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Treatment of Fracture Dislocation of the Femoral Head in a Resource Limited Country (Burundi)

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Abstract

Introduction: Fractures of the femoral head are rare injuries which generally follow a traumatic dislocation of the hip or in a poly-trauma scenario. A fracture dislocation of the femoral head is an orthopedic emergency. The most frequent complications after a fracture of the femoral head are osteonecrosis, post traumatic arthritis and heterotopic ossification. **Objective:** To focus on the therapeutic aspect of fracture-dislocations of femoral head and their short- and long-term prognoses. **Materials and Methods:** This is a prospective study conducted at Kamenge teaching hospital and Rohero Christian medical and surgical clinic from January 2013 to August 2020. All patients diagnosed with fracture-dislocations of the femoral head were included in this study. **Results:** Five patients were admitted for fracture dislocation of the femoral head. The mean age was 40.4 years and varied between 25 and 55 years. The dashboard injury was the most common mechanism and was found in four patients (80%). A standard x-ray was performed for the five patients as well as CT scans in two cases. All patients had posterior iliac dislocations with fractures of the femoral head classified as Pipkin I in three patients and Pipkin III in two patients. Closed reduction under general anesthesia within six hours was possible in one among the five patients and within 12 hours in two patients. These three cases were managed with open reduction and internal fixation (ORIF) via anterior approach with screw fixation of the femoral head fragment. In the two remaining patients reduction was not possible and for one of them there was a femoral neck fracture following closed manipulation, making the fracture Pipkin III. The two patients with Pipkin III injuries were managed with total hip replacement. With an average

follow up of five years, standard x-rays of the three patients who had ORIF showed fracture union without avascular necrosis, posttraumatic arthritis or heterotopic ossification. The functional results for the five patients with an average follow up of four years were very good (3/5) and good (2/5). **Conclusion:** The diagnosis of fracture dislocations of the femoral head was based on clinical, radiographic and computed tomography criteria. Early reduction and internal fixation can restore the natural anatomy of the hip joint, especially in young adults with a good long-term prognosis. Sometimes total hip replacement is necessary for management of fracture dislocations of the femoral head.

Keywords

Fracture Dislocation, Femoral Head, Treatment, Prognosis

1. Introduction

Fractures of the femoral head are rare injuries which generally follow a traumatic dislocation of the hip or in a poly-trauma scenario [1] [2] [3]. Dislocation of the coxofemoral joint associated with a fracture of the femoral neck is rare and the mechanism is complex [4]. Fractures of the femoral head happen in only 6 to 28% of posterior dislocations of the hip [5].

A fracture dislocation of the femoral head is an orthopedic emergency. Reduction of the dislocation must be done under general anesthesia, preferably within the first six hours in order to minimize the risk of avascular necrosis of the femoral head [3]. In most cases, this includes fixation or excision of the fractured femoral head fragment. The most frequent complications after a fracture of the femoral head are osteonecrosis, post traumatic arthritis and heterotopic ossification [2]. Because this injury is so rare the treating surgeon has usually little or no prior experience and it is, therefore, relevant to focus on the therapeutic aspect of fracture dislocations of femoral head and their short- and long-term prognoses.

2. Materials and Methods

This is a prospective study conducted at Kamenge Teaching Hospital and Rohero Christian Medical and Surgical clinic from January, 2013 until August, 2020. Included in the study were all patients presenting with a fracture dislocation of the femoral head diagnosed by imaging studies available in Burundi (standard radiographs and/or CT scan). We evaluated the results of treatment of these injuries and their short-term and long-term prognoses. We recorded clinical, radiographic and functional criteria at an average follow up of four years. We evaluated pain and mobility according to the Merle d'Aubigné hip score (Table 1). The limits of our study are due to the small sample size because of the rarity of the injury.

Table 1. The merle d'Aubigné hip score [6].

Criteria	Assessment	Score (Points)
Pain	Intense and permanent	0
	Severe even at night	1
	Severe when walking, prevents any activity	2
	Tolerable with limited activity	3
	Mild when walking, disappearing at rest	4
	Mild and inconsistent; normal activity	5
Mobility	Ankylosis with bad position of hip	0
	No movement, pain or slight deformity	1
	Flexion < 40˚	2
	Flexion 40˚ - 59˚	3
	Flexion 60˚ - 79˚, foot can be reached	4
	Flexion 80˚ - 90˚, abduction of at least 15˚	5
	Flexion exceeds 90˚, abduction of 30˚	6
Ability to walk	None	0
	Only with crutches	1
	Only with canes	2
	With one cane, less than an hour, very difficult without cane	3
	A long time with a cane, short time without cane and limping	4
	Without cane, slight limp	5
	Normal	6
Absolute results for hip function	Very good	11 - 12
	Good	10
	Medium	9
	Fair	8
	Poor	≤7
Relative results	Very great improvement	≥12
	Great improvement	7 - 11
	Fair improvement	3 - 6
	Failure	≤2

The Merle d'Aubigné hip score includes the parameters of pain, mobility, and ability to walk, each rated from 0 (worst condition) to 6 points (best condition). The sum of the scores of pain and mobility provides an absolute estimation of hip function.

The results are classified in two ways: *absolute results* (the evaluation of the functional value of the hip after the operation) and *relative results* (the appreciation of the difference between the preoperative and the postoperative functional states, in other words, the operative functional benefit gained by the patient).

3. Results

Five patients were admitted for fracture dislocation of the femoral head during the period of the study among whom two were females and three were males. The average age was 40.4 years and varied between 25 and 55 years. Road traffic accident was the commonest etiology and four patients (80%) had a Dashboard injury. All patients had standard x-rays and two patients had CT scans. All of the five patients had a high posterior fracture dislocation with a femoral head fracture. Two patients had additional injuries, one had a head injury and one had a fracture of the contralateral distal femur. The fractures were classified as Pipkin I for three patients and Pipkin III for two patients. A closed reduction under general anesthesia was possible during the first six hours for one patient and within 12 hours for two patients. After the control x-ray and/or CT scan the three patients underwent ORIF via an anterior approach with screw fixation of the femoral head fragment (**Figure 1**, **Figure 2**). Trans tibial traction was set up for two weeks after the surgery and total weight bearing was allowed at two months postoperatively. In two patients closed reduction was not possible and one among the two had an association of a femoral neck fracture making the lesion Pipkin III. For these two patients, a total hip replacement (THR) was performed (**Figures 3-5**). Thromboembolic prophylaxis was systematically employed using low molecular weight heparin. All the patients had postoperative physiotherapy.

On a five years average follow-up, the fractures treated by ORIF healed without necrosis of the femoral head, osteoarthritis or heterotopic ossification (**Table 2**).

Table 2. Patient data.

Age	Sex	Fracture type	Delay to reduction	Treatment	Follow-up	Complications (necrosis of femoral head, osteoarthritis)	Results
25	F	Pipkin I	>12H	ORIF	6 years	No	Very good
37	F	Pipkin I	>12H	ORIF	5 years	No	Very good
55	M	Pipkin I	>6H	ORIF	4 years	No	Good
48	M	Pipkin III	Irreductibility	THR	7 years	-	Good
37	M	Pipkin III	Irreductibility	THR	4 months	-	Very good

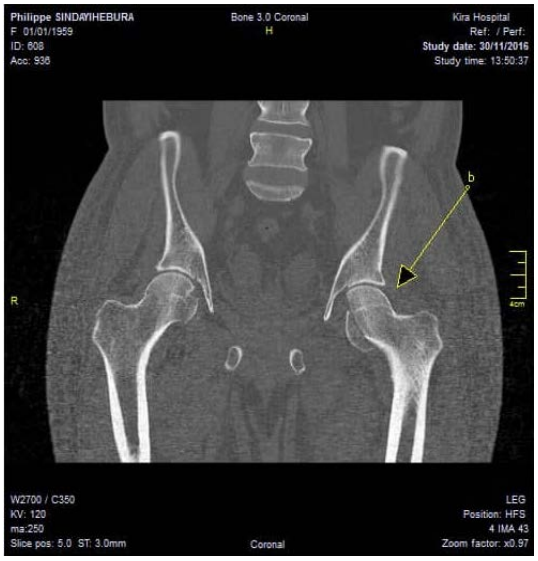


Figure 1. CT scan post closed reduction.



Figure 2. A 2 years anteroposterior x-ray after ORIF.

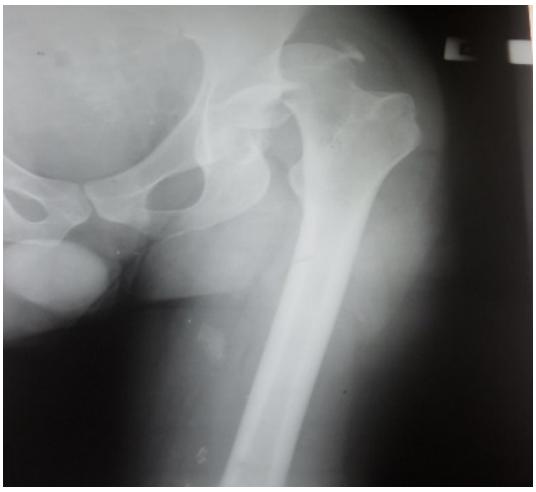


Figure 3. Anteroposterior x-ray Pipkin I.



Figure 4. Post closed reduction anteroposterior x-ray Pipkin III.



Figure 5. THR.

According to the Postel and Merle d'Aubigné hip score, the functional results at a four years average follow-up were very good (3/5) and good (2/5). Therefore, four patients resumed their daily routine life as before the injury.

4. Discussion

In this study, five patients were admitted for fracture dislocations of the femoral head and all of them had a high posterior dislocation. J. Toneti *et al.* [7] in a large retrospective series admitted between 1972 and 2008 110 patients for fracture dislocation of the femoral head, the dislocations were posterior in 102 cases and anterior in eight cases. Posterior dislocation of the hip is more frequent [4]. All the patients presented with severe hip pain and deformity with abduction, internal rotation and shortening of the lower limb. One patient had signs of a sciatic nerve injury. Giannoudis *et al.* [8] reviewed the literature and found that the incidence of a sciatic nerve lesion associated with a femoral head fracture-dislocation was 3.95%. Surgical exploration of the nerve is indicated if the sciatic nerve damage follows closed reduction [3]. According to Kenneth J. Koval and Philip J. Kragor [3], sciatic nerve damage occurs in 10% to 15% of hip

dislocations.

In our study standard x-rays were done for all patients and two among the five had a CT scan.

Vincenzo *et al.* [2] found that very small fragments of the head and free articular fragments can be very difficult to diagnose on standard x-ray. This finding makes CT scan an essential diagnosis tool. McCarthy and Busconi [9] observed free fragments in the hip joint that were not diagnosed by conventional radiographs in 76% of traumatic hip dislocations undergoing arthroscopy.

Two patients in our series had associated injuries, one head injury and one fracture of the opposite distal femur. Suraci [10] reported that 95% of patients presenting traumatic dislocation of the hip following a road traffic accident had additional injuries necessitating in-hospital treatment. Knee injuries are particularly common. Tabuenca and Truan [11] reported that 25% of 187 patients with dislocation or fracture dislocation of the hip had associated serious injuries of the knee.

In our series, the fractures were classified Pipkin I for three patients and Pipkin III for two patients.

Pereira *et al.* [1], in a retrospective study of a database collected in a prospective manner in a trauma centre between 1987 in 2003 found 68 fractures of the femoral head, of which 35 (51%) were classified Pipkin I, 22 (32%) Pipkin II, 3 (4%) Pipkin III and 8 (12%) Pipkin IV.

In our series, a closed reduction under general anesthesia during the first six hours was performed in one patient and within 12 hours for two patients. In these three patients, a transtibial skeletal traction was placed and control radiographs were taken. Afterwards these three patients underwent surgery using an anterior approach and screw fixation of the femoral head. Tibial traction was continued for two weeks post operative.

The most important prognostic factor is probably the delay between injury and reduction of the dislocated hip [3]. Stewart and Milford [12] and Morton [13] reported excellent results if the hip was reduced in the 12 hours following injury. Brav [14] noted that reduction of the hip after 12 hours increased the percentage of unsatisfactory results from 22% to 52%. Reigstad [15] found no cases of osteonecrosis or post-traumatic arthritis when simple dislocations were reduced during the first six hours. Hougaard and Thomsen [16] found increased incidence of osteonecrosis and arthritis if the delay in reduction was greater than six hours. While the majority of authors recommend urgent closed reduction, some recommend open reduction for all fracture dislocations in order to remove fragments from the joint and fix fragments if possible [3]. No study has demonstrated the superiority of open or closed reduction as long as the hip joint is congruent and clinically stable [3]. Indications for an open reduction of a dislocated hip include the inability to perform a closed reduction, post reduction articular incongruity and associated acetabular fracture causing instability of the hip [3].

In two of our patients, closed reduction was impossible and for one of these

patients, a femoral neck fracture occurred and converted the injury to Pipkin III. These two patients then underwent a total hip replacement. In fact, these two patients were at high risk of avascular necrosis since their treatment was delayed beyond 12 hours. According to Li Wei [17], total hip arthroplasty is justified when the risk of necrosis is high.

In the series of J. Tonetti *et al.* [7], 32 cases had a nonsurgical treatment and 78 cases were treated surgically of which 51 were approached posteriorly, an anterior approach was used in 19 patients, 4 underwent a medial approach and 4 had an arthroscopic surgery. Surgery included ORIF of the femoral head in 30 cases and of the acetabulum in 16 cases, removal of fragments in 40 cases and total hip arthroplasty in five cases. The femoral head fractures occurred in the coronal plane and consequently fixation of the fragments was easier by using an anterior approach [3]. The Treatment of fractures of the femoral head depends on the site of the fracture and the presence of associated lesions. For Pipkin I, closed reduction is recommended if the fracture is non-displaced or minimally displaced (less than 1 to 2 mm) and if the hip is stable. For displaced fractures, open reduction and internal fixation with small screws or absorbable pins is recommended via the anterior approach [3]. For young patients presenting with a Pipkin I or II fracture in which the hip is congruent and stable after reduction and the fragment is anterior or anterolateral it is preferable to use the Smith-Peterson anterior approach or the Watson Jones anterolateral approach [2]. When the fragment is posterior or if there is an associated fracture of the posterior lip of the acetabulum (Pipkin IV) a posterior Kocher-Langenbeck approach is preferable. Pipkin I and II fractures have the same prognosis as a simple dislocation if reduction is performed in the first six hours [18]. Marecek and Routt [19] describe a percutaneous technique which enabled intra-articular bone fragments to be removed using a hook and fluoroscopy for guidance.

Thromboembolic prophylaxis was systematically administered to our five patients. Thromboembolism can happen after a traumatic hip dislocation so patients should receive adequate prophylaxis consisting of compression stockings, intermittent pneumatic compression and anticoagulation particularly if the patient must be in traction for a prolonged period [3].

In our series all patients had physiotherapy. Full weight bearing was authorized two months after the surgery for the patients who had ORIF and the day after surgery for the patients who had arthroplasty. Early mobilization is the goal after fixation of articular fractures; immobilization of joints can result in joint stiffness and adhesions leading to post-traumatic arthrosis so it must be avoided [3]. While certain authors have recommended a period of traction following reduction of hip dislocation until the initial pain has resolved, this has not been proven to be beneficial [3].

In fracture dislocation of the femoral head, it is often the associated injuries that determine the timing of patient mobilization, joint motion and weight bearing. With fractures of the posterior lip of the acetabulum, full weight-bearing is generally delayed for 8 to 12 weeks. Similar restrictions are usually recom-

mended after fixation of a fracture of the head or neck of the femur [3]. Partial weight-bearing should start immediately with crutches or walker and should progress gradually until the fracture is healed and total weight bearing can be allowed [2].

At an average follow-up of five years, in our three patients who had osteosynthesis of the femoral head, radiographs showed fracture union without evidence of arthritis, necrosis or heterotopic ossification. Osteonecrosis can appear up to five years following the injury. Post traumatic osteoarthritis is the most frequent long-term complications of traumatic hip dislocation; the incidence is considerably higher when associated with fractures of the acetabulum or chondral fractures of the femoral head [3]. Giannoudis *et al.* [8] reported late complications including post-traumatic arthrosis (20%), heterotopic ossification (16.8%) and osteonecrosis (11.9%). Vécsei V *et al.* [20] reported a series of 82 patients having suffered a dislocation of the hip. The treatment consisted of closed reduction under general anaesthesia in the first six hours followed by weight-bearing if tolerated after 14 days. 43 patients were available for follow-up ranging from six months to 19 years. Radiographic signs of arthritis were observed in 17 patients (40%) but osteonecrosis was noted in only one hip.

Heterotopic ossification is frequent after posterior dislocation of the hip and might be related to muscle damage and haematoma formation. Surgery increases the incidence of heterotopic ossification. Prophylaxis for heterotopic ossification includes indomethacin for six weeks or low dose radiation [3].

In our series, functional results after an average follow-up of four years were excellent in one case, very good in two cases and good in two cases.

Marchetti *et al.* [21] reported a series of 33 patients who suffered a fracture dislocation of the femoral head and who were followed up for an average of 49 months. Globally the results were very good for 67% while 18% had good results and 15% bad results. No excellent results were reported. The Pipkin classification is a useful predictor of outcome; patients with Pipkin I or II injuries have statistically better results than those who are treated for Pipkin III or IV lesions.

Dreinhofer KE *et al.* [22] reported worse results in patients who had several serious injuries. Pape *et al.* [18] reported a series of 29 patients having suffered 31 traumatic dislocations and 13 patients were available for follow-up at 8 years. The clinical results were excellent in three, good in seven and acceptable in 4 hips. Five patients showed radiographic signs of premature hip degeneration and seven patients had osteonecrosis. The patients who had suffered fractures of the femoral head had worse results.

It is important to inform the patient and his family that complications and poor results can happen up to 50% of the time whatever the treatment [2].

5. Conclusion

The diagnosis of fracture dislocations of the femoral head depends on clinical, radiographic and computed tomography criteria. Early reduction and internal

fixation can restore the normal anatomy of the hip especially in young adults thus ensuring a favourable prognosis. Sometimes immediate total hip replacement is necessary to treat these injuries.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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