Injury, Int. J. Care Injured 47 (2016) 188–191

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

The epidemiology of fractures in infants – Which accidents are preventable?

Helmut Wegmann *, Ingrid Orendi, Georg Singer, Robert Eberl, Christoph Castellani, Johannes Schalamon, Holger Till

Department of Pediatric and Adolescent Surgery, Medical University of Graz, Graz, Austria

ARTICLE INFO

Article history:
Accepted 28 August 2015

Keywords:
Fractures
Infants
Skull
Maltreatment

ABSTRACT

Introduction: In children, fractures have a huge impact on the health care system. In order to develop effective prevention strategies exact knowledge about the epidemiology of fractures is mandatory. This study aims to describe clinical and epidemiological data of fractures diagnosed in infants.
Methods: A retrospective analysis of all infants (children < 1 year of age) presenting with fractures in an 11 years period (2001–2011) was performed. Information was obtained regarding the location of the fractures, sites of the accident, circumstances and mechanisms of injury and post-injury care.
Results: 248 infants (54% male, 46% female) with a mean age of 7 months presented with 253 fractures. In more than half of the cases skull fractures were diagnosed ($n = 151$, 61%). Most frequently the accidents causing fractures happened at home (67%). Falls from the changing table, from the arm of the care-giver and out of bed were most commonly encountered ($n = 92$, 37%). While the majority of skull fractures was caused from falls out of different heights, external impacts tended to lead to fractures of the extremities. 6 patients (2%) were victims of maltreatment and sustained 10 fractures (2 skull fractures, 4 proximal humeral fractures, 2 rib fractures, and 2 tibial fractures).
Conclusion: Falls from the changing table, the arms of the caregivers and out of bed caused the majority of fractures (especially skull fracture) in infants. Therefore, awareness campaigns and prevention strategies should focus on these mechanisms of accident in order to decrease the rate of fractures in infants.

Introduction

Each year, one of four children sustains an injury requiring medical attention [1]. Moreover, 10–25% of all paediatric injuries will result in fractures [2]. A fracture incidence ranging from 16 to 20 per 1000 children has been described [3]. About a third of all boys and girls will sustain a fracture before the age of 16 years [3].

The majority of the available reports shedding light on the incidence of fractures included data assessed in heterogeneous age groups [4]. Other publications reviewing fracture patterns evaluated solely younger children and concentrated on the association between types of fractures and suspicion for abuse [5]. Before one year of age, one out of every three fractures has been described to be non-accidental, compared to one of nine fractures before 18 months of age and one of 205 fractures of children between 19 months and 5 years of age [6].

Infants (children younger than one year of age) represent a special patient group. The onset of the ability to walk at around one year of age is associated with an increased risk of falls [7]. Concomitantly, a different fracture pattern of infants compared to older children could be expected. However, a detailed analysis of the distribution and the mechanisms of accident causing fractures in this special patient group – to our knowledge – has not been performed yet.

An exact knowledge of the site of the accident, circumstances and mechanism of injury leading to fractures is of pivotal importance to develop prevention strategies and awareness campaigns. While there is a plethora of such analyses for older children and adolescents [7–9], a detailed analysis of the circumstances causing fractures in infants may lay the cornerstone to raise alertness of parents and caregivers and subsequently contribute to decreasing the number of infant fractures. The aim of the present study was, therefore, to analyse the distribution and the mechanisms of

* Corresponding author at: Department of Pediatric and Adolescent Surgery, Medical University Graz, Auenbruggerplatz 34, 8036 Graz, Austria.
Tel.: +43 316 385 13762; fax: +43 316 385 13775.
E-mail address: helmut.wegmann@medunigraz.at (H. Wegmann).

http://dx.doi.org/10.1016/j.injury.2015.08.037
0020–1383/

accident of fractures in infants seen in a single trauma centre in an 11 years period.

Patients and methods

The XXXX represents the only paediatric Level-1 Trauma Centre within the respective catchment area for both children and adolescents ranging from 0 to 18 years of age. The population of the catchment area is approximately 1.2 million inhabitants (<19 years estimated to be approximately 220,000).

The administration of patients in the hospital data base is performed using a computerised documentation system called MEDOCS, based on a SAP healthcare solution (System Applications and Products in Data Processing, Walldorf, Germany). This documentation system has been primarily designed for administration of the patients' master data, cost accounting, processing as well as storage of medical reports. Additionally, a paediatric injury data base form has been integrated to the hospital information system to collect locations, circumstances and diagnoses of all accidents. For all children seeking medical attention following an accident, the trauma survey is completed by the attending physicians at the time of initial presentation. In addition, the ICD 10-coding of the related diagnosis is recorded.

For the present study, all infants (children < 1 year of age) presenting with fractures at our Department in an 11 years period (2001–2011) were evaluated retrospectively. Information was obtained regarding the location of the fracture, site of the accident, circumstances and mechanism of injury. Moreover, length of hospital stay – if required – and the necessity for operative treatment were recorded. Special emphasis was put on cases with child maltreatment. In our department all cases with suspected child maltreatment are referred to our Child Protection Group consisting of paediatric surgeons, social workers, psychologist and paediatricians. Necessary further steps like involvement of the state youth welfare services are taken according to a group decision.

Initially, most of the fractures were diagnosed by X-rays. Since the primary diagnosis is made by the attending surgeon, reports of the paediatric radiologist were reviewed in all cases to exclude possible misinterpretation.

For analysis, data were entered into a computerised database (SPSS Version 22, SPSS Inc., Chicago, IL, USA).

Results

Within the study period of 11 years, 248 infants (54% male, 46% female) with a mean age of 7 months presented with 253 fractures. While the vast majority of the infants sustained a single fracture ($n = 245$), three patients presented with multiple fractures. One infant fell off the arms of its older sister and sustained a fracture of the collar bone and the femur. The remaining two patients were victims of maltreatment and presented with fractures of the tibia, rib and humerus and fractures of the tibia, rib and skull, respectively.

The distribution of the different fractures is presented in Fig. 1. In more than half of the cases skull fractures were diagnosed ($n = 151$, 61%). Most frequently the accidents causing fractures happened at home (67%). 6% of the fractures were caused by outdoor accidents and 2% of the fractures were in association with traffic accidents. In 25% of the fractures the records of the documentation system were incomplete and the exact location of the accidents could not be reproduced. In Table 1 the distribution of fractures according to the accident location is presented.

The exact mechanisms of accidents causing fractures were grouped in 18 categories which are depicted in Fig. 2. Falls from the changing table, from the arm of the care-giver and out of beds were most commonly encountered ($n = 92$, 37%). In 12% of the cases the

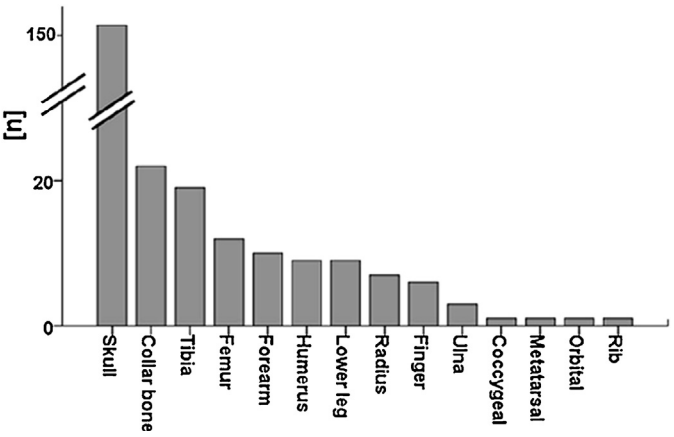

Fig. 1. Distribution of 253 fractures of 248 infants presenting in an 11-years study period (2001–2011).

Table 1
Location of the accidents causing 253 fractures and distribution of fractures according to the accident location.

Location of accident	Number of patients	Distribution of fractures
Home	168	65% Skull 8% Collar bone 6% Tibia 4% Forearm 4% Femur 4% Lower leg 3% Humerus 3% Radius 3% Finger
Outdoor	17	47% Skull 24% Collar bone 12% Femur 12% Lower leg 5% Tibia
Traffic	2	100% Skull
Unknown	66	

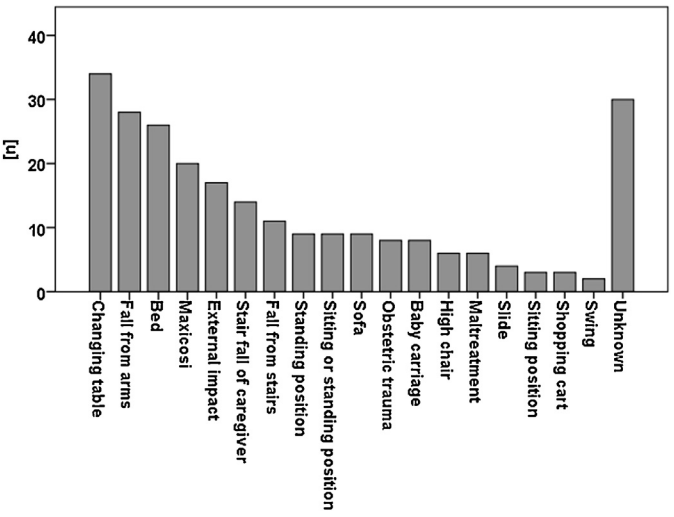

Fig. 2. Exact mechanisms causing fractures in 248 infants. Note that falls from the changing table, from the arm of the care-giver and out of beds were most prevalent.