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Femoral distal end fracture (surgical treatment) Retrospective, epidemiological, clinical and therapeutic studies

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Abstract

In this paper we present a retrospective study over a period of 4 years, from January 2019 to December 2022, 66 fractures of the distal extremity of the femur, occurred in 64 patients, treated in the Department of Traumatology-Orthopedics at the IbnTofail Hospital of the Hospital and University Centre Mohamed VI of Marrakech. The aim of this work is to analyze the epidemiological, therapeutic and evolutionary characteristics of this series, to evaluate our results and to compare them with literature data. The average age of our patients was 43.4 years, with extremes ranging from 18 to 77 years. We noted a male predominance with a gender ratio of 4.3: Men represented 81.25%, while women represented only 18.75%. The etiologies were dominated by road accidents in 41%.31.25% had skin openings and there were two cases of LLE attacks. For the anatomopathological study, we adopted the AO classification of MULLER due to its simplicity and its anatomotherapeutic correlations, so we noted 41% of cases of fractures of type A, 18% of type B and 41% of type C. Different osteosynthesis materials were used dominated by judetvis place in34.8% and DCS vis plaque was used in 22.72%. The overall results were both anatomically satisfactory (84.84%) and functionally satisfactory (71.3%).Complications were dominated by knee stiffness in 22.72%. Our findings largely coincide with the findings in the literature, and confirm the significant importance of surgical treatment in the management of lower femur fractures as well as in improving their prognosis. However, emphasis must be placed on the crucial importance of rehabilitation to significantly improve functional outcomes and prevent stiffness.

Keywords: Fracture; Femoral Distal End; Epidemiology; Clinical Treatment

1. Introduction

The fractures of the distal end of the femur correspond to a solution of the Bone Continuity at the level of the epiphysse and/or the lower metaphysis of the fetus. They are located between the joint interline of the lower knee and an area about twelve centimeters above that interline, which is equivalent to about six thorns.(4) These fractures are relatively common, accounting for half of the knee fracture and approximately 10% of the total femur fracture.(1). These fractures have a bimodal distribution, they occur in polytraumatic situations during high-energy accidents (such as road accidents or height drops...), especially in young men. Moreover, they occur in simpler and less violent circumstances. In elderly people, mainly women with osteoporosis. These fractures, often comminutive and open, affecting the bearing joint The most voluminous of the organism with the complex mechanics, they have as their curse a high rate of complications and sequences, osteitis, stiffness, arthrosis, even amputation.(2) Currently, the surgical approach by osteosynthesis is more effective than the orthopedic treatment to apply the principles of treating fractures of the lower end of the femur. This involves achieving a precise anatomical reduction and solid fixation of bone fragments, which facilitates early knee rehabilitation. Over the past two decades, the introduction of specific osteosynthesis devices adapted to this type of fracture, with different design principles, has significantly improved

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treatment results. However, the right choice of fixing material is only one aspect of the treatment, patient care, from initial care to the end of rehabilitation, must be impeccable to avoid any risk of therapeutic failure.

2. Material and methods

This is a four-year retrospective study from January 2019 to December 2022 involving 64 patients with femur distal end fracture at the IbnTofail Hospital Trauma-Orthopedic Service A at CHU Mohamed 6 in Marrakech. we included in the study all adult patients operated for distal femur fracture, whose medical records were exploitable on the various clinical, para-clinical, therapeutic and evolutionary aspects. As for patients under the age of 18 years, those who left against medical advice or those whose files were found incomplete and unusable their files were excluded from our study. For the working methodology: The records were extracted from a pre-defined, elaborate sheet that enabled us to collect anamnestic, clinical, biological and radiological data as well as the evolution, complications and functional and anatomical outcomes of these patients from the hospitalization archives of the Traumatology Service of the Ibn Tofail Hospital.

3. Results

A total of 429 femur fractures were treated in our service, of which 66 were at the distal end of the femur, representing a rate of 15.38% of the total femur fracture. The average age in our series was 43.4 years, with extremes ranging from 18 to 77. We noted a male predominance with a gender ratio of 4.3, Men accounted for 81.25 per cent of the population, while women only 18.75 per cent. The gender distribution by objective age group indicates a male predominance among young subjects, and a female prevalence among elderly persons over the age of 60. We noted medical history in 5 patients including 4 patients followed for balanced diabetes and 1 patient with depression under antidepressants, 8 patients had a history of surgical interventions represented mainly by fractures of the lower limb For the trauma etiologies, they were dominated by PAHs with a rate of 76.56% Followed by falls with a rate of 17.25% of which 11% were falls from height and 6.25% from a high spot Regarding the achieved side: The injury affected both the right and the left side with a slight predominance on the right side, our series also included 2 cases of bilateral fracture or 3.12% of all fractures. All our patients were admitted as part of the emergencies, the purpose of the initial examination was: The elimination of a major injury that puts the patient's life prognosis at stake, the conduct of a locoregional examination in search of an immediate complication, such as an emergency that can compromise the functional and vital prognose of the patient. The conduct of a general examination in search of other distant-associated lesions, in order to establish therapeutic priorities. After stabilizing the hemodynamic state of the patients and eliminating any vital emergency, a thorough clinical examination of the traumatized limb revealed common findings among all our patients. Functional signs such as pain and functional impotence were present in all patients The physical signs were as follows: a discharge, a shortening, a total tumification of the distal half of the thigh in 85% of cases and a large knee in 30% of cases In our study 31.25% fractures were open Dominated by Type I According to the classification of Cauchoix and Duparc. Regarding the standard X-ray one face and profile was asked in all patients (Figure1),Knee TDM was performed in 8 patients, Knee MRI in 2 patients, Echo-doppler of the knee was done in 1 patient.

We listed the fractures of our patients according to Muller's AO classification. Significant equality was found between supra condylial fractures (type A) (Figure 1) and supra and inter-condylial Fractures type C (figure 3), with a 41% concordance rate. However, the A1 type fracture remains the most represented in our series. Unicondyl fractures (type B) (Figure 2) end up with a rate of 18% of cases. With regard to associated lesions, there are two cases of LLE (external lateral ligament) and no cases of 47.78% and 30% respectively.



Figure 1 Right type A1 supracondylar single extraarticular fracture (face+profile)



Figure 2 Medial B2 right (Face+Profil) partial unicondylar joint fracture.



Figure 3 Complete joint fracture, single metaphyseal plurifragmentary joint of right type C2 (Face+Profil)

Regarding surgical care The average operating time was 6 days, ranging from a minimum of a few hours to a maximum of 39 days. Rachianesthesia was used in 76.56% of all our patients, whereas 23.44% of the patients had benefited from general anaesthetics. 93.75% of our patients were placed in dorsal decubitus on a regular table, knee flexed at 30° using a pillow or a knee bar, while 6.25% were installed on an orthopedic table. As for the first surgical pathways, the lateral pathway was used in 40 patients (figure 4). The path of the top of the large trochanter was used in 4 patients for anterograde centromedular enclosure. The medial patellar pathway was used in 5 patients for retrograde centromedular enclosure. For the fixation of fractures, we have used various osteosynthesis materials:

- DCS visplate was used in 15 cases, or 22.72%
- Judetvis-plate was used in 23cas, or 34.8% (figure 5).
- Centromedular retrograde enclosure (ECR) was used in 2 cases, or 3%

- Anterograde centromedular enclosure (ECA) was used in 4 cases, or 6.1%
- The embroidery was used in 1 case, i.e. 1,54%



Figure 3 The side path was used for setting up a judetvis-plate.



Figure 5 Control X-ray (face +profile) of a patient treated with judet plate screw.

Results in our patients were evaluated with an average decline of 14 months with a minimum of 6 months and a maximum of 4 and a half years. We evaluated the results of our patients using the anatomical and functional evaluation criteria of VIVES(table1). The anatomical results obtained were mostly favourable, with 84.84% of our patients having succeeded in regaining an anatomically correct alignment. Our functional results were mostly positive, with 71.3% of our patients having managed to regain a level of functioning of the knee compatible with a normal active life.

Table 1 Distribution of functional results according to VIVES criteria.

Functional results	Number of cases	percentage
Excellent	20	30.30%
Good	27	41%
Average	14	21.20%
Bad	5	7.50%
Overall	66	100%

As far as complications are concerned, we have noted any general complications. Early local complications were dominated by infection with a rate of 4.5%, found in 3 cases of which,1 case of deep sepsis on osteosynthesis equipment, versus 2 cases of superficial suppurations, their evolution proved positive thanks to careful local care and targeted

antibiotic therapy. Secondary and late complications were mainly represented by knee stiffness with a rate of 22.72% of cases.

4. Discussion

The frequency of femur distal end fractures in our series was 15.38% which is close to the results of De FESSY(3), ASCENCIO(4) AND BERGERAULT (5). On the other hand, Ehlinger (32) and KOLMERT (33) a rate of 3%,4%, respectively. All age groups included were represented. With a predominance of young subjects. This is consistent with the results of Weight(6) and RADEMAKER(7) However, our results remain lower than those found in the series of APPLETON(8),PIETU (9)ET SHEARING (10),This can be explained by the longer life expectancy and the high rate of road accidents in our context, which mainly concern young active subjects. the predominance of the male sex was very clear with a rate of 81.25%, The same is true for Hani(11) and WISS(12) and Benchikh(13). The incidence of road trauma in this pathology therefore explains this clear predominance of the male sex The analysis of the circumstances of the injuries studied in our series objectives a clear predominance of road accidents. This is consistent with many series of literature, including those by Boureïma (14), ssa (15), Chipalo (16), Lamrani (17), as well as Weight (6), Hani (11) and Chiron (2) We noted a slight predominance on the right-hand side, with a rate of 53.13%. What matches literature data globally The bilateral attack affected 3.12% of our patients What is in agreement with the observation of SMITH(18) and SIDKI(19).

The clinical examination of femur distal end fractures involves a thorough assessment of pain, deformity, swelling, joint mobility, sensitivity, muscle strength and vascularization, in order to determine the presumed severity of the fracture and to guide treatment.

Radiological examination in all cases is essential to establish the final diagnosis of the lesions, it must include X-rays from different angles, including the face, profile, and sometimes three quarters, of the traumatized knee. In some situations, a preoperative tomodensitometric analysis with reconstructions in frontal and sagittal vision may be useful to examine fractural traits, displacements, and to diagnose condylial fractures that may go unnoticed.

In our study, we adopted the MULLER AO classification, which is the most widely used classification in literature. Our study revealed a significant equality between supra condylia fractures (type A) and supra and inter-condylia fracture C, with a 41% concordance rate. Several other authors such as Madougo (20), Pietu (9), khimari (21) noted a predominance of fractures of type A of which the subtype A1 was the most presented which is in line with our findings As for associated injuries, 31.25% of our fractures were open, which is consistent with literature data that reports a rate of between 20 and 40%.We did not detect any cases of vascular or nerve damage in our study, which matches the results of CHIRON and TRAORE(22) With regard to ligament and meniscal lesions, in our series there have been two cases of LLE violations. Due to the frequency of high-energy trauma, associated trauma is relatively common. They have a great deal of influence on therapeutic conduct and prognosis, hence the importance of researching them and classifying them in order of priority. In our series, 42.12% of patients had associated trauma, which is close to the results of SIDKI(19) AND CHEIKH (23) With regard to therapeutic data, The intervention time in our series was on average 6j. which is consistent with literature data, This delay in care, still present, is due to several factors, including problems related to the availability of osteosynthesis equipment due to the high cost and very limited purchasing power of most of our patients.

As well as the large flow of traumatized patients who cannot be operated in due time due to the limitations of our technical platform. Rachianesthesia was the most widely used in our study, as well as in several other series of literature. This is explained by the reduced morbidity of this technique which also offers postoperative analgesia Patient accommodation varies by school: The installation in dorsal decubitus on ordinary table knee folded at 30° remains the most used position. The latter was achieved in 93.75% of our patients, which matches the results of other series published in particular that of EHLINGER et al. Compared to the first pathways, there are many pathways whose use differs mainly depending on the type of fracture and the osteosynthesis process used. The surgeon chooses a single path first, which must allow an appropriate exposure, to the anatomical type of the fracture, and to the technical criteria for placing the implant chosen. Given the wide variety of surgical options for the treatment of femur distal end fracture, the choice of the implant is a crucial step before proceeding to surgery. This choice depends on several factors: including the type of fracture, the general health of the patient and the experience of the operator. The judet plate visor is the most widely used implant in our series. in 34.8% that joins CHIRON (1). The DCS visplate has been used in our series for the fixation of 22.72% representing a good surgical alternative both from a technical and mechanical point of view. which matches the results of the literature Regardless of the type of equipment or technique used, it is imperative that the surgical treatment allows: a perfect reduction of the epiphyse, the correction of desaxation, and the creation of a stable structure. Compared to the complications, in our study, we identified 4.5% of infections, what is closer to the

results of Chiron and SABAR(24). Its incidence varies depending on the series, Other authors, such as ASCENCIO(4), MEYER(25), ARAZI(26), CLAVEL SAINZ(27) AND AZOUHRI(28) higher rates. However, no cases of infection were in the GHANDOUR series. (29), As part of this measure, it is essential to ensure that patients receive systematic antibiotic prophylaxis, while closely monitoring their clinical condition, including for the presence of fever, possible local signs such as erythema or discharge, as well as through paraclinical analyses such as sedimentation rate (VS), C-active protein (CRP) and blood formula counting. (NFS) No cases of thromboembolic complications were detected in our study, which is in line with the findings of several other series. Ascencio (4) had 2% of thromboembolic complications. As for pseudarthrosis, in our series it is a complication both frequent and serious, having been observed in 7.57% of cases. This is also in line with the observations of Chiron(2) and Arazi(26).

In our series 3.2% of cases presented a vicious cal. Which is consistent with CHIRON's results and remains inferior to the results found by David(30) and Weight(6). Knee stiffness should be seen as a functional sequence rather than a major complication In our series, 22.72% of cases had knee stiffness which matches the results of CHIRON(2), DAVID(30), and Lahdami (31) Some key preventive measures include early mobilization and early and stable osteosynthesis.

As far as knee arthrosis is concerned, the insufficient backwardness in our series, as in most of the published series, has not allowed us to evaluate the results relating to this feared long-term complication. According to VICHARD, no cases of arthrosis have been detected. What matches our results For WEIGHT (6), the rate of osteoarthritis was 36%. AND 20% for ASECNCIO(4) evaluate after 10 years of evolution.

5. Conclusion

Distal end fractures of the femur are usually the result of high-energy trauma, more common in young individuals, especially male. However, it is important to note that low-energy fractures are also common in elderly people with bone fragility due to osteoporosis. The fractures of the distal end of the femur are anatomically diverse. These are serious injuries that have a significant impact on the functional prognosis of the knee and the entire lower limb. Rapid, appropriate and multidisciplinary care is essential to prevent potential complications associated with these fractures.

The surgical treatment is distinguished by the significant evolution of osteosynthesis techniques, and it is the only guarantee of obtaining a favourable outcome both clinically and radiologically. This approach has greatly improved the prognosis of femur distal end fractures by providing increased stability and the possibility of early care. The comminative and joint nature of these fractures is at the basis of the problem of osteosynthesis and subsequent complications.

Nevertheless, despite the advances in surgery in this type of fractures, some complications are still observed in more serious forms, including infection, pseudoarthrosis and knee stiffness, in addition to the risk of arthrosis in the long term.

Compliance with ethical standard

Disclosure of conflict of interest

The authors declare no conflict of interest regarding the publication of this article.

Statement of informed consent

Informed consent was obtained from the patient included in the study. The patient information was be kept confidential during and after study period.

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