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Trauma Case Reports

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Case Report

Delayed hematoma in gluteus medius caused by Gamma nail protrusion over the greater trochanter

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ARTICLE INFO

Keywords:

Femoral trochanteric fracture
Short femoral nail (SFN)
Gamma nail protrusion
Delayed hematoma
Hip and thigh pain

ABSTRACT

Aside from cases of mechanical complications or infection short femoral nails (SFNs) are not removed after open reduction and internal fixation (ORIF) because femoral trochanteric fractures often occur in older osteoporotic females. Occasionally, SFN removal is performed because of severe chronic hip and thigh pain after surgery. However, cases of large hematoma formation in the gluteus medius with associated severe pain have not been reported in patients after ORIF.

A 58-year-old healthy woman fell and incurred a femoral trochanteric fracture at work. ORIF was performed using Gamma nail for the fracture, which was classified as AO31-1.2 according to the AO Foundation/Orthopaedic Trauma Association (AO/OTA) classification. The bone healed sufficiently. The patient reported chronic hip and thigh pain after ORIF, but the SFN was not removed because of concerns about further fractures. After 1 year and 8 months, she suddenly experienced severe hip and thigh pain with hip swelling, but without prior trauma. Magnetic resonance imaging (MRI) showed a large hematoma in the gluteus medius near the greater trochanter. Under general anesthesia, SFN removal was performed because of the persistent pain. After SFN removal, the chronic pain resolved without any complications, such as a femoral neck fracture.

In this case, chronic hip and thigh pain and delayed hematoma may have been caused by SFN protrusion over the greater trochanter, damaging soft tissues around the gluteus medius. Thus, soft tissue injury and hematoma are possible in patients with chronic hip and thigh pain after ORIF using SFN. In using SFN for femoral trochanteric fractures, it is important to prevent protrusion of SFN over the greater trochanter. Further careful follow-up with MRI and/or ultrasonography is needed to study delayed hematoma after ORIF using SFN.

Introduction

Open reduction and internal fixation (ORIF) using a short femoral nail (SFN) is a well-established management approach for femoral trochanteric fractures [1]. Except for cases of cut-out of a lag screw or surgical site infection, removal of SFNs is rarely performed for femoral trochanteric fractures because of the increased likelihood of femoral neck fractures in older osteoporotic females [2]. In some cases, persistent hip and thigh pain after ORIF is considered an indication for the removal of SFN. In this series, young females had chronic hip and thigh pain caused by SFN which protruded over the greater trochanter. We report a rare case of

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<https://doi.org/10.1016/j.tcr.2021.100542>

Accepted 28 September 2021

Available online 1 October 2021

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sudden severe pain and delayed hematoma in the gluteus medius 1 year and 8 months after ORIF and without any subsequent history of trauma.

Case presentation

A 58-year-old healthy woman (height: 162.5 cm, weight: 60.8 kg, body mass index: 23.0 kg/m²) fell at work and incurred a femoral trochanteric fracture (Fig. 1), classified as AO31-1.2 using the AO Foundation/Orthopaedic Trauma Association (AO/OTA) fracture classification. Bone mineral density was 0.498 g/cm² (T-score: -2.7). She was previously healthy and had never taken any anticoagulant treatment. Under general anesthesia, ORIF was performed using a 10 mm, 130° Gamma3 trochanteric nail (Stryker, Schoenkirchen, Germany). Selective estrogen receptor modulator was administered after ORIF. The bone healed sufficiently (Fig. 2), but the patient reported chronic hip and thigh pain after ORIF. However, the SFN was not removed despite the persistent hip pain to avoid femoral neck fracture. After 1 year and 8 months, the patient suddenly experienced severe hip and thigh pain, along with hip swelling, without any prior trauma. Magnetic resonance imaging (MRI) showed a large hematoma in the gluteus medius on the greater trochanter (Fig. 3). Under general anesthesia, the SFN was removed because of the persistent pain and the patient's informed choice. After SFN removal, the chronic pain resolved without any complications, such as a femoral neck fracture.

Discussion

In the absence of significant mechanical complications (e.g., cases of cut-out of a lag screw) or surgical site infection, removal of SFNs is not recommended because of the increased likelihood of femoral trochanteric fractures in older osteoporotic females. The primary reason for retaining the SFN is the possibility of fracture of the proximal femur, more commonly the femoral neck, after removal [3,4].

Barquet et al. reported that prevalent factors for femoral neck fracture after implant removal in healed trochanteric fractures are: 1) preexisting systemic osteoporosis; 2) local osteoporosis as a result of fixation device preloading in the femoral neck, leading to stress shielding; and 3) the removal of hardware from the femoral neck, with a reduction in the failure strength of the neck [2]. In a systematic review, femoral neck fractures after the removal of implants (i.e., SFN with sliding hip screw) occurred spontaneously, which accounted for approximately 15% of cases [2,3]. Despite the risk of femoral neck fractures, there are cases when SFN is removed because of persistent hip and thigh pain after ORIF. Chang et al. reported that 25.4% of patients who underwent ORIF using SFN reported hip and thigh pain at the 6-month follow-up [5]. In the study by Bojan et al., 30 (0.98%) out of 3066 Gamma nails were removed for persistent hip and thigh pain [1].

Apart from cases of surgical site infection, non-union, or avascular necrosis, postoperative hip and thigh pain is caused by excessive lag screw lateralization pressing on the iliotibial band and the protrusion of the proximal part of the SFN over the greater trochanter, irritating the gluteus medius [5-7]. In this case, the exact mechanism that induced chronic hip and thigh pain after ORIF is unknown. However, it is notable that the patient had a large hematoma in the gluteus medius around the proximal part of the SFN protruding over the greater trochanter, without any prior history of trauma. Considering its location, the delayed hematoma was considered to have been caused by SFN protrusion which injured soft tissues.

Vascular injuries during the treatment for proximal femoral fractures had been reported before [8]. Iatrogenic vascular injury can occur pseudoaneurysm. We could not deny the possibility that we had injured the branch of superior gluteal artery and made pseudoaneurysm causing the delayed hematoma, because we had not performed any angiography. The hematoma was absorbed gradually at the time of the surgery removing the nail, and there was no renewed bleeding intraoperatively. Based on these matters, we have come to the conclusion that the hematoma was not caused by pseudoaneurysm but caused by soft tissue injury due to the protruding

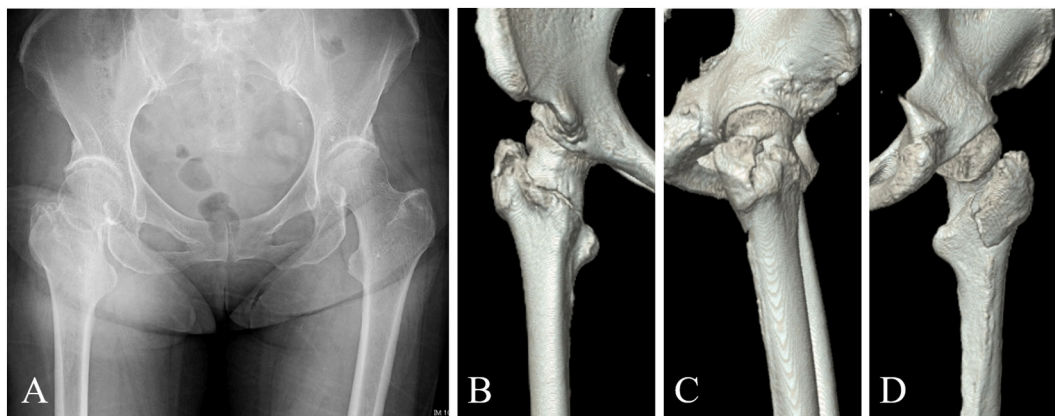


Fig. 1. Preoperative radiograph and computed tomography (CT) scan of the patient. (A) Radiograph shows a femoral trochanteric fracture, classified as AO31-1.2 according to the AO Foundation/Orthopaedic Trauma Association (AO/OTA) classification. (B, C, D) CT scan shows the right simple femoral trochanteric fracture with a disrupted greater trochanter. (B: anterior view, C: lateral view, D: posterior view).

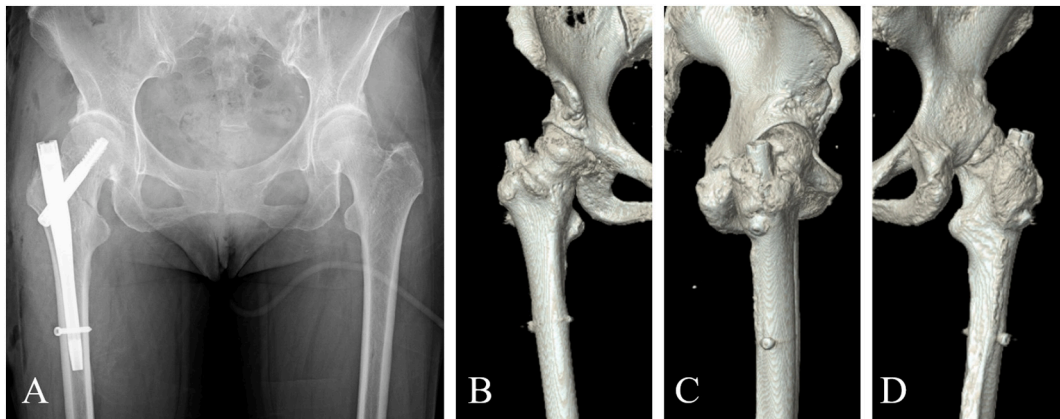


Fig. 2. Postoperative radiograph and computed tomography (CT) scan of the patient. (A) Radiograph shows that the SFN was inserted in the proper position in the femoral head. (B, C, D) CT scan shows that bone fusion is successful but that the SFN is significantly protruded over the greater trochanter. (B: anterior view, C: lateral view, D: posterior view).

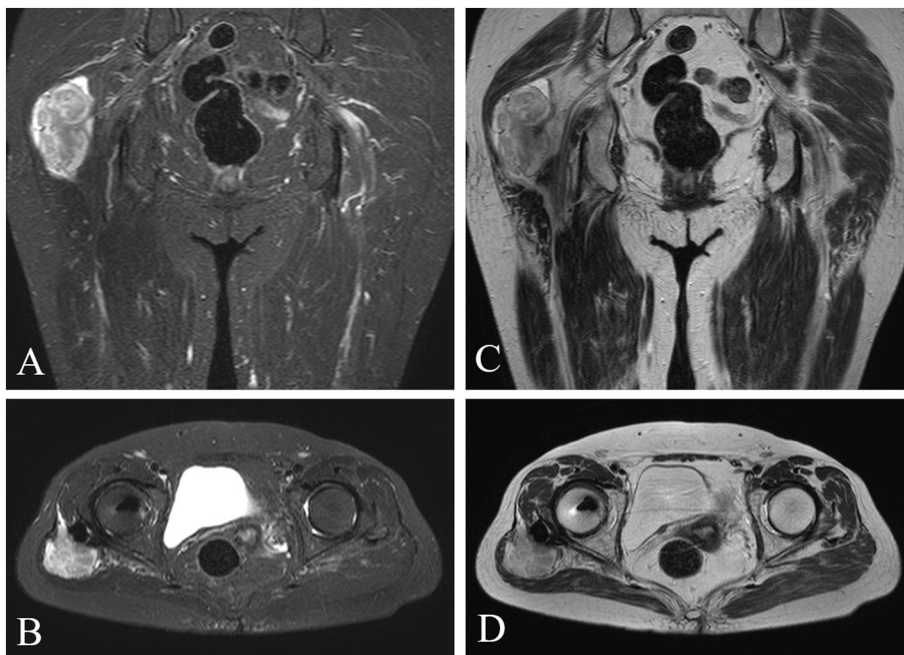


Fig. 3. Magnetic resonance imaging (MRI) shows a large hematoma in the gluteus medius around the short femoral nail protruding over the greater trochanter. (A, B) Short-T1 Inversion Recovery (STIR)-weighted MRI with coronal and axial sections. (C, D) T2-weighted MRI with coronal and axial sections.

SFN.

There are three possible contributory factors for SFN protrusion over the greater trochanter. The first factor is the mismatch between the size of the SFN and the physique of the patient. Proximal Femoral Nail Antirotation (PFNA) system (Depuy Synthes, West Chester, PA, USA) has been reported to be of almost the same size as the Gamma3 trochanteric nail. Hu et al. reported that 60.8% of PFNAs protruded >5 mm over the greater trochanter, with the average protrusion length being 6.25 mm (male: 4.84 mm, female: 7.09 mm) in Chinese [7]. There are some reports that almost all commercially available SFNs have a geometric mismatch in short, elderly Asian females [9,10]. The second factor is the position of the lag screw in the femoral head. SFN protrusion is related to the position of the lag screw insertion in the femoral head. A more superior insertion makes protrusion over the greater trochanter more likely. To avoid protrusion, it is essential to insert the lag screw in the proper position [6]. The final factor is the type of fracture. In cases of femoral trochanteric fracture with a disrupted or comminuted greater trochanter, the SFN is likely to be inserted through the split and, as a result, may protrude and become exposed.

Chronic hip and thigh pain after ORIF using SFN for femoral trochanteric fracture has been observed in the past. However, the

delayed hematoma was a novel finding and has never been reported. There is a possibility that patients with chronic hip and thigh pain after ORIF using SFN may incur soft tissue injury and undetected hematoma.

Conclusion

When using SFN for femoral trochanteric fractures, it is important to avoid protrusion of the SFN over the greater trochanter. And further careful follow-up with MRI and/or ultrasonography is needed to study delayed hematoma after ORIF using SFN.

Informed consent

The patient has provided written informed consent to publish the case report.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that have influenced the work reported in this paper.

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