

Case Report

Mature peritrochanteric heterotopic ossification as a mechanical block to intertrochanteric fracture reduction

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ABSTRACT

While heterotopic ossification (HO) around the hip is frequently cited as a late complication leading to stiffness or technical difficulty during reconstructive surgery, its role as a primary mechanical impediment to the reduction of acute intertrochanteric fractures is rarely documented. We present the case of a 45-year-old male with a significant history of polytrauma, traumatic brain injury, and conservatively managed bilateral acetabular fractures. The patient presented with mature peritrochanteric and periacetabular HO and an acute, comminuted right intertrochanteric femur fracture following a low-speed motor vehicle collision. Preoperative imaging confirmed extensive ossification bridging the greater trochanter and lateral acetabulum. Intraoperatively, standard closed reduction on a traction table proved impossible, as the proximal femoral fragment was anchored by a rigid, extra-articular bony block. To achieve reduction, a limited osteotome-assisted release of the obstructing HO bridge was performed without requiring radical excision. This maneuver restored proximal femoral mobility, facilitating successful reduction and internal fixation. The postoperative course was unremarkable; follow-up imaging confirmed fracture union and stable hardware. This case emphasizes that mature periarticular HO can act as a definitive mechanical block to closed reduction. Surgeons should utilize CT-based preoperative planning to identify such obstacles early, allowing for a targeted surgical release when standard reduction maneuvers fail.

Keywords: Intertrochanteric fracture, Heterotopic ossification, Failed closed reduction, Irreducible fracture, Cephalomedullary nailing, Osteotome-assisted release

INTRODUCTION

Intertrochanteric fractures of the proximal femur are commonly managed with fracture table-assisted reduction followed by cephalomedullary nailing or sliding hip screw fixation, and failure of standard traction and rotational manoeuvres may necessitate adjunctive reduction tools or open techniques.¹⁻³ Standard operative goals remain restoration of length, alignment, and rotation before definitive fixation.²⁻³ Heterotopic ossification (HO) is the formation of mature lamellar bone within extraskelatal soft tissues and is a recognized sequela after acetabular fracture surgery, femoral intramedullary nailing, polytrauma, and

neurotrauma.⁴⁻⁸ Around the hip, clinically significant HO may lead to stiffness, ankylosis, pain, or, in advanced cases, neurovascular compromise.^{4,5,9,10} Traumatic brain injury and major acetabular or pelvic trauma are established risk factors for substantial periarticular HO formation.^{4,6,9,10} The literature has largely addressed HO as a delayed post-traumatic or post-operative complication that affects hip motion or complicates later reconstructive procedures.⁴⁻¹⁰ By contrast, reports specifically describing pre-existing mature periarticular HO as a mechanical obstacle to reduction of an acute intertrochanteric fracture are lacking. Existing studies on irreducible intertrochanteric fractures have instead emphasized

fracture morphology, fragment interlocking, and soft-tissue restraint as the main causes of failed closed reduction.¹⁻³ This case report describes a patient with prior acetabular trauma, traumatic brain injury, and mature superolateral peritrochanteric and periacetabular HO around the greater trochanter and lateral acetabulum who sustained a new comminuted intertrochanteric fracture. The pre-existing HO acted as a rigid extra-articular mechanical block that prevented standard traction-table reduction. To current knowledge after focused review of adjacent literature, this scenario appears to be rarely described in the published literature.

CASE REPORT

A 45-year-old man was brought to the emergency department after a low-speed T-bone motor vehicle collision in September 2025. He was hemodynamically stable on arrival, with oxygen saturation of 99% on room air and a Glasgow coma scale score of 15/15. The main clinical finding was severe right hip pain with marked restriction of movement. A right foot drop was present, but this was confirmed to be chronic and unchanged from baseline.



Figure 1: Pre-operative imaging of the right hip: (A) pre-operative anteroposterior radiograph demonstrating an acute right intertrochanteric femur fracture with mature periarticular heterotopic ossification and (B) CT image confirming the comminuted intertrochanteric fracture and demonstrating mature heterotopic ossification predominantly in the superolateral peritrochanteric and periacetabular region around the greater trochanter and lateral acetabulum.

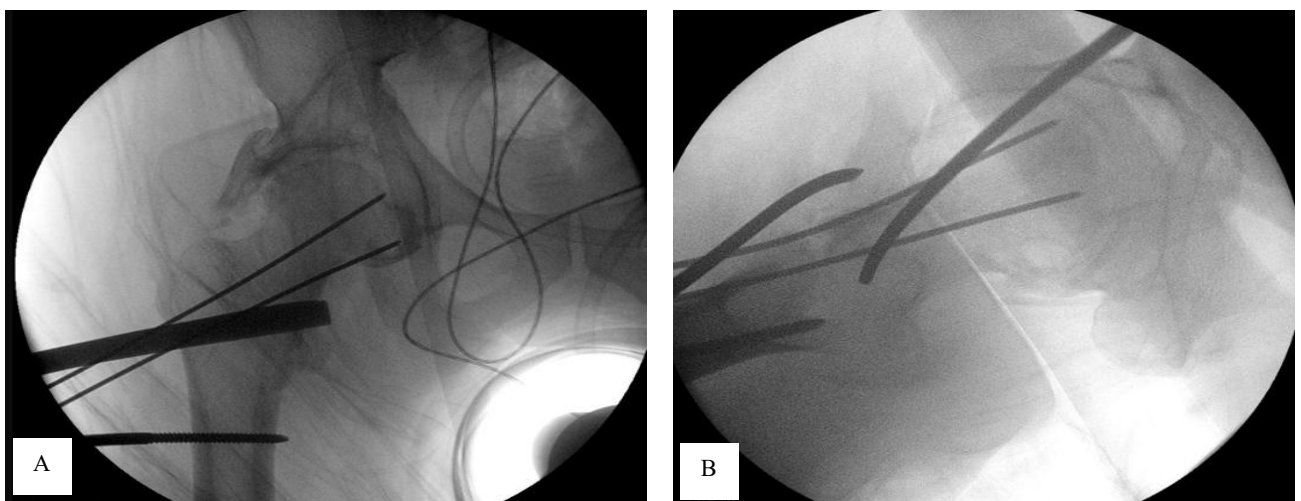


Figure 2: Intraoperative fluoroscopic images after reduction and provisional stabilization: (A) anteroposterior and (B) lateral intraoperative fluoroscopic images obtained after selective osteotome-assisted release of the obstructing heterotopic bone. The fracture reduction is provisionally maintained with K-wires before definitive cephalomedullary fixation.



Figure 3: Seven-month follow-up radiographs: (A) anteroposterior and (B) lateral radiographs at seven months demonstrating maintained alignment, stable implant position and fracture healing.

His past history was significant for major polytrauma sustained in a road traffic accident in December 2010. The injuries included a bilateral acetabular fracture treated conservatively, bilateral parietal haemorrhagic cerebral contusions, cervical and lumbar spine fractures, left clavicle fracture, left rib fracture, and left scapular acromion fracture. Following this injury, he developed a persistent limp and chronic right foot drop.

Earlier in 2025, he had been assessed in the orthopaedic clinic for chronic right hip and ankle symptoms. Examination showed restricted right hip movement, particularly internal rotation, and findings consistent with chronic deep peroneal nerve dysfunction. Nerve conduction studies confirmed axonal neuropathic changes in the deep branch of the right common peroneal nerve, consistent with chronic partial axonotmesis. Pelvic radiographs demonstrated bilateral hip post-traumatic arthritic change with mature periarticular heterotopic ossification. His medical background included type 2 diabetes mellitus and hypertension, with HbA1c of 7.93%.

Emergency radiographs demonstrated an acute right intertrochanteric femur fracture with mature periarticular heterotopic ossification, predominantly in the superolateral peritrochanteric and periacetabular region around the greater trochanter and lateral acetabulum. CT of the chest, abdomen, and pelvis confirmed an acute comminuted right intertrochanteric femur fracture and further demonstrated the spatial relationship between the fracture, proximal femur, acetabulum, and mature heterotopic bone (Figure 1 A and B). CT head and cervical spine showed no acute injury. Coagulation profile was normal, and the patient was cleared for surgery as ASA grade II. Surgery was performed the following day under

general anaesthesia. Standard peri-operative cefazolin and tranexamic acid were administered. Opposite side lower limb placed with care. Closed reduction was initially attempted on the traction table. Despite traction and rotational manoeuvres, acceptable alignment could not be achieved. The proximal femoral fragment remained fixed and could not be mobilised adequately for reduction.

The intraoperative finding was that mature heterotopic bone around the superolateral peritrochanteric and periacetabular region was mechanically restricting mobility of the proximal femur and preventing reduction. The obstruction was not attributed to the lesser trochanter or iliopsoas insertion. Rather, the mature heterotopic ossification appeared to function as a rigid extra-articular bony block around the greater trochanteric and lateral acetabular region. Intraoperative decision made to proceed with limited osteotome-assisted release of HO. The obstructing heterotopic bridge was selectively disrupted without attempting radical excision of the entire heterotopic mass.

After release of the mechanical block, reduction became possible. A 5-mm Schanz pin was inserted distal to the fracture site to assist correction of the distal fragment and improve translational alignment. The reduction was held provisionally with two K-wires placed in the anterior femoral neck. Intraoperative anteroposterior and lateral fluoroscopic images confirmed improved alignment and provisional K-wire stabilisation after release of the heterotopic block (Figure 2 A and B). A guidewire was then inserted, reaming was performed, and a proximal femoral nail measuring 12×240 mm was introduced. Cephalic fixation was completed using a 100 mm cephalic fixation device, and distal locking was performed with a

35 mm screw. Fluoroscopy confirmed acceptable reduction and implant position in both anteroposterior and lateral views. The wound was irrigated and closed in layers.

Post-operatively, the patient received multimodal analgesia, venous thromboembolism prophylaxis with enoxaparin, three additional doses of cefazolin, and glycaemic control with insulin sliding scale alongside his baseline medications. Haemoglobin decreased from 13.7 g/dl pre-operatively to 10.5 g/dl on post-operative day 1, without haemodynamic instability. Physiotherapy was initiated during admission. He progressed from bed mobility to walker frame-assisted standing and was discharged on post-operative day 4 with toe-touch weight-bearing instructions for 4-6 weeks.

At two weeks, the wound was clean and dry, clips were removed, and radiographs showed satisfactory early healing. At ten weeks, radiographs confirmed fracture union, the wound had fully healed, and distal perfusion was intact. He was advanced to weight-bearing as tolerated with a Zimmer frame. At seven months, follow-up anteroposterior and lateral radiographs demonstrated maintained alignment, stable implant position, and fracture healing, with no documented wound complication, implant-related complication, or new neurovascular deficit (Figure 3 A and B).

DISCUSSION

Visible mature HO around the hip on pre-operative imaging should alert the surgeon that standard traction-table reduction may fail. Giannoudis et al and Meyers et al emphasized that periarticular HO around the hip can substantially alter local mechanics and produce clinically important restriction of motion.^{4,5} Similar observations have been made in trauma-related and neurogenic HO literature, in which prior acetabular injury, polytrauma, and traumatic brain injury are consistently associated with more extensive hip involvement.^{6,9,10} In such patients, the presence of mature periarticular bone should prompt anticipation of reduction difficulty and preparation for adjunctive reduction strategies.

Plain radiographs identify the presence, maturity, and broad distribution of HO, but they may underestimate its three-dimensional relationship to the proximal femur and acetabulum. Reviews of hip HO after trauma and neurogenic injury have shown that cross-sectional imaging is useful for defining whether ectopic bone is predominantly peritrochanteric, periacetabular, or bridging, and for assessing its relationship to nearby neurovascular structures.^{4,5,9,10} In a case such as the present one, CT is particularly valuable because it helps determine the mechanical relationship between mature HO and the expected path of proximal femoral movement during attempted reduction. When a mature bony restraint is present, repeated forceful traction or rotation is unlikely to restore alignment and may worsen the injury. Studies of

irreducible intertrochanteric fractures have shown that failed closed reduction should lead to reassessment of the underlying deforming mechanism rather than repetition of the same manoeuvres with increasing force.¹⁻³ In the setting of mature periarticular HO, persistent fixed deformity should therefore raise concern for a structural extra-articular block rather than simple technical difficulty.

A practical stepwise response is advisable when closed reduction is unsuccessful. Said et al described irreducible intertrochanteric patterns requiring open reduction, whereas Yurek et al and Vidalis et al highlighted the need for adjunctive aids when traction-table reduction alone is insufficient.¹⁻³ In the present context, fluoroscopy should be reviewed to determine whether the proximal fragment is moving as expected, and CT should be revisited to distinguish fracture-pattern irreducibility from HO-related mechanical restriction. If mature heterotopic ossification is identified as the main mechanical block to reduction, meticulous preoperative planning and critical evaluation of the factors influencing intraoperative reducibility are required. This assessment should guide the decision between limited selective release and formal open reduction.

The underlying cause of failed reduction should be established, and in the acute fracture setting, the objective is not complete excision of all ectopic bone but restoration of sufficient fragment mobility to permit acceptable reduction and stable fixation. Giannoudis et al and Meyers et al noted that formal HO excision is usually discussed in delayed settings for established stiffness or ankylosis rather than during acute fracture fixation.^{4,5} For that reason, a focused osteotome-assisted release of only the obstructing segment may be more appropriate than radical excision when the immediate goal is fracture reduction.

Formal open reduction remains appropriate when fracture morphology itself is primary reason for irreducibility.¹⁻³ However, when the fracture is otherwise reducible and the principal obstacle is localized mature HO, targeted release may preserve the advantages of indirect reduction and minimally invasive cephalomedullary fixation. The existing literature on fracture reduction supports the use of adjunctive tools such as Schanz pins, joysticks, and provisional wires when standard traction-table manoeuvres are insufficient.^{2,3}

Selective release around the greater trochanter and proximal femur carries a risk of iatrogenic fracture propagation, especially in bone previously altered by trauma or chronic abnormal loading. Reviews of HO biology and trauma-related HO underscore that ectopic bone may coexist with distorted local anatomy and abnormal surrounding soft tissues.^{5,6} Accordingly, osteotome use should be controlled, incremental, and repeatedly reassessed under fluoroscopy. Extensive mature HO around the hip may lie in close proximity to the femoral neurovascular bundle, gluteal vessels, or sciatic

nerve. Neurogenic HO reviews have emphasized that advanced periarticular bone can threaten nearby structures directly or complicate exposure because of altered anatomy.^{9,10} These considerations support careful pre-operative CT review, limited exposure, and avoidance of blind osteotome advancement when the HO extends toward the pelvis or anterior hip.

A practical approach for similar cases is as follows: identify periarticular HO on pre-operative imaging; obtain or review CT to define its relationship to the proximal femur and acetabulum; anticipate reduction difficulty; attempt gentle traction-table reduction; avoid repeated forceful manoeuvres when a fixed deformity persists; identify whether the main obstacle is fracture morphology or mature HO; perform selective HO release if a safe corridor exists; use Schanz pin or K-wire joystick techniques to complete reduction; and then proceed with cephalomedullary fixation.^{1-3,9,10} Patients with substantial prior HO burden or intra-operative manipulation of mature ectopic bone should then be followed for both fracture healing and HO behaviour.⁴⁻⁶

Evidence regarding HO prophylaxis is strongest in acetabular fracture surgery rather than acute intertrochanteric fracture fixation. Heare et al concluded in a systematic review that available evidence for prophylaxis after acetabular fixation is heterogeneous.¹¹ Blokhuis and Frölke found no clear superiority of radiation over indomethacin in acetabular fracture patients, while Ghalambor et al and Burd et al identified clinically relevant HO risk after operative acetabular treatment and evaluated preventive strategies.¹²⁻¹⁴ After acute fracture fixation in the presence of mature HO, prophylaxis should therefore be individualized, balancing possible benefit against fracture-healing priorities and medication- or radiation-related risk.

Intra-operative disruption of mature ectopic bone may increase concern for recurrence or progression of HO, particularly in patients with prior neurotrauma or extensive periarticular disease.^{5,6,9,10} Although direct evidence for this specific scenario is limited, the extent of HO manipulation should be documented clearly and the post-operative plan should address whether selective prophylaxis is warranted. Follow-up should monitor both fracture union and any radiographic or clinical progression of residual HO.

CONCLUSION

Mature peritrochanteric and periacetabular HO can function as a rigid extra-articular mechanical block to reduction of an acute intertrochanteric fracture. In this setting, visible mature periarticular ectopic bone on pre-operative imaging should prompt CT-based anatomical mapping, anticipation of reduction difficulty, and early consideration of alternatives to repeated forceful traction. When a safe corridor exists, selective osteotome-assisted release of the obstructing HO may restore proximal

femoral mobility and allow reduction adjuncts and cephalomedullary fixation without radical excision.

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