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Research Article

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Epidemiological and Lesional Aspects of Traumatic Floating Knees

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Abstract

The floating knee is a particular lesional entity described for the first time in 1974 by Blake and McBryde and which associates a fracture of the femur with a homolateral fracture of the tibia. This lesion was isolated, among other things, because of its severity. We report in this work the study of a series of 22 cases of floating knee in their epidemiological and lesional aspects. It was a joint retrospective and prospective study covering a period of three and a half years, from 01 January 2013 to 30 June 2016, dealt with at general surgery division of the Department University Hospital of the Ouémé Plateau.

The average age in our series was 38.91 years with extremes of 10 and 67 years, the sex ratio was 4.5 in favor of the male sex. All socio-occupational categories were represented with the majority of workers at 31.80%. Highway accidents accounted for 86.40% of the main etiology. Most patients in our series were 68.20% on the left side. The fractures were open in the femur and in the tibia in 22.60% and 72.70%, respectively. We recorded all types of floating knees according to the FRASER classification, with a clear predominance of type I at 81.80%. There has been a steady increase in the recrudescence of floating knees over the years.

The floating knee, in our context, is a rare but serious lesion of young adults, favored by the development and the celerity of the means of transport.

Keywords: *Floating knee; Ipsilateral fracture*

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Introduction

The floating knee is a lesional entity that associates a fractured femur with an ipsilateral fracture of the tibia. Described for the first time in 1974 by Blake and McBride [1], it isolates the knee joint from the rest of the pelvic limb. Severe and generally occurring in a context of violent trauma, the floating knee can be grafted with formidable associated lesions.

The aim of this work is to describe the epidemiological and lesional aspects of the floating knees in our practice.

Materials and Methods

This was a three-year retrospective descriptive study from January 1, 2013 to December 31, 2015, followed by a six-month prospective study from January 1, 2016 to June 30, 2016. We included all patients admitted to surgical emergencies for a traumatic floating knee with a complete medical record (complete clinical observation, x-rays of the femur and leg). Patients with incomplete medical records were excluded from this study.

The following variables were examined: epidemiology (frequency, age, sex, occupation), admission time, mode of admission (fire-fighters, four-wheeled vehicles, two-wheeled vehicles), etiology, type of collision in the event of a road accident, fractured side, anatomo-pathological type of lesions according to the Fraser classification (Figure 1) [2], distribution by opening or not, distribution of the open lesions according to the bone segment, type of opening according to the classification of Gustillo and Anderson.

Hospital records and patient records were used to collect data. The data were collected using a survey form.

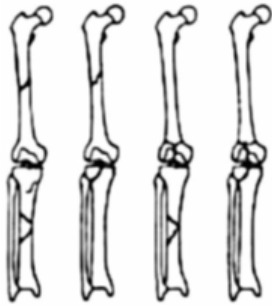

Figure 1: *The FRASER classification of floating knees [2].*

Results

Frequency

During the study period, 22 floating knees were collected, i.e. approximately 6 cases per year. Floating knees accounted for 0.39% of hospitalizations in the study period.

Age and sex

The average age of patients was 38.91 years with extremes of 10 years and 67 years. Table I shows the distribution of patients by age group. The ages of 21 years to 40 years and those of 41 years to 60 years were the most affected in respectively 11 cases and 8 cases.

Age Bracket	Number of Cases
0 to 20 years	1
21 to 40 years	11
41 to 60 years	8
61 years and over	2

Table I: *Distribution by Age Bracket.*

18 men and 4 women were involved, making a sex ratio of 4.5. Table II shows the distribution by age and sex. It was found that men were the most affected in the age brackets of 21 to 40 years and 41 to 60 years in 9 cases and 6 cases respectively.

	Male	Female
0 to 20 years	1	0
21 à 40 years	9	2
41 à 60 years	6	2
61 years and over	2	0

Table II: *Distribution by age and sex.*

Occupation	Total Number
Civil servants	3
Workers	9
Farmers	3
Tradepeople	5
Others	2

**Other: 1 motorcycle taxi driver and 1 student.*

Table III: *Distribution by occupation.*

Time and method of admission

All patients were admitted within the first hour following the trauma and without taking by another health center.

Table IV shows the distribution of patients by mode of transportation to the hospital. 10 patients were transported by firefighters.

Means of Transport	Number of Cases
Firefighters	10
Four-wheeled vehicles	5
Two-wheeled vehicles	7

Table IV: *Distribution by Means of Transport to Hospital.*

Etiology and type of collision

Road accident was the most common etiology with 19 cases (86.40%). For the other etiologies, there were two cases of landslide and one case of brawls.

As concerns road accident cases, motorcycle-with-motorcycle collisions accounted for 10 cases, motorcycle-with-automotive collision for 8 cases, and a motorcycle-with-pedestrian collision in 1 case.

Affected side

We recorded a more frequent attack on the left side with 15 cases as against 7 cases for right-side lesions.

Anatomopathomopathological distribution

Table V shows the distribution of lesions according to the Fraser classification. Type I was the most frequent, with 18 cases.

Type	Number
Type I	18
Type Iia	2
Type IIb	2
Type IIc	0

Table V: *Lesion distribution according to FRASER classification.*

Breakdown by opening or not

Of the 22 floating knees, 17 cases were considered open either on one of the 2 segments, or on 2 at the same time.

Distribution of open lesions according to the bone segment

Of the 17 open lesions, the single break cases involved the leg segment in 12 cases, and the thigh in 1 case. The simultaneous involvement of thigh and leg amounts to 4 cases.

Distribution of the type of opening according to Gustillo and Anderson

Table VI shows the distribution of the type of opening according to the bone segment, and according to the classification of Gustillo and Anderson. Types IIIa and IIIb were the most found in the tibia in respectively 10 cases and 2 cases, as against 3 cases and 1 in the femur. Type IIIc was found in only one case in the tibia.

Open fractures	Femur	Tibia
Type I	0	0
Type II	1	3
Type IIIa	3	10
Type IIIb	1	2
Type IIIc	0	1

Table VI: *Distribution of the open lesions according to the bone segment and according to the classification of Gustillo and Anderson.*

Discussion

The floating knee is an uncommon lesional entity in our daily practice. We collected 22 cases in three and a half years, an average of about 6 cases per year. This result is superimposable to those of other studies in our African context. Thus, Hans-Moevi., *et al*. [3] in Benin and Agoh., *et al*. in Cote d'Ivoire [4] reported 53 cases in 10 years and 55 cases in 10 years, respectively. On the other hand, this is significantly higher than the 39 cases in 18 years reported by Zrig., *et al*. [5], in Morocco. In France, Pietu., *et al*. [6], reported 172 cases in a multicentre study.

In Asia, Rethnam., *et al*. [7] in India and Yokoyama., *et al*. [8] in Japan, reported 29 cases in 3 years and 67 cases in 14 years, respectively. The largest series remains Fraser [2] with 222 cases in 10 years in Canada.

The average age of our patients was 38.91 years. It is close to that found by Abalo., *et al.* [9] in Lomé (37 years) but superior to those of Mezouri., *et al.* [10] (22u) and Hikmat., *et al*. [11] (23u) in Morocco with an average age of 35 years and 30.6 years respectively.

Young adults in full economic activity, therefore more active and more mobile, are the most affected. The 21 to 40 age group was the most represented with half of the total workforce. In most studies, sex ratio is largely in favor of men [12-13], probably because they are the most numerous users of the road network but certainly also the most reckless.

Workers were the most important professional layer both in our study and in that of Gogoua., *et al*. [14], in Côte d'Ivoire.

All our patients were admitted within the first hour after the trauma without taking through another health center. The severity of the lesions as well as the unavailability of a technical platform able to manage this type of patient in most peripheral centers account for this rather unusual attitude of the populations who generally prefer to consult first at the secondary centers.

Road accidents were, in our context, the main cause of floating knee. The finding is the same for Hans-Moevi., *et al.* [3] in Cotonou and Abalo., *et al*. [9] in Lomé, with mainly motorcycle-vehicle collision in 72.57% in Cotonou and 100% in Lomé whereas we found ourselves rather a majority proportion of motorcycle-with-motorcycle collisions. This could be explained by the fact that the motorcycle is by far the most common means of transport in Beninese cities.

As for lesions, we recorded 18 cases of Fraser type I floating knees. This result is consistent with those of the different African series [4,5,9, 11-14].

There were 17 cases of open lesions, with an isolated lesion of the tibial segment in 12 cases. The subcutaneous situation of the tibia associated with the most frequent type of collision (motorcycle-with-motorcycle in 10 cases), in our context, could account for this result.

Open fractures of type IIIa were the most frequent in our series with a clear predominance on the tibia in 10 cases. This reflects the violence of the trauma involved causing extensive lesions of soft tissues.

Conclusion

Floating knees are a relatively rare infectious entity in our daily practice. However, it affects a young population, with a clear male predominance. The etiology is dominated by road accidents with a motorcycle-with-motorcycle collision providing diaphyseal involvement of the two bone segments. Open lesions are the most frequent with a clear predominance of opening of type IIIA to the leg segment showing extensive lesions of the soft parts.

A prospective study on the management of these lesions, taking into account the means of bone restraint and the management of the extensive lesions of the soft parts, will make it possible to evaluate the anatomical and functional prognosis of these lesions.

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Conflict of interest

Any financial interest or any conflict of interest.

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