



Salvage Treatment for a Patient with a Postoperative Recurrent Femoral Neck Fracture after Intertrochanteric Fracture Healing: A Case Report

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Abstract

Background: Femoral intertrochanteric fractures are fragility fractures that commonly occur in elderly people and are generally extracapsular. Femoral neck fractures are among the most common orthopedic fractures observed in the elderly population; these fractures affect patient mobility and cause complications that may lead to a high mortality rate. The surgical treatment options include internal fixation, hemiarthroplasty, or Total Hip Arthroplasty (THA) according to the type of fracture and patient characteristics.

Case Report: Herein, the authors describe the successful clinical application of joint arthroplasty as a salvage procedure for the treatment of postoperative recurrent femoral neck fractures after intertrochanteric fracture healing. Fifteen months after closed reduction and INTERTAN fixation of the right intertrochanteric fracture, the patient experienced right hip pain and mobility disorders for 3 months. X-ray examination revealed loosening and cut-out of the integrated INTERTAN screws. Then, we removed all the internal fixators and performed revision surgery by inserting an allogeneic bone rod. Three months after revision surgery for internal fixation loosening and cut-out, this patient experienced right hip pain and joint activity limitations because of accidental sprain. Finally, we performed hemiarthroplasty in the elderly patient with a femoral neck fracture, and she recovered well and presented no pain or discomfort during weight-bearing.

Conclusion: Postoperative recurrent femoral neck fractures after intertrochanteric fracture healing are not very common in elderly patients. Nevertheless, hemiarthroplasty can be considered a salvage procedure for recurrent femoral neck fractures after revision surgery for failed fixation of intertrochanteric fractures.

Keywords: Intertrochanteric fracture; Femoral neck fracture; Revision; Hemiarthroplasty

Introduction

Hip fractures include two main fracture types: Femoral neck fractures and intertrochanteric fractures. Intertrochanteric (IT) fractures, which are associated with age and poor health status, represent more than 60% to 70% of hip fracture cases, with an annual mortality rate of 15% to 20% among elderly patients; these fractures are sources of high health and economic burdens and pose challenges for nursing care [1,2]. Most IT fractures can be successfully treated with contemporary surgical techniques and internal fixations; however, clinical failures still occur in 0.5% to 56% of cases, due to unfavorable fracture patterns, poor bone quality, or suboptimal positioning of internal fixation devices [3]. Femoral neck fracture is a commonly encountered fracture in orthopedic clinics and represents approximately 3% to 5% of all fractures [4]. Hemiarthroplasty is usually performed on frail and elderly patients, while THA is recommended for more active patients, as it can provide better functional outcomes [5].

Herein, we report a case of an IT fracture in a patient who subsequently developed ipsilateral femoral neck fracture. Revision with an allogeneic bone rod was successful and the results were maintained for three months, but a femoral neck fracture still occurred after intertrochanteric fracture healing. The elderly patient ultimately underwent hemiarthroplasty, which was successful.

Case Presentation

We report the case of an 85-year-old Chinese woman with a history of several orthopedic surgeries. She first underwent INTERTAN fixation for a right femoral intertrochanteric fracture

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Figure 1: (A) A hip radiograph taken 15 months after the operation shows cut-out of the lag screw and loosening of the compression screw. (B) An anteroposterior radiograph of the pelvis shows good fracture healing with the allo-fibular strut bone that was placed after removing all INTERTAN fixators.



Figure 2A, 2B: Anteroposterior and lateral radiographs of the hip show right femoral neck fracture 3 months after revision surgery for IT fracture fixation failure.



Figure 3: Coronal CT scan (A) and 3D computed tomography scan of a reconstructed (B) model of the hip and pelvis show that the type of femoral neck fracture is Garden III.

15 months prior at another hospital (Figure 1A). She also had osteoporosis, hypertension, hyperlipidemia and diabetes. The patient developed obvious pain in the right hip without obvious inducement for 3 months, which worsened for the past 2 weeks. Radiographic work-up of the hip joint showed that the integrated INTERTAN screws had cut out the femoral head and seemed loose. Then, she underwent revision surgery, after which the internal fixators were removed. Moreover, we inserted an allogeneic bone rod into the greater trochanter (Figure 1B). Postoperative recovery was good. The patient was allowed to partially bear weight 6 weeks after surgery with a walker and crutches and was not allowed to transition to full weight bearing until 3 months post-surgery. The last X-ray examination showed good fracture healing and morphological changes in the femoral head.

Three months after this revision surgery, she complained about right hip pain and wrinkling while walking, worsening of the pain and mobility disorders. Physical examination revealed medial and lateral tenderness of the right hip (+), axial percussion pain in the right



Figure 4: Anteroposterior radiograph of the pelvis after hemiarthroplasty shows the hip femoral prosthesis in a good position.

lower limb (+), and obvious limitations in the abduction, flexion, and extension of the right lower limb due to pain. There was no swelling in the bilateral lower limbs. X-ray examination revealed a right femoral neck fracture (Figure 2A, 2B). Additionally, a CT scan revealed a femoral neck fracture and a change in the femoral head shape (Figure 3A, 3B). Additionally, a Dual-energy X-ray Absorptiometry scan (DXA) showed that the L2-L4 Bone Mineral Density (BMD) was 0.958 g/cm², and the T score was - 1.5. The Trabecular Bone Score (TBS) of L2-L4 was 1.238.

Considering that the patient was in obvious pain and unable to walk due to recurrent femoral neck fracture, surgical treatment was recommended. After thorough preoperative assessment, this patient was advised to undergo resection of allogeneic bone rods and treatment with hemiarthroplasty. Intraoperatively, the bone rod was removed successfully on the femoral side, and the femoral head was removed after femoral neck osteotomy. We chose appropriate prostheses based on the measurement results obtained during surgery. The patient recovered well after surgery. Full weight-bearing was allowed one week after the hip replacement operation. Conventional radiographs showed good prosthesis location (Figure 4).

Discussion

IT fracture is a common type of hip fracture with a 1-year mortality rate of up to 36% [6]. Although most IT fractures can be treated successfully with contemporary surgical techniques and internal fixators, such as intramedullary nails and sliding hip screws, clinical failure still occurs in 0.5% to 56% of cases depending on the fracture type, patient status, and quality of the reduction and fixation [7,8]. Failed treatment of IT fractures leads to remarkable disability and pain, which may cause complications associated with prolonged recumbency and affect the long-term prognosis of these fragile patients, thereby necessitating effective surgical intervention. Salvage osteosynthesis and conversion hip arthroplasty, rather than conservative, nonoperative therapy, which is limited to incredibly healthy patients, are the main treatments for failed internal fixation of IT fractures [9].

In this case, the patient underwent INTERTAN fixation due to an intertrochanteric fracture 15 months prior. Three months prior, the patient experienced postoperative hip joint pain and limited mobility. X-ray examination indicated cut-out and loosening of the integrated interlocking lag screw system. The main reasons for the failure of our patient's postoperative internal fixation were as follows. First, there were risk factors for internal fixation failure, as the patient had osteoporosis (T-1.5; TBS 1.238) as well as a history of diabetes. The loss of trabecular bone density leads to a more significant decrease in

bone strength [10,11], which leads to a decrease in the forces holding the screw in the bone and prohibits the INTERTAN screws from fully compressing the fracture. Second, INTERTAN screws are prone to causing cut-out. The INTERTAN cephalomedullary nail system is a unique integrated interlocking lag screw system. In such a fixation, a main lag screw is placed above and a compression screw is placed below. The screws are integrated by their threads and can be inserted sequentially through the lag screw hole in the nail body. In varus malalignment, the long length of the lever arm can cause the nail or the lag screw to be dislodged from the femoral head or to break. As patients walk in the later stage, the risk of screw cutting-out increases under the dual effects of bone strength decline and fracture fretting. To increase the force needed to hold the screws in place and reduce the rate of internal fixation failure in patients at high risk of lag screw cutting, InterTAN fixation should be combined with bone cement fixation, and evidence-based antiosteoporosis treatment should be administered after surgery.

Because of the obvious clinical symptoms of the patient and confirmation *via* X-ray examination, we removed all the INTERTAN fixators and filled the integrated lag screw hole at the femoral head with the allo-fibular strut bone. Bone grafting has increased union rates and causes few complications. Implants used for revision internal fixation are typically selected according to the quality and location of the remaining bone stock of the proximal femur. The bone stock of the inferior femoral head is usually not violated by the prior device. Bone defects of the proximal femur after implant removal pose challenges in revision surgeries for failed IT fixations. Both intramedullary bone defects and cortical screw holes should be considered when attempting to perform a surgery successfully. Therefore, we implanted an allogeneic bone rod after removing the intramedullary bone.

Unfortunately, three months after the revision surgery, the patient experienced femoral neck fracture due to a sprain. Although the patient had a follow-up X-ray before the sprain, which confirmed good fracture healing, we believe that osteosynthesis was limited in the elderly patient due to osteopenia. Conversion hip arthroplasty is beneficial for early weight bearing and mobilization, eliminating the risk of delayed fracture healing and accelerating functional recovery, which are pivotal for determining the prognosis in elderly, debilitated patients [12]. The decision to perform Hemiarthroplasty (HA) or THA should be made based on the functional demand of the patient and the status of the acetabular articular cartilage. With well-preserved cartilage, HA may be considered, as it is minimal invasive and facilitates the recovery of desirable stability in patients with several comorbidities and low activity demands. For conversion arthroplasty, there are several disadvantages to consider when preparing the femoral canal. Fracture callus formation, nonunion fracture translation, and malunion often result in bone deformity of the proximal femur, which increase the risk of fracture during canal preparation or implant placement [13]. Contrary to our expectation, the fractured allogeneic bone rod was successfully removed during surgery. Then, we smoothly completed half-hip replacement surgery.

Postoperative X-ray images confirmed that the position of the prosthesis was good (Figure 4). Treatment of osteoporosis with vitamin D, calcium, and bisphosphonate was started postoperatively. Additionally, one week later, the patient started out-of-bed activity with the assistance of a walking aid.

This study has several limitations. This was a single-case study

and thus has the associated limitations of a retrospective follow-up study of a single patient. Furthermore, this case involved a surgical procedure based on the patient's bone condition and the surgeon's clinical experience, and no systematic evaluation strategy was used to quantitatively evaluate the condition of this patient to determine whether primary joint replacement was considered as a revision surgery option due to failed internal fixation of the intertrochanteric femoral fracture. Therefore, additional cases need to be studied.

In conclusion, when internal fixation of an IT fracture fails, the cause of failure should be analyzed comprehensively, and a suitable surgical method should be selected according to the patient's condition. When performing salvage procedures for failed fixation of IT fractures, the removal of previously placed fixation devices involves more extensive dissection and frequently requires the removal of loose or broken screws. Revision with allogeneic strut bone may be selected for patients whose osteoporosis is not severe and whose femoral head shows no obvious necrosis. Nevertheless, hemiarthroplasty can still be considered a salvage procedure for recurrent femoral neck fractures who have undergone revision surgery due to failed fixation of intertrochanteric fractures.

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