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Treatment Options in Pipkin Fracture-Dislocation of the Femoral Head: Cases Review

Ovidiu Alexa, Bogdan Puha*, Dragos Popescu, Radu Ioan Malancea and Bogdan Veliceasa

[1]Department of Orthopedics and Traumatology, "Gr.T. Popa" University of Medicine and Pharmacy Iași, Romania

Abstract

Background: Fractures of the femoral head associated with a hip dislocation are relatively rare and often associated with a poor functional outcome. Materials and methods: In the past two years we had nine cases of femoral head Pipkin fracture-dislocations type I, II and IV. Medical data and radiographs, including computed tomography of the patients were reviewed for analysis. All patients were followed postoperatively for a period of minimum 22 months. Functional outcome was evaluated with the Merle d'Aubigne-Postel score.

Results: Of the fractures, four of them were classified as type I Pipkin, of which one was an open type 1 Gustilo-Anderson fracture, two were classified as type II Pipkin, and three were classified as type IV Pipkin. The time from injury to successful closed reduction was 6.7 hours (range 4.5-10 hours). Three type I Pipkin fracture-dislocations were treated by conservative means (no surgery) and one case required excision of intra-articular free bodies. In type II Pipkin fracture-dislocations, open reduction and internal fixation (ORIF) was performed in one case and hemiarthroplasty in the other. In type IV Pipkin lesions, we performed open reduction and internal fixation of the acetabular fracture through posterior Kocher-Langenbeck approach and excision of femoral head intra-articular free bodies The overall outcome was excellent in four cases and good in five cases. Throughout the follow-up period, there was no case of avascular necrosis (AVN) recorded. Heterotopic ossifications (HO) were observed in one case of type I Pipkin, two cases of type II Pipkin and one case of type IV Pipkin fractures.

Conclusion: Treatment aim should always be the anatomic reduction of the fragments with minimal soft tissue injury. Sometimes closed reduction is enough, but in the presence of large fragments, the fracture-dislocation is better treated by ORIF. We should not forget that half of these patients will have good outcomes no matter the treatment strategy; this result depends on the general health of the patient, the severity of the injury, associated injuries, associated cartilage injury, and timing of admission to the hospital.

Keywords: Hip fracture-dislocation; Pipkin; ORIF

Introduction

Fractures of the femoral head associated with a hip dislocation are relatively rare and often associated with a poor functional outcome [1]. Keely and Lipscomb reported that the incidence of this type of femoral head fracture is two cases per one million per year [2]. Treatment strategies in femoral head fracture-dislocations are very controversial and represent one of the few true orthopedic emergencies - reduction must be done as soon as possible under general anesthesia with good muscle relaxation to prevent further damage. After reduction, careful examination on multislice computed tomography (CT) should be performed for assessing reduction quality, comminution and free intraarticular fragments [3]. Conservative treatment is accepted only when post-reduction CT demonstrates anatomical reduction [4]. Closed non-surgical treatment can be the best option for Pipkin type I and type II fractures. If closed reduction is not appropriate, open reduction and internal fixation (ORIF) should be the choice of treatment [5]. Type IV Pipkin fractures should be treated surgically by ORIF of the acetabular fracture and fixation or excision of the femoral head fragments. In the past two years, we had nine cases of type I, II and IV Pipkin femoral head fracture-dislocations.

Materials and Methods

We reviewed nine patients admitted to our emergency department due to femoral head fracture-dislocations between November 2012 and May 2015. Medical data and imaging studies (radiography and CT) of the patients were reviewed for analysis. All patients were followed postoperatively for a period of minimum 12 months (12-26 months). According to Pipkin, femoral head fractures are classified in: Type I - does not involve the weight bearing portion of the femoral head, Type II - involves the weight bearing portion of the femoral head, Type III - type I or II with associated femoral neck fracture and Type IV - type I or II with associated acetabular fracture (usually posterior wall fracture) [6]. Functional outcome was assessed with the Merle d'Aubigne-Postel score [7]. The Merle d'Aubigne-Postel score evaluates hip function taking into account three parameters: pain, mobility and walking, each of them with a maximum score of 6 points. Eighteen points indicate excellent, 15-17 points good, 12-14 points fair, and <12 points poor results. Complications such as heterotopic ossification, avascular necrosis (AVN) and posttraumatic arthritis were also documented.

Result

Of the fractures, four of them were classified as type I Pipkin, of which one was an open type 1 GustiloAnderson fracture, two were classified as type II Pipkin, and three were classified as type IV Pipkin (Table I).

***Corresponding author:** Bogdan Puha, Department of Orthopedics and Traumatology, "Gr.T. Popa", University of Medicine and Pharmacy Iași, Romania, Tel +40 (0) 722 22 34 18; E-mail: puhab@yahoo.com

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Table I: Patients detailes.

Patient/sex/age	Fracture type	Associated lessions	Treatment	Complications	d'Aubigne score
Case 1/F/69	Pipkin type I open type 1 Gustilo-Anderson	42-C2 Open type 3B Gustilo-Anderson	Closed reduction	HO	Excelent
Case 2/M/ 33	Pipkin type I		Closed reduction		Good
Case 3/M/ 31	Pipkin type I		Excision of intra-articular free bodies		Good
Case 4/M/34	Pipkin type II	13-C3 Open type 2 Gustilo-Anderson	ORIF	HO	Good
Case 5/F/43	Pipkin type IV		ORIF of acetabular fracture + Excision of intra-articular free bodies		Excelent
Case 6/M/65	Pipkin type II		Hemiarthroplasty	HO	Excelent
Case 7/M/28	Pipkin type IV	Common peroneal nerve paralysis	ORIF of acetabular fracture + Excision of intra-articular free bodies		Good
Case 8/M/47	Pipkin type I		Closed reduction		Excelent
Case 9/M/35	Pipkin type IV	Common peroneal nerve paralysis	ORIF of acetabular fracture + Excision of intra-articular free bodies	HO	Good

Two patients were female and seven were male. The average age at the time of injury was 42.7 (28-69) years. Most of the fractures were due to traffic accidents (eight cases), only one patient sustained injury from falling from a height. Immediate closed reduction of the fracture-dislocation of the hip was performed under general or epidural anesthesia in all patients. The average time elapsed from injury to successful closed reduction was 6.7 hours (range 4.5-10 hours). Three of the four type I Pipkin fracture-dislocations were stable with minimum displacement after reduction and were treated conservatively (Figure 1) and one case required surgery that consisted in excision of intra-articular free bodies (Figure 2). In one of the type II Pipkin fracture-dislocations we performed ORIF of the fragment with 3 countersunk screws by Smith-Peterson approach (Figure 3). In the second case, orthopedic reduction was performed per primam (in another department) and after 3 months, when the patient was admitted in our department, we reviewed the post-reduction images and decided to perform a hemiarthroplasty (Figure 4). All type IV Pipkin fracture-dislocations underwent ORIF of the acetabular fracture through posterior Kocher-Langenbeck approach and excision of femoral head intra-articular free bodies (Figure 5). The overall outcome was excellent in four cases (two type I Pipkin, one type II Pipkin and one type IV Pipkin) and good in five cases. Throughout the follow-up period, there was no case of avascular necrosis (AVN) recorded. Heterotopic ossifications (HO) were observed in one case of type I Pipkin, two cases of type II Pipkin and one case of type IV Pipkin fractures.

Discussion

The time elapsed between traumatic dislocation of the hip joint and reduction of is a key element for a good outcome. Epstein et al. indicated that early reduction (within 24 hours) is associated with better results than late reduction [8]. McMurtry and Quaile [9] showed that the joint should be relocated within 6 hours; failure to do so increases the risk of avascular necrosis of the femoral head. Our study shows that anatomical reduction of dislocation in the first 12 hours of injury is associated with good functional results, only one case requiring hemiarthroplasty following a delayed initial reduction. The size and location of the fractured fragment significantly impacts the outcome. An exact anatomical reconstruction of the femoral head, especially if the weight-bearing part is involved, is absolutely necessary [10]. Patients with type I Pipkin fractures can be treated either by closed reduction or open reduction. If the fragment is large early reduction and internal fixation is recommended in order to produce good results [11]. Regarding the effect of timing of large fragment fixation in patients with type I Pipkin fractures, Lin et al. [12] suggested that surgical reduction and fixation should be performed shortly after injury to improve treatment outcome. For small fragments, surgical fragment excision after closed reduction is an effective treatment for type I Pipkin fractures [13]. For type II Pipkin fractures of the femoral head associated with posterior dislocation of the hip, recommended treatment methods have varied from primary closed reduction to ORIF. Epstein et al. [14] suggested that all traumatic dislocations of the hip must be treated as surgical emergencies and multiple attempts of closed reduction are contraindicated. His studies indicated that results after primary open reduction were better than after closed reduction or after closed reduction followed by open reduction. Butler [15] and Chakraborti [16] suggest that conservative methods should be considered per primam, although treatment of this injury is difficult. The key is to obtain anatomic reduction of all fragments but this is difficult by closed reduction. Henle et al. [4] showed that only 1 in 12 patients obtained an anatomic fracture position after closed reduction; in his study, if the fracture gap within the joint showed a displacement of > 2 mm, operative treatment was indicated to improve reduction. The optimal surgical approach in the treatment of femoral head fractures remains controversial. Some studies advocate the use of Kocher-Langenbeck, others the Smith-Peterson approach or percutaneous fixation after a successful closed reduction [1,8,14,17]. In several cases the femoral head component of the fracture is small and has an infrafoveal location and can either be ignored or simply excised through a Kocher–Langenbeck approach while addressing the posterior wall component. However, when the femoral head component requires fixation, surgical dislocation of the hip allows for simultaneous treatment of both fractures [18]. Solberg et al. [19] reported the outcome of 12 type IV Pipkin fracture-dislocations treated through a surgical hip dislocation. The authors reported a 100% union rate, while only 1 out of 12 patients developed osteonecrosis.

Conclusion

Treatment aim should always be the anatomic reduction of the fragments with minimal soft tissue injury. Sometimes closed reduction is enough, but in the presence of large fragments, the fracture-dislocation is better treated by ORIF. We should not forget that half of these patients will have good outcomes no matter the treatment strategy; this result depends on the general health of the patient, the severity of the injury, associated injuries, associated cartilage injury, and timing of admission to the hospital.

Conflict of interest

Authors have no conflict of interests to disclose.

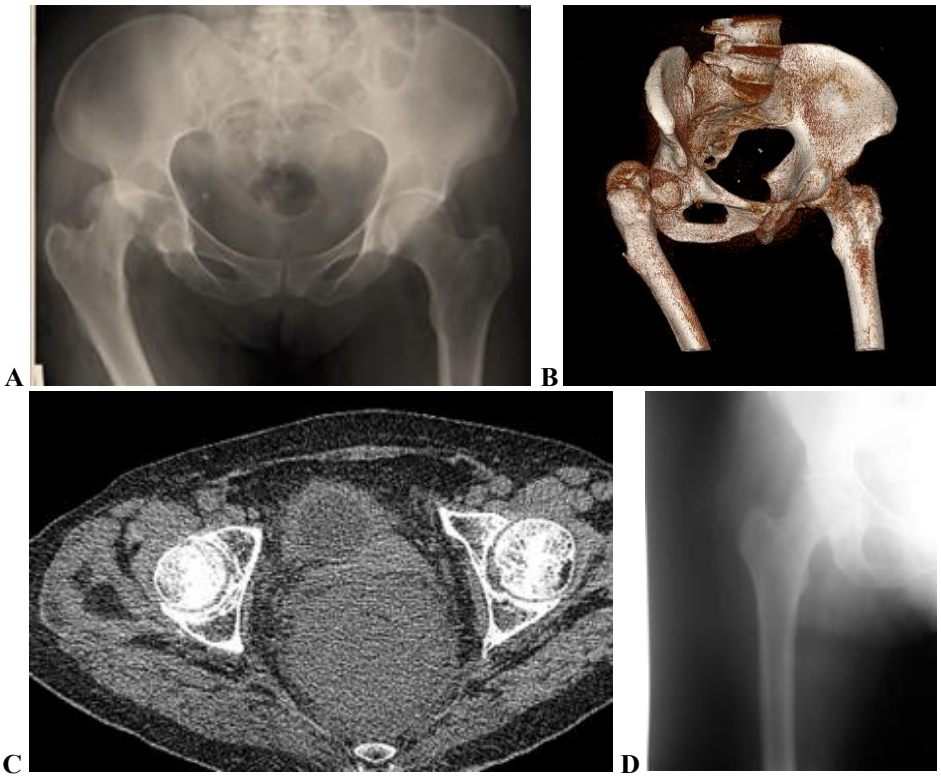

Figure 1: 69 years old female patient treated conservatively. Preoperative X-ray (**A**) and 3D CT (**B**) showing postero-superior dislocation of the hip associated with a femoral head fracture inferior to fovea centralis (Pipkin type I). Postreduction CT (**C**) shows anatomical reduction. The patient healed without any complication (**D** – one year follow-up X-ray).

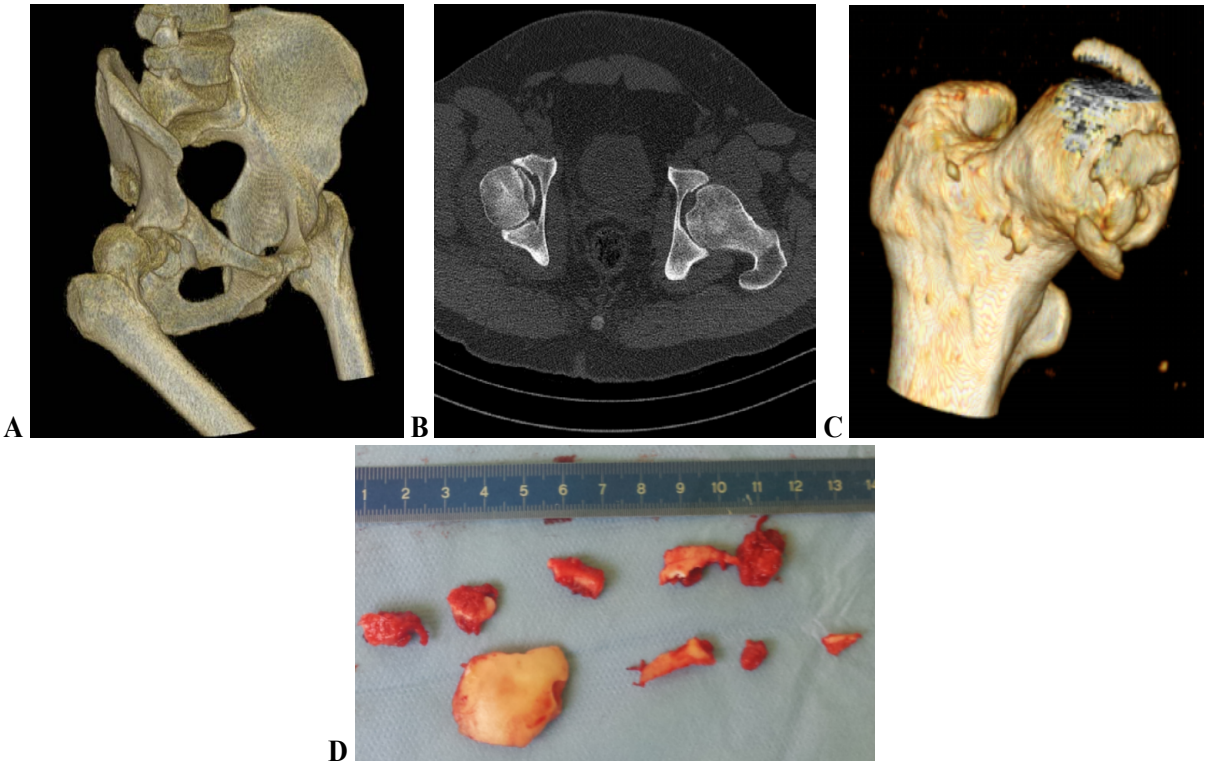

Figure 2: 31 years old male patient treated surgical. The initial 3D CT showed postero-superior dislocation of the hip associated with a femoral head fracture inferior to fovea centralis (**A**). After reduction we observed on CT a non-anatomical reduction of the fracture (**B, C**) that required surgery - excision of intra-articular free bodies (D).

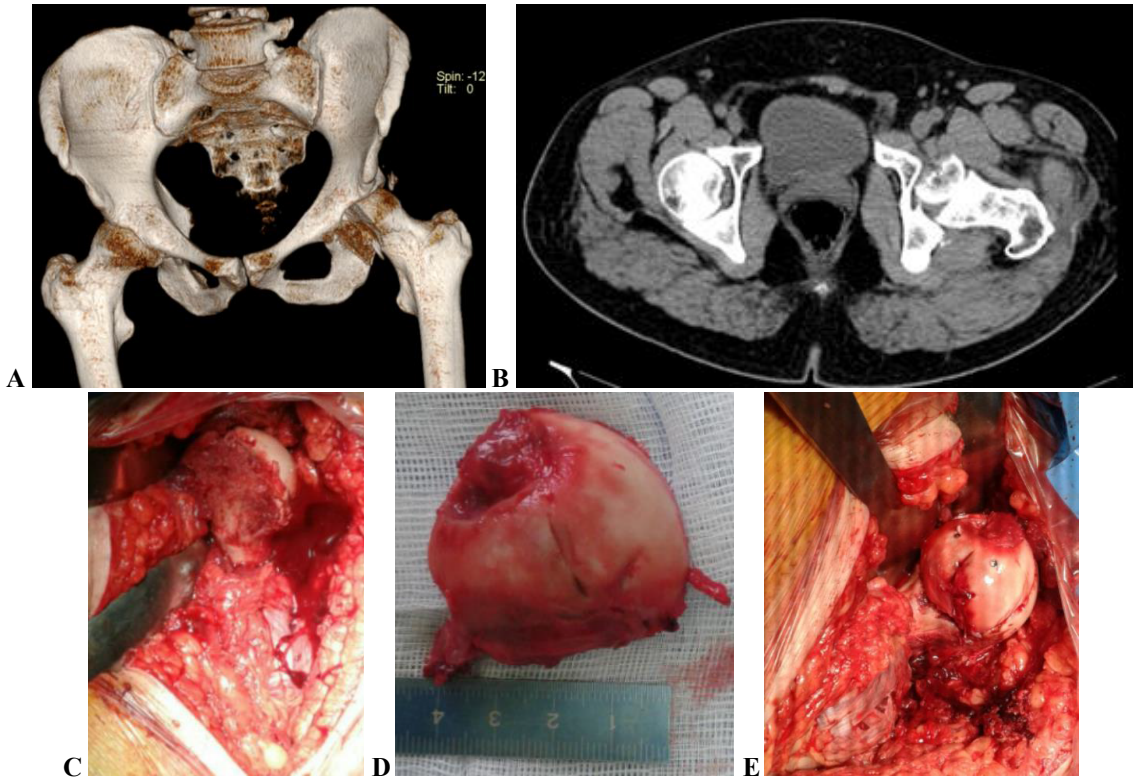

Figure 3: 34 years old male patient. After reduction we observed a large femoral head fragment displaced (**A, B**). **C, D** - Intraoperative imagines showing the fracture and the large femoral head fragment. **E** – Intraoperative imagine with fracture reduced and fixated with three countersunk screws.

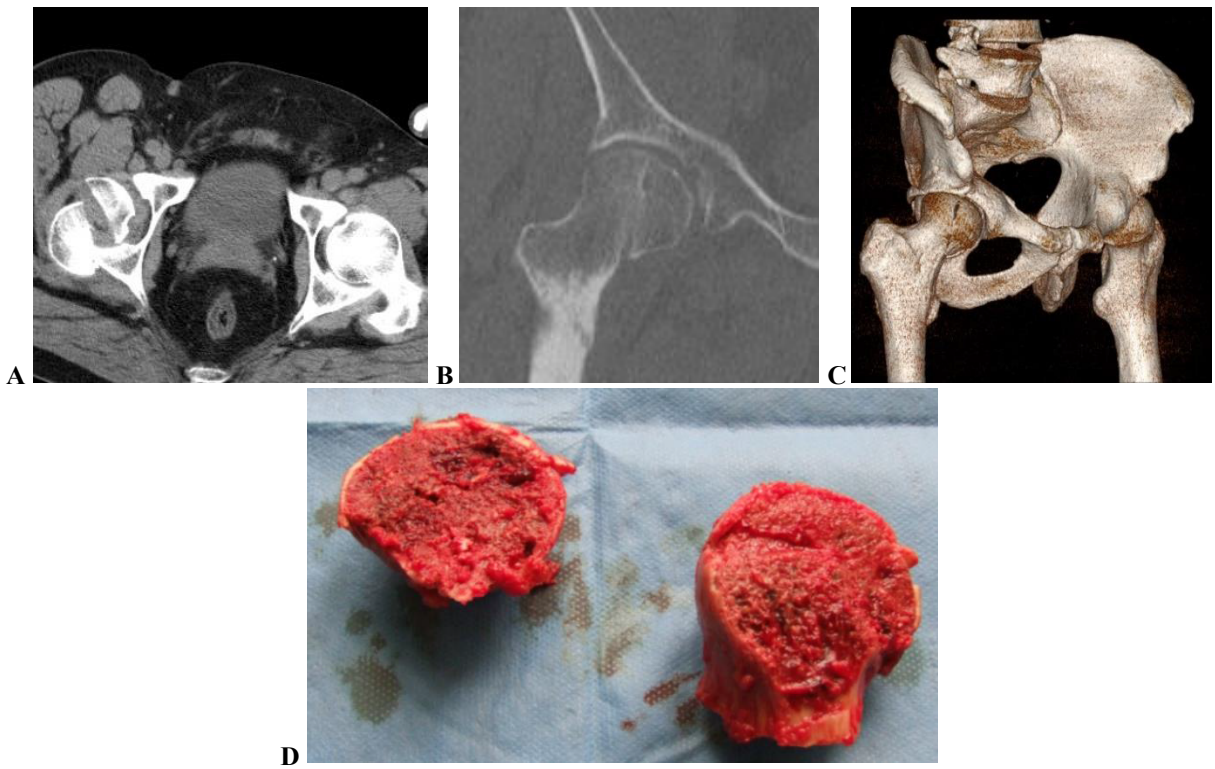

Figure 4: 65 years old male patient. The initial CT showed postero-superior dislocation of the hip associated with a femoral head fracture
A)That was treated conservatively in another department. At 3 month the patient come to us with severe pain, CT
B)(**B, C**) showing a non-anatomical reduction (4 mm of displacement). We treated surgically this patient with excellent functional outcome.
C) **D** – Intraoperative imagine showing a fragment almost half of the femoral head so we performed hemiarthroplasty.

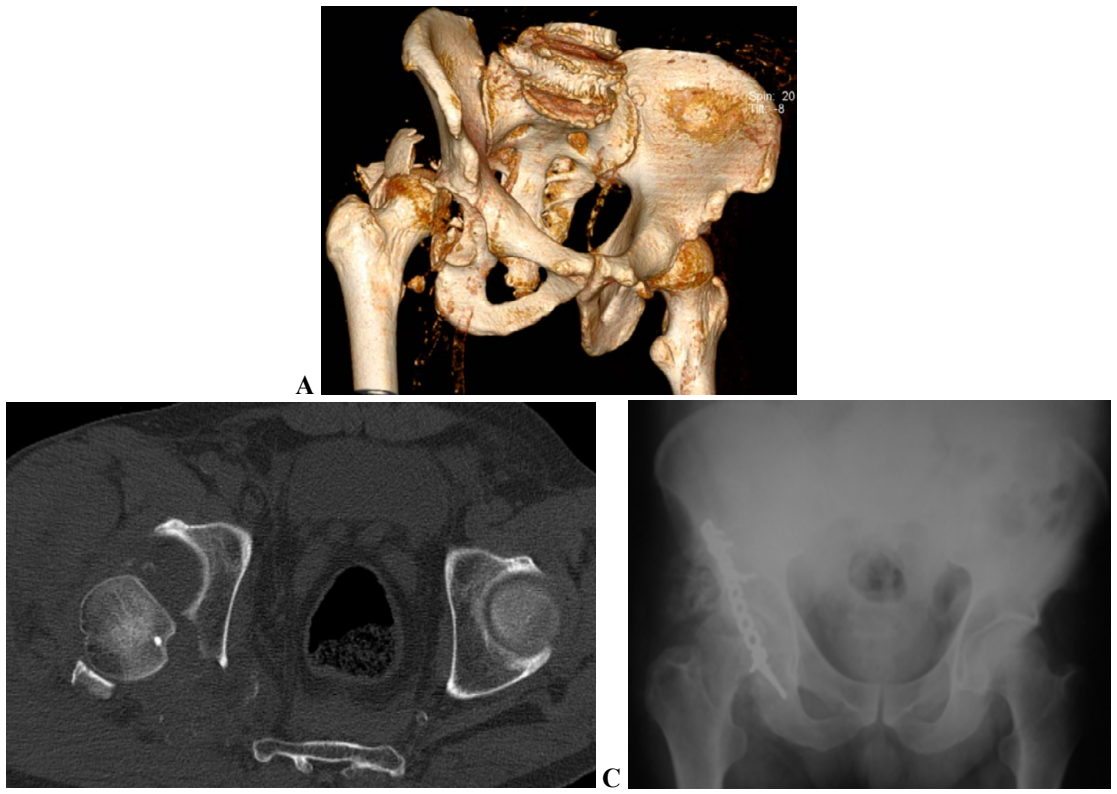

Figure 5: 35 years old male patient. The initial CT showed postero-superior dislocation of the hip associated with a femoral head fracture (subfoveal) and posterior acetabular wall fracture – Pipkin type IV
(**A, B**) that was treated surgical - open reduction and internal fixation of the acetabular fracture through posterior Kocher-Langenbeck approach and excision of femoral head intra-articular free bodies.
C – six month follow-up X-ray – we observed heterotopic ossifications.

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