



Original Article

Epidemiologic, Diagnostic and Therapeutic Aspects of Paediatric Femoral Shaft Fractures at The Yaounde Gynaeco-Obstetric and Paediatric Hospital

Épidémiologie, diagnostic et traitement des fractures de la diaphyse fémorale de l'enfant à l'Hôpital Gynéco-Obstétrique et Pédiatrique de Yaoundé

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RÉSUMÉ

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Abbreviation
YGOPH; Yaounde Gynaeco-Obstetric and Paediatric Hospital

Introduction. Femoral shaft fractures (FSF) are common in the paediatric age group. They represent 1.4 to 1.7% of fractures in children and 20% of children hospitalized for fractures. It is a traumatologic emergency, whose diagnosis is clinical and the prognosis is generally good. The aim of the study was to describe the epidemiologic, diagnostic and therapeutic aspects of FSF in children at the Yaounde Gynaeco-Obstetric and Paediatric Hospital (YGOPH). **Methods.** This was a retrospective descriptive study from 2004 to 2016 and prospective study from November 2016 to February 2017. It was conducted at the paediatric surgical service of the YGOPH. We included patients aged 0 to 15 years of age who were treated in the service, excluding those who were discharged against medical advice. **Results.** FSF represented 67 (91.8%) of femoral fractures. The mean age was 4.7±4.3 years among which 46 (68.7%) were males. 41 (61.2%) were schooling. The main circumstance of occurrence was road traffic accident 32(47.8%). Clinically, deformity (94%) predominated. (65%) of fractures affected the right limb. The most common radiological sign was: the visibility of the transverse line of fracture (70.1%). Displacement was overlap in 31.3% of cases. The treatment was always orthopaedic (100%). The morbidity was mainly valgus angulation (16.5%). **Conclusion.** FSF occur mostly in male children of 4.7 years as a result of road traffic accidents. The diagnosis is clinical and the role of plain radiography is to assess fracture line and displacement. The treatment is usually orthopaedic.

ABSTRACT

Introduction. Les fractures de la diaphyse fémorale (FDF) sont fréquentes chez l'enfant. Elles représentent 1.4 à 1.7% des fractures chez l'enfant et 20% des patients hospitalisés. C'est une urgence traumatologique. Le diagnostic est clinique et le pronostic est bon. Le but de l'étude était de décrire les aspects épidémiologiques, diagnostiques et thérapeutiques des fractures de la diaphyse fémorale chez l'enfant à l'Hôpital Gynéco-Obstétrique et Pédiatrique de Yaoundé (HGOPY). **Méthodologie.** Il s'agit d'une étude transversale rétrospective descriptive de 2004 à 2016 et prospective de Novembre 2016 à Février 2017. Elle a été menée dans le service de chirurgie pédiatrique de l'HGOPY chez les enfants âgés de 15 ans ou moins. Les variables d'intérêt étaient les aspects sociodémographiques, diagnostiques et thérapeutiques des enfants souffrant de fractures de la diaphyse. **Résultats.** Les FDFs représentaient 67 (91.8%) des fractures fémorales. L'âge moyen était 4.7±4.3 ans parmi lesquels 46 (68.7%) étaient de sexe masculin. 41 (61.2%) étaient scolarisés. La circonstance de survenue la plus fréquente était les accidents de la voie publique 32(47.8%). Cliniquement, la déformation (94%) prédominait. (65%) des fractures étaient à droite. Le trait: (70.1%) transverse prédominait. Le chevauchement (31.3%) était le déplacement le plus fréquent. Le traitement était orthopédique (100%). L'angulation valgus était la morbidité la plus fréquente (16.5%). **Conclusion.** Les FDFs sont fréquentes chez le garçon de 4.7 ans survenu à la cour d'un accident de la circulation. Le diagnostic est clinique et fait appel à la radiographie standard pour préciser le trait et le déplacement. Le traitement est essentiellement orthopédique.

BACKGROUND

Paediatric traumatology has a place of choice in the activities of paediatric-surgeons of the Yaounde Gynaeco-Obstetric and Paediatric Hospital. Epidemiologic data of femoral shaft fractures represent 1.4%-1.7% of all fractures in children [1]. They are more common in boys than in girls [2]. Boys are having a bimodal distribution with a peak at 4 years and at 12 years [2]. Right femur is always of high frequency in children with right dominant side [3]. In a study done in Cameroon, the male to female ratio was 1.7:1 [4] with a bimodal distribution at age 6 years and 13 years [4] with place of occurrence been road traffic accident [4]. The circumstances of occurrence of femoral shaft fractures in children are due to the following; road traffic accident, falls, child abuse, obstetrical trauma and sports. In Cameroon, middle shaft fractures accounted for 86% of femoral shaft fractures [3]. Femoral shaft fractures in children can be diagnosed clinically and standard radiography is sufficient to identify the line and displacement of the fracture. Work-ups (full blood count, blood grouping and clotting profile) are needed before reduction of fracture. To the best of my knowledge, data in Cameroon with regards to the diagnostic aspect of femoral shaft fracture in children has not been clearly demonstrated. The steps of management are; pre-hospital care, emergency department care, consultation and further inpatient care. The principle of treatment include; reduction, restriction (fixation) and early mobilisation. Treatment is orthopaedic or surgical. The various therapeutic modalities are; skin traction, bone traction, pavlik harness, spica cast, flexible intramedullary nailing (FIN), intramedullary K-wires, titanium elastic nailing (TEN). All reductions procedures are done under anaesthesia [5]. In Cameroon, the main means of treatment is orthopaedic and revealing good results [4].

METHODS

Study design, setting and population

This was a retrospective (10th February 2004-10th November 2016) and prospective (11th November 2016-10th February 2017) study with descriptive patterns. This was conducted in the paediatric-surgical service at the Yaounde Gynaeco-Obstetric and Paediatric Hospital. This is a first category hospital in Cameroon health system. Patients who present with femoral shaft fracture are managed and followed-up in the paediatric surgical service.

Data collection

We used a convenience non probability sampling method for every patient respecting our inclusion criteria. We identified the time to diagnosis. This was the interval between injury and arrival at the hospital for treatment.



Figure 1: Mid-thigh deformity. (Thigh deformity in case of mid-shaft fracture superior collected from the paediatric-surgery ward - YGOPH)



Figure 2: Right middle shaft simple transverse femoral fracture collected at the YGOPH

We calculated from x-ray films; the line, the displacement and the location of fracture using a protractor, plane sheet of paper, negatoscope and a graduated ruler. Orthopaedic treatment was done by skin traction applied at the distal portion of the fractured femur. This was done with the limb horizontally at the level of the bed. We could also do bone traction (trans-trochanteric bone traction) on a Boppe splint. Bryant skin traction was considered only for children from zero to two years of age.

The length of traction was 15 days in average with a maximum of 21 days. Traction was done with 1/7th of body weight.



Figure 3: (a) Buck's Skin traction and (b) Unilateral hip spica cast at the YGOPH

A repeat x-ray is done. Follow up by day 8- day 10 is aimed at palpating a callus formation. The objective during this traction for those with non-union is to allow at most 1-2 cm of non-union. A unilateral hip spica cast is placed. Patient is monitored for extra 24hours and monitored for compartment syndrome. Plane X-ray of the thigh follow this sequence in days; day 0, 8, 15 and monthly.



Figure 4: repeat standard radiography of the femur at YGOPH.

The time to treatment was calculated. This was the interval between injury and initial treatment. Surgical treatment was discussed only for patients at the end of bone growth (children between 13-15 years of age). Anaesthesia was not use during this procedure.

Definition

- Femoral Shaft: The cylindrical, anteriorly arched body of the femur between 2.5cm distal to lesser trochanter and 2.5cm proximal to adductor tubercle.
- Children: Individuals from age 0 day to 15 years of life.
- Orthopaedic treatment: it is the correction or prevention of deformities, disorders or injuries of the skeleton and associated structures (as tendon, muscle and ligament).

Statistic analysis

Data were recorded immediately as it was collected into 2 different data bases created in a standby laptop. This was to ensure double data entry. At the end of each day the records of the 2 data bases were compared and verified for any immediate errors. Most of the data collected were analysed using Microsoft Excel 2010 and Epi-Info 7.

Sample size estimation

The sample size was estimated from the proportion of patients who had femoral shaft fracture 0.86 from previous studies in Cameroon [3]. A precision of 10% and a z value of 1.96. Based on these assumptions a minimum of 47 participants was required.

RESULTS

Femoral shaft fractures represented 67 (91.8%) of femoral fractures with a prevalence of 5.6 cases/year. The mean age was 4.7±4.3 years among which 46 (68.7%) were males. 41 (61.2%) were schooling. The main circumstance of occurrence was road traffic accident 32(47.8%). Children with right dominant side were 39 (79.6%).

The time to diagnosis was within the 1st 2 hours with 44 (65.7%) cases. The clinical aspects were; (94%) deformity, (85.1%) patella externally rotated and (85.1%) external border of foot lying against the bed.

Table 1: Clinical presentation of femoral shaft fracture

Clinical presentation		n(%)
Deformity		63(94.0)
Position of limb	externally rotated	57(85.0)
	not externally rotated	10(15.0)
Position of patella	externality rotated	57(85.0)
	not externality rotated	10(15.0)
Apparent shortening		49(73.1)

Most femoral shaft fractures were to the right with 65%.

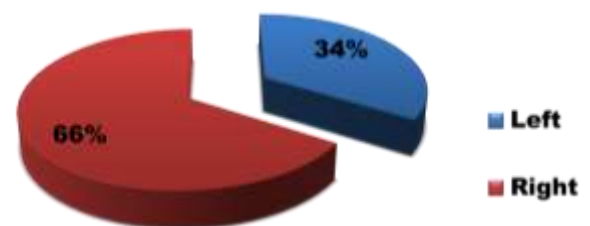


Figure 5: Site of occurrence of femoral shaft.

Standard radiography of the thigh was done by all patients 67 (100%). Combine standard radiography of the pelvis and of the thigh was done by 2 (3.0%) of cases. The paraclinical aspects were: (70.1%) transverse, (13.4%) spiral, (11.9%) oblique, and (4.5%) complex line of fracture.

Table 2: Clinical presentation of femoral shaft fracture.

Line of fracture	n	%
Transverse	47	70.1
Oblique	8	12.0
Spiral	9	13.4
complex	2	3.0

Displacements were mainly; 21(31.3%) overlap and 11(16.5%) varum angulation. The time to treatment was <2 hours in 64.2% of cases. The treatment was essentially orthopaedic (100%) and dominated by early skin traction and casting (100%) with palpable callus at 8-10 days. The morbidity of femoral shaft fracture in children is mainly related varum angulation (16.5%) and lengthening (9.0%).

DISCUSSION

The ages of these patients were in the interval Day 0 to 15 years. The mean age was 4.7±4.3 years. A smaller mean was seen in a study done by catena et al [6] with a mean of 3.3±1.1. This was because only children below six years of age were included. This was compared to 6.8±4.7 gotten form Hoffmann et al [7]. This increase in the mean was due to the fact only patient with a two year follow up were recruited in the study. There was a bimodal distribution at age <1 year and at 3years. A controversy were observed in the study by Catena et al [6] and Komlatsè et al [8] with a bimodal distribution at early infancy and late infancy. This was because new born with obstetric trauma were excluded or less in this study respectively.

There were more males involved in the study than females with a male to female ratio of 2.2:1. This was similar to that reported by Bob'oyono et al in Cameroon in 2014 [4] and Catena et al [6] with a ratio of 1.7:1 and 3:1 respectively.

We had 41 (61.2%) cases of children going to school and 26 (38.8%) were not going to school. This was low when compared with Mansoor et al [9] with 61(40.4%) children going to school. This was because this study included adolescent.

The majority of patients were right handed 28 (65.1%) and more fractures were to the right. This was because dominant side was the right and respecting the mechanism of injury.

The main place of fracture was road traffic accidents with 32(47.8%) cases. This was low when compared to the study done by Bob'Oyono et al [4], with 55% of road traffic accident. This was explained by the fact that only infants where uses and infants were always involved in road traffic accidents.

This was similar to Rapp et al [10] with approximately 66%. This was similar to the study done by catena et al [6] with 57% of cases. This was due to the fact that; both studies had similar mean age hence similar activities. Delivery accounted for 3 (4.5%) cases of femoral shaft fractures. This was similar to 10 cases

gotten form Ramprasad et al [11]. This was because Ramprasad et al [11] worked in a specialized hospital for orthopaedic centre like in our context (reference hospital). We had 2 (3.0%) cases of child abuse diagnosed below 4years. This was low when compared to Catena et al [6] who identified child abuse to be 30-80% of fractures. Also this was low when compared to Murphy et al [12] who identified child abuse to be 13 (25%) of child abuse. This was because battery in less encountered in the African context.

The qualification of referrer was dominated by doctors with 7 (10.5%). This was because doctors are the once to take decision on patient transfer.

Diagnostic aspect

The time to diagnosis was from 0-24 hours with a mean of 2hours. This was similar to the study done by Akiyoola et al [13] with a mean of 3 hours and ranging from 10 min to 6 days. This was because of the incomparable role played by the lower limb (walking). Secondly this study was conducted in a reference hospital where parents generally had good socio economic background (parental education and family income). The majority of femoral shaft fractures were more to the right 44 (65.7%). This was in contrast with Bob' Oyono et al [4] with 26 (65%) to the left. This was because they did not have similar dominant side. Similarly road traffic accident was more with Bob' Oyono et al [4] is explained by the side for pedestrians to cross the road exposing the left femur.

The presentation of femoral shaft fracture included; deformity 63 (94.0%). This was due to the initial angulation created at the fracture side. External rotation 57 (85.1%) of the limb and the patella 57 (85.1%) and the external border of the foot lying against the bed 57 (85.1%) were also common. These high frequencies were due to the fact that all fractures received were complete fractures. Also, the lost in the stability of the limb leads to this vicious position of the limb.

Most fracture were to the right with 44(66%) of cases. This was much larger when compared to catena et al [6] with 44% to the right. This result was explained by the fact that patients had more road traffic accidents and it was while crossing the road. This was similar again to Bob' Oyono et al [4] with 65% to the left. This result was explained by the fact that patients had more road traffic accidents and it was while crossing the road.

All patients had a standard radiography of the femur being done 67(100%). Two patients did a standard radiography of the pelvis 2 (3.0%). This was because patients did not have enough money to pay the bills.

The most common line of fracture was transverse fracture 47(70.1%). This was larger when compared to D'Ollonne et al [14] with 13.0% of transverse fracture. This could be explained by the high frequency of fall from height hence increasing the number of spiral fractures.

The major complications of femoral shaft fracture encountered here was; overlap (31.3%). This was larger when compared to Sagan et al [15] with 5(7.1%) of

varus angulation. This was because he studied only complications due to femoral shaft fractures.

Therapeutic aspect

The time to treatment was for a great majority 43 (64.2%) cases within 0-2hours. This was because the severe pain and the limb impotence endured by the patient led to his immediate treatment. The main type of management here was orthopaedic 67 (100%). This was similar to Akinyoola et al [13] with 100% orthopaedic treatment.

None of the patients in YGOPH with femoral shaft fractures underwent orthopaedic reduction in the theatre under anaesthesia. Sedation was used in 12 (17.9%) cases. Most reductions were done at bed side. This was in contrast with Jauquier et al [16] with 6(13.1%) of patients who underwent anaesthesia (general anaesthesia). This was because the hospital insurances existed in their hospital setting.

All patients underwent early traction followed by casting 67(100%). This was larger when compared to Akinyoola et al [13] with 5.8%. this was because the commonest method of treatment was skin traction alone.

Bryant traction was done for 17 (25.4%) of cases. This was smaller when compared to Akinyoola et al [13] with 3.6% of cases. This was because he had a mean age of 6.1 years.

We had 16 (23.9%) of skin lesions. This was higher when compared to Jauquier et al [16] with 2 (4.4%) of skin lesions. This was because only 41.31% of his patients underwent orthopaedic treatment. Skin itches were more predominant with 16 (23.9%). This was because not enough soft bands were used and the cast was sometime in contact with the underling skin. Some patients presented with deteriorating cast 14 (20.9%). This is because not enough casting material was used in the confection of the cast. More so waterproof liners were not used in our practice to prevent easy deterioration.

All patients were healed. This was similar to Catena et al [6] with a 100% patient healed. This was because of the rigorous follow-up.

The mean time of healing was 45 days with an interval of 42 days to 50 days. The mode was that of 44 days. This was higher when compared to Akinyoola et al [13] with a value of 1.4 weeks this was because he had an interval of 0-7 weeks as time of healing and defined it was the time to discharge.

CONCLUSION

We had 67 cases femoral shaft fractures. Mean age 4.7±4.3 years male predominant (68.7%). Clinical diagnosis: limb attitude (85.0%). No patient underwent general anaesthesia (0%). The only treatment was orthopaedic (100%). The morbidity: varum angulation(20%).

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Authors' contribution: DG collected data from files of patients and from newly admitted patients. DG wrote the manuscript. MTF and NNM supervised this work. First corrections was done by PNT. All authors approved final manuscript and are responsible for it.

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