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Case Report

Progression to Rommens type IIIa fragility fracture of the pelvis managed by delayed open reduction and interdigitating screw fixation: A case report

Yuhei Nakayama [a], Takashi Suzuki [b,*], Taketo Kurozumi [a], Yoshinobu Watanabe [b]

[a] Trauma Center, Federation of National Public Service Personnel Mutual Aid Associations, Toranomon Hospital, Tokyo, Japan
[b] Trauma and Reconstruction Center, Teikyo University Hospital, Tokyo, Japan

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ABSTRACT

Efficient management of fragility fractures of the pelvis (FFPs) is established during the acute phase of injury. However, a small number of FFPs exhibit fracture progression with increased instability over time. Fracture progression is typically seen in sacral fractures and rare in iliac fractures. Herein, we present the case of a 72-year-old woman with Rommens type IIIa FFP, following an isolated iliac fracture. It was successfully treated four months after the initial injury with retrograde suprapubic screw fixation via the anterior intra-pelvic approach and percutaneous lateral compression type-2 screw fixation using an interdigitating technique.

Introduction

Fragility fractures of the pelvis (FFPs) are associated with low-energy trauma and osteoporosis as etiologic factors and are growing into a global problem with an increasing population of the elderly [1]. Since Rommens et al. first published their work in 2013, the classification and treatments proposed are based on the fracture types. However, indications for surgery of atypical or transitional fracture patterns remain controversial [1,2]. Furthermore, some FFPs have been reported to demonstrate fracture progression; therefore, subsequent treatment, including surgical timing and procedures is still debatable [3].

We present a case of a non-displaced unilateral iliac fracture in an elderly patient who subsequently showed fracture progression leading to Rommens type IIIa FFP during conservative treatment. The patient was treated with a delayed open reduction and screw fixation, which allowed full weight bearing immediately. Bone union and successful long-term functional outcomes were achieved by using a unique screw arrangement.

Case presentation

The patient was a 72-year-old woman with a medical history of diabetes mellitus and pessary insertion for uterine prolapse. She sustained a fall from a standing height and was unable to walk. The patient was admitted to another hospital. Radiographs and computed tomography (CT) scanning revealed a non-displaced left iliac fracture without extension to the sacroiliac joint, which was classified as an atypical lateral compression type-2 (LC-2) fracture according to the Young–Burgess classification. There were no

* Corresponding author at: Teikyo University Hospital, 2-11-1 Kaga, Itabashiku, Tokyo 173-8606, Japan.
E-mail address: takashisuzuki911@yahoo.co.jp (T. Suzuki).

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evident fractures in the other parts of the pelvis (Fig. 1). The left iliac fracture was initially treated nonoperatively. Weight-bearing was basically prohibited for six weeks, followed by progression to full weight bearing in 10 weeks. The patient spontaneously recovered and resumed walking with a cane. However, on the day of discharge, she suddenly experienced pain in the anterior groin without any history of trauma, while walking in the corridor of the hospital. She remembered vividly the episode of sudden onset of pain. Twelve weeks after the injury, the patient was evaluated by the original doctor at an outpatient clinic. Radiographs revealed not only a displaced left iliac fracture but also a newly displaced left pubic ramus fracture. Fifteen weeks after the injury during the referral to our hospital, she could not ambulate due to severe pain in the groin and buttocks. The numerical rating scale (NRS) for pain intensity was nine points out of ten.

She was admitted to our hospital and a radiologic examination was performed, which revealed a significantly displaced ipsilateral pubic ramus and iliac fracture (Fig. 2). The fracture morphology was classified as Rommens type IIIa. We meticulously planned surgical treatment to balance fixation strength and invasion in the patient. During the operation, we chose the anterior intrapelvic (AIP) approach for open reduction of the left pubic ramus since the displacement was >100 % and expected to be irreducible through a closed approach. The scar tissues at the fracture site were cleaned. Serrated bone forceps and Weber clamps were used for reduction. A guidewire for a 6.5 mm cannulated screw was inserted in a retrograde manner (Fig. 3a). After the guidewire penetrated the outer cortex of the ilium, a fully threaded 6.5 mm cannulated screw was inserted to maintain the reduced position. After pubic ramus screw insertion, the iliac fracture had been naturally reduced to some extent which facilitated the insertion of two guidewires for LC-2 screws. Fully threaded 6.5 mm cannulated screws were inserted using the interdigitating technique [4] (Fig. 3b). The operation duration was 2 h and 33 min, and the estimated blood loss was 99 ml. The patient was allowed immediate full weight bearing postoperatively. The NRS score evaluated on the third postoperative day improved to one point out of ten. After administering physiotherapy, she was discharged two weeks after the operation. Radiographs at 16 weeks postoperatively showed good bone healing (Fig. 4). The patient was followed up for two years. She had no complications and demonstrated full scores on patient-reported outcome measures.

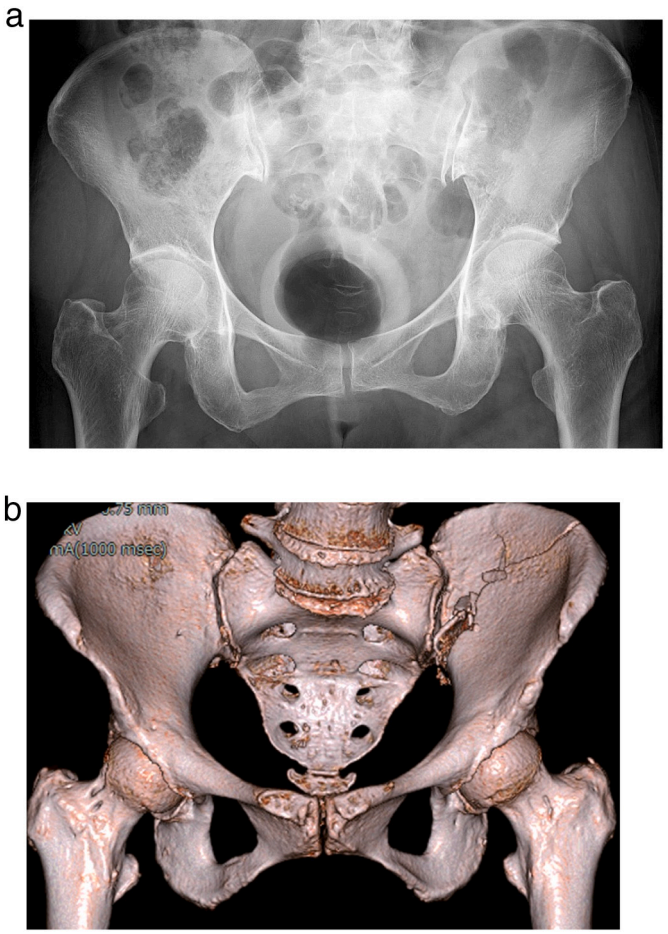

Fig. 1. X-ray radiograph (a) and 3D-Computed tomography image (b) of the pelvis at the initial injury. A left iliac fracture is observed.

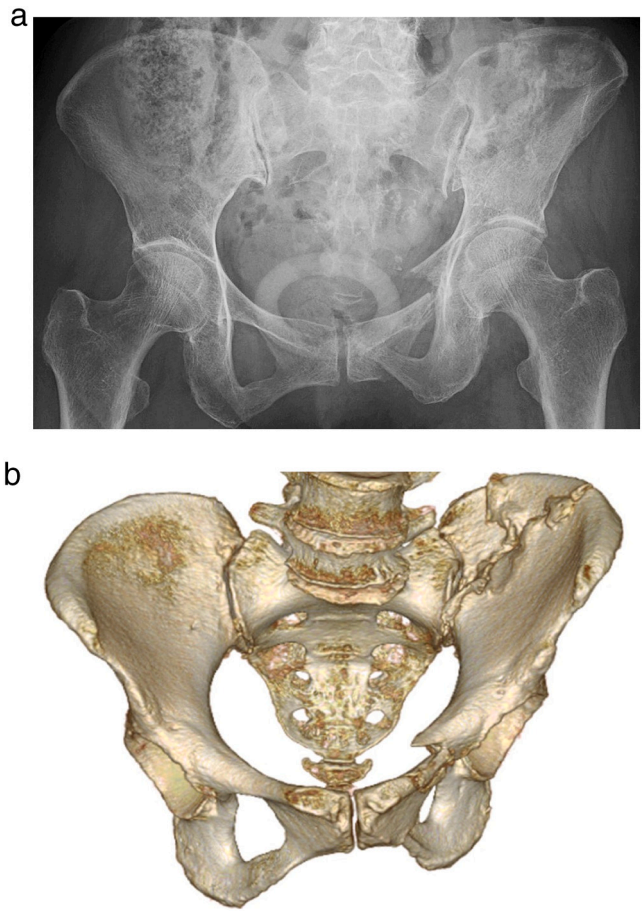

Fig. 2. X-ray radiograph (a) and 3D-Computed tomography image (b) of the pelvis at the time of referral to our hospital. A left pubic ramus fracture and displaced left iliac fracture are observed.

Discussion

One of the specific characteristics of the present case was the fracture morphology at the time of the injury which differed from typical FFPs in terms of an isolated iliac fracture. The Young–Burgess classification is frequently used for high-energy pelvic fractures. Although the fracture was not caused by a high-energy injury, it was initially classified as a variant of LC-2 fracture based on the Young–Burgess classification. Calafi et al. reported that 20 % of LC-2 fractures were variants that did not match the Day classification [5]. There is no clear consensus on the treatment of this variant, and it has been reported that non-displaced LC-2 fractures usually heal with just conservative treatment [6].

In patients with FFPs, fracture progression, which indicates slowly increasing instability, is sometimes observed during conservative treatment without any history of trauma [1–3,7]. Previous studies have reported that fracture progression was identified in 14.2–22.8 % of FFPs and was significantly associated with prolonged pain [3,7]. However, there has been no established treatment strategy regarding surgical timing, approaches, or procedures for subsequently progressed fractures after the initial conservative treatment.

In the present case, since the left pubic ramus fracture was not evident on the initial CT scan, magnetic resonance imaging (MRI) could have detected an occult fracture or bone bruise in the pubic bone. In a study by Graul et al., additional MRI in FFPs changed the diagnosis of fracture type in 31 %, and conservative treatment was replaced with surgery in 10 % of their cases [8]. The MRI findings, however, need not necessarily change the decision on operative versus non-operative treatment, since the treatment strategy is determined not only by the fracture morphology but also by various factors such as the severity of pain, comorbidities, and level of activity of daily living.

In general, closed reduction and percutaneous screw fixation have been regarded as ideal surgical fixation methods for elderly patients. However, in cases of significantly displaced fractures or subacute/chronic fractures, it is difficult to reduce fractures and insert screws in a closed approach. Consequently, an open approach to fracture reduction becomes inevitable. Furthermore, when open reduction is required, the choice between plate or screw fixation is a matter of consideration. Lodde et al. reported that in a study of Rommens type IIc fractures using an osteoporotic bone model, the fixation properties of plates and screws were comparable in the

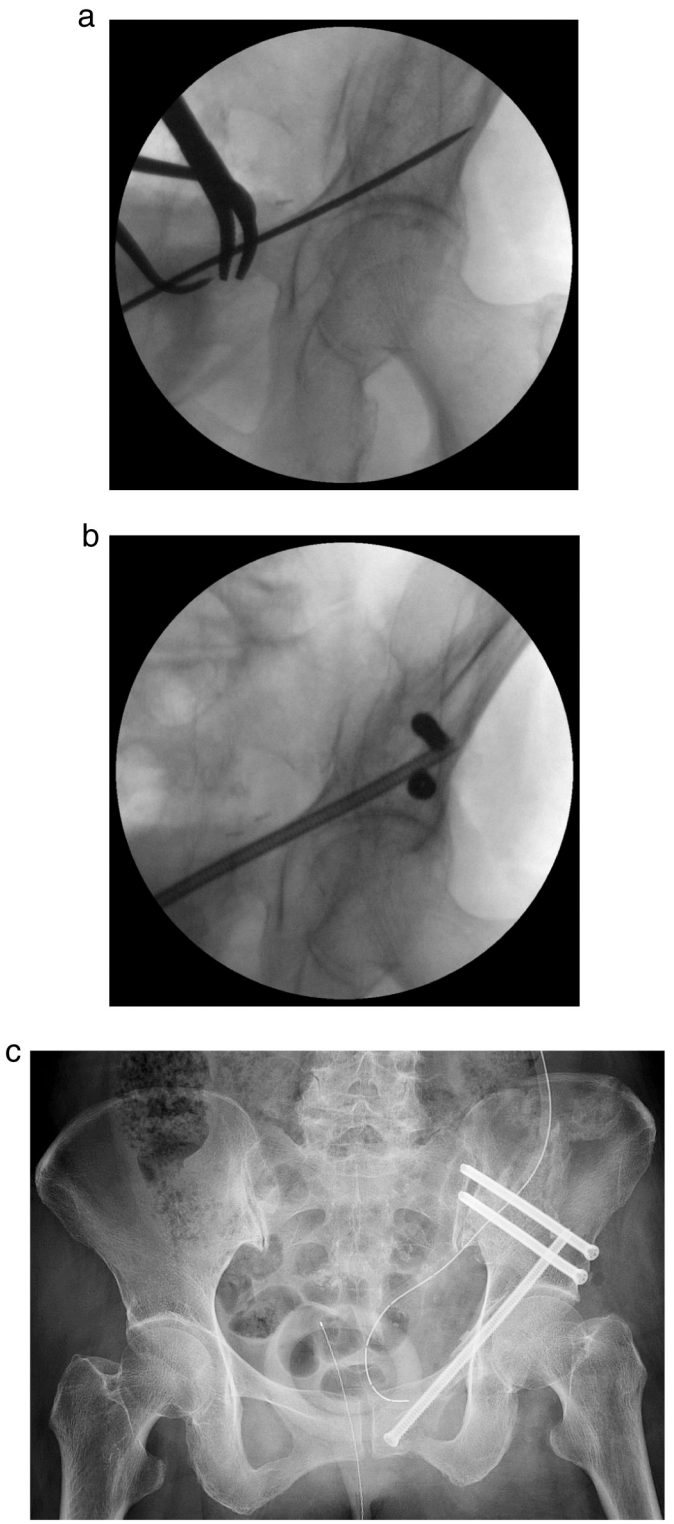

Fig. 3. Intraoperative images and postoperative X-ray radiograph. Accurate reduction was achieved with forceps and by inserting guide wire in pubic ramus (a). Interdigitation in supra-acetabular area with two LC-2 screws is inserted (b). Postoperative AP view of the pelvis (c).

Fig. 4. X-ray radiograph obtained 16 weeks after the operation.

pubic ramus [9]. Theoretically, considering the involvement of the surgical dissection area, screw insertion has an advantage over plate fixation. One of the complications of retrograde suprapubic screw fixation is the loosening of the screw causing backout. Consequently, effective methods for preventing screw backout such as bicortical fixation and interdigitating with LC-2 screws are being applied [4]. Methods of iliac fracture fixation include external fixation, plate fixation, and posterior spinal instrumentation. Our choice of percutaneous LC-2 screws has several advantages in terms of fixation stability, less invasiveness, and a supine position of surgery. In the present case, the iliac osseous pathway for the two LC-2 screws was secured by accurate reduction of the pubic ramus fracture.

In the surgical fixation of FFPs, the anatomical reduction is not required [10]. Bone healing can be achieved by splinting the fractures with screws. In the present case, the patient's pain was alleviated immediately on the day of the operation, resulting in early ambulation with full weight bearing. This screw fixation could provide adequate stability and promote bone healing by acting as intramedullary splinting.

In conclusion, elderly patients should be regularly followed-up in the context of fracture progression in FFPs. Although the treatment strategy should be appropriately chosen on a case-by-case basis, after fracture progression, open reduction and screw fixation for Rommens type IIIa FFP is an effective method which is less invasive and is associated with increased fixation strength. Thus, our study will help in the better management of FFP in the elderly.

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None.

Statement of informed consent

The patient was informed that data concerning the case would be submitted for publication and agreed with the creation and publication of this article.

Declaration of competing interest

The authors declare no competing interests.

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