fixation hardware are visible. In the left lower extremity, a Biomet OSS prosthesis is present, along with a subtrochanteric periprosthetic fracture stabilized with a proximal femoral plate (ChM) and no radiographic evidence of union (4 months after presentation).

the Department of Orthopedics at Jan Biziel University Hospital No. 2 (Bydgoszcz, Poland) for surgical treatment. Revision surgery involved removal of the previous Biomet OSS prosthesis and implantation of a modular total femur prosthesis (Implantcast) to restore biomechanical alignment of the hip and knee joints (**Figures 4-7**). A modified lateral S-shaped approach extending along the entire length of the thigh was used to reduce skin tension and improve postoperative wound perfusion. Muscular attachments—including the gluteal muscles, piriformis, short external rotators, iliopsoas, vastus muscles, and remnants of the adductor muscles—were detached from the femur. The hip and knee joints were then mobilized. Reconstruction was performed using an Implantcast modular total femoral system. The femoral component was assembled from a 70-mm proximal femoral segment and a 110-mm distal femoral segment (M-O-M), connected with a 30-mm reducer using M10 × 105-mm and M10 × 45-mm screws. The knee joint was reconstructed with a cemented MK tibial component (size 5) and a cemented revision stem (15 × 150 mm), supplemented

Figure 5. Intraoperative images of total femoral replacement. Left: trial and definitive Implantcast total femoral prosthesis. Right: resected left femur with the OSS Biomet prosthesis, proximal femoral plate (ChM), and cerclage wires in place (4 months after presentation).

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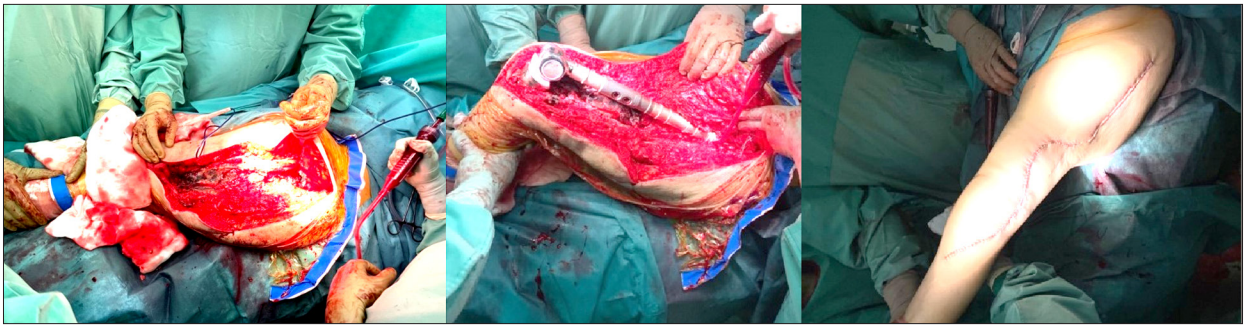

Figure 6. Intraoperative images of total femoral replacement, from left to right: left lower extremity after femoral resection; left lower extremity after implantation of the total femoral prosthesis; completed wound closure (4 months after presentation).

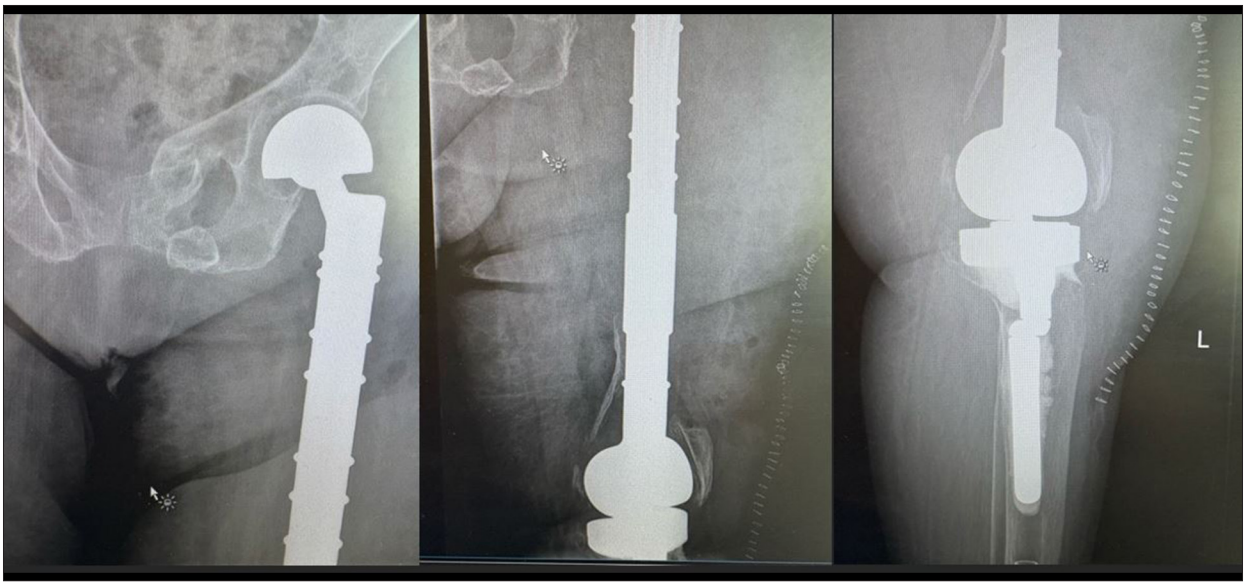

Figure 7. Postoperative radiographs of the left lower extremity demonstrating the implanted total femoral prosthesis (4 months after presentation).

with 2 tibial augments (5 mm and 10 mm), a 60-mm extension, an MK adapter (+6 mm), and an MK BK polyethylene insert (5/12.5 mm). The hip joint was reconstructed with a bipolar acetabular component (48/28 mm) and a bipolar head (44/28 S) with a 12/14 taper. All prosthetic components were silver-coated to reduce the risk of infection. Gluteal muscles were reattached through dedicated eyelets in the proximal portion of the prosthesis, and the quadriceps mechanism was stabilized around the implant.

Intraoperatively, the patient developed hemorrhagic shock due to substantial blood loss. Management included a norepinephrine infusion, aggressive fluid resuscitation, and transfusion of 2 units of packed red blood cells, 1 unit of fresh frozen plasma, and 2 units of cryoprecipitate. These interventions resulted in clinical improvement and hemodynamic stabilization. Once stable, prophylactic anticoagulation with enoxaparin (40 mg subcutaneously daily) was initiated. However, on postoperative day 5, dislocation of the hip prosthesis was diagnosed, requiring open reduction. The patient was discharged in good general condition with instructions to ambulate using a walker with full weight-bearing and to continue rehabilitation exercises.

Five months after presentation, the patient was readmitted due to hip instability. Revision surgery was performed, involving removal of the bipolar head (44/28 S) and implantation of a cemented Implantcast 52/44/28 “S” dual-mobility cup to increase range of motion and prevent recurrent dislocations. The postoperative hospital course was uneventful, and early rehabilitation was initiated. The patient was advised to ambulate with a walker and full weight-bearing. Thromboprophylaxis was continued after discharge in accordance with standard protocols.

Seven months after presentation, another hip dislocation occurred during routine activities of daily living, and the patient again presented to the Emergency Department at the District Hospital (Krotoszyn, Poland). Initial attempts at closed reduction were unsuccessful, and open reduction with adjustment

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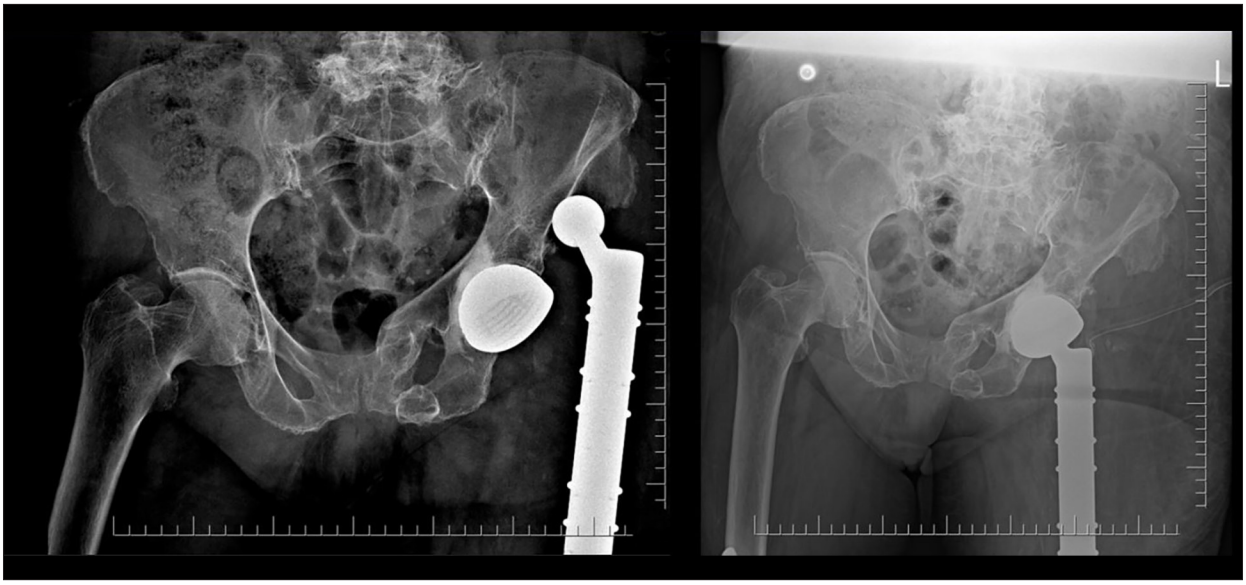

Figure 8. Radiographs of the left hip. Left: dislocation of the total femoral prosthesis. Right: successful reduction of the hip joint (7 months after presentation).

Figure 9. The patient during rehabilitation, 4 weeks after surgery, ambulating independently with the assistance of a rehabilitation walker (8 months after presentation).

of the proximal prosthetic component was performed. The instability was attributed to suboptimal soft tissue tension and excessive femoral component anteversion. Clinically significant shortening of the operated lower limb was also observed. The dual-mobility head was replaced with another head of the same size, using an offset correction of -3.5 mm to optimize soft tissue tension (**Figure 8**). Additionally, the anteversion angle was reduced to improve joint stability, and successful reduction was achieved. Postoperatively, the patient developed bloody wound discharge and a superficial surgical site infection. Targeted antibiotic therapy was initiated. Based on culture results demonstrating *Escherichia coli* and antimicrobial susceptibility testing, meropenem (1 g intravenously every 8 hours) was administered. Prophylactic anticoagulation with enoxaparin (40 mg subcutaneously daily) was continued throughout the postoperative period. Rehabilitation and gait training with a rehabilitation walker were initiated, with weight-bearing as tolerated (**Figure 9**). The patient was discharged home in good general and local condition.

At the 12-month follow-up, the patient remained in good general condition and was able to ambulate independently with

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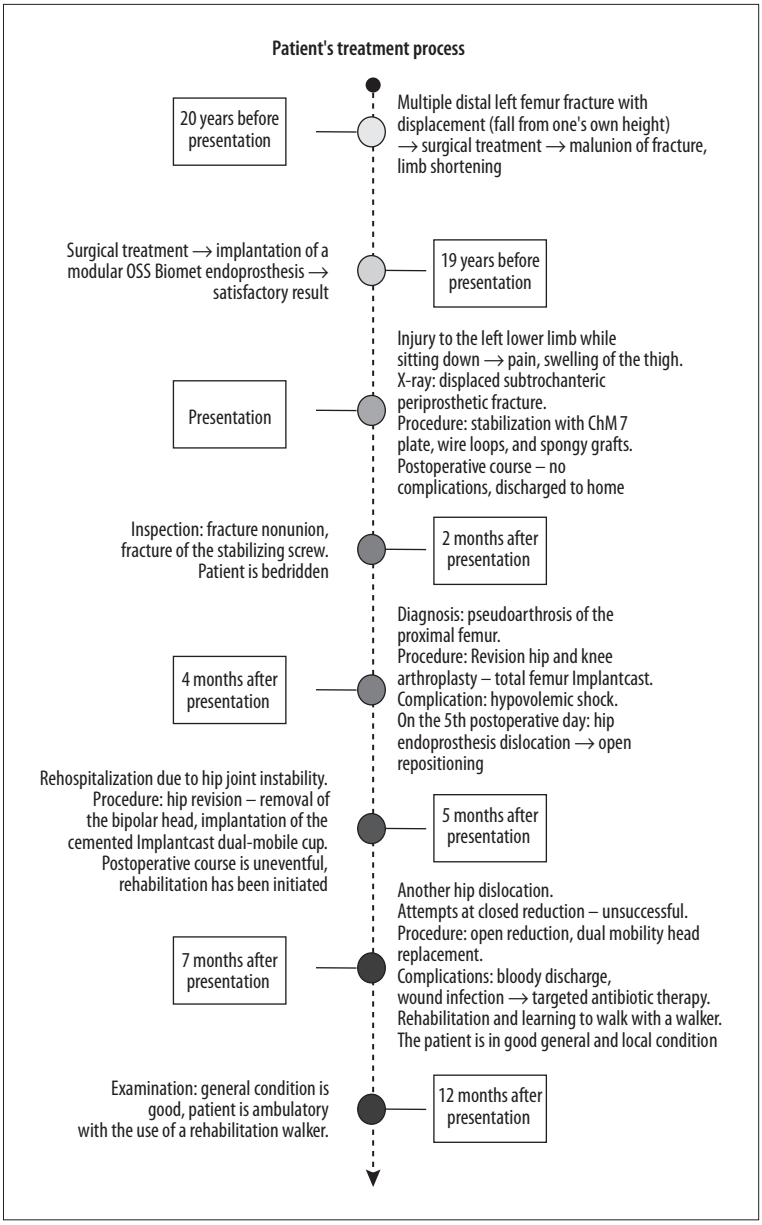

Figure 10. Timeline of the patient's treatment course.

a rehabilitation walker. She completed the Harris Hip Score questionnaire regarding hip pain, function, and overall performance. Her score was 70.7 points, compared with 44.4 points before the periprosthetic fracture, indicating substantial improvement. At the 14-month follow-up, the patient continued to show robust recovery and reported no complaints. A timeline of the patient's treatment is shown in **Figure 10**.

Discussion

The treatment of complex femoral fractures in patients who have undergone multiple previous surgeries remains a serious challenge in orthopedic surgery. Each surgical intervention, whether osteosynthesis with plates and screws or prosthetic revision, is associated with difficulties such as scarring and soft tissue damage, altered biomechanics, and reduced bone stock [4,8]. In the present case, these factors accumulated over 2 decades of surgical interventions involving the left lower limb, leaving very limited options for limb salvage. Our patient presented with several risk factors for complications, including advanced age, a history of multiple previous surgeries, osteoporosis, impaired glucose tolerance, and obesity. These comorbidities reduce fracture healing potential and significantly increase the risk of complications such as nonunion, periprosthetic fracture, recurrent dislocation, and infection [1,3,9,10], all of which occurred in this case.

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When other surgical techniques fail, TFR may be considered the final limb-salvage option. It is among the most complex reconstructive procedures in orthopedics; its use in non-oncologic cases remains limited and is relatively infrequently reported in the literature [1,3,11]. There are no well-established guidelines defining the optimal timing for TFR; thus, each case must be evaluated individually [3]. Systematic reviews indicate that the most common non-oncologic indications include periprosthetic fractures, massive bone defects after multiple revision procedures, implant loosening, and septic bone loss [3,8,12].

The available literature indicates that TFR preserves the limb in 85% to 91% of cases, thereby avoiding amputation [13,14]; reported 10-year implant survival rates are 80% to 90% [15,16]. Functionally, approximately 60% to 70% of patients regain the ability to ambulate with a walker or crutches after surgery, and better outcomes are reported in oncologic patients. Mean Harris Hip Score values generally range from 60 to 75 points [8,12]. Our patient achieved a Harris Hip Score of 70.7 points, representing a clinically significant improvement of 26.3 points compared with her pre-fracture status. Despite her advanced age and multiple comorbidities, she regained independent ambulation with a walker, representing a favorable outcome relative to literature reports [6,17,18].

TFR is associated with a very high overall complication rate, reportedly 5 to 10 times higher than that of standard joint replacement procedures [14]. Patients undergoing TFR for non-oncologic indications typically have poor soft tissue quality and a greater burden of comorbidities, which likely contributes to the higher complication rates observed relative to the oncologic population [6,17]. The most common and severe complication after TFR is periprosthetic joint infection, which occurs in up to 35% of cases and is classified as Henderson type IV failure. It is the leading cause of implant removal and the greatest threat to limb preservation, often resulting in amputation [3,6,17]. In the present case, a superficial wound infection developed but was successfully managed via targeted antibiotic therapy. Similar observations were reported by Muratori et al, who found that prompt diagnosis and treatment of infection can often prevent the need for implant removal [16].

Soft tissue failure and hip instability (Henderson type I) represent the second most common complications after TFR, with reported prevalences of up to 25% [3,19]; they are often accompanied by infection [7,16]. In the present case, after hip prosthesis dislocation, the bipolar head was replaced with a dual-mobility component, which has been shown to improve joint stability [3,8]. However, dislocation recurred; sustained stability was only achieved via reduction of the femoral component anteversion angle combined with correction of the prosthetic head offset. Our case illustrates that instability after TFR is multifactorial and that even implants designed to enhance stability may be insufficient. Precise biomechanical optimization and appropriate soft tissue tension remain critical. Recent data also suggest that joint stability can be further improved through the use of large femoral heads, tripolar cups, and preservation of the joint capsule, residual greater trochanter, and abductor tendon attachments, followed by direct fixation to the prosthesis [3].

Our experience supports previous reports indicating that, despite the high risk of complications, TFR can provide older patients with acceptable functional outcomes and a substantial improvement in quality of life relative to amputation or arthrodesis [13,16,18]. However, successful treatment depends on individualized surgical planning, an experienced multidisciplinary team, close postoperative monitoring, and appropriate rehabilitation. The present case adds to existing literature regarding non-oncologic TFR, demonstrating that it can be an effective limb-salvage procedure—even in the presence of multiple complications—provided that treatment is carefully planned on an individualized basis and supported by a multidisciplinary approach.

This report has several limitations typical of single-case clinical studies. First, it describes only a single patient, precluding generalized conclusions regarding the efficacy and safety of TFR in non-oncologic populations. Second, the follow-up period was relatively short (14 months), limiting the ability to fully assess long-term implant survival and late mechanical or infectious complications. Therapeutic decisions (eg, use of a dual-mobility acetabular component) were individualized and based on clinical necessity, rather than comparison with alternative techniques. Nevertheless, this case provides valuable practical insights and contributes to the understanding of TFR as a limb-salvage procedure in non-oncologic settings.

Conclusions

This case illustrates the extreme complexity and high complication burden associated with multiple failed interventions for femoral pathology. TFR can be an effective salvage procedure when conventional osteosynthesis techniques and revision arthroplasty have failed. Our findings highlight the importance of meticulous preoperative planning, individualized surgical strategies, and multidisciplinary management. They also suggest that, even in older patients with multiple comorbidities and a history of repeated treatment failures, favorable functional outcomes can be achieved through a carefully planned and systematically executed surgical approach.

Departments and Institutions Where Work Was Done

Department of Orthopedic Surgery, Jan Biziel University Hospital No. 2, Bydgoszcz; Department of Orthopedics, District Hospital, Krotoszyn, Poland.

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Patient Consent

Informed consent was obtained from the patient for publication of this report. Ethics review was not required.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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