

## The Floating Knee in Bangui (Central African Republic): 41 Cases Report

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### Summary

**Introduction:** Floating knee refers to the ipsilateral fractures of the femur and the tibia. Its management is difficult because of lesions associated with a long period of hospitalization. The treatment remains controversial. The objective of this study was to evaluate our support.

**Patients and methods:** This is an ongoing prospective study of 4 years from July 1, 2012 to May 30, 2015, in patients with a floating knee. Old cases and the lost to follow-up were excluded. The lesions were classified according to Letts and evaluation of patients to the minimum decline in 12 months using the criteria of Karlström and Olerud. The data were collected and analyzed at the 2008 Epi-Info version 3.5.1 software. Our threshold of significance was 0.05.

**Results:** The study included 40 patients presenting 41 floating knees in 28 men and 12 women aged on average 28 years (ranges: 17 and 65 years). The etiology was dominated by accidents of the way public with 35 cases (87.5%), followed by falls from heights. Form percentage-pathology dominant according to Letts was the type D (55%); the skin openings were in 65.8% to leg and 21.9% in the thigh. The osteosynthesis was made for 39 femurs and 38 tibias. The average hospital stay was 32 days (Ranges: 8 to 236 days). The average decline in 12 months (Ranges: 12 to 36 months), at two sites of fracture consolidation was complete in 39 patients with an average of 90 days (range: 60 to 180 days): The functional results according to the criteria of Karlström and Olerud were excellent and good in 23 patients, fair in 14 patients and bad in 3 patients. The bad results were related to 3 amputations.

**Conclusion:** Floating knee occurs during high energy trauma in a context of polytrauma. Rigid osteosynthesis of the femur and the tibia allows early mobilization of the knee thus avoiding the stiffness often incriminated.

### Introduction

The floating knee or “floating knee” of the Anglo-Saxons indicates a solution of homolateral continuity of the femur and tibia. This term was first used in 1975 by Blacke and Fraser [1,2] to describe high energy trauma to the lower limb (femur and tibia). This lesional entity, which most often occurs in a context of polytrauma, is

accompanied by associated lesions [3, 4,5]. The floating knee is increasingly common and represents 5% to 10% of lower limb fractures [3,6]. Associated lesions found are generally cranial, thoracic and abdominal, life-threatening [6,7]. Locally, knee ligament injuries are often reported associated with frequent skin openings in the leg [4, 8].

Treatment of the floating knee is based on internal osteosyntheses in the absence of skin opening, and intramedullary pelvic repair is the recommended technique [9]. This rigid osteosynthesis allows the load and early rehabilitation avoiding joint stiffness. The centromedullary entrapment is the most used implant in the countries of the North as well as the external fixator [10-12]. Some authors use only one approach for anterograde locked nailing for the tibia and retrograde for the femur [11-14].

African studies have focused on epidemiological analysis, pathology and therapeutic outcomes [6,12,15]. In the Central African Republic, the introduction in 2008 of motorcycles as a means of public transport, we often observe cases of floating knees in our service. This is how we propose to carry out this first national study, the objectives of which were to describe the anatomico-clinical forms and to evaluate the results of our treatment.

## Patients and Methods

This was a 4-year continuous prospective study (July 1, 2012 to May 30, 2015) on floating knee cases admitted to the service. All patients over the age of 17, including a floating knee less than D21, were regularly included and evaluated with a minimum follow-up of 12 months after therapeutic management.

Patients were excluded from the series, old cases and lost to follow-up. The lesions were analyzed using the Gustillo classification [8] for skin lesions and that of Letts [16] for the anatomopathological type. The search for abnormal knee movements (drawer and laxity) was systematically sought in all our patients. Severity of the lesions was classified according to Baker [17]. The evaluation of patients at a minimum follow-up of 12 months using the criteria of Karlstrom and Olerud [18].

The global data analysis was done on Excel and Epi-Info 2008 software version 3.5.1. The Chi2 statistical test was calculated for the comparison of means with a significance threshold retained at 0.05.

## Results

### Series

During our study, 40 patients were consecutively taken into account for this study. These were 28 men and 12 women aged 28 years on average (range: 17 and 65).

The most affected age group was 17 to 30 years old, the sex ratio was 2.3. The etiology was dominated by accidents on the public highway which represented 35 cases or 87.5%, including 5 pedestrians overturned by motorcycle, 18 motorcycle drivers and 12 passengers, 1 case of assault by gunshot and 4 cases of fall from height. One patient presented with bilateral form. Lesions predominated on the left in our series with 66.7%. 35 patients had been treated after 6 hours.

### Associated lesions

In a patient with a bilateral floating knee and a closed humerus fracture. Another patient had a head injury in addition to his floating knee. The latter developed during hospital bedsores. Two patients had a contralateral femur fracture. Two others had a contralateral tibia fracture.

### Skin openings

In the thigh, 9 skin openings were observed during fractures of the femur, including 2 types IIIa, 4 of types I, 1 of type I having benefited from a trimming with delayed suturing and 2 types IIIc case with a fracture of the femur which were immediately amputated. On the leg, 27 skin openings were noted, of which 24 were trimmed and 3 types IIIc amputated during emergency management.

36 skin openings were recorded, distributed to the femur (n = 9 or 21.9%) and the leg (n = 27 or 65.8%). Type D from Letts was more represented (n = 22, or 55%) as detailed in Table I.

### Treatment

The therapeutic attitude varied according to the fracture site. Thigh, 34 femurs were treated surgically and two patients had received orthopedic treatment, including 28 nailing (ECM); 2 external fixator (fessa); 2 target plate (PV); 2 amputations and 2 plastered immobilizations. On the leg, an osteosynthesis was performed 33 times, and 3 orthopedic treatments, including 17 centromedullary nailing; 13 external fixators; 3 amputations and 3 plastered immobilizations.

The medical treatment of open fractures combined tri-antibiotic prophylaxis with a 3rd generation cephalosporin + an aminoglycoside and a metronidazol combined with low molecular weight heparin (LMWH) and analgesics.

Characteristics	Effective	(%)
Middle age	28 ans (extrêmes 17 et 65)	
<30 years	22	55
> 30 years	18	45
Sexe		
Masculin	28	70
Féminin	12	30
Sex-ratio (H/F)	2,3	
Etiology		
AVP	35	87,5
Fall from height	4	10
Ball	1	2,5
Rated side		
Law	13	33,3
Left	27	66,7
Bilateral	1	2,5
PEC delay		
<6 hours	5/41	12,2
>6 hours	36/41	87,8
Skin opening		
Thigh	9/41	21,8
Leg	28/41	68,2
Classification de Letts		
Type A	9/41	21,9
Type B	3/41	7,3
Type C	0	0
Type D	22/41	53,6
Type E	7/41	17
ISO		
Femur	0	0
Leg	8/41	19,5

Table 1: Characteristics of the floating knee series in Bangui.

Technique	Femur	Tibia
ECM	30	19
FE	4	18
PV	2	0
Plaster	2	3
Traction	1	0

Amputation	2	1
Total	41	41

Legends: ECM = Central Medullary Nailing, FE = External Fixator, PV = Screwed Plate

Table 2: Distribution according to the therapeutic modalities used.

Consolidation	Seat					
	Femur	Rate (%)	Ch2 p	Tibia	Rate (%)	Chi2 p
Yes	41	100	2 0,09	40	97,5	35 0,001
Non	0	-		1	2,5	
Total	41	100		41	100	

Table 3: Bone consolidation at follow-up.

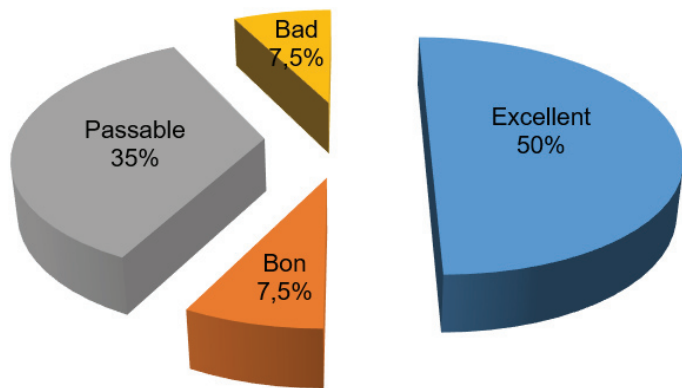


Figure 1: Overall results of the series of 41 floating knees in Bangui.



Evolution

8 cases of osteitis; 1 case of non-union; 2 cases of vicious callus; 1 case of algodystrophy; 4 cases of joint stiffness represented the late complications observed. The average length of hospital stay was 32 days (range 8 to 236 days). At an average follow-up of 12 months (extremes of 12 and 36), consolidation was noted in 39

cases with an average delay of 90 days (extreme: 60 and 180). The functional results assessed according to the Karlstrom and Olerud criteria were excellent and good for 23 cases and fair for 14 cases and 3 poor functional results linked to the 3 amputations. In retrospect, all our patients had been consolidated except for one case of non-union of the leg



## Discussion

This prospective, mono-operator and mono-evaluator study was conducted in the only orthopedic surgery service in the Central African Republic. The absence of a locked nail during intramedullary nailing constitutes a limitation on the performance of the acts performed. The results will be of a precarious context.

The series of 40 patients, although small, had the highest frequency in terms of prospective study. The series by Fraser et al (2) is the highest with 222 cases, but performed retrospectively over a period of 10 years.

Floating knees are seen in young 28-year-old males in our series. This observation is noted by several authors [6,12,19]. This is due to the more aggressive attitude of the men behind the wheel and the excessive speed of the motorcycle taxis which are exposed during the accidents. Gurkan et al [13] does not confirm this hypothesis and identifies an equal distribution between men and women.

Most of the etiology is dominated by accidents on the public highway, this is related to the work of Zrig et al (15); 86.6% of these injuries are due to accidents on the public highway and 10% to accidents at work, as for our study series we found 87.5% of accidents on the public highway then followed height drop with 10%.

We note a predominance of lesions on the left in our series, because it is the most exposed side in the circulation, unlike the series of Zuchman et al [5], lesions predominate on the right, the latter incriminate the mode of circulation to law in English speaking countries. During the study, 36 open fractures were observed including 27 (75.0%) in the leg and 9 (25.0%) in the thigh. These skin openings are the cause of deep infections in 8 cases of osteitis (50.0%) that we found in our study with a clear predominance of Gustillo type I and Type II. Pathologically, our results agree with those of Mohammed et al [20] who find a predominance of type D lesions at 85.5%, our series at 55%, which is a fracture closed in the femur and open in the leg. According to the classification of Letts but diverge for type A, B, E, C. This is explained by the cutaneous opening on the leg often observed.

Lesions of the floating knees are seen in a context of polytrauma. The ISS observed in our study confirms this assertion with several associated lesions [12,15,17]. Orthopedic treatment is a complication complained of by many authors [15, 21,22]. Two shortened femoral calluses are observed in this study leading to poor results. The best indication retained for the femur is a rigid osteosynthesis by a locked centromedullary nail. This surgical indication is also valid for the leg if the skin condition allows it [14].

The delay in treating open lesions negatively influenced our clinical and functional results. Our particular work context favored this state of affairs. There is no health insurance. This obliges to prescribe consumables to patients even in an emergency such as an open fracture. This situation is found in African colleagues [12,23].

During the study, open fractures classified type I and II received before 6 am are also treated by central medullary nailing according to a well codified protocol. This protocol consisted of washing the wound, starting antibiotic prophylaxis combining a 2nd or 3rd generation cephalosporin, a gentamycin and metronidazole before trimming and skinning. This explains the number of centromedullary nailing. This attitude has also been practiced by Gogoua et al. [6, 24.25].

The infection rate observed was zero in the femur and eight cases in the leg. This justifies the effectiveness of our protocol. The length of hospital stay was on average 32 days. This extended period is explained by the delay in treatment due to the absence of consumables. Our functional results were satisfactory despite our difficult exercise conditions. Half of the overall results are excellent and

good. This result is comparable to that of [15,26] and contrary to that of [18,27,28]. The poor results are influenced by stiffness of the knee, algodystrophy due to prolonged immobilizations due to the impossibility of surgical management for economic reasons observed in 25% of the cases in our series. These findings are noted by Ran et al [29] who find 16.6% and Feron et al [30] who note 15%.

## Conclusion

The floating knee occurs during high energy trauma in a context of polytrauma. The skin opening often encountered affects the prognosis on the infectious level. The rigid osteosynthesis of the femur and tibia allows early mobilization of the knee, thus avoiding the stiffness often implicated. Open fractures can also be nailed down, precise codification is respected.

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