

# The Pattern of Femoral Diaphyseal Fractures in Children Admitted in Sarawak General Hospital

A H Rasit, MS(Orth), A W Mohammad, MS(Orth), K L Pan, MS(Orth)

Department of Orthopaedic Surgery, Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak, Kuching, Sarawak, Malaysia

## Summary

Trend towards changing the face of management for pediatric femoral fractures tends to advocate operative treatment. This study was undertaken to review our current practice in the wake of recent progress in the management of pediatric femoral fractures. Fifty patients with femoral diaphyseal fracture treated in Sarawak General Hospital were reviewed retrospectively after an average follow-up of 2.6 years. There were 36 boys and 14 girls, with a mean age of 6.2 years (range five months to 14 years). Children under six years of age constituted the majority of the patients. Half of the fractures were caused by road traffic accident. Nine patients had associated injuries. The most common site of fracture was at the middle third (N = 31). The treatment regimens were delayed hip spica (DHS) in 16, immediate hip spica (IHS) in 24, plate osteosynthesis (PO) in five, titanium elastic nailing (TEN) in five, and external fixation (EF) in one. The minimum hospital stay was two days, and the maximum 33 days (mean, 9.7 days). Malunion was the commonest complication. Conservative treatment is the preferred option for children under six years of age. It is cost-effective with minimal complication. The other treatment options are reserved for specific indication in older children. Diaphyseal fractures of the femur in children can be adequately managed non-operatively.

**Key Words:** Femur, Children, Fracture, Sarawak General Hospital

## Introduction

There has been no reported case study on pediatric femoral fractures in Sarawak. The purpose of this study is to provide an epidemiology data on pediatric femoral fractures treated in Sarawak General Hospital. This study is very important to initiate further clinical study for the reason of providing the optimum care to the paediatric orthopaedic patients.

## Materials and Methods

### Study Design

This is a retrospective study on femoral fractures in children age below 14 years old admitted in the Sarawak General Hospital from January 2002 until December 2004.

### Patients

There were fifty femoral fractures (50 children; 36 boys and 14 girls) with an average age of 6.2 years old. The majority of patients were Malay (57%), followed by Chinese (23%), Iban (10%) and Bidayuh (10%).

### Treatment Options

The treatment options include immediate hip spica (IHS), delayed hip spica (DHS), plate osteosynthesis (PO), titanium elastic nailing (TEN) and external fixation (EF). Immediate hip spica is defined as application of hip spica cast within 72 hours following injury. Delayed hip spica indicates application of hip spica 72 hours after the injury. Plating is performed by using standard internal fixation techniques as described by the AO ASIF. Titanium elastic nailing is performed by closed reduction under image intensifier guidance.

using two titanium elastic nails of similar diameter. External fixation is performed by reduction of fracture and stabilization with any type of external fixator. The choice of the treatment method is based on the age of the patient and the presence of open fracture and polytrauma.

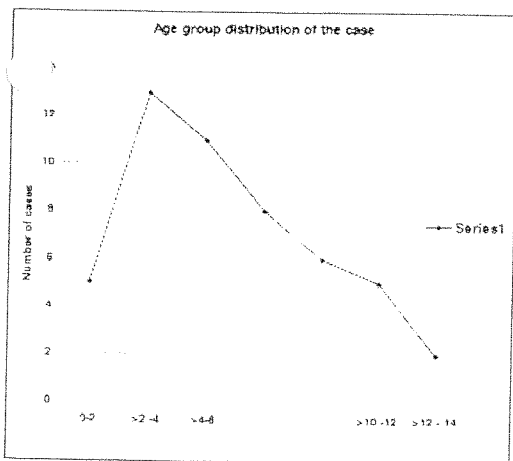
**Results**

**Demographic Data**

The age distribution for femoral fractures in children in our series showed a peak incidence between 2 to 4 years (Fig. 1). The fractures affected boys (72%) more than girls (28%). This finding is similar to other series<sup>1,2</sup>. Majority of the cases were Malay (57%); followed by Chinese (23%), Iban (10%) and Bidayuh (10%). These data correspond to racial distribution of patients admitted to the Sarawak General Hospital.

Half of the fractures were caused by a fall occurring at home in 80% and at school in 20% of the cases. Road traffic accidents accounted for the remaining 50% involving bicycle riders in 29%, pedestrians 29%, pillion riders 28% and car occupants 14%.

The most common site of fracture was the middle third (N = 31), and 34 were at the right femur. Except for one case, all fractures were closed.



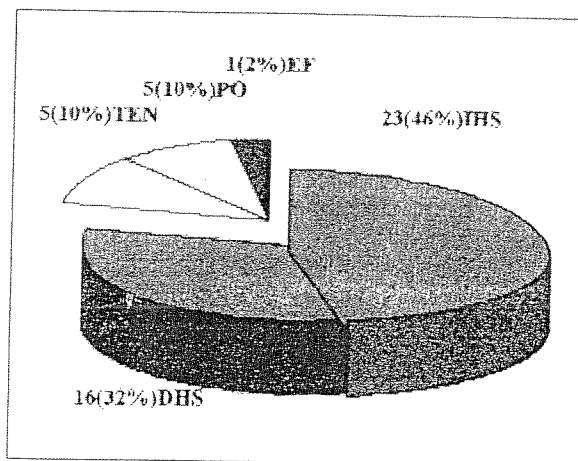
**Fig. 1: Distribution of the cases according to age group**

**Treatment**

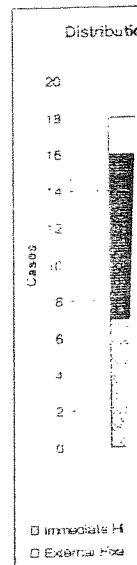
DHS was used in 16 patients (32%), IHS 24(46%), PO 5(10%), TEN 5(10%), and EF in one (two percent) as shown in Fig. 2. The minimum duration of hospital stay was two days, and the maximum was 33 days (mean, 9.7 days). The average follow-up was 2.6 years. The treatment trend for pediatric femoral fractures in our series showed increasing preference to flexible nailing. However the preamble choice of treatment was still immediate or delayed spica cast as shown in Fig. 3.

**Outcome**

All fractures united. In two patients in the group treated with immediate hip spica who developed significant loss of fracture reduction at two weeks post-treatment, the spica was noted to be loose. Both patients underwent second closed reduction and reapplication of hip spica. Two patients with osteogenesis imperfecta who were treated with hip spica had re-fracture at the old fracture site, and immediate reapplication of the hip spica was carried out. At two years follow-up, two patients treated with delayed hip spica had malunion with an angulation of more than 20°. There was no major complication in the operative group except for one patient treated with TEN. He had 15° of angulation, due to early weight bearing.



**Fig. 2: Distribution of Treatment Options**



**Fig. 3: Distribution of Treatment Options**

**Discussion**

Fractures of the femoral shaft in children represent about 10% of all fractures in children. In Sarawak, Sarawak General Hospital, the number of hospitalizations for femoral shaft fractures in children is increasing.

Until the late 1980s, the femoral shaft fracture in children was treated with a cast. After two weeks, the cast was removed and the child was referred to a specialist for further treatment.

Hedin *et al.* reported that the main factor for the number of hospitalizations for femoral shaft fractures in children in Malaysia is the conservative treatment. Conservative treatment is a safe, non-operative treatment for children under two years of age. The majority of children under two years of age are treated conservatively and affordably.

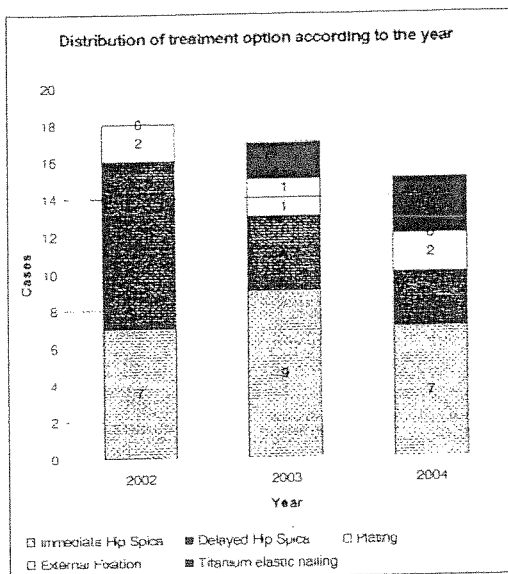


Fig. 3: Distribution of the treatment option by year

**Discussion**

Fractures of the femur can be the most disturbing injury to both the child and the parent. Femoral fractures represent about two percent of all fractures in children. Children with femoral fractures always require hospitalization with much higher resources than that of other childhood fractures<sup>1</sup>.

Until the last few years, the treatment for pediatric femoral shaft fractures in our center has been DHS cast after two weeks of preliminary traction. This regime is preferred as it was cheaper and it needed limited resource to provide the treatment.

Hedin *et al.*<sup>2</sup> in their multicenter study reported that the main factor in determining the cost of treatment was the number of days in hospital. In other study in West Malaysia, Moses *et al.*(1998) reported that the conservative management of femur fracture in children is a safe, simple and practical method to treat the childhood femoral shaft fracture. In our series, non-operative treatment was the preferred choice based on two considerations: the cost and the age of the patient. The majority of our patients are in the age group of two to six years, and these patients tolerated non-operative treatment regime. Conservative treatment remains safe and affordable to our local population.

In the last decade, there has been a trend towards surgical treatment for pediatric femoral fractures. The main advantage of operative treatment is the shortened hospitalization time. Available options include PO, EF and TEN. Our experience in using TEN is still early but we have been using External Fixation (EF) and Plate Osteosynthesis (PO) for open fractures and polytrauma patients.

Metaizeau strongly suggested that the new treatment with TEN was becoming more practical as non-operative treatment necessitated a long hospital stay for traction and subsequent immobilisation in an uncomfortable cast. This treatment was not well tolerated, especially in adolescents. Moreover, near the end of growth, accurate reduction was necessary, as malunion was no longer correctable by growth.

TEN uses two flexible nails which are introduced percutaneously either through the lower metaphysis or the subtrochanteric area. This technique does not disturb the healing of the fracture. The elasticity of the device allows slight movement at the fracture site which favours union. Reduction and stabilisation are adequate and the operative risk is very low. A cast is not required, functional recovery is rapid and the patient is allowed to walk with crutches after seven to ten days according to the type of fracture. This technique is very efficient in adolescents and can be used after the age of seven years when non-operative treatment is unsuccessful.

In other study Houshian *et al.*<sup>3</sup> reported that TEN seemed to be a safe method for the treatment of femoral shaft fractures in children between four and 11 years of age even in grade I open fracture of femur.

Flyn *et al.*<sup>4</sup> in their cohort study further supported that the patient treated in TEN group achieved recovery milestones significantly faster than a child treated with traction and a spica cast. They also reported that the hospital charges for the two treatment methods were similar. The complication rate associated with nailing compared favorably with that associated with traction and application of a spica cast.

Narayanan *et al.*<sup>5</sup> analyzed their first 5-year experience with TEN, specifically highlighting the complications associated with this technique and the pitfalls to avoid. The surgeon should advance nail ends to lie against the supracondylar flare to avoid symptoms at the insertion site and should avoid implanting nails of two different

46%), PO percent) as spital stay ys (mean, ears. The res in our le nailing. was still Fig. 3.

he group eveloped eeks post- se. Both tion and ts with hip site, and as c ed ated with gulation of tion in the ated with dy weight



ons

diameters. In cases of comminuted fractures, close monitoring should be carried out with a view to provide additional immobilization.

However, Luhmann *et al.*<sup>5</sup> reported that there were two major postoperative complications: one septic arthritis after nail removal and one hypertrophic nonunion. Minor postoperative complications were pain at the nails in 13 extremities, nail protrusion through the skin in four, and one delayed union. To minimize the complication they recommended leaving less than 2 mm of nail out of the femur and using the largest nail size possible.

Our experience indicates that conservative treatment is still preferable not only because of the cost but the majority of our patients are in age group below six years in which non-operative treatment is safe with minimal complication. Other treatment options are reserved for specific indication for example; external fixation for open fracture, plating for polytrauma patient and TEN for patients above six years of age where non-operative treatment is less tolerable in our

hot and humid weather. The new treatment trend for pediatric femoral fractures, especially TEN should provide improved care in the near future after refining the technique to avoid major complications as well as to provide comfort to our patients in the temperate region.

### Conclusion

Femoral fracture in children represents a potentially disturbing and disabling injury. Current trend favoring surgical treatment is appealing but conservative treatment remains a viable option especially for those below the age of six years.

### Acknowledgement

We are grateful to Miss Bibiana Wong and staff of medical report department of Sarawak General Hospital. We also would like to thank the Director of Sarawak general hospital for permission to carry out this study.

### References

- Hedin H. Surgical treatment of femoral fractures in children. Comparison between external fixation and elastic intramedullary nails: A review. *Acta Orthop Scand.* 2004; 75(3): 231-40.
- Bridgman S, Wilson R. Epidemiology of femoral fractures in children in the West Midlands region of England 1991 to 2001. *J Bone Joint Surg.* 2004; 86-B(8): 1152-7.
- Al-Habdan I. Diaphyseal femoral fractures in children. Should we change the present mode of treatment? *Int Surg.* 2004; 89(4): 236-9.
- Hedin H, Borgquist L, Larsson S. A Cost analysis of three methods of treating femoral shaft fractures in children: A comparison of traction in hospital, traction in hospital/home and external fixation. *Acta Orthop Scand.* 2004; 75(3): 241-8.
- Moses T, Pan KL, Razak MA. Conservative treatment of femoral shaft fractures in children. *Med J Malaysia.* 1998; 53 (Suppl. A): 22-6.
- Metaizeau JP. Stable elastic intramedullary nailing for fractures of the femur in children. *J Bone Joint Surg.* 2004; 86-B(7): 954-7.
- Houshian S, Gothgen CB, Pederson NW, Harving S. Femoral shaft fractures in children: Elastic stable intramedullary nailing in 31 cases. *Acta Orthop Scand.* 2004; 75(3): 249-51.
- Flynn JM, Leudtke LM, Ganley TJ *et al.* Comparison of titanium elastic nails with traction and a spica cast to treat femoral fractures in children. *J Bone J Surg.* 2004; 86-A(4): 770-7.
- Narayanan UG, Hyman JE, Wainwright AM *et al.* Complications of elastic stable intramedullary nail fixation of pediatric femoral fractures, and how to avoid them? *J Pediatr Orthop.* 2004; 24(4): 363-9.
- Luhmann SJ, Schootman M, Schoenecker PI *et al.* Complications of titanium elastic nails for pediatric femoral shaft fractures. *J Pediatr Orthop.* 2003; 23(4): 443-

# Apollo@ Malaya

A A Abbas, M

Department of  
Selangor, Malay:

### Summary

Total knee arthroplasty is the short-term treatment for an average for Apollo@ Total knee analogue screws were a System. Degenerative knees were a years (range, 1-11 years), respectively. The survivor. The the Apollo@

### Key Words

### Introduction

Total knee arthroplasty treatment of bicompartmental desired goals: deformity, stability and most serious successful i

The aim of and function utilizing the Malaya Me