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Floating Knee Injuries in a North African Trauma Center: A 9-Year Retrospective Analysis of Epidemiological, Lesional, and Therapeutic Aspects of 52 Cases

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Abstract: Background: *The floating knee, defined as the ipsilateral combination of femoral and tibial fractures, is an uncommon but severe injury reflecting high-energy trauma. Published epidemiological data from North African settings remain limited despite the growing regional burden of road traffic trauma.* ***Methods:*** *We conducted a retrospective, single-center, descriptive study of all floating knee injuries managed at the Department of Traumatology and Orthopedics A, Hassan II University Hospital, Fez, Morocco, between January 2017 and December 2025. Demographic, clinical, radiological, therapeutic, and outcome data were extracted from departmental records using a standardized form. The Fraser classification was used for fracture stratification and the Cauchoix-Duparc classification for open fractures. Functional outcomes were assessed using the Karlström-Olerud criteria at last available follow-up (range 6–36 months). Only descriptive statistics were used.* ***Results:*** *Fifty-two patients were included (44 men, 8 women; mean age 29 years, range 16–67). Road traffic accidents accounted for 92.3% of cases, with two-wheeled vehicle accidents representing 59.6%. Polytrauma was present in 25% of cases (mean ISS 22). Open fractures occurred in 71.2% of patients at one or both fracture sites (femur 17.3%, tibia 53.8%). Fraser Type I predominated (71.2%), followed by Type IIa (13.5%), IIb (9.6%), and IIc (5.7%). All patients were managed surgically, with static locked intramedullary nailing used in 39 femoral and 36 tibial fractures. Vascular injury occurred in 11.5% of cases, with two requiring amputation. Secondary complications included infection (9.6%) and fat embolism (1.9%). Late complications included pseudarthrosis (11.5%), joint stiffness (9.6%), and malunion (7.7%). In-hospital mortality was 7.7%, all from refractory hemorrhagic shock within 48 hours of admission. Karlström-Olerud functional outcomes at last available follow-up were excellent or good in 78.8% of cases.* ***Conclusion:*** *The epidemiological and lesional profile of floating knee injuries at our center reflects the regional trauma context, dominated by high-energy two-wheeled vehicle accidents with frequent open fractures. Surgical management with static locked intramedullary nailing remains the reference technique. The complication and mortality profile points to the importance of improving pre-hospital trauma care and standardizing postoperative follow-up.*

Keywords—floating knee; ipsilateral fracture; femur; tibia; polytrauma; intramedullary nailing; Morocco; road traffic accident

1. INTRODUCTION

The floating knee, a term coined by Blake and McBryde in 1975, designates the combination of ipsilateral fractures of the femur and tibia, leaving the knee joint suspended between two fracture sites on the same lower limb [1]. Although uncommon — estimated to represent 0.5 to 1% of long-bone fractures — this injury is disproportionately morbid. It almost invariably reflects high-energy trauma, occurs predominantly in young adults of working age, and is frequently associated with polytrauma that may threaten the patient's immediate vital prognosis [2,4].

The most widely used classification system remains that proposed by Fraser et al. in 1978 [2], which distinguishes purely diaphyseal forms (Type I) from those involving articular extension at the knee (Types IIa, IIb, IIc). This anatomical distinction has prognostic relevance, with articular involvement generally associated with poorer functional outcomes. More recently, alternative classifications based on AO principles [24], prognostic stratification [25], and reanalysis of cases not fitting the original Fraser system [29] have been proposed, although Fraser's classification remains the most widely used in clinical practice and the literature. Surgical management is now considered the standard of care for nearly all cases, with static locked intramedullary nailing (SLIMN) of both bones representing the most commonly used technique. SLIMN provides solid fixation of both fracture sites, allows early knee mobilization, and facilitates rapid functional rehabilitation [3,7,8].

The epidemiology of floating knee injuries has been characterized in several large series from Europe, North America, and Asia [2,13–17,28]. Recent comprehensive reviews [22,23] have synthesized current management challenges. Published data from North Africa and other low- and middle-income settings remain comparatively limited, despite the fact that road traffic accident–related trauma — and particularly motorcycle-related trauma — represents a major and growing public health burden in these regions [11,18]. Documenting the epidemiological, lesional, and therapeutic profile of floating knee injuries in such contexts is therefore of

clinical and public health interest, both to characterize the regional injury pattern and to inform prevention strategies.

The present work reports a retrospective analysis of 52 cases of floating knee managed over a 9-year period (2017–2025) at the Department of Traumatology and Orthopedics A of Hassan II University Hospital, Fez, Morocco. The objectives were threefold: (1) to describe the epidemiological and lesional profile of floating knee injuries in a North African tertiary trauma center; (2) to report the therapeutic approaches employed and the immediate management of associated complications; and (3) to document the complication profile, with particular attention to the impact of open fractures and polytrauma in this setting.

2. MATERIALS AND METHODS

2.1 Study design and setting

This was a retrospective, single-center, descriptive study conducted at the Department of Traumatology and Orthopedics A of Hassan II University Hospital, Fez, Morocco. The hospital is a tertiary referral center serving the Fès-Meknès region.

2.2 Study period and population

All patients managed for floating knee injury between January 2017 and December 2025 were reviewed. A floating knee was defined, in accordance with the original description by Blake and McBryde [1], as the ipsilateral combination of a femoral fracture and a tibial fracture on the same lower limb, regardless of the precise level of either fracture.

Inclusion criteria: documented ipsilateral femoral and tibial fracture; patient managed surgically or non-operatively at our department; available medical record permitting data extraction.

Exclusion criteria: incomplete records precluding classification or management description; pathological fractures (tumor, prior bone disease).

A total of 52 cases met these criteria.

2.3 Data collection

Patient records were retrieved from departmental archives. A standardized data extraction form was used, capturing demographic and epidemiological data (age, sex, occupation, comorbidities, side affected, mechanism of injury, etiology); clinical data on admission (general condition, Injury Severity Score where available, skin status, neurovascular status, associated ligamentous injury, associated injuries elsewhere); radiological data (fracture site, fracture pattern, displacement, classification according to Fraser [2], and Cauchoix-Duparc classification of open fractures); therapeutic data (time from admission to surgery, type of anesthesia, surgical technique used at each fracture site, length of hospital stay, postoperative care); and complications (immediate, secondary, and late).

2.4 Classifications used

The Fraser classification [2] was applied based on the location of fracture lines and the presence or absence of articular involvement: Type I (extra-articular fractures of both femur and tibia); Type IIa (ipsilateral femoral diaphyseal fracture and tibial plateau fracture); Type IIb (distal femoral fracture and tibial diaphyseal fracture); Type IIc (ipsilateral distal femoral and tibial plateau fractures). Open fractures were graded using the Cauchoix-Duparc classification.

2.5 Outcome assessment

Functional outcomes were assessed using the criteria of Karlström and Olerud [10] at the most recent available follow-up visit for each patient. **Follow-up duration varied widely between patients, ranging from 6 months to 36 months,** and was not standardized to a fixed time point. Outcome data should therefore be interpreted as a global descriptive snapshot at last available follow-up rather than as a comparable measurement at a uniform time-point.

2.6 Statistical analysis

Given the descriptive nature of this study, only descriptive statistics were used. Continuous variables are presented as means; categorical variables are presented as counts and percentages. No inferential statistical tests were performed, as the objectives of this work were descriptive rather than analytical.

2.7 Ethical considerations

This retrospective study used anonymized archival data from departmental records.The study was conducted in accordance with the principles of the Declaration of Helsinki. Patient confidentiality was maintained throughout; all data were anonymized before analysis. Written informed consent for publication of clinical images was obtained from the patients concerned. No patient-identifying information appears in this manuscript.

3. RESULTS

3.1 Epidemiological characteristics

Over the 9-year study period, 52 patients with floating knee injury were managed at our department, with annual incidence ranging from 3 to 9 cases (Table 1). The mean age was 29 years (range: 16–67 years), with the 21–30 year age group most affected (38% of cases), followed by the 31–40 year group (24%). There was a clear male predominance, with 44 men (84.6%) and 8 women (15.4%), giving a sex ratio of 5.5:1.

Comorbidities were rare in this predominantly young population: 3 patients had diabetes and 1 patient was on long-term anticoagulation. The left side was affected in 29 cases (55.8%) and the right side in 23 cases (44.2%).

Road traffic accidents (RTA) were by far the leading cause, accounting for 48 cases (92.3%). Among RTA mechanisms, two-wheeled vehicle accidents (motorcycles and bicycles) represented 59.6% of cases, reflecting the high prevalence of

motorized two-wheeler use in our region. The remaining etiologies included falls from height and occupational accidents. Direct violent impact was the most common mechanism, identified in 41 patients (78.8%); indirect mechanism in 8 cases (15.4%); and undetermined in 3 cases (5.8%). Mean time from injury to hospital admission was 1.8 hours.

Table 1. Epidemiological and demographic characteristics (n = 52)

Variable	Value
Annual cases (2017–2025)	3 to 9 (mean 5.8/year)
Mean age (years)	29 (range 16–67)
Most affected age group	21–30 years (38%)
Male / Female	44 (84.6%) / 8 (15.4%)
Side: Left / Right	29 (55.8%) / 23 (44.2%)
Etiology — RTA	48 (92.3%)
Two-wheeled vehicle (subset)	31 (59.6%)
Direct impact mechanism	41 (78.8%)
Mean admission delay	1.8 hours

3.2 Lesional characteristics

The floating knee injury occurred in the context of polytrauma in 13 patients (25.0%), with associated injuries (without meeting polytrauma criteria) in 19 additional patients (36.5%); the injury was isolated in 20 cases (38.5%). The mean Injury Severity Score (ISS) was 22. Associated injuries identified across the cohort included cerebral lesions (most frequent), thoracic, abdominal, and other limb injuries. Concomitant lower-limb injuries documented across all 52 patients included 8 ipsilateral fibular fractures, 2 patellar fractures, 2 contralateral leg fractures, 3 malleolar fractures, 1 traumatic contralateral amputation, and 1 foot crush injury.

Open fractures were highly prevalent, occurring in 37 of the 52 cases (71.2%) at one or both fracture sites: 9 femoral fractures (17.3%) and 28 tibial fractures (53.8%) were open. The middle third was the most frequent site of open injury at both bones. According to the Cauchoix-Duparc classification, type III open fractures predominated, particularly at the tibia (Table 2).

Vascular injuries were identified in 6 cases (11.5%), including superficial femoral artery, popliteal artery, and posterior tibial artery lesions; two of these required amputation (one transtibial, one transfemoral) for irreversible ischemia. No primary nerve injury was identified. Ligamentous injuries were diagnosed during postoperative follow-up in 3 patients (5.8%); this is likely an underestimation given the absence of systematic ligamentous assessment in the acute setting.

The fracture site distribution showed clear diaphyseal predominance at both bones: femur (proximal third 9.6%, diaphysis 73.1%, distal third 17.3%); tibia (proximal third 21.2%, diaphysis 69.2%, distal third 9.6%). Simple fracture patterns predominated (femur 76.9%, tibia 73.1%) over complex patterns (comminuted or with third fragment).

According to the Fraser classification, Type I (extra-articular at both sites) accounted for 37 cases (71.2%), Type IIa for 7 cases (13.5%), Type IIb for 5 cases (9.6%), and Type IIc for 3 cases (5.7%) (Table 2).

Table 2. Lesional characteristics (n = 52)

Variable	n (%)
Context	
Isolated injury	20 (38.5)
Associated injuries (non-poly.)	19 (36.5)
Polytrauma (mean ISS 22)	13 (25.0)
Skin status	
Closed	15 (28.8)
Open (≥1 site)	37 (71.2)
Open femoral fracture	9 (17.3)
Open tibial fracture	28 (53.8)
Vascular injury	6 (11.5)
Fraser classification	
Type I	37 (71.2)
Type IIa	7 (13.5)
Type IIb	5 (9.6)
Type IIc	3 (5.7)

3.3 Initial management

Thirteen patients (25%) required intensive care unit admission, of whom 12 were polytrauma cases admitted for initial resuscitation and one was admitted postoperatively. ICU stay ranged from 4 hours to 7 days. Three of the four deaths recorded in the series occurred in the first 4 hours after admission and the fourth within the first 48 hours; all four deaths were attributable to refractory hemorrhagic shock and are described in detail in section 3.5.

Emergency surgical management (within 24 hours) was performed in 11 patients. Indications included Cauchoix-

Duparc grade III open fractures, associated vascular injury requiring revascularization, severe limb mangling, and uncontrolled hemodynamic instability necessitating damage-control orthopedic management.

3.4 Surgical management

All 52 patients were managed surgically. Static locked intramedullary nailing (SLIMN) was the dominant technique at both fracture sites: 39 femoral and 36 tibial fractures were treated by SLIMN. Plate osteosynthesis was used for articular fractures (Fraser II subtypes) and for proximal/distal metaphyseal fractures unsuitable for intramedullary fixation. External fixation was used for severe open fractures or as a temporizing measure in damage-control protocols. Two femoral fractures were treated by retrograde nailing. One tibial amputation was required (Table 3). Representative preoperative and postoperative imaging is shown in Figures 1 and 2.

Table 3. Surgical management of the 52 floating knee injuries

Implant / Technique	Femur (n)	Tibia (n)
Static locked IM nail	39	36
Plate fixation	8	10
External fixator	3	5
Retrograde nail	2	—
Amputation	—	1
Total	**52**	**52**

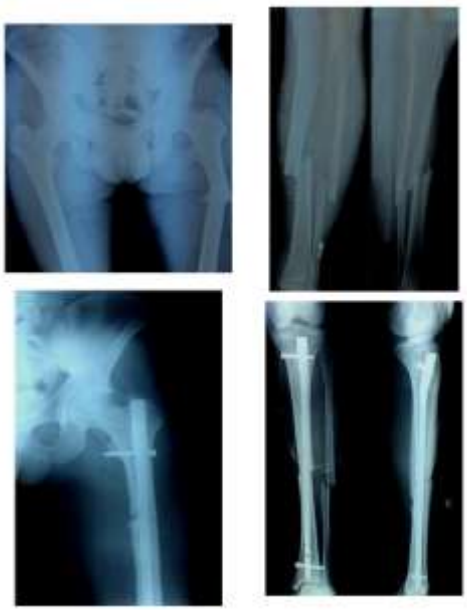

Fig. 1. Fraser Type I floating knee, left lower limb. Top: preoperative radiographs showing ipsilateral femoral and tibial diaphyseal fractures. Bottom: postoperative radiographs after fixation by antegrade static locked intramedullary nailing of both the femur and the tibia.

3.5 Complications

Immediate complications were dominated by vascular injuries (6 cases, 11.5%), managed by revascularization in 4 patients and amputation in 2. No primary nerve injury was identified.

Secondary complications included infection in 5 cases (9.6%): two cases of early sepsis on femoral plate fixation requiring repeated debridement, antibiotic therapy, hardware removal, and conversion to external fixation; two cases of pin-tract infection on external fixators; and one case of grade III open tibial fracture complicated by sepsis with bone exposure, requiring muscle flap coverage. One case of fat embolism (1.9%) was managed in ICU. Systematic anticoagulant prophylaxis was associated with no observed thromboembolic complications.

Late complications included 4 cases of malunion (7.7%), 6 cases of pseudarthrosis (11.5% — two septic, four aseptic), and 5 cases of joint stiffness (9.6%) requiring intensive prolonged physiotherapy (Table 4).

In-hospital mortality was 7.7% (4 deaths), all occurring within 48 hours of admission in the context of refractory hemorrhagic shock related to severe polytrauma.

Fig. 2. Fraser Type IIa floating knee, left lower limb (G = gauche). Top: preoperative radiographs showing femoral diaphyseal fracture (left) and tibial plateau fracture with articular involvement of the knee (centre, AP view; right, lateral view). Bottom: postoperative radiographs after fixation by antegrade femoral intramedullary nailing and plate osteosynthesis of the proximal tibia.

Table 4. Complications observed in the series (n = 52)

Complication	n (%)
Vascular injury (immediate)	6 (11.5)
Infection (secondary)	5 (9.6)
Fat embolism	1 (1.9)
Thromboembolic events	0 (0.0)
Malunion	4 (7.7)
Pseudarthrosis	6 (11.5)
Joint stiffness	5 (9.6)
Mortality (≤48 h, hemorrhagic shock)	4 (7.7)

3.6 Functional outcomes

Functional outcomes were assessed at the most recent available follow-up visit for each patient. Follow-up duration ranged from 6 to 36 months across the series, without standardization to a fixed time point. Across the series, Karlström-Olerud results were classified as excellent or good in 78.8% of cases and as acceptable or poor in 21.2%. When stratified by skin status, closed floating knees yielded 93.3% excellent or good results compared to 73.0% in cases with at least one open fracture, suggesting a negative impact of skin opening on functional recovery. By Fraser type, results were excellent or good in 75.7% of Type I, 85.7% of Type IIa, 100% of Type IIb (5 cases), and 66.7% of Type IIc (3 cases) (Table 5).

Table 5. Karlström-Olerud functional outcomes at last available follow-up (range 6–36 months)

Stratum	Excellent / Good	Acceptable / Poor
Overall (n = 52)	78.8%	21.2%
Closed (n = 15)	93.3%	6.7%
Open (n = 37)	73.0%	27.0%
Fraser Type I (n = 37)	75.7%	24.3%
Fraser Type IIa (n = 7)	85.7%	14.3%
Fraser Type IIb (n = 5)	100%	0%
Fraser Type IIc (n = 3)	66.7%	33.3%

4. DISCUSSION

4.1 Epidemiological profile

The demographic characteristics of our series are consistent with the international literature on floating knee injuries, which uniformly describes a young, male-predominant population. Our mean age of 29 years falls within the range reported across major published series (26 years in Karlström and Olerud [10], 31 years in Pietu et al. [17], 34 years in Fraser et al. [2], 38 years in Hung et al. [15]). The male predominance in our series (84.6%) is similarly consistent with figures reported by Hee et al. (89.9%) [14], Rethnam et al. (93.1%) [16], and Zrig et al. (92.3%) [18]. This consistent demographic pattern reflects the underlying mechanism: floating knee is overwhelmingly an injury of high-energy trauma, and young adult males are the population most exposed to road traffic accidents in nearly every studied setting.

What distinguishes our series from most published cohorts is the etiological breakdown. Road traffic accidents accounted for 92.3% of cases overall — itself comparable to most published figures — but two-wheeled vehicle accidents represented 59.6% of all cases. This proportion is markedly higher than that observed in Western series, where automobile-related trauma typically dominates [2,13,17]. It is, however, in line with data from other low- and middle-income settings where motorcycle and motorbike use is widespread and protective equipment use is inconsistent [18]. This epidemiological feature is not incidental: it directly conditions the lesional severity profile observed in our cohort.

4.2 Lesional severity in our context

The high open fracture rate observed in our series (71.2% of patients with at least one open fracture site, including 53.8% open tibial fractures) is a notable feature of this cohort. Interestingly, this figure is very close to that reported in the large French multi-centric series of Piétu et al. (69.2%) [17], suggesting that high open-fracture rates are not unique to low- and middle-income settings but are characteristic of the floating knee injury itself, which by definition reflects high-energy trauma. The Cauchoix-Duparc grade III predominance at the tibia in our series, however, points to a particularly severe soft-tissue injury profile, consistent with the high prevalence of unprotected two-wheeled vehicle mechanisms in our regional context [5]. The combination of high open-fracture rate with high grade III predominance therefore conditions both the surgical approach (favoring damage-control orthopedics and external fixation in selected cases) and the complication profile.

The Fraser Type I predominance (71.2%) in our series is consistent with the literature. Type I fractures, being purely diaphyseal, are generally associated with better functional prognosis than Type II variants involving articular extension [2,14,15,17]. The relatively small numbers of Type II subtypes in our cohort (Type IIa: 7 cases; IIb: 5; IIc: 3) limit the conclusions that can be drawn about subgroup outcomes, and these figures should be interpreted with this caveat in mind.

The polytrauma rate of 25% in our cohort, with a mean Injury Severity Score of 22, underscores the systemic gravity of these injuries. Cerebral injuries were the most frequent associated lesion, consistent with the high proportion of two-wheeled vehicle mechanisms. Early stabilization of femoral fractures in polytrauma patients has been associated with improved outcomes since the seminal work of Bone et al. [20], a principle that informed the management strategy in our cohort.

4.3 Therapeutic approach

Surgical management was undertaken in all 52 cases, in line with current consensus that floating knee injuries require operative stabilization of both fracture sites [7,8,10]. Static locked intramedullary nailing was the dominant technique at both bones (39 femoral and 36 tibial fractures), confirming SLIMN as the reference technique for diaphyseal fractures in this context. This preference reflects both the biomechanical advantages of intramedullary fixation in diaphyseal long-bone trauma and the practical advantages of this approach for early mobilization and functional rehabilitation.

Plate osteosynthesis was reserved primarily for articular fractures (Fraser II subtypes) and for proximal or distal metaphyseal fractures unsuitable for satisfactory intramedullary fixation. External fixation was employed for grade III open fractures and as a temporizing measure in the context of damage-control orthopedics for unstable polytrauma patients. Early conversion of external fixation to definitive intramedullary fixation, as soon as soft-tissue and infectious conditions allow, is recognized as important to limit the risks of pseudarthrosis and malunion [6,21].

We did not employ a single-stage synchronous nailing protocol of the kind described in some recent series [26]. The choice between staged and synchronous nailing remains debated, with arguments centering on operative time, blood loss, and infection risk in polytrauma patients. Retrograde femoral nailing, used in two cases in our series, has been associated with a higher rate of heterotopic ossification around the knee compared with antegrade nailing [30] and should therefore be reserved for situations in which the antegrade approach is not feasible.

4.4 Mortality

The in-hospital mortality rate in our series was 7.7% (4 deaths), all occurring within 48 hours of admission in the context of refractory hemorrhagic shock. This figure is higher than that reported in the historical Western series of Veith et al. (1.75%) [13] and Fraser et al. (4.05%) [2]. We interpret this difference as primarily reflecting context-dependent factors rather than departmental management quality: in particular, limited pre-hospital resuscitation capacity, the higher proportion of severe polytrauma cases associated with motorcycle mechanisms, and the cumulative severity of associated cerebral and torso injuries in this mechanism profile. Strengthening the pre-hospital trauma chain — including pre-hospital resuscitation, en route blood product availability, and standardized triage protocols — represents a priority axis for reducing mortality in this patient population in our regional context.

4.5 Complication profile

The infection rate of 9.6% (5 cases) is reasonable in a series with such a high open-fracture proportion (71.2%). Septic complications were managed by repeat debridement, targeted antibiotic therapy, and, where necessary, hardware removal with conversion to external fixation. The pseudarthrosis rate of 11.5% (six cases, two septic and four aseptic) and the malunion rate of 7.7% (four cases) are within ranges reported in the literature for floating knee series with comparable open-fracture profiles. The absence of clinically detected thromboembolic events likely reflects the systematic use of pharmacological prophylaxis in all bedridden patients, although the retrospective design and absence of routine screening preclude any firm conclusion on true thromboembolic incidence.

The 9.6% rate of joint stiffness (5 cases requiring intensive rehabilitation) reflects the well-recognized challenge of preserving knee function after this composite injury. Early postoperative mobilization, made possible by stable fixation of both fracture sites, is a key element in mitigating this complication [9]. Functional outcomes in Fraser Type I floating knees treated by internal fixation have been the subject of focused studies including isokinetic muscle strength assessment [27], which represents an avenue for more granular outcome evaluation in future prospective work.

4.6 Comparison with prior institutional experience

The Department of Traumatology and Orthopedics at our institution previously reported a series of 18 ipsilateral femoral and tibial fractures managed between 1996 and 2004 [11]. Comparison of that earlier cohort with the present 52-case series spanning 2017–2025 illustrates the increase in case volume managed at our center over the past two decades, in parallel with the regional growth of motorized two-wheeled transport. From a therapeutic standpoint, the prior series employed a heterogeneous mix of fixation techniques, whereas the present series shows clear consolidation around static locked intramedullary nailing as the technique of reference for diaphyseal fractures at both bones. Continued documentation of departmental practice over time, ideally with prospective and standardized methodology, will be needed to confirm whether this shift in technique has translated into measurable improvements in patient outcomes.

4.7 Limitations

This study has several important limitations that condition the interpretation of its findings. First, the retrospective single-center design limits generalizability and introduces inherent risks of selection and information bias. Second, although follow-up duration is reported (range 6–36 months), it was not standardized to a uniform time point; time-dependent variables such as malunion or pseudarthrosis healing may therefore be incompletely captured for patients evaluated at the shorter end of the follow-up range. Third, no formal inferential statistical

analysis was performed, and comparisons across subgroups (open vs closed, Fraser type) are reported for completeness but should not be taken as evidence of statistically significant differences. Fourth, ligamentous injury was not systematically assessed in the acute setting, which likely results in substantial underestimation of the true rate of associated ligamentous lesions — a phenomenon well documented in the literature [12,19]. Finally, the small numbers of cases in some Fraser subgroups (particularly Types IIb and IIc) preclude any meaningful subgroup analysis.

These limitations should be addressed in future work through prospective design with standardized follow-up protocols, systematic ligamentous assessment, and where feasible, multi-center recruitment to overcome the small-numbers limitation.

5. CONCLUSION

This 9-year retrospective analysis of 52 floating knee injuries managed at a Moroccan tertiary trauma center confirms the classical demographic profile of this entity — young adult males injured in high-energy trauma — while highlighting epidemiological features specific to the regional context. The high proportion of two-wheeled vehicle mechanisms (59.6%) and the resulting high open-fracture rate (71.2%) distinguish this series from most published Western cohorts and reflect the distinct trauma epidemiology of low- and middle-income settings. Static locked intramedullary nailing was the dominant fixation technique, employed in the great majority of cases at both bones. The complication profile, including a 9.6% infection rate and 11.5% pseudarthrosis rate, is consistent with the high open-fracture proportion. The 7.7% mortality rate, occurring within 48 hours in all cases from refractory hemorrhagic shock, points to the importance of strengthening the pre-hospital trauma chain as a priority for reducing morbidity and mortality from these severe injuries. Future work should focus on standardized prospective follow-up, systematic ligamentous assessment, and regional collaborative documentation of practice and outcomes.

6. DECLARATIONS

Conflicts of interest: The authors declare that they have no conflicts of interest.

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Informed consent: Written informed consent for publication of clinical images was obtained from the patients concerned.

7. REFERENCES

[1] Blake R, McBryde A Jr. The floating knee: ipsilateral fractures of the tibia and femur. South Med J. 1975;68(1):13–16.

[2] Fraser RD, Hunter GA, Waddell JP. Ipsilateral fracture of the femur and tibia. J Bone Joint Surg Br. 1978;60-B(4):510–515.

[3] Bansal VP, Singhal V, Mam MK, Gill SS. The floating knee. 40 cases of ipsilateral fractures of the femur and the tibia. Int Orthop. 1984;8(3):183–187.

[4] Nouraei MH, Hosseini A, Zarezadeh A, Zahiri M. Floating knee injuries: results of treatment and outcomes. J Res Med Sci. 2013;18(12):1087–1091.

[5] Masquelet AC, Bégué T, Court C. Fractures ouvertes de jambe. EMC – Traumatologie-Orthopédie. Paris: Elsevier; 1995. 14-086-A-20:1–12.

[6] Barquet A, Massaferro J, Dubra A, Nin F. Ipsilateral open fracture of the femur and tibia treated using the dynamic ASIF-BM tubular external fixator: case reports. J Trauma. 1991;31(9):1312–1315.

[7] Kempf I, Jenny JY. L'enclouage centromédullaire à foyer fermé selon Küntscher: principe de base, apport du verrouillage. Cahier d'enseignement de la SOFCOT. 1990;39:5–12.

[8] Gregory P, DiCicco J, Karpik K, DiPasquale T, Herscovici D, Sanders R. Ipsilateral fractures of the femur and tibia: treatment with retrograde femoral nailing and unreamed tibial nailing. J Orthop Trauma. 1996;10(5):309–316.

[9] De Ryck W. Mobilisation précoce de l'articulation du genou traumatisé opéré. Ann Kinésithér. 1990;17(9):465–467.

[10] Karlström G, Olerud S. Ipsilateral fracture of the femur and tibia. J Bone Joint Surg Am. 1977;59(2):240–243.

[11] Elmrini A, Elibrahimi A, Agoumi O, Boutayeb F, Mahfoud M, Elbardouni A, Elyaacoubi M. Ipsilateral fractures of tibia and femur or floating knee. Int Orthop. 2006;30(5):325–328. doi:10.1007/s00264-006-0084-0.

[12] Szalay MJ, Hosking OR, Annear P. Injury of the knee ligament associated with ipsilateral femoral shaft fractures and with ipsilateral femoral and tibial shaft fractures. Injury. 1990;21(6):398–400.

[13] Veith RG, Winquist RA, Hansen ST. Ipsilateral fractures of the femur and tibia. A report of fifty-seven consecutive cases. J Bone Joint Surg Am. 1984;66(7):991–1002.

[14] Hee HT, Wong HP, Low YP, Myers L. Predictors of outcome of floating knee injuries in adults: 89 patients followed for 2–12 years. Acta Orthop Scand. 2001;72(4):385–394.

[15] Hung SH, Lu YM, Huang HT, Lin YK, Chang JK, Chen JC, et al. Surgical treatment of type II floating knee: comparisons of the results of type IIA and type IIB floating knee. Knee Surg Sports Traumatol Arthrosc. 2007;15(5):578–586.

[16] Rethnam U, Yesupalan RS, Nair R. The floating knee: epidemiology, prognostic indicators and outcome

following surgical management. J Trauma Manag Outcomes. 2007;1(1):2.

[17] Piétu G, Jacquot F, Féron JM. The floating knee: a retrospective analysis of 172 cases. Rev Chir Orthop Reparatrice Appar Mot. 2007;93(6):627–634.

[18] Zrig M, Mnif H, Hammouda I, Abbadi A, Allagui M, Hamdi MF, Koubaa M. Le genou flottant: étude rétrospective de 39 cas. Tunis Orthop. 2008;1(2):165–170.

[19] Liu Y, Zhang J, Zhang S, Li R, Yue X. Concomitant ligamentous and meniscal injuries in floating knee. Int J Clin Exp Med. 2015;8(1):1168–1172.

[20] Bone LB, Johnson KD, Weigelt J, Scheinberg R. Early versus delayed stabilization of femoral fractures: a prospective randomized study. J Bone Joint Surg Am. 1989;71(3):336–340.

[21] Behrman SW, Fabian TC, Kudsk KA, Taylor JC. Improved outcome with femur fractures: early versus delayed fixation. J Trauma. 1990;30(7):792–798.

[22] Yadav S, Rawal G. Advances in understanding and managing floating knee injuries: a comprehensive review. Cureus. 2024;16(3):e57122.

[23] Kenmegne GR, Zou C, Lin Y, Yin Y, Huang S, Fang Y. The current issues and challenges in the management of floating knee injury: a retrospective study. Front Surg. 2023;10:1164032.

[24] Zhou N, Zhang N, Wang Z, et al. Application of digital classification based on AO classification in floating knee injury. BMC Musculoskelet Disord. 2024;25(1):966.

[25] Meccariello L, Pica R, Erasmo R, et al. Floating knee: a new prognostic classification. Injury. 2024;55:111471.

[26] Engorn JR, Vivace BJ, Seligson D, Parkulo T, Arrington DD, Rashid SF, Roberts C, Zamora R. Intramedullary nailing of concurrent ipsilateral fractures of the tibia and femur: primary synchronous nailing versus staged osteosynthesis with temporizing external fixation. Eur J Orthop Surg Traumatol. 2023;33(5):1727–1734.

[27] Andrade-Silva FB, Carvalho A, Mansano C, Giese A, de Camargo OP, Kojima KE, Silva JS. Functional results and isokinetic muscle strength in patients with Fraser type I floating knee treated with internal fixation. Injury. 2017;48(Suppl 4):S2–S5.

[28] Feron JM, Bonnevialle P, Pietu G, Jacquot F. Traumatic floating knee: a review of a multi-centric series of 172 cases in adult. Open Orthop J. 2015;9:356–360.

[29] Karslı B, Tekin SB. The floating knee injuries: does it need a new classification system? Indian J Orthop. 2020;55(2):499–505.

[30] Kent WT, Shelton TJ, Eastman J. Heterotopic ossification around the knee after tibial nailing and ipsilateral antegrade and retrograde femoral nailing in the treatment of floating knee injuries. Int Orthop. 2018;42(6):1379–1385.