Annals of Medical Research

DOI: 10.5455/annalsmedres.2019.09.561 2019;26(12):2836-40

Original Article

Clinical characteristics of newborns with long bone fractures: A single center experience

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Abstract

Aim: The aim of this study was to determine the newborns in our hospital with fractures of the femur or humerus and their clinical characteristics.

Material and Methods: This study was conducted as a retrospective trial and using the patient information system, the following clinical data were reviewed: maternal age, parity, gestational age at delivery (week),fetal weight, pregnancy complications (preeclampsia, gestational diabetes mellitus [GDM]), the type of delivery (cesarean [CS] or vaginal delivery [VD]), the fetal presentation, labor induction, meconium-stained amniotic fluid, neonatal birthweight and gender, history of shoulder dystocia and intracranial hemorrhage, type of fracture, presence of clavicle fracture or brachial plexus injury, and if has fetal diagnosis and length of hospital stay (day).

Results: After the screening, 59622 live births were detected in our hospital in the last 2 years. Long bone fractures were detected in eight of the newborns who were consulted for fractures in the orthopedics department.Femoral fractures were found in 3 patients , humeral fractures in 3patients and both femur and humerus fractures in 2 patients,extra clavicle fracture and brachialplexus injury were detected in two patients.The mean age of the mothers was 29 years ,two patients were diagnosed with gestational diabetes and one patient with severe preeclampsia.

Conclusion: The results we found in this study show that long bone fractures are congenital trauma and congenital conditions that require early diagnosis and correct intervention. Especially in the presence of malpresentations and prematurity, the family should be informed about the bone fractures that may develop before cesarean. In addition, careful examination of newborns and avoiding long bone fractures is very important. In our city, these complications are seen with a similar frequency with the literature.

Keywords: Long bone; fracture; newborn

INTRODUCTION

The long bone fractures are very rare in the neonatal period and they may be missed due to unossifield cartilage and uncertain symptoms (1,2). Congenital diseases, presentation anomalies, birth traumas and prematurity are the most important causes of these fractures whose incidence varies between 0.05-0.13(3,4). In addition, it is very important to distinguish these fractures from abuse. Treatment and management of long bone fractures should be performed as early as possible by orthopaedic surgeons. After the diagnosis, broken bone can be treated by immobilization with bandage . After conservative or surgical treatment, radiographs detect callus tissue and movement can be started. Most cases are treated conservatively, whereas fractures associated with neurological damage require longer treatment.In the studies, the most frequently broken long bones were identified as humerus or femur and generally healed without disability (5,6). We could not find any data in the current literature on neonatal long bone fractures from Sanlıurfa.Also we need studies in Turkey about long bone fracture on newborns.Therefore, the aim of this study was to determine the newborns in our hospital with fractures of the femur or humerus and their clinical characteristics.

MATERIAL and METHODS

This study was conducted as a retrospective trial in the Sanlıurfa Research and Training Hospital between January 2017 and December 2018. The orthopedic consultations requested by the neonatal intensive care

Received: 19.09.2019 **Accepted:** 27.10.2019 **Available online:** 09.01.2020
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unit of our hospital were screened. This study was conducted according to the Declaration of Helsinki. Informed consent was obtained from all participants. The inclusion criteria were newborn infants diagnosed with long bone fracture (developed intrauterine or during labor). Patients whose consecutive results or radiographs could not be obtained, patients whose fracture site was unclear and radiographs could not be taken correctly, patients without control radiograph taken 7-14 days after diagnosis and stillbirths were excluded.Using the patient information system, the following clinical data were reviewed: maternal age, parity, gestational age at delivery (week), fetal weight,pregnancy complications (preeclampsia, gestational diabetes mellitus [GDM]), the type of delivery (cesarean [CS] or vaginal delivery [VD]), the fetal presentation, labor induction, meconium-stained amniotic fluid, neonatal birthweight and gender, history of shoulder dystocia and intracranial hemorrhage, type of fracture, presence of clavicle fracture or brachial plexus injury, if has fetal diagnosis and length of hospital stay (day). Preeclampsia is a disease characterized by hypertension in pregnant women over 20 weeks. The diagnosis of GDM is made after 75 mg oral glucose challenge test between 24-28 th gestational weeks. Prematurity was classified as early preterm (delivery before 32 weeks) and late preterm (delivery at 32–36 weeks). Birth weight> 4000 g were defined as macrosomia. The diagnosis of long bone fractures suspected by immobilized extremity and physical examination findings was made by orthopedists by radiography and the diagnosis was confirmed by radiographic callus formation 7-14 days after the first visit. Brachial injury in a group of patients with Moro reflex loss and persistent symptoms of Erb-Duchenne or Dejerine-Klumpke palsy after discharge. Osteogenesis imperfecta defined as a genetic disorder characterized by low bone mass, increased bone strength, increased bone fragility, and shortened stature.

Statistical Analysis

Statistical Pack age for the Social Sciences (SPSS 21 Inc., Chicago, IL, USA) computer software was used forbio-statistical analyses. When the data were presented as mean values their standard deviation values, when they were presented as median values their minimum-maximum values were also stated.

RESULTS

After the screening, 59 622 live births were detected in our hospital in the last 2 years. Long bone fractures were detected in eight of the newborns who were consulted for fractures in the orthopedics department. Mean gestational week was 34 weeks (min: 28 weeks- max: 39 weeks), mean birth weight was 2563 grams (min: 28 weeks- max: 39 weeks) and two cases were over 4000 grams.

Table-I presents the maternal and fetal demographic characteristics. The mean age of the mothers was 29 years (min: 22years-max: 37years) and all pregnancies were followed up regularly. Five women (62.5%) were multiparous and three women were grandmultipardia (25%). Two cases (25%) were late preterm, two cases (25%) were early preterm and four cases (37.5%) were term. Two patients were diagnosed with gestational diabetes and one patient with severe preeclampsia.One patient gave birth on the road before he could reach the hospital.Five (62.5%) cases were delivered with CS and three (37.5%) were with vaginal delivery. None of the cases had induction, vacuum, forceps or delivery maneuver. In addition, it was learned that there was no meconium-stained amniotic fluid. One of the two cases who underwent CS for preterm labor was foot and the other was breech presentation. Direct X-ray on physical examination diagnosed all of the cases after swelling and tenderness at the fracture site, asymmetry of the extremities. Six patients had fractures in the shaft region and two patients had fracture in the distal one-third of the shaft of femur (Figure 1).

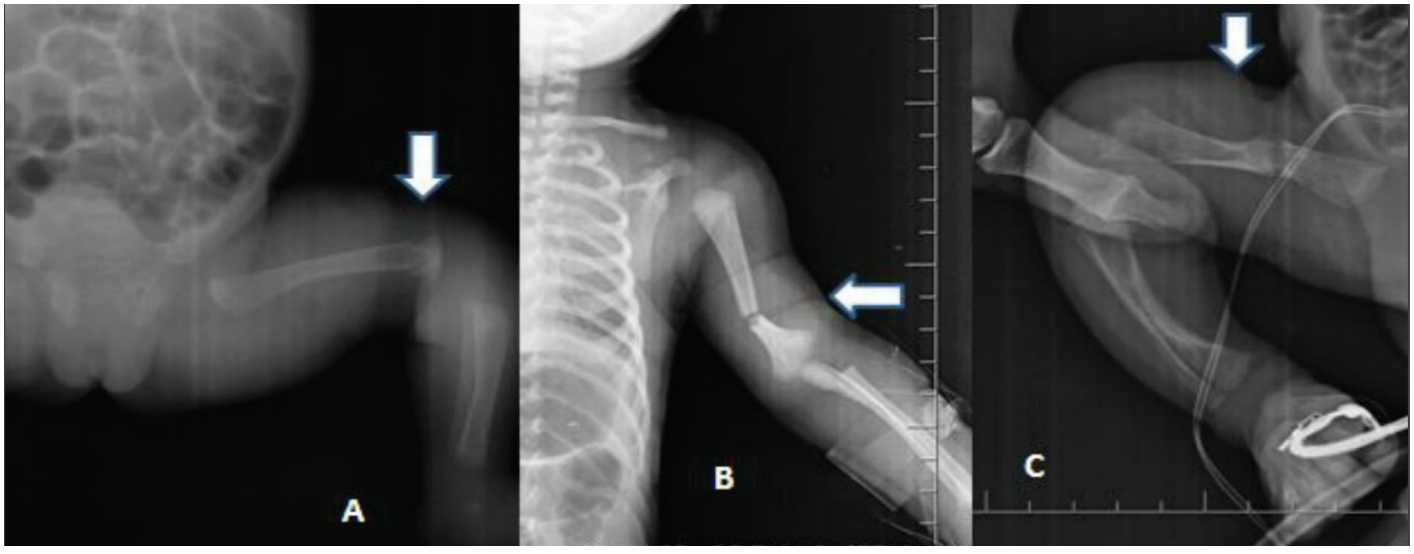

Figure 1. A: Fracture in the distal one-third of the shaft of femur, B: Humerus shaft fracture, C: femur shaft fracture

Table 1. Demographic characteristics of patient with neonates long bone fractures

Case no	Maternal age	Parity	Gestational age at delivery (weeks)	Fetal Weight (gr)	Fetal gender	Pregnancy complications	Meconium-stained Amniotic fluid	Mode of delivery	The fetal presentation
1	22	2	34	2300	M	None	None	C/S	Vertex
2	30	3	28	880	F	PE	None	C/S	Foot arrival
3	35	9	39	4280	M	A2 GDM	None	VD	Vertex
4	23	3	38	3200	M	None	None	VD	Vertex
5	31	3	27	760	F	None	None	C/S	Breech arrival
6	37	9	39	4390	F	A2 GDM	None	VD	Vertex
7	26	2	33	2200	M	None	None	C/S	Vertex
8	31	6	38	2500	M	None	None	C/S	Vertex

A2 GDM: gestational diabetes mellitus, C/S: Cesarean, VD: Vaginaldelivery, M: male, F: female, PE: Preeclampsia

Table-2 presents the clinical features of patients diagnosed with long bone fractures.Femoral fractures were found in 3 (37.5%), humeral fractures in 3 (37.5%) and both femur and humerus fractures in 2 (25%) patients. Three patients with long bone fractures had osteogenesis imperfecta (case 1,7,8). Two of these cases had both femur and humerus fractures and one case had only femur fractures. One patient with humerus fracture was diagnosed as hypotonic infant (case 3). Extra clavicle fracture and brachialplexus injury were detected in two cases (case 3,6) who had normal birth and whose shoulder was inserted during delivery. None of the patients had intracranial hemorrhage. Long bone fractures were closed reduction and splinted. All patients were discharged for follow-up with the orthopedics department. No patient was lost during follow-up.

The incidence of long bone fractures was 0.13 per 1000 live births, the incidence of humerus fractures (5 patients) was 0.08 per 1000 live births, the incidence of femoral fractures (5 patients) was 0.08 per 1000 live births, and the incidence of humerus and femoral fractures (2 patients) was 0.03 per 1000 live births.

Table 2. Neonatal and peripartum characteristics of patients with long bone fractures

Case no	IH	Fracture	Fetal Diagnosis	Clavicle Fracture	Brachial PlexusInjury	Length of hospitalstay (day)	Shoulder dystocia
1	None	Right FSF Left HSF	OI	None	None	20	None
2	None	Right DTSF	Premature problems	None	None	90	None
3	None	Right HSF	None	Yes	Yes	9	Yes
4	None	Left HSF	None	None	None	1	None
5	None	Left DTSF	Premature problems	None	None	92	None
6	None	Right HSF	None	Yes	Yes	23	Yes
7	None	Right FSF Left HSF	OI	None	None	20	None
8	None	Right FSF	OI	None	None	8	None

OI: osteogenesis imperfecta, IH: IntracranialHemorrhage,FSF:femur shaft fracture,HSF:Humerus shaft fracture, DTSF:Distal one-third of the shaft of femur fracture

DISCUSSION

We found that the etiology of newborn long bone fractures in our hospital is multifactorial. In 3 patientswerecaused by underlying congenital causes such as osteogenesis imperfecta. Brachial plexus paralysis developed in patients with shoulder fracture due to macrosomia and humeral fracture.

Only two patients had malpresentation (foot presentation, breech presentation) and one patient had a post-cesarean femur fracture due to prematurity. Two babies with macrosomia had shoulder dystocia during delivery and two patients with clavicle and humerus fractures developed brachial plexus paralysis.

Injury to the baby due to mechanical force during the delivery process is called birth trauma. The most important risk factors are fetal macrosomia, dystocia, presentation anomalies and prematurity. Birth traumas may cause temporary or permanent neurological sequelae in the neonatal period and later in life. Therefore, early diagnosis, treatment and multidisciplinary close follow-up of these patients are important for preventing sequelae. As the incidence of femoral fractures is reported to be 0.13 per 1000 live births and the incidence of humerus fractures is 0.05-0.09 per 1000 live births, the incidence of long bone fractures varies (7,8). These rates are similar to the incidence of fractures in our study.Since our patients were newborns, we did not use non-steroidal drugs, so no drug-related interaction is expected (9).

Long bone fractures can occur in both vaginal and cesarean deliveries (5). Fractures developed after vaginal delivery in three of our cases. Two of these are macrosomic and one is out-of-hospital delivery. Cases 2 and 5, of which 5 were cesarean, had one foot and one breech, were premature below 1000 grams and both had femoral fractures. Since premature infants have low bone organization and resistance, the possibility of accompanying fractures increases (10). According to the reports, it is not related to birth trauma of fractures that are seen in 1-2% incidence in low-weight or premature infants in neonatal intensive care unit (11,12). The combination of clinical follow-up, X-ray appearance and laboratory data showed that insufficient calcium and phosphorus intake in these infants caused bone loss. Improvement of the x-ray appearance of bone tissues and reduction in fracture recurrences have been achieved by improving the metabolism of premature babies and paying special attention to calcium and phosphorus uptake (11). The other tree cases were diagnosed as osteogenesis imperfecta.

Three of our patients had humerus fractures. In cases 3 and 6, humeral and clavicle fractures were present. The most common fracture during delivery is seen in the clavicle at a rate of 0.035% to 3.2% (4). During these vaginal births of these cases weighing over 4000 grams, there were shoulderdystocia and babies were delivered by maneuvers. These maneuvers and trauma resulted in a very rare fracture of the clavicle and humerus. The fact that the fractures were on the same side suggested that this was due to shoulder dystocia (13). In both cases, clavicula fracture is described in Garcia et al. Similar to the results of, it was mid shaft (14). Humerus shaft fractures were closed reducted and splinted. For clavicle fracture, it was recommended not to lay on the fracture side and was followed up with weekly radiographic controls. After the formation of callus tissue, splinting was terminated and controlled movements were allowed. The treatment took an average of 3 weeks. In addition, brachial plexus paralysis was diagnosed due to the absence of spontaneous movement of the arm and Moro reflex in both patients. In the follow-ups, it was observed that the nerve field did not regress. Multidisciplinary approach and regular follow-up are important for reducing sequelae due to unforeseen complications such as shoulder dystocia. In case 4, although there was no known risk factor, we attributed the presence of a humerus shaft fracture to the fact that this patient gave birth outside the hospital and under unfavorable conditions. It may also be caused by an unknown trauma after birth. Therefore, this possibility should be taken into consideration in out-of-hospital deliveries and limb examinations of infants should be performed in detail. In addition, study Cebesoy et al (15) showed that the possibility of humerus fracture was increased in births with arm extension, depending on the position of the canal.

Fractures in 3 of our cases are due to congenital diseases. Cases 1, 7 and 8 showed severe micromelia and multiple angulation of the bones in perinatal ultrasound follow-ups (16). Osteogenesis imperfecta (OI), which caused bone fragility and low bone mass, was delivered by cesarean to make delivery less traumatic (17). However, femoral and humeral fractures were detected together in cases 1 and 7, and isolated femoral fractures were detected in case 8. Radiological appearance, family history and the clinical features such as blue sclera and ligament laxity provided us to make the diagnosis. The family was informed and the babies were followed up.

The most powerful aspect of our study is that we have patients with different etiologies such as out-of-hospital delivery or clavicle and humerus fracture, which are rare complications from the literature. Our study has some limitations. First it's design was retrospective. Therefore, determination of perinatal clinical features is limited. Since we are the hospital with the highest annual number of births in the second country, there are limitations in obtaining some records and patients who cannot be included in the study.

CONCLUSION

The results we found in this study show that long bone fractures are congenital trauma and congenital conditions that require early diagnosis and correct intervention. Especially in the presence of malpresentations and prematurity, the family should be informed about the bone fractures that may develop before cesarean. In

addition, careful examination of newborns and avoiding long bone fractures is very important. In our city, these complications are seen with a similar frequency with the literature. According to our results, the fracture types and the patients are similar with the literature, so special attention should be shown to the newborns who are at risk for long bone fracture.

Competing interests: The authors declared no conflict of interest.
Financial Disclosure: The authors declared that this study has received no financial support.
Ethical approval: Since it is a retrospective study, we did not apply for ethical committee approval.

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