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Sequential femoral complications in an elderly female: From failed PFN to THR and periprosthetic fracture managed with GTR plating

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Abstract
Introduction: Periprosthetic femoral fractures following total hip replacement (THR) present a complex challenge, particularly after prior failed fixation. Vancouver type B1 fractures, characterized by a stable femoral implant, are typically treated with open reduction and internal fixation (ORIF). However, management becomes more complex when fractures involve residual trochanteric fragments from prior surgeries.
Case Report: A 67-year-old woman sustained a right intertrochanteric femur fracture in September 2024, treated initially with proximal femoral nailing (PFN). The implant failed within two months, prompting conversion to a THR in December 2024 using a standard-length stem. Associated fracture fragments were not addressed during the THR. In May 2025, after a minor fall, she sustained a periprosthetic femoral fracture at the stem level, classified as Vancouver B1. Radiographs and CT confirmed a well-fixed implant. She underwent ORIF using a Greater Trochanteric Reconstruction (GTR) plate with proximal cerclage cables and distal bicortical screws. No infection was present. The patient demonstrates good functional recovery and is able to gradually bear weight after 6 weeks.
Discussion: This case highlights the elevated risk of periprosthetic fracture following conversion THR after failed PFN. The stable stem allowed for B1 classification, permitting ORIF without the need for stem revision. The use of a GTR plate provided stable fixation even in the presence of residual trochanteric fragments, facilitating early mobilization and successful fracture union.
Conclusion: ORIF using a GTR plate and cable construct can be an effective solution for Vancouver B1 periprosthetic fractures, particularly in complex cases following failed hip fixation. Stable fixation without stem revision offers a pathway to good functional recovery.

Keywords: Periprosthetic femoral fracture, Vancouver B1 fracture, total hip replacement, failed proximal femoral nailing, Greater trochanteric reconstruction plate, open reduction and internal fixation

Introduction
Periprosthetic femoral fractures (PFFs) are increasingly common complications of hip arthroplasty, occurring in roughly 0.4-1.1% of primary THA and up to 4% of revision cases [1]. As the volume of hip replacements rises, so does the incidence of PFFs [2, 3]. Vancouver classification is widely used for PFFs: type B fractures occur around the stem. In B1 fractures, the femoral implant remains well-fixed, and treatment consensus favours open reduction and internal fixation (ORIF) [4, 5]. Systematic reviews and guidelines state that stable B1 fractures are best managed with ORIF using plates and cables [6, 7]. By contrast, B2 (loose stem) requires revision arthroplasty with a longer stem. In the setting of failed fixation of an intertrochanteric hip fracture, conversion to THR is a recognized salvage procedure [4]. However, conversion arthroplasty patients may be at higher risk for PFF due to bone loss, stress risers from prior implants, and micro fractures during stem insertion [5]. We report a complex case of sequential fixation and arthroplasty: a failed PFN for an intertrochanteric fracture followed by THR without long-stem bypass, and subsequent Vancouver B1 PFF treated with trochanteric plate and cables. This report highlights surgical decision-making and the favourable outcome achieved with ORIF in a B1 fracture.

Case Report
A 67-year-old woman (BMI 28) presented in September 2024 after slipping and falling onto her right hip. Radiographs confirmed a right intertrochanteric femur fracture (Fig 1). Initial management at an outside hospital was closed reduction and internal fixation with a proximal femoral nail (PFN).

Immediate post op x-ray not available to our team. Two months later, the patient developed worsening hip pain; follow-up radiographs revealed implant cut-out/non-union, consistent with PFN failure. (Fig 2)

Fig 1: Index trauma causing right Intertrochanteric fracture

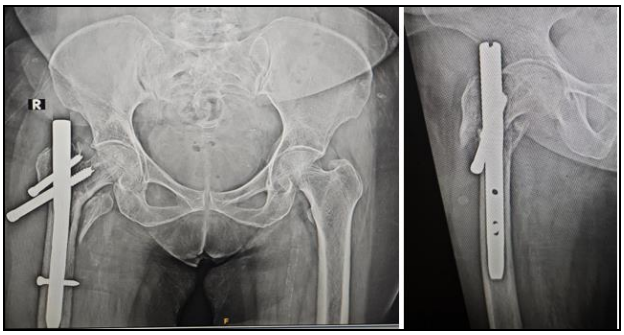

Fig 2: Failed Proximal femur nail with screw cut out

In December 2024, the patient underwent conversion to total hip replacement (THR) for salvage of the failed PFN. (Fig 3)

Fig 3: THR for salvage of failed PFN; Greater and lesser trochanter fractures not addressed.

Surgical details are limited: a standard femoral stem (not a long-stem revision prosthesis) was used, and any concomitant trochanteric fracture fragments were not fixed.
In May 2025, the patient experienced another fall and was brought to our team. Radiographs showed a periprosthetic femoral fracture around the THR stem, classified as Vancouver type B1. The implant appeared well-fixed and no infection was present. (Fig 4)

Fig 4: Radiograph of Vancouver B1 periprosthetic fracture at hip stem

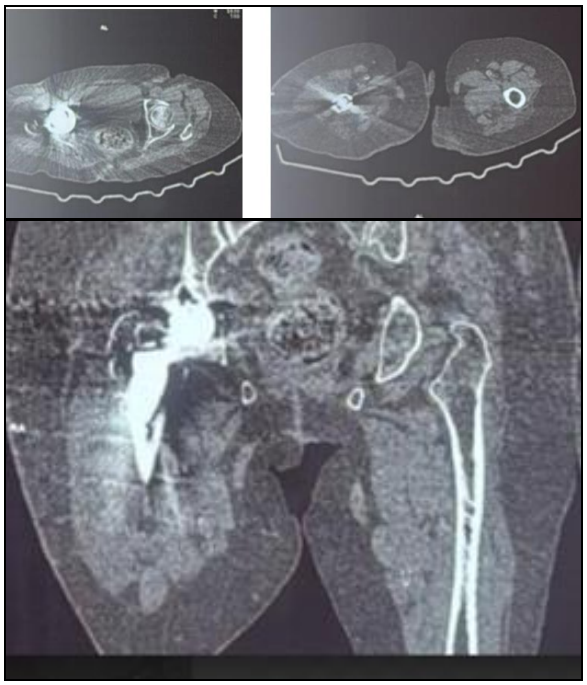

Fig 5: CT scan demonstrating stable, well-seated THR stem

Surgery was performed using a lateral approach. The fracture was exposed and anatomically reduced. Stability of THR stem is confirmed intra operatively. (Fig 6)

Fig 6: Intraoperative photographs demonstrating fracture site reduction and GTR plate fixation using lateral approach.

Fixation was achieved with a Greater Trochanteric Reconstruction (GTR) plate spanning the fracture. Distally, four bicortical locking screws were placed. Proximally, two cerclage cables were passed around the femur and through the trochanteric plate, tensioned to secure the plate to bone. (Fig 6 & 7).

Fig 7: Intra op picture showing the extent of GTR plate

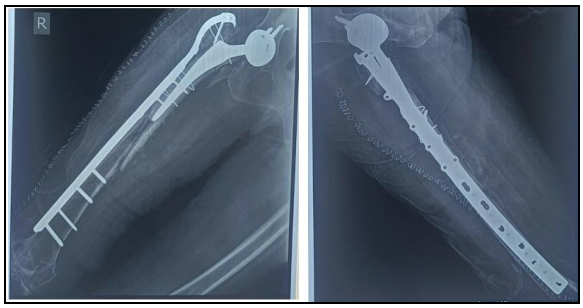

Fig 8: Post-op radiograph showing reduced fracture and well-positioned GTR plate

Post op radiograph show well fitted stem and GTR plate. GTR plate is fixed with Fracture is reduced.

Postoperatively, the patient was made to gradually weight-bear after 6 weeks and started on physiotherapy. By 8 months, complete fracture union was evident. At one-year follow-up, she walked independently with a cane as needed.

Discussion

This case illustrates the management of a complex sequence of hip pathologies in an elderly female: failed fixation of an intertrochanteric fracture, conversion to total hip replacement, and a subsequent periprosthetic fracture around a stable femoral implant. Each stage underscores important principles of contemporary hip surgery.

Proximal femoral nailing is the standard treatment for intertrochanteric fractures, especially in unstable patterns. However, complications such as screw cut-out, nonunion, and implant breakage occur in many cases. In elderly patients with osteoporotic bone, inadequate reduction or suboptimal implant placement further increases the risk. Once fixation fails, options include revision fixation or conversion arthroplasty. In elderly, active patients, conversion to total hip replacement offers better pain relief and mobility, though it is technically more demanding than primary arthroplasty, with higher risks of blood loss, dislocation, and periprosthetic fracture [2]. Long femoral stems are often advised to bypass weakened bone and screw holes, which act as stress risers. In this case, a standard stem was used, which may have predisposed the patient to fracture after minor trauma.

Periprosthetic femoral fractures are increasingly common with the rise in arthroplasties and aging populations [8]. The Vancouver classification is widely used to guide treatment. Type B fractures occur around or below the stem and are subdivided into B1 (stable stem), B2 (loose stem), and B3 (loose stem with poor bone stock) [10]. Differentiating B1 from B2 is crucial, as B1 fractures require fixation while B2 fractures require stem revision. Intraoperative assessment of stability is therefore essential to avoid misclassification.

Fixation around a prosthesis presents unique biomechanical challenges due to reduced bone stock, stress shielding, and limited screw purchase. Cable-plate systems and locking plates are commonly used: cables provide circumferential fixation around the stem, while distal locking screws ensure rigidity [1, 3, 4]. This construct facilitates stable fixation around the in situ THR stem, where screw placement in the proximal segment is not feasible. The GTR plate allowed us to address the fracture of the greater trochanter along with the fracture near the THR stem.

This case highlights several lessons: salvage arthroplasty should ideally use long stems; accurate classification of fractures is critical; and cable-plate constructs remain the standard for Vancouver B1 fractures. Early mobilization and structured rehabilitation aid recovery. Importantly, not all periprosthetic fractures mandate stem revision—stable implants can be preserved, sparing patients the morbidity of revision surgery.

Conclusion

This case underscores the complexity of managing recurrent femoral pathology in an elderly patient and highlights the importance of individualized surgical decision-making. The initial intertrochanteric fracture fixation failure, followed by a suboptimally executed total hip replacement without a long stem, predisposed the patient to further complications. The subsequent Vancouver B1 periprosthetic fracture emphasized the need for careful fracture classification and intraoperative confirmation of implant stability, as misdiagnosis can lead to inappropriate management and poor outcomes. In this patient, the femoral stem remained stable, making internal fixation the most appropriate option.

The use of a Greater Trochanter Reconstruction (GTR) plate with cables proximally and screw fixation distally proved to be a valuable strategy. The GTR plate offered anatomical conformity, stability in the proximal femur around the prosthesis, and secure fixation of trochanteric fragments where conventional screws could not be applied due to stem interference. The addition of circumferential cables enhanced construct stability, distributing stress and minimizing the risk of hardware failure. This approach allowed for early mobilization, satisfactory functional recovery, and union without complications. The case highlights that GTR plate-cable constructs are a reliable method for managing periprosthetic fractures with trochanteric involvement when the implant is stable. With growing numbers of elderly patients and revision surgeries, mastering such techniques is crucial for orthopedic surgeons to ensure optimal outcomes in complex hip reconstructions.

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Conflict of Interest
Not available

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Not available

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