

## **Femoral fractures in children: Surgical treatment.**

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### **Summary:**

We performed a retrospective review of paediatric femoral fractures treated with flexible intramedullary nailing. The study was performed between January of 2004 and December of 2006. There was 14 children's with a mean age of 6,5 years. The clinical evaluation involved: age, gender, aetiology of fracture, side of the limb, time of hospitalization, Intra-operative and post-operative complications and time to full weight-bearing. There was rapid healing of the fracture, accelerate functional rehabilitation and early full weight-bearing.

The authors recommend the use of flexible intramedullary nailing for paediatric femoral fractures, because is a simple technique, rapid and reliable procedure with minimal complications, avoiding long hospitalization. This is also an easily removal material.

### **Introduction:**

Diaphyseal fractures of the femur represent 1-2% of fractures in children. They are 2.5 times more frequent in males than in females.

Classically, the treatment of choice has been conservative by means of continuous traction or spica casts resulting in long periods of hospitalization, being unable of bear weight and school leave.

Series of behavioral studies in theses children suggest the existence of a negative impact in this population. Still, conservative versus surgical treatment remains controversial. Endomedullary nailing in children was first describe about 2 decades ago, as a simpler procedure, it spares the physeal plates, it is not expensive, it is easy to remove, and allows early deambulation (48-72 hours).

The potential advantages of this treatment are the improvement of the outcomes, reduced hospitalization time, and decreased complications.

Children are able to return to school as soon as 15 days after surgery, upon they become familiar with the use of crutches.



Fig.1. Surgical technique for elastic endomedullary nailing.

**Materials and Methods:**

This was a retrospective study, between January 2004 and December 2006.

All cases were treated with closed reduction and internal fixation with elastic stable endomedullary nails (Fig. 1).

There were 14 patients, 3 females and 11 males (age 3-14), mean age was 6.5 years old.

Data was collected from the medical records, as well as in the outpatient clinic; the criteria were: Age, sex, side of injury, insulting injury, shortening, length of in-hospital stay.

**Results:**

We included 14 children with femoral diaphyseal fracture treated surgically with endomedullary elastic nails, 4 children in 2004; 5 children in 2005, and 5 in 2006 (Fig. 2).

Table 1. Sex distribution.

Sex	2004	2005	2006	Total	%
Feminine		1	2	3	21%
Masculine	4	4	3	11	79%
Total	4	5	5	14	100%

There was a higher incidence in the male population.

Age	2004	2005	2006	Total	%
De 0-5 y.o.	1	2	1	4	29%
De 6-10	3	3	3	9	64%
De 11-15	-	-	1	1	7%
Total	4	5	5	14	100%

Table 2. Age distribution.

Table 3. Side of injury distribution.

Side	2004	2005	2006	Total	%
Right	3	2	2	7	50%
Left	1	3	3	7	50%

Total	4	5	5	14	100%
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Fracture etiology:

There were 7 fractures related to MVA (pedestrian vs. vehicle), 3 during recreational activities, 3 falls within home, 1 related to MVA (car wrack) .

Perioperative complications:

There were no intra-operative complications.

There was 1 case (7%) of wound infection, after a fall that caused a laceration “inside-out” due to protrusion of the nail. Two cases (14%) had a external rotational deformity that corrected in bipedestation. We did not have any cases with delayed consolidation or pseudarthroses.



Fig.2. Diaphyseal fracture of the femur in a 8 y.o. patient, MVA (pedestrian vs. vehicle). A.- Endomedullary elastic nailing. B.- One year follow up, with fracture consolidation.

Follow-up:

The mean follow-up was 20.5 months (5 to 36), all patients where autonomous at the end of their follow-up. We documented shortening in 4 children, between 0.5 and 1.2 cm (28,26%), corrected with insoles and with no clinical importance. Only one patient (7%) had a 1cm thigh atrophy. All fractures consolidated. (Fig. 3).

In-hospital stay:

The mean in-hospital stay was 3.92 days (2 to 7).

Patient satisfaction:

All parents were satisfied with the treatment (non-surgical and surgical), they stated that they would choose the same treatment considering the in-hospital stay and time to deambulation.



Fig 3. Short oblique diaphyseal femur fracture in a 4 y.o. child. (A) Pre-Op A-P radiograph. (B) Post-Op X-ray showing nailing of the fracture. (C) Three months follow up.

### Discussion:

Surgical treatment of Diaphyseal fractures of the femur is indicated in children age 3-4 until age 13-15. In presence of subtrochanteric, diaphyseal and distal metaphyses femoral fractures, the lower age limit should be raised due to the width of the medullary canal at these ages, it should be large enough to allow the introduction of 2 elastic nails.

This technique and the properties of the implants allow weight bearing and deambulation in a short period of time. Despite their higher costs, the titanium nails are preferred over the stainless steel nails in the pediatric patient.

The advantages over the external fixation are the apprehension of the patient and the family and the possibility of pin tract infections; and the advantage over plating is the less invasive technique for the implantation as well as for the removal of the hardware.

Endomedullary nailing is a widely accepted treatment for the first approach in the long bone fractures in children.

We studied all the patients treated surgically between 2004 and 2006, the results are promising both in morbidity and consolidation of the fractures.

### Conclusions:

Most fractures occurred in male patients, related to MVA (pedestrian vs. vehicle).

Complications were similar to the current literature when it comes to operative complications, infection, and shortening, they were not significant.

It is a simple, fast and safe technique with minimal complications.

We recommend this treatment to allow early mobilization, decreased length of in-hospital stay and early return to school and social activities.

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