Causes of Femoral Shaft Fracture in Children Under Five Years of Age

YONGYOT JEERATHANYASAKUN, MD*,
DILOK BHUMMICHITRA, MD**,
DOOL KOVITVANITCHA, MD*,
PAICHIT HIRANYAVANITCH, MD**,
PISIT SUKSWAI, MD*,
VEERASAK THUMKUNANON, MD*,

Abstract

Objective : To study the causes of femoral shaft fracture in children younger than 5 years of age.

Study design : Retrospective, descriptive study.

Patients and Method : Medical records and radiographs of 39 children younger than 5 years of age with femoral shaft fractures treated in Queen Sirikit National Institute of Child Health during the years 1996-2001 were reviewed. The responsible causes for the femoral shaft fracture given by caretakers by interview were collected.

Results : The most common history was falling or jumping from a height (36%) followed by traffic accidents (26%) and object or person falling on top of them (23%) respectively. Only one case presented with a history of abuse. Nine cases were suspected of abuse, but, without further investigations it was not possible to identify the exact cause of fracture.

Conclusion : Histories given by caretakers for the cause of femoral shaft fracture in children younger than 5 years of age are varied. The orthopedists should find out the exact cause of fracture to prevent missed or delayed diagnosis of abuse that may have occurred.

Key word : Femoral Shaft Fracture, Cause, Children Under 5 years

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* Department of Orthopaedic Surgery,
** Consultant, Queen Sirikit National Institute of Child Health, Bangkok 10400, Thailand.

The causes of femoral shaft fracture in children are different; depending on the age of the child. For children younger than walking age, abuse is reported to be a major cause of up to 80 per cent (1), whereas, in older children it is mostly caused by high energy injuries(2).

The incidence of physical abuse in Queen Sirikit National Institute of Child Health during the years 1995-1999 was 0.3-3 case(s) per 100,000 patient visits(3). Usually one third of physically abused cases present with musculoskeletal injury, of which the femoral shaft is the second most common fracture site(4).

Blakemore et al(5) found that history of falls accounted for 81 per cent (34/42) of femoral fracture in children from 1-5 years of age. This study aimed to find out the cause of femoral shaft fracture in children younger than 5 years of age in one tertiary pediatric care center.

PATIENTS AND METHOD

The medical records and radiographs of children from birth to five years of age treated by orthopedists in the out-patient department and emergency room of Queen Sirikit National Institute of Child Health during the years 1996 to 2001, were reviewed. All patients had the diagnosis of femoral shaft fracture. Patients with femoral neck fractures, subtrochanteric fractures, and supracondylar fractures or greenstick fracture of the distal femur were excluded from the present study, as were patients with pathologic fractures.

Thirty nine patients were indexed to this study. Data collection included age, gender, location and morphologic features of fracture, associated injury (injuries) and the responsible causes of femoral shaft fracture given by caretakers by interview.

RESULTS

From 1996 to 2001, there were 39 femoral shaft fractures in 39 patients. The average age of the patients was 2 years and 5 months, with a range of 2 months to 5 years. The most common age group was the three to four years group (12, 31%), followed by the two to three years group (11, 28%). There were seven patients in each of birth to one year and one to two years groups. Twenty four (62%) were boys and fifteen (38%) were girls (Fig. 1). The fracture occurred on the right side in 24 patients (62%) and left side in 15 patients (38%). There were eleven fractures in the

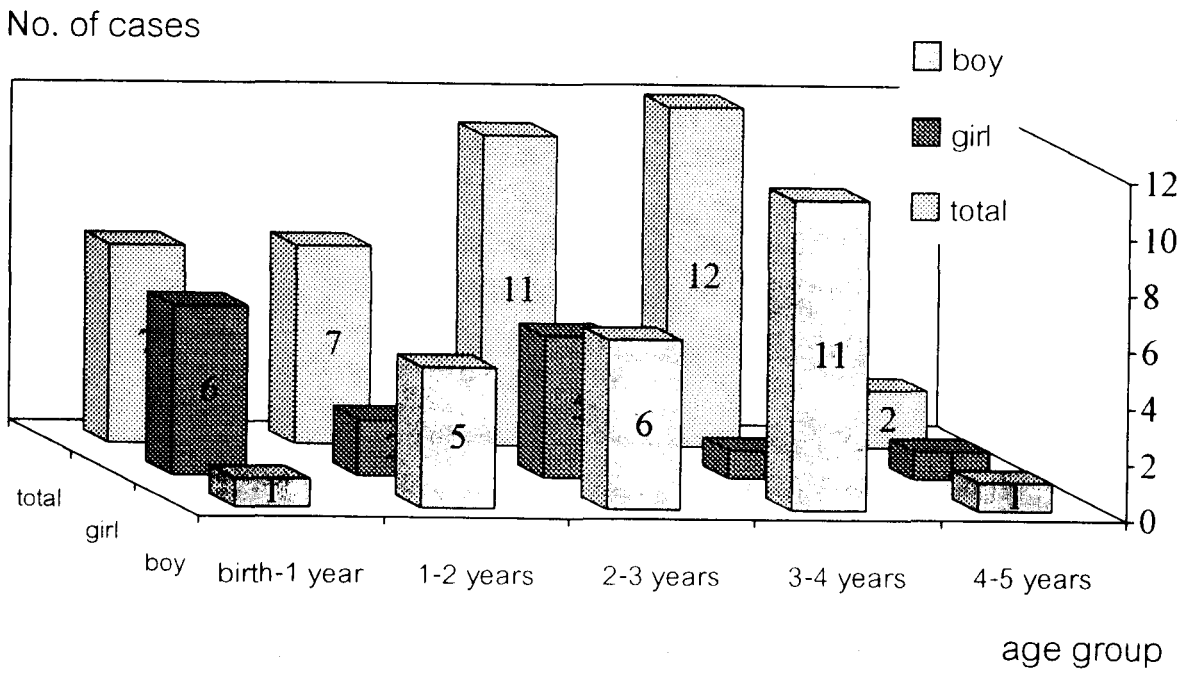

Fig. 1. Occurrence of femoral shaft fracture by age and gender.

proximal part (28%), twenty five (64%) in the middle part and three (8%) in the distal part of the shaft. A transverse fracture line (41%) was the most common, followed by spiral (36%) and oblique fracture lines (23%) respectively.

Most patients presented with an isolated femoral shaft fracture. Only five patients had an associated injury (injuries); one presented with multiple rib fractures with pneumothorax and intraventricular hemorrhage, one with a left brachial plexus injury, two with skull fractures and the last one with ipsilateral physeal injury of the distal tibia.

Histories were obtained from parents in all cases. The responsible causes of fracture were varied. The most common history was falling or jumping from a height. There were fourteen cases (36%) in this group including two cases (5%) with a history of falling out of bed. Ten cases (26%) were involved in a traffic accident. In this group, nine cases (23%) were pedestrians struck by a moving vehicle, whereas one was crushed in the vehicle. Nine cases (23%) were caused by an object or person falling on the patients. Two cases (5%) fell down while walking or running. The remaining causes were; abuse by a parent, stroller-related injury, vaccination and thigh massage by a parent (Table 1).

Medical care seeking was inappropriately delayed in three non-referral cases: 5, 8 and 9 days after the injury.

Skeletal survey was not performed in all cases.

Table 1. Histories given by caretakers for the cause of femoral shaft fracture.

History	No.	Percentage
Falling or jumping from a height	12	30.77
Falling out of bed	2	5.13
Pedestrian struck by a vehicle	9	23.08
Car accident	1	2.56
Object or person falling on the patient	9	23.08
Fell while walking or running	2	5.13
Stroller related injury	1	2.56
Abuse	1	2.56
Thigh massage by a father	1	2.56
Vaccination	1	2.56
Total	39	100

DISCUSSION

Falling and pedestrians struck by a vehicle are two of the most common mechanisms of femoral shaft fracture in children reported in the literature[2]. In the present study, falling from a height excluding falling out of bed (31%) was the most common mechanism of injury, followed by a pedestrian struck by a moving vehicle (23%). According to a previous study[4], 57 per cent of the histories of abused Thai children with long bone fracture is falling.

The femoral shaft fracture in walking children can occur in low energy injuries such as falling from a low height or falling while running[6,7]. In the present study, there were eight cases who fell from a low height or fall while running. Two out of eight cases also had a history of an inappropriate delay in seeking medical care.

The rarity of fracture in children falling out of bed has been confirmed. Helfer et al[8] reported only one long bone fracture in 304 patients falling out of bed at home and in the hospital. Nimityongskul et al[9] found only one tibial fracture in an osteoporosis imperfecta child out of 76 children who fell out of their hospital beds. Conversely, the authors found 2 cases out of 39 (5%) who had histories of falling

Table 2. Details of nine suspected cases of abuse.

Histories given by parents	Age	Gender	Criteria
Vaccination 9 days	0.2y	F	Unreasonable history, delayed care seeking
Person fell on the child while carrying him/her	0.4y	F	Non correlated history and finding
Person fell on the child while carrying him/her	0.6y	F	Non correlated history and finding
Falling out of bed	0.9y	M	Non correlated history and finding
Person fell on the child while carrying him/her	1.4y	M	Non correlated history and finding
Falling from table 8 days previously	1.5y	M	Delayed care seeking
Falling while walking 5 days previously	1.5y	F	Delayed care seeking
Thigh massage	3.4y	M	Previous abuse, unreasonable history
Falling out of bed	3.6y	M	Non correlated history and finding

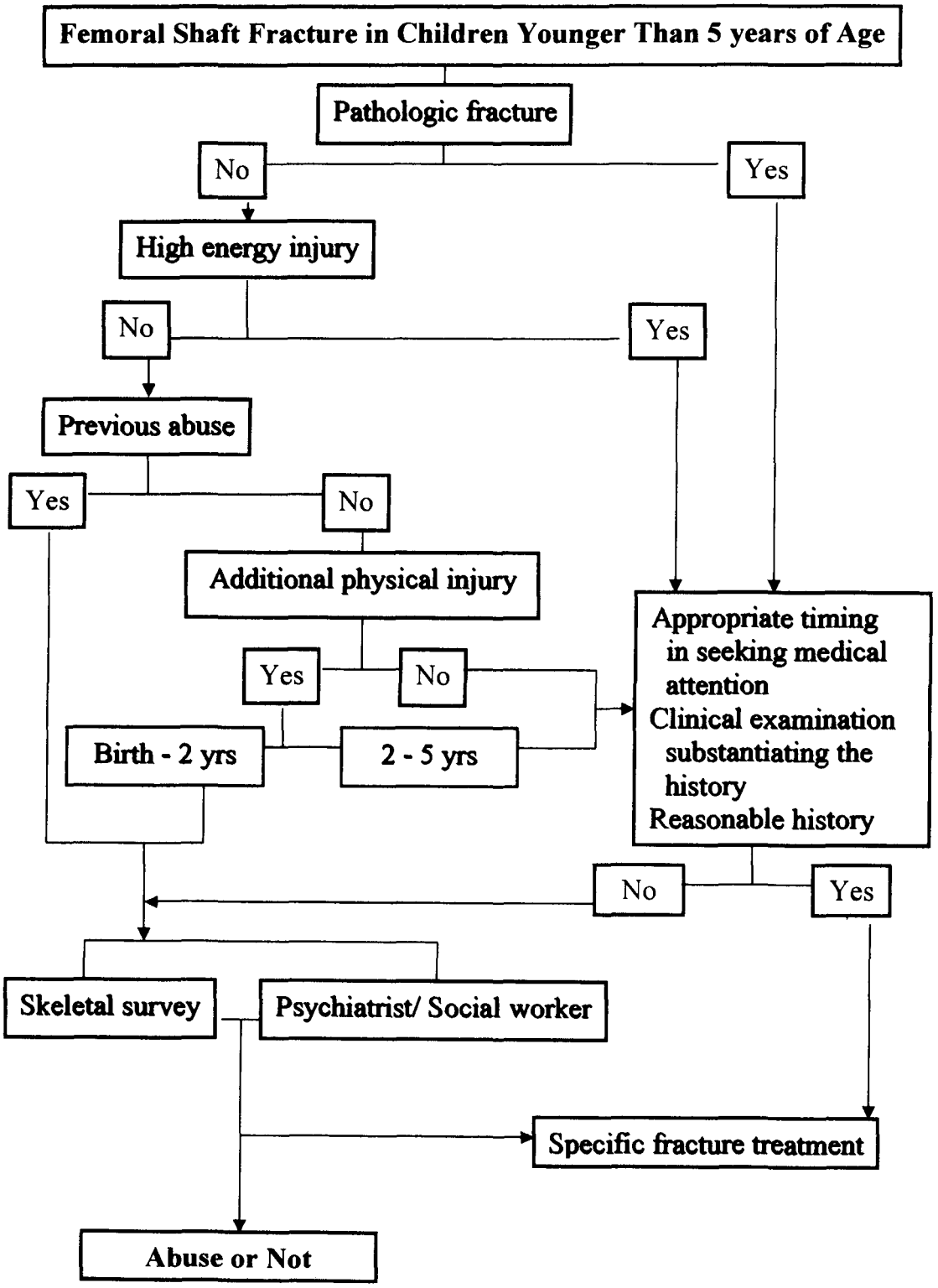

Fig. 2. Algorithm for abuse detection in femoral shaft fracture in children from birth to 5 years of age.

out of a 50 centimeter high bed at home and suffered from spiral fracture.

Two children in the present study sustained a femoral fracture with the history of vaccination and thigh massage by the father. These two cases had no underlying bone diseases that could produce a fracture from such mechanisms. Beals et al[10] found that ninety-five per cent of children with an unreasonable history such as diaper changes or no history of injury at all usually suffered from abuse.

The greenstick fracture of the medial distal femoral metaphysis is specific for children with a history of parents felling on their children who were straddling them[11]. In the present study, three cases presented with a history of a person carrying them and falling on them which developed two fracture patterns: spiral and transverse. All three children were less than 2 years.

Totally, 9 out of 39 (23%) presented with suspicious histories of cause of fracture. Four (44%) were younger than 1 year and seven (78%) were younger than 2 years (Table 2). The presence of a suspicious history is a statistically significant parameter in abused children[5]. The skeletal survey is mandatory in all cases of suspected physical abuse in children younger than 2 years[12], but none of the cases in the present study were investigated with this intervention.

Based on the retrospective nature of the present study, it was not possible to do further investigations in these suspected cases. Therefore, the authors could not identify the exact causes of the fractures, which may explain why only one case of abuse was identified.

Because there are no pathognomonic patterns of femoral fracture shaft in child abuse[2], other specific features of histories, physical findings or radiographic findings for abuse should be searched for. Otherwise, orthopedists can be misled by the histories given by caretakers. It is imperative to accurately diagnose abuse, to prevent further harm to the children. The authors, thus, established a clinical guideline for abuse detection in children younger than 5 years sustaining a femoral shaft fracture (Fig. 2).

In summary, the responsible causes of femoral shaft fracture in children younger than 5 years of age obtained by interview were varied. The exact causes cannot be solely based on histories given by caretakers.

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สาเหตุของกระดูกต้นขาหักในเด็กอายุน้อยกว่า 5 ขวบ

ยงยส จีระธัญญาสกุล, พบ, ไพจิตร หิรัณยวนิชย์, พบ**, ดิลก ภูมิจิตร, พบ**, พิศิษฐ์ สุกไสว, พบ*, ดุล โกวิทวณิชชา, พบ*, วีระศักดิ์ ธรรมคุณานนท์, พบ**

วัตถุประสงค์ : เพื่อหาสาเหตุของกระดูกต้นขาหักในเด็กอายุน้อยกว่า 5 ขวบ

รูปแบบการศึกษา : การศึกษาเชิงพรรณนา แบบย้อนหลัง

วิธีการศึกษา : ทบทวนประวัติและภาพถ่ายรังสีในผู้ป่วยเด็กอายุน้อยกว่า 5 ขวบที่กระดูกต้นขาหักที่ได้รับการรักษาจากสถาบันสุขภาพเด็กแห่งชาติมหาราชินีระหว่าง มกราคม 2539 ถึงธันวาคม 2544 จำนวน 39 ราย รวบรวมสาเหตุจากการซักประวัติที่ได้จากผู้ปกครอง

ผลการศึกษา : สาเหตุที่ได้จากการซักประวัติที่พบบ่อยที่สุด 3 ลำดับ คือตกจากที่สูง (36%) อุบัติเหตุบนท้องถนน (26%) วัตถุหรือบุคคลล้มทับ (23%) พบผู้ป่วยเพียง 1 รายที่ได้ประวัติการถูกกระทำทารุณโดยผู้ปกครอง มีผู้ป่วย 9 รายที่น่าสงสัยว่าอาจมีสาเหตุเนื่องมาจากการถูกกระทำทารุณ แต่เนื่องจากขาดการสืบค้นเพิ่มเติม จึงไม่อาจสรุปสาเหตุที่แท้จริงได้

สรุป : สาเหตุของกระดูกต้นขาหักในผู้ป่วยเด็กอายุน้อยกว่า 5 ขวบที่ได้จากการซักประวัติมีความแตกต่างกันในแต่ละราย แพทย์ผู้ดูแลควรให้ความสำคัญในการสืบค้นหาสาเหตุที่แท้จริง เพราะอาจมีผู้ป่วยที่มีสาเหตุมาจากการถูกกระทำทารุณ

คำสำคัญ : กระดูกต้นขาหัก, สาเหตุ, เด็กอายุน้อยกว่า 5 ขวบ

ยงยส จีระธัญญาสกุล, ไพจิตร หิรัณยวนิชย์, ดิลก ภูมิจิตร, พิศิษฐ์ สุกไสว, ดุล โกวิทวณิชชา, วีระศักดิ์ ธรรมคุณานนท์
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* กลุ่มงานออร์โธปิดิกส์,
** แพทย์ที่ปรึกษา, สถาบันสุขภาพเด็กแห่งชาติมหาราชินี, กรุงเทพ ฯ 10400