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Case Report

"Bone-shot fracture" – An unusual iliac wing fracture caused by a projectile of autologous bone fragment. A case report☆

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ABSTRACT

Case: A young adult male sustained a high-energy crash suffering multiple injuries including a comminuted right femoral shaft fracture and an ipsilateral iliac wing fracture. The iliac fracture was caused by a femoral fragment which was projected and pierced the iliac wing. The patient underwent surgery with retrieval of the femoral fragment and fixation of the iliac and femoral fractures. The lesions healed uneventfully.
Conclusion: This is the first reported case of an iliac fracture caused by a projectile of autologous bone. High-energy trauma may present unusual or never seen injury patterns to the trauma surgeon.

Introduction

Penetrating trauma encompasses a large array of possible injuries and has the potential to damage several structures, from the skin to soft tissues, viscera, neurovascular bundles and even bones and joints.

Fractures may originate from penetrating trauma and are mostly caused by non-organic projectiles. Fractures caused by projectiles of organic tissue are almost unheard of and the few cases present in the literature describe fractures associated with projectiles of heterologous tissue [1].

We present the case of a young male victim of high-energy trauma who sustained an iliac wing fracture caused by a projected bone fragment originated on a synchronous femoral fracture.

Case-report

A 46-years old male, with no past medical history, was referred to our hospital 4 weeks after being victim of a high-energy motor vehicle crash on the commute to work.

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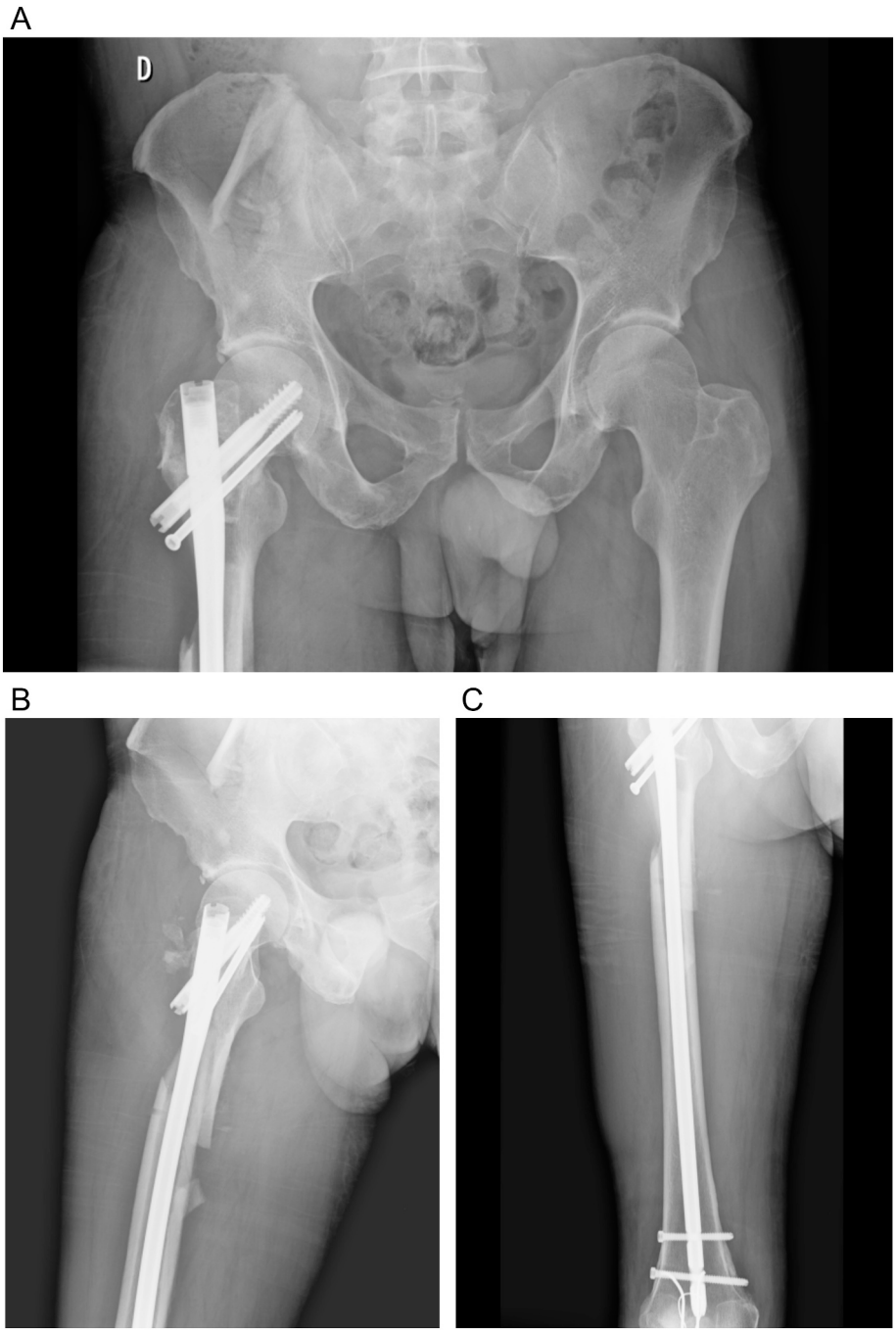

Fig. 1. A, B and C – Pelvis and right femur radiographs at admission. The femoral fracture had been fixed with a long nail, but it is obvious the critical cortical defect of the proximal femur. It is noticeable a bone fragment overlaying the right iliac wing.

The patient was the driver and solo occupant of a car that crashed with another vehicle at high speed on the highway.

He was initially assisted at the local general hospital where he was diagnosed with the following musculoskeletal injuries: right femoral neck and shaft fractures, right medial tibial plateau fracture, right patella fracture and right distal radius fracture. At the local hospital, patient's initial surgical treatment comprised cephalomedullary long nailing of the right femoral fractures, open reduction and fixation of patella fracture with tension band construct, open reduction and internal fixation of right distal radius fracture with volar plating and k-wires.

After the initial surgeries and uneventful early post-op period, the patient was transferred to our unit to proceed with further treatments under worker's compensation medical care.

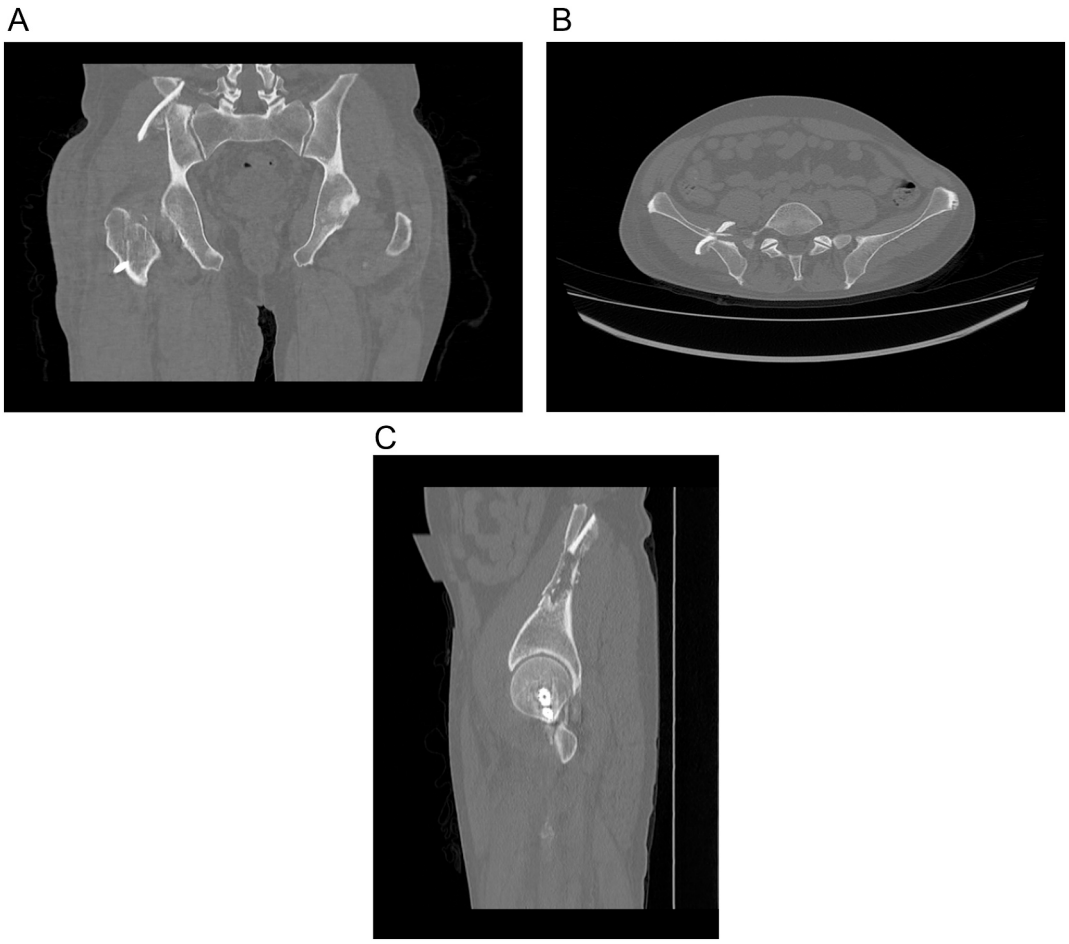

Fig. 2. A, B and C – Coronal, axial and sagittal CT images of the pelvis. The images show a fracture of the right iliac wing, which was pierced by a cortical bone fragment.

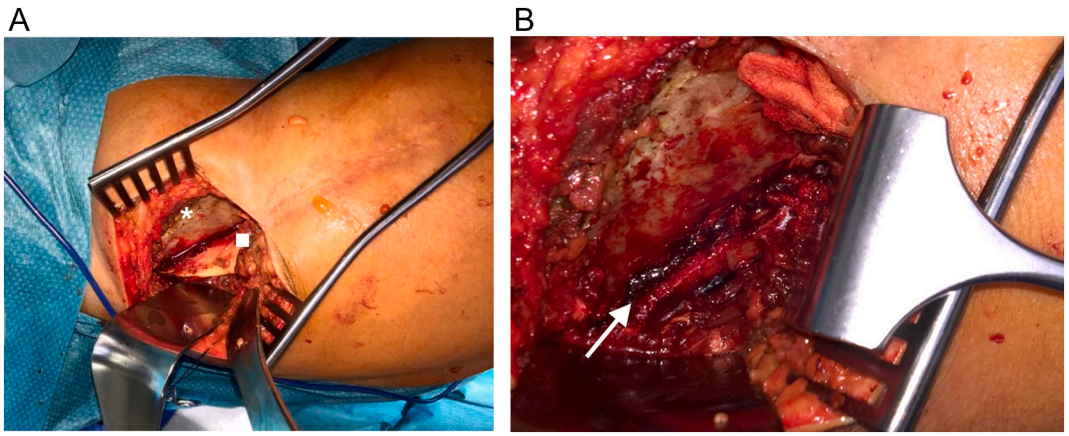

Fig. 3. – Intra-operative images. A – Through a Gibson approach it was evident the fragment of femoral cortical bone (white square) piercing the right iliac wing (white asterisk); B - After removal of the bone fragment it was obvious the fracture of the right iliac wing (white arrow).

At the time of referral to our hospital the patient was clinical stable and with sole complaints of lower back and right buttock pain, as well as pain in his right thigh and knee. Surgical wounds were fully healed. The patient exhibited mild tenderness to palpation of the posterior half of his right iliac crest and buttock and presented presented incomplete and still painful range of motion of the right hip.

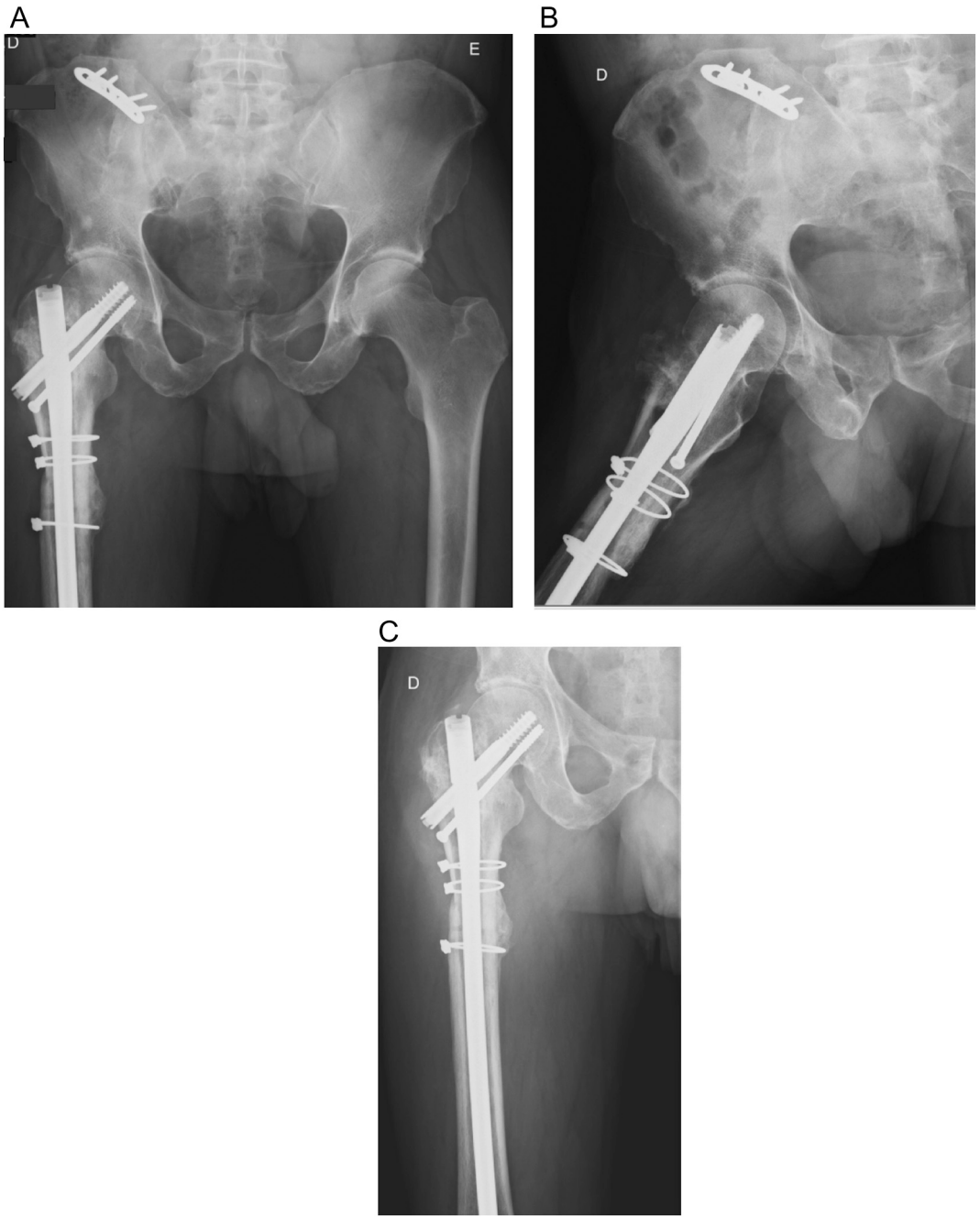

Fig. 4. A, B and C – 12-month post-operative pelvis and right hip radiographs, which show uneventful union of the fractures.

No neurovascular deficits were present on examination.

On the imaging study taken (Figs. 1A–C and 2A–C), the right femur exhibited signs of a basicervical fracture and also a fracture of the upper third of the shaft. The femur had been fixed with a long anterograde nail but it was notorious a segmental defect in the lateral cortex of the femur. However, the third fragment of the femur was missing and was not identifiable on the radiographs acquired. On the other hand, the patient exhibited a peculiar fracture of the right iliac wing which was pierced on its most posterior aspect by a large bone fragment. This bone fragment, which was approximately 8 cm in length, had perforated the iliac wing, where it was still lodged and protruding into the pelvic cavity.

The patient was scheduled for surgery, aiming to treat the right iliac fracture and to review the fixation of the right femur.

With the patient placed in left lateral decubitus we performed a Gibson approach. Through the most cranial segment of the approach we were able to identify the fracture of the iliac wing and the piercing femoral bone fragment (Fig. 3A and B).

The fragment of femur was carefully removed with aid of bone clamps and the iliac wing fracture was reduced and fixed with a 4-hole DCP plate. The femoral fixation was then reassessed, putting the missing femur lateral cortex fragment back in place, where it fitted perfectly and fixing it with 3 cables.

No complications occurred during the procedure and the post-op period.

After discharge from the hospital the patient progressed on his rehabilitation program and maintained follow-up appointments.

At 12-month follow-up the patient walks unassisted and shows no limitations in the range of motion of his right hip, reporting mild pain only with more demanding activities. 12-month radiographs show uneventful union of the iliac and femoral fractures (Fig. 4A–C).

Discussion

Fractures caused by penetrating injury require a high energy agent and are most commonly seen after firearm insults or explosion, and limbs are the segments most frequently affected [2]. In the scenery of multiple casualty bombings or severe accidents there have been reported cases of unusual injuries caused by fragments of foreign bone, such as harmful upper body injuries [3] or injuries mimicking limb fractures [4,5].

Sometimes the projectile is a fragment of autologous bone. Projected fragments of clavicle fractures have been responsible for thoracic injuries [6]. There are also reports of bone fragments causing secondary wound channels after gun-shot trauma [7]. However, it is even rarer for a fragment of a fractured bone to cause another fracture.

Non-blunt trauma is an uncommon cause of pelvic ring fracture and is mostly associated with penetrating injuries inflicted by ballistic projectiles [8]. While there are reports of non-ballistic penetrating fractures of the pelvis [9], to our knowledge this is the first described case of a pelvic fracture caused by a projectile of autologous bone.

The pelvic ring showed no other signs of injury and there was no evidence of bony defects at this level. As there were no signs of open injuries beside the surgical wounds described, we concluded that this bone fragment should be the third fragment from the right femoral fracture which had been projected at the time of injury and causing this iliac fracture.

It is unlikely that the third fragment of the femoral fragment travelled all the way from its anatomic position before piercing through the iliac wing. Most probably, the distal fragment of the femur suffered an extreme proximal displacement after being fractured, putting the shaft in close relationship to the iliac wing. This is supported for the fact that the patient also suffered injuries around the knee suggesting that a dashboard-like injury might have occurred. The shaft fragment might very well itself impact on the iliac wing leaving the third fragment protruding in the pelvis after it broke off. Nevertheless, it would still require a lot of kinetic energy for the cortical fragment to pierce though the iliac wing.

We chose to re-operate the patient after he had been referred to our hospital for two reasons. Firstly, we felt the treatment of the femoral fracture was insufficient as there was a critical defect of the lateral cortex of the femur that was disregarded. In fact, several studies highlight the importance that the presence of a third fragment in femoral shaft fractures may have in the development of non-union [10]. Secondly, the patient was still symptomatic in regard to his iliac wing fracture. Despite not representing a displaced or unstable fracture pattern, we believed that by addressing this lesion we might obviate the risk of chronic pain caused by the protruding fragment at the fracture site.

Conclusion

In this paper we report the unique case of an iliac wing fracture caused by a projectile of autologous bone, originating in a synchronous fracture.

In the setting of high-energy trauma, the high kinetics and degree of damage to the affected structures may frequently present never seen injury patterns and impose new and different challenges to the trauma surgeon.

Declaration of competing interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

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