



Evaluation of Surgical Treatment for Recent Epiphyseal Avulsion Fractures of the Distal Femur at Centre Hospitalier National Matlaboul Fawzaini (CHNMFT): A Study of 30 Cases

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Abstract

Introduction: Epiphyseal avulsion fractures of the distal femur account for 30% of epiphyseal fractures noticed in children. Surgical treatment remains the gold standard for these fractures. **Materials and Methods:** This is a retrospective, descriptive, and evaluative study of 30 cases, conducted from January 2022 to December 31, 2024, at *Centre Hospitalier National Matlaboul Fawzaini (CHNMFT)* in Touba. **Results:** The average age of the patients was 15 years, with a clear predominance of males. Traffic accidents were the most common cause in 56% of cases. According to the SALTER and HARIS classification, Type II fractures were the most common in 97% of cases. “X”-shaped pinning combined with a cruro-pedious cast (PCP) was the most frequent treatment in 57% of cases. Over an average follow-up period of 29.6 months, ranging from 6 to 48 months, we evaluated our patients according to the lower extremity assessment criteria of the Société d’Orthopédie-Traumatologie de l’Est (SOTEST); our results were satisfactory in 90% of cases. **Conclusion:** Epiphyseal avulsion fractures of the distal femur are becoming increasingly common. Their management remains an absolute emergency. Treatment may be orthopedic or surgical. The most common complications observed are lower limb length discrepancy, angular deviation, and knee stiffness.

Subject Areas

Orthopedics

Keywords

Epiphyseal Avulsion Fractures, Distal Femur, Growth Plate, “X”-Shaped Pinning, Stiffness, Evaluation

1. Introduction

Epiphyseal avulsion fractures of the distal femur are, by definition, specific to children. This condition involves a disruption of the growth plate at the distal end of the femur. First described in 1867 by OLLIER, DEEF is a relatively rare condition, accounting for only 30% of epiphyseal fractures in children, with a predominance in males [1]. They most often occur during traffic accidents, with a peak incidence between the ages of 11 and 16 [2].

Management of these fractures remains an absolute emergency. Treatment may be orthopedic or surgical [3].

The prognosis is usually poor, characterized by lower limb length discrepancy (LLD), angular deformity, knee stiffness, and, most importantly, epiphysiodesis [2]. The objective of this study is to evaluate the surgical treatment of these fractures.

2. Materials and Methods

From January 2022 to December 31, 2024—a period of 36 months—we identified 30 cases of Epiphyseal avulsion fractures of the distal femur in the Orthopedics and Traumatology Department of Centre Hospitalier National Matlaboul Fawzaini (CHNMFT). The mean age of the patients was 15 years, with ages ranging from 8 to 20 years.

Inclusion criteria applied to patients who presented with Epiphyseal avulsion fractures of the distal femur before the age of 21 days.

We observed the presence of the growth plate at the age of 20 in one patient.

Table 1. SOTEST lower limb assessment criteria [5].

quote	3	2	1	0
Pain	absent	Intermittently or at the end of the day	During exercise	Permanent
Walk	Normal	Limping caused by exertion	Permanent limp	A cane
activity	Same activity Sport reform	Same activity Unable to do sport	Career change Decline of activity	Invalid
mobility	Normal	Complete extension flexion > 120° < 90°	Flexion > 90° < 60°	10° extension error Stiffness Flexion < 60°
stability	Normal	Few discrepancies	Frequent deviation	A cane Impotent instability
length	Normal	Contraction < 2 cm	Contraction > 2 cm < 4 cm	Contraction < 4 cm
		Varus < 5°	10° > varus > 5°	Varus > 10°
		Valgus < 5°	10° > valgus > 5°	Valgus > 10°
Axis	Normal	Flessum < 5°	flessum < 5°	flessum > 10°
		recurvatum < 5°	recurvatum > 5°	recurvatum > 10°

The study population consisted of 27 boys and 3 girls, 50% of whom attended Franco-Arabic schools and 43% of whom attended Quranic schools; 56% were victims of traffic accidents and 20% of recreational accidents. According to the Salter and Harris (S.H.) classification [4], the cases were distributed as follows: Type I (n = 1), Type II (n = 29). Surgical treatment was performed in all cases: “X” pins reinforced with a PCP in 17 cases and “X” pins combined with screw fixation reinforced with a PCP in 11 cases. Over an average follow-up period of 29.6 months, we evaluated our patients according to the lower extremity assessment criteria of the Société d’Orthopédie-Traumatologie de l’Est (SOTEST, **Table 1**) [5] and overall patient satisfaction.

The result was very good (above 19 points), good (between 16 and 19 points), average (between 12 and 15 points), or poor (below 12 points).

3. Results



Figure 1. A) Epiphyseal avulsion fracture of the distal end of the femur type II of Salter and Harris; B) Traitement par embrochage en X + vissage + PCP.

We observed a predominance of male patients with an average age of 15 years among school-aged adolescents who were victims of 56% of ACR cases. The time to consultation was less than 24 hours in 84% of cases, with an average time to treatment of 5 days. According to the S and H classification, Type II fractures were the most common in 97% of cases. “X”-shaped pinning combined with a PCP was the most common fixation method in 57% of cases, followed by “X”-shaped pinning combined with screws and a PCP in 37% of cases (**Figure 1**, **Figure 2**). In terms of recovery, partial weight-bearing was permitted on postoperative day 21 after removal of the cast. Functional rehabilitation was performed in 20 patients, with an average of 11.7 sessions. The remaining patients opted for self-rehabilitation. In addition, 23 patients have completed the follow-up, and we noted 4 cases of infection at the pin entry sites, 1 case requiring removal of the osteosynthesis hardware, 5 cases of knee stiffness, 2 cases of ILMI, Clinically assessed with the patient in the supine position: using a tape measure, the distance from the anterior

superior iliac spine to the medial malleolus is measured and compared for each limb, 1 case of varus deformity of the knee clinically assessed in a standing subject by measuring the medial intercondylar and medial intermalleolar distances, and 1 case of malunion (**Figure 3**). The mean time to union was 6 weeks. Over an average follow-up period of 29.6 months, ranging from 6 to 48 months, we evaluated 23 patients using the SOTEST criteria, and a “Very Good” score was recorded in 70% (n = 16), a “Good” score for 17% (n = 4), and an “Average” score for 13% (n = 3) of our patients. Based on overall patient satisfaction, 65% (n = 15) were very satisfied, 26% (n = 6) were satisfied, 4.5% (n = 1) were disappointed, and 4.5% (n = 1) were dissatisfied.



Figure 2. A) Epiphyseal avulsion fracture of the distal end of the femur type I of Salter and Harris; B) Traitement par embrochage en X + PCP.



Figure 3. Patient presenting with a right varus knee and leg-length discrepancy.

4. Discussion

It will focus on treatment and outcomes.

The average time to treatment was 5 days. This long wait time could be explained by the high cost of care and surgery, as well as the absence or inadequacy of health insurance coverage. Our results are significantly better than those reported in the literature [6]-[8].

PCP-reinforced “X” pinning was the most common technique in 57% of cases, followed by pinning combined with screw fixation in 37% of cases. Our results are consistent with those reported by various authors [6] [9] [10]. This diversity in surgical techniques depends, on the one hand, on the stability of the fracture and surgical schools of thought, and, on the other hand, on the fact that pins are less traumatic to the growth plate compared to screws, which are larger in diameter. Screw fixation was performed exclusively in a transverse direction.

We noted four (4) cases of superficial infections involving osteosynthesis hardware, representing 13.3%, which resolved well after specific antibiotic therapy.

Knee stiffness was observed in 16.6% of our patients. It remains the most common complication in the series reported by various authors [8]-[10].

Early and appropriate rehabilitation remains necessary to ensure a free and mobile joint.

Indeed, prolonged use of a PCP and a lack of assisted rehabilitation in some patients could explain this stiffness.

ILMI and varus deformity of the knee were present in 6.6% and 3.3% of patients, respectively. This can be explained by inadequate fracture reduction leading to shortening or axial deviation of the limb. This same finding has been reported by several authors [6] [7]. However, extremely rare complications, including one case of removal of the osteosynthesis hardware and one case of malunion, were recorded.

These complications can occur following improper fracture reduction or early weight-bearing on the limb, leading to secondary displacement of the fracture and the removal of the osteosynthesis hardware. The average time to union was 6 weeks.

Our results contrast with those of some authors [8] [9], who reported times to union of 3.3 months and 2.8 months, respectively. According to the SOTEST evaluation criteria, a “Very Good” score was noted in 70% of cases, with an overall satisfaction rate of 91%. This can be explained by early functional rehabilitation, which began in the third postoperative week.

During our study, we encountered some difficulties, particularly regarding the maintenance of patient records and the loss of follow-up for certain patients.

5. Conclusion

Epiphyseal avulsion fracture of the distal end of the femur is becoming increasingly common, a trend linked to the rising number of traffic accidents. Its management remains an absolute priority. Treatment involves anatomical reduction, most often by surgical treatment. The prognosis is usually poor, characterized by ILMI, angular deviation, and knee stiffness, but also—and most importantly—epiphysiodesis.

Author Contributions

Mohamed Hachim contributed to the conception and drafting of the manuscript. Malick Diop contributed to its conception. Faty Balla Lo, Ibrahima S. Camara, Mayoro Sow, Bokar Sylla, and Ousmane Ba read the manuscript. Mohamed Daffé provided supervision.

Conflicts of Interest

The authors declare no conflicts of interest.

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