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Original article

Ipsilateral proximal and shaft femoral fractures

Eric Lawson*, Soumaila Madougou, Pascal Chigblo, Gildas Quenum, Abdourahmane Ouangré, Fiacre Tidjani, Oswald Goukodadja, Aristote Hans-Moevi Akué

Department of Orthopaedic and Traumatology Surgery, Cotonou Teaching Hospital, Jericho Cotonou, Benin

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ABSTRACT

Purpose: To study the management and evaluate anatomical and functional outcomes of patients with ipsilateral proximal and shaft femoral fractures.

Methods: A retrospective, descriptive and analytic study lasted for ten years and a half ranging from January 1, 2005 to June 30, 2015. The following parameters were studied: epidemiology, fracture characteristics, therapeutic, anatomical and functional outcomes. The correlation between different parameters was analyzed with Fischer test. The significant threshold was defined for p value <0.05.

Results: Ten medical files were registered. There were 7 men and 3 women, with a sex ratio of 2.33. The average age was 46 years (range: 29–62 years). It was about traffic road accidents in all cases. Motorcycle–motorcycle and motorcycle–car collision were most frequent. Average admission delay was 7 h (range: 1.5–24 h). Left side was most reached in 8 cases. According to Garden classification, there was type III cervical fracture in 2 cases, type II in 1 case and type IV in 1 case. According to Ender classification, there was type I trochanteric fracture in 3 cases, type VI in 2 cases and type VII in 1 case. According to AO classification, there was type A shaft fracture in 6 cases (A2 in 4 cases and A3 in 2 cases), type B in 2 cases (B1 in 1 case and B2 in 1 case) and type C in 2 cases (C1 in 1 case and C2 in 1 case). Average surgical delay was 28.7 days (range: 11–61 days). For proximal femoral fracture, Moore prosthesis was used in 1 case, blade plate 130° in 2 cases, long Gamma nail in 4 cases, double screwing in 2 cases and dynamic hip screw in 1 case. For shaft femoral fracture, blade plate 95° was used in 3 cases, low compressive plate in 2 cases. Osseous contention was achieved in 4 cases with long Gamma nail and in 1 case with long blade plate 130°. Nonunion of cervical fracture was achieved in 2 cases. The average osseous healing delay was 5.14 months (range: 3–12 months) for proximal femoral fracture and 5 months (range: 3–8 months) for shaft femoral fractures. According to Friedman and Wyman criteria, functional results were good in 4 cases, average in 4 cases and bad in 2 cases. Regarding implants, healing delay showed no statistic difference between one-implant group and two-implant group ($p = 0.52$), and among the patients with different functional outcomes ($p = 0.52$). Functional outcomes showed no statistic difference between one-implant group and two-implant group ($p = 0.46$).

Conclusion: Ipsilateral proximal and shaft femoral fractures are relatively uncommon in our daily activities. It is difficult to recognize proximal femoral fractures which are unnoticed. Results are generally good if the doctors take the two fractures into account in the management.

Introduction

Ipsilateral proximal and shaft femoral fractures are uncommon, accounting for 2.5%–6% of femoral fractures.[1,2] These injuries often result from high energy mechanism after a motorcycle–car collision in traffic road accidents or falling from height.[3–5] Moreover, the questions about management, therapeutical difficulty concerning implants choice, order of injury management and time of surgical management are unknown. The aim of this work was to study surgical management and evaluate anatomical and functional outcomes of patients with ipsilateral proximal and shaft femoral fractures.

* Corresponding author.
E-mail address: ericson_bj@yahoo.fr (E. Lawson).

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Materials and methods

It was about a retrospective descriptive and analytic study for 10.5 years ranging from 1st January 2005 to 30th June 2015. We included all the medical files of patients with both conditions: patients treated in our department and evaluated in mid-term follow-up. The following parameters were studied: age, sex, circumstances, type of collision, admission delay, side reached, cervical fracture distribution according to Garden classification, trochanteric fracture distribution according to Ender classification, shaft femoral fracture distribution according to AO classification; surgical management delay, osteosynthesis material, complications, osseous healing delay and functional results according to Friedman and Wyman criteria (Table 1).[6] The data collected were treated with Excel logiciel. The correlation between different parameters was analyzed with Fischer test. The significant threshold was defined for p value < 0.05.

Results

During the study period, 10 cases of ipsilateral proximal and shaft femoral fractures were registered. There were 7 men and 3 women, with the sex ratio of 2.33. The average age of patients was 46 years (range: 29–62 years). It was about traffic road accidents in all cases. Motorcycle–motorcycle collision and motorcycle–car collision were the most frequent in 4 cases respectively, followed by car–car collision in 2 cases. The average admission delay was 7 h (range: 1.5–24 h). The left side was the most reached in 8 cases.

According to Garden classification, there was type III cervical fracture in 2 cases, type II in 1 case and type IV in 1 case. According to Ender classification, there was type I trochanteric fracture in 3 cases, type IV in 2 cases and type VII in 1 case. According to AO classification, there was type A shaft femoral fracture in 6 cases (A2 in 4 cases and A3 in 2 cases), type B in 2 cases (B1 in 1 case and B2 in 1 case) and type C in 2 cases (C1 in 1 case and C2 in 1 case).

The average surgical delay was 28.7 days (range: 11–61 days). The majority of our patients (6 in 10) were operated within 11–30 days after admission.

In our series, 5 patients were operated with one implant for the 2 fractures and the other 5 received two implants. For proximal femoral fracture, Moore prothesis was used in 1 case, blade plate 130° in 2 cases (long blade plate was used in one case), long Gamma nail in 4 cases, a double screwing in 2 cases and a dynamic hip screw in 1 case. For femoral shaft fracture, blade plate 95° was used in 3 cases, and low compressive plate in 2 cases. The long Gamma nail was used for femoral shaft fracture in 4 cases and the long blade plate 130° in 1 case. Two cervical fractures evolved to nonunion. The average osseous healing delay for proximal femoral fracture was 5.14 months (range: 3–12 months). The average osseous healing delay for shaft femoral fracture was 5 months (range: 3–8 months). The average follow-up was 43.5 months (range: 6–108 months). According to Friedman and Wyman criteria, functional results were good in 4 cases, average in 4 cases and bad in 2 cases. Table 2 shows the distribution of osseous healing delay according to number of implants used.

Three patients treated surgically with one implant healed in 5 months. In the 4 patients treated surgically with 2 implants, 2 healed in 4 months and 2 healed in 5 months, indicating no significant difference ($p = 0.3$). Good and average functional results were achieved in 5 cases in one-implant group and in 3 cases in two-implant group. Bad functional results were achieved in 1 case in two-implant group. Difference was not statistically significant ($p = 0.46$). Table 3 shows the distribution of osseous healing delay according to functional results. The good functional results were achieved in 3 patients including 2 who healed in 4 months. The average results were achieved in 5 patients including 3 who healed in 5 months. Bad results were achieved in 2 patients who healed in 5 months and 6 months respectively. The difference was not statistically significant ($p = 0.2$). Table 4 shows the detailed information of 10 patients.

Table 1
Friedman and Wyman criteria.

Grade	Perturbation of daily activity	Pain	Lost of motion of hip or knee
Good	No perturbations	None	<20%
Average	Average	Average to moderate	20%–50%
Fair	Moderate	Severe	>50%

Table 2
Distribution of osseous healing delay according to number of used implants.

Number of implants	Cases	Osseous healing delay (months)				
		3	4	5	6	8
1	5	1	0	3	0	1
2	5	0	2	2	1	1

Note: $x^2 = 5.2$, $p = 0.3$.

Discussion

Ipsilateral proximal and shaft femoral fractures are a challenge for orthopaedic surgeons.[7] The rarity of this injured entity is linked to necessity of high energy trauma in which forces should be applied longitudinally to the femoral shaft. They can be the result of longitudinal compression on hip in flexion and abduction occurring after traffic road accidents in car collision.

The diagnosis of proximal femoral fracture is delayed in 20%–50% of cases.[2,8,9] Patients have a high Injury Severity Score (ISS) and several other injuries associated to shaft femoral fracture, leading to the ignorance of proximal femoral fracture.[9,10]

An early recognition allows stabilization and decreases risk of nonunion and avascular necrosis.[11] Failure of recognizing cervical fracture before surgical management of shaft fracture can lead to cervical fracture displacement, limiting cervical fixation choice.[12] In our series, circumstances were traffic road accidents in all patients, similar to those of literature.[5,13,14] This is explained by the importance of energy necessary to generate this injury. Male predominance was found in literature.[5,11,13,15] In our study, this was due to the professions like motorcycle drivers, and the fact that men worked in mobility and the most common means of transport was motorcycles. The average age was 46 years old. It was higher than that of Abalo et al[5] in Lomé, similar to those of Wang et al[13] in Xijing, and Vidyadhara et al[9] in Manipal.

The average admission delay was 7 h, due to lack of national rescue system for injured persons other than firemen. Family members had to organize patient transfer. Average delay of surgical management was 28.7 days, due to the lack of universal medical insurance system. Each patient was obliged to find financial support for his management. The associated injuries need a therapeutic approach, different from that of each injury taken

Table 3
Distribution of osseous healing delay according to functional results.

Functional results	Cases	Osseous healing delay (months)				
		3	4	5	6	8
Good	3	0	2	1	0	0
Average	5	1	0	3	0	1
Bad	2	0	0	1	1	0

Note: $x^2 = 10.9$, $p = 0.2$.

Table 4
The detailed information of 10 patients.

No.	Age (years)	Sex	Proximal fracture	Shaft fracture	Collision	Implant for proximal fracture	Implant for shaft fracture	Follow-up (month)	Functional results
1	29	Male	End 1	32A3	Car–car	Blade plate 130°	Long compressive plate	107	Bad
2	35	Male	Gard III	32A2	Moto–moto	Moore prosthesis	Blade plate 95°	13	Average
3	41	Male	End 1	32A2	Moto–moto	Long blade plate 130°	–	108	Average
4	43	Male	End 6	32A2	Moto–car	Long Gamma nail	–	15	Good
5	44	Female	Gard II	32C1	Moto–car	Double screwing	Blade plate 130°	96	Good
6	44	Female	Gard IV	32A3	Moto–car	Dynamic hip screw	Blade plate 95°	15	Good
7	51	Female	End 6	32B2	Car–car	Long Gamma nail	–	6	Average
8	53	Male	Gard III	32A2	Moto–car	Long Gamma nail	–	13	Good
9	57	Male	End 7	32B1	Moto–moto	Long Gamma nail	–	6	Average
10	62	Male	End 1	32C2	Moto–car	Double screwing	Long compressive plate	56	Bad

Note: The cases No. 3, 7 and 10 had associated injuries while case No. 5 had Gustillo II injury.

separately.[11] More than 64 operation strategies had been described for the management.[9,16,17] Even if it was admitted on that day and the indication was surgical for stabilization of the two fractures, there was still no consensus on the method of fixation for each injury. In our series, there was also multiplicity of therapeutic means. Conventional treatments were screwing, dynamic hip screw, Moore prothesis, dynamic compressive plate, blade plate and Gamma nail. Surgical delay was long in our study since recommendations in literature indicated cervical fixation which varied from one day to a week.[16,17] Most authors recommended a prompt management with priority given to reduction and stabilization of cervical fracture.[1,3,4,10,16,18,19] Someone advocated giving shaft fixation firstly so that reducing proximal fracture would be easier.[20–22] In all cases, the conditions of the patients, associated injuries and hemodynamic status should be taken into account in determining when to operate and what to do. Regarding implants, there was no significantly statistical association between the number of implants and the osseous healing delay ($p = 0.52$), between the functional results and the number of implants ($p = 0.46$), between functional results and osseous healing delay ($p = 0.52$). A meta-analysis related to 722 cases from 65 published studies found no superiority of an implant.[23] Our average time to union was 5 months for both proximal and diaphyseal fractures, consistent with the results in literature.[5,8,13,20–22,24–26] There were 2 patients with proximal femoral nonunion but none at diaphyseal fractures.

In our series, we registered 2 patients (20%) with bad results and 8 (80%) with good and average results. These functional results were similar with those of literature because the function appeared to be good in 63%–93% of cases.[9,10,26]

Nevertheless, the results of functional assessment are principally qualitative and the use of valid tools is rare.[9,10] Besides, the rarity of this injury makes it difficult to analyze and most of studies are retrospective with small sample size (inferior to 40 cases). These studies are insufficient to confirm the difference in functional outcomes between one-implant group and two-implant group. A randomized prospective study is further needed.

In conclusion, ipsilateral proximal and shaft femoral fractures are relatively uncommon in clinic. They pose the problem of recognition of the proximal femoral fracture which can go unnoticed. Results are generally good if the doctors take the two fractures into account in the management.

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