

Orthopedic Reflections on Violence and Child Abuse

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Abstract

Although increasing awareness of abuse all over the world is pleasing, it must be known that gaining data and detected cases are the tip of the iceberg. Physicians should always keep abuse in mind while examining patients. They should pay attention to the patient's history and age, along with the location, number and patterns of the lesions and the time which passed since the event occurred. Although there is point of view "there is no specific fracture for abuse" we believe that some lesions should alert a physician for cases of abuse. For exact diagnosis we recommend that a detailed history should be taken into consideration, a detailed examination should be performed and requiring imaging modalities to be performed and to be evaluated properly. In a study, it was demonstrated that the average rate of physical abuse during childhood was 20.5% in our country. However we realized that the awareness in our country is not adequate. Therefore, in this review we aimed to gather data discussing the topic of abuse and hope to increase awareness for child abuse.

Keywords: Child abuse, Fracture, Violence.

Introduction

Behavioral disturbances and violence are becoming increasingly common worldwide. Violence due to abuse reflects the defenselessness of the patient. Abuse may be physical, psychological, sexual, or simply due to negligence or connivance.

Although an increasing awareness of abuse across the world is encouraging, it must be borne in mind that the data gathered so far, and detected cases, are only the tip of the iceberg. Possible cases of abuse should always be considered by physicians when examining patients, and attention should be paid to the patient's history and age, along with the location, number, and patterns of lesions and the time that has passed since the injuries occurred.

Although there is a general opinion that "there is no specific fracture for abuse" [1-4], we believe that some lesions ought to alert physicians to cases of abuse. For an exact diagnosis, we recommend that a detailed history should be taken, a detailed examination performed, and imaging modalities be conducted and properly evaluated.

In a study conducted in youth by Koç et al., it was shown that the average rate of physical abuse during childhood in our country was 20.5% [5]. However, we are conscious that there is inadequate awareness of such abuse. Our aim was to gather data, discuss the subject of abuse from an orthopedic perspective, and increase awareness of child abuse.

Abuse

It can be difficult for patients who have been exposed to violence to express themselves clearly and, as a result, incidents of violence and abuse tend to be concealed. Because of this, abuse is more likely to be misdiagnosed by physicians. In a previous study, it was suggested that 20% of cases are misdiagnosed [6]. In another study, it was shown that half of all abused children underwent examination by an orthopedic specialist on at least one occasion [7]. Therefore, physicians need to be alert to possible abuse when examining children, particularly those under three years of age [3,8-10]. Moreover, 50% of abuse patients who are unprotected are likely to be exposed to abuse again, and 5–10% of those die due to recurrent abuse [7,10-12].

In hospitals, orthopedic specialists play a major role in identifying physical abuse victims due to their involvement with trauma cases. However, identifying abuse can prove difficult. According to Oral et al., 42% of abuse-related cases are impossible to detect [10]. Difficulty in detecting abuse may occur for various reasons. First, physicians working in emergency departments generally work very hard. While they pay close attention to caring for their patients, they do not tend to think like police officers and generally do not consider the answers to questions such as "why" and "how". Second,

physicians are dependent on the history that a family provides. This said, awareness and experience can resolve this problem. Studies have demonstrated that pediatric orthopedists are more successful at identifying and reporting abuse cases than general orthopedists [10,13]. Additionally, it is understood that

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Table 1: Major features which are closely associated with violence & physical abuse

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History:	
1.	Inconsistent and unclear history, provided by family
2.	Negligence in looking for healthcare
Clinical Exam:	
1.	Unhappy, extremely introverted, being frightened by adults, having impaired communication of the child
2.	Skin bruises, ecchymosis and skin burns (most common physical finding)
3.	Tenderness on palpation of long bones
4.	Palpable mass of callus formation
5.	Neglected previous injuries
6.	Impairments of consciousness and vision
Radiographical features:	
1.	Epiphysiometaepiphyseal corner fractures (pathognomonic)
2.	Posterior rib fractures (pathognomonic)
3.	Fractures in different healing ages
4.	Sternal fractures
5.	Vertebral spinous tubercle fractures
6.	Scapula fractures
7.	Long bone fractures before the ambulatory age
8.	Solitary long bone fractures (nonspecifically but the most)
9.	Multiple fractures
10.	Spiral humerus fractures
11.	Spiral femur fractures
12.	Finger fractures

experienced physicians report more abuse cases than their inexperienced colleagues [12].

Among the literature, most studies that have scrutinized cases of abuse are review articles or case reports. A few original prospective studies have investigated, via questionnaires, whether orthopedists could provide correct answers and how much they were aware of potential abuse. However, bias remains a huge problem. In a previous study, the authors formulated a questionnaire and presented orthopedists with various scenarios. They were asked to identify whether these scenarios were cases of child abuse or accidental trauma, while also being asked whether they would report them [13]. The authors found that 80% of the orthopedists had given a correct diagnosis and that 73% would have reported the appropriate cases to the child protection services. However, this is not an ideal way to ask physicians if a particular case might be abuse-related. When abuse is recalled by a physician, he or she will tend to consider it to be an abuse case. Therefore, we believe that in order to determine the correct rate of awareness, physicians ought not to be asked "Is this abuse?" but rather, "What is this likely to be?" For this reason, we believe that the awareness and reporting rates would be much lower than the authors have suggested if leading questions are removed.

Bruises and ecchymosis occurring on different parts of the victim's body are the most common presentations of abuse to orthopedists [2,7-9,14,15] (Fig. 1). Ecchymosis of varying age and multiplicity indicates an increased risk of exposure to violence. When it is an acute injury, ecchymosis may show as a pink-red color, becoming purple after two or three days. After a week, it will turn green-yellow in color. Ecchymosis in abuse cases tends to be located on the posterior parts of the body such as the back, calf, or posterior part of the hip [9]. Genital and perineal lesions are other examples of injuries that are more likely to be abuse-related [11]. Moreover, the characteristics of skin lesions are also important. Though the lesions may only be cigarette or iron burns, there is usually ecchymosis due to associated blunt trauma. Additionally, the more time that has passed since the injury occurred, the more likely it is to be abuse-related [14]. Fong et al. reported that a third of all abused children were late in being brought to hospital [8].

On physical examination, unless there is no complaint, palpation of the long bones should be performed in order to reveal old, neglected fractures. Mild tenderness may be present due to an historic fracture or a mass may be palpated which relates to callus formation. This method is reasonable both in infants and mental impaired patients to detect abuse.

Hair tourniquet syndrome may be another form of abuse. It is identified primarily around the toes but can also appear around the penis, clitoris, and nipples [16,17]. Children must be examined in the nude in order that lesions on the feet or genitals are not missed. Additionally, severe diaper rash may also indicate negligence [11].

Although solitary long bone fractures (Fig. 2) are the most common bone lesions in child abuse, it is not always the case that additional lesions are detected. In this instance, a family's behavior and history should be closely examined. In abuse cases, families provide inconsistent and unclear histories [9]. If there is any doubt, another member of the family should be examined for any possible skin lesions. If any solitary bone fractures are detected in patients under ambulatory age, the risk of abuse increases [3,4,7-9,14,15,18,19]. In different studies, fractures of the humerus [9,18], forearm [8], and rib [2-4,14] were reported as being the most common fractures in abuse cases. In spite of the fact that fractures may occur at different times and/or there are multiple fractures, this may indicate bone metabolism abnormalities and physicians should be on the alert for abuse [4,9,20]. According to some studies, the most pathognomonic lesions in child abuse are fractures at different stages of healing [2,8]. Fong et al. recommend bone scintigraphy in order to detect all lesions [8]. However, it is a well-known fact that the epiphysis in children has a good blood supply and therefore high radiation exposure would be inevitable if scintigraphy was performed [11]. As stated earlier, there is no specific fracture type for cases of abuse [21]. However, some authors suggest that metaphysioepiphyseal

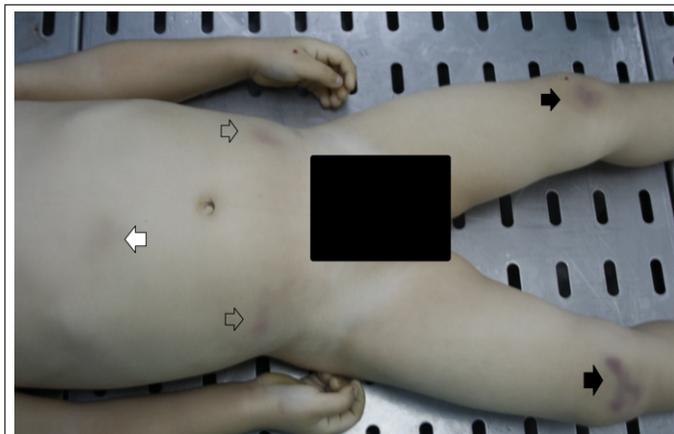


Figure 1: Multiple aged ecchymosis is seen in a 5 years old victim's body.



Figure 2: Isolated long bone fractures are common findings in physical abuse cases. A rotational fracture at femoral shaft is seen in a 2 years old patient.

fractures or spiral long bone fractures are more closely associated with abuse [2,11]. Fractures that are, according to the literature, closely associated with physical abuse are listed in the table below (Table).

Clavicle fractures, which are the most common obstetric fracture, may also occur due to abuse. In newborns, families may claim that a clavicle fracture occurred during delivery. However, if there is no callus formation visible on roentgenograms taken between the 10th–14th days of life, an abuse-related fracture that occurred after delivery is indicated [11]. Therefore, findings on direct roentgenograms are crucial for determining fractures due to abuse. Occasionally, in pediatric populations, fractures may not be able to be diagnosed by direct roentgenograms. In these cases, fractures are diagnosed by subsequent radiographs according to callus formation, which emerges 10–14 days after the fracture has occurred. There are reported abuse-related cases involving rib fractures, which were diagnosed by secondary findings such as a periosteal reaction or callus formation on radiographs [11]. Direct radiographs may also reveal aberrant callus formation, which indicates inadequate treatment or stabilization. Metaphysioepiphyseal fractures are usually not visible on radiographs via callus formation because the periosteum has not been ruptured [11].

Since spinal injuries associated with child abuse are rare, publications about this issue is limited. In a recent study it is demonstrated that spine injuries are also generally seen in children under 2 years old. Authors reported that spine injuries associated with abuse are mostly seen in thoracic vertebrae [22]. While considering the "large head to body ratio" in infants, we expect servical injuries to be more common in infants. Though it is rare, thoracic injuries under 2 years old may alert physician for abuse.

Osteogenesis imperfecta, rickets, and prematurity may be ranked among the various mineralization abnormalities that can be confused with cases of abuse. Delayed mineralization in prematurity is normalized around the first year of age [14]. Rickets may be distinguished by metaphyseal expansions and

diaphyseal looser zones at the long bones on direct roentgenograms and laboratory studies including calcium, phosphorus, 1,25 dihydroxyvitamin D, and 25-hydroxyvitamin D. Osteomyelitis may be misdiagnosed on X-ray and confused with a previous fracture due to abuse. However, to rule out osteomyelitis, normal levels of erythrocyte sedimentation rate, C-reactive protein, and white blood cell counts must be detected. Additionally, disuse osteoporosis is yet another condition that may be confused with abuse due to leading long bone fractures caused by mild trauma.

Since rib fractures in abuse cases most often occur in the posterior parts of the ribs, oblique views are more valuable for easy detection [9,20,23].

The level of consciousness and vision impairments, accompanied by fractures, may be indications of shaken baby syndrome. Subarachnoidal and retinal bleedings may occur in children who have been shaken by their shoulders [7]. The causes of a generation of violence should be sought via socio-cultural and economic findings. Risk factors for abuse among women and children include unplanned, early age, and out-of-favor pregnancies, pregnancies that occurred due to rape [8,9], marital conflict [7] or separated parents [9,18], a lack of medical insurance and a low income status [7,8,20,21], prematurity [7,9,20], congenital abnormalities in children [9,20], or cerebral palsy. Gera et al. reported that girls were more susceptible to abuse than boys in China [18]. By contrast, many publications suggest no gender discrimination [3,20]. Detecting the perpetrators of abuse is also crucial for the sake of the victims. Gera et al. demonstrated that in cases where the abusers went undetected, the possibility of abuse would increase five-fold [18]. Though the perpetrator(s) of child abuse may be a babysitter, neighbor, or grandparent it is, unfortunately, usually the parents [20]. Although stepfathers or natural fathers were most often accused of engaging in child abuse [8,9,18], a meta-analysis conducted by Mulpuri et al. showed that the main culprits were young mothers who were unable to establish a proper bond with their child [20].

It has been demonstrated that children who are confronted with violence are unhappy, extremely introverted, frightened by adults, have impaired communication, and tend to torture other children or animals [7,24].

Johnson et al. and Limbos & Berkowitz suggested the formation

of a data collection chart to ensure abuse cases were not missed [25,26]. Moreover, Oral et al. suggest asking the following questions in every child trauma case in order to identify the cause of injury [10]: What caused the injury? How did it occur? When and where did it occur? Who witnessed the event?

Conclusions

Ecchymosis, of varying age and location, is the most common indicator of abuse. Solitary long bone fractures, particularly in those younger than ambulatory age, are closely associated with abuse. It must be considered that every abuse case that is misdiagnosed may encounter unjustified violence in the future. Therefore, the recognition and reporting of abuse cases by physicians is vital for the victims concerned.

General orthopedists do not see children in clinical practice as pediatric orthopedists do, and are more likely to misdiagnose abuse-related fractures. We recommend that orthopedists keep up to date with advances and recall abuse-related cases by continuing postgraduate education programs.

Child abuse should be a national concern and, in conjunction with such awareness, a national online data collection system should be

formed that would alert physicians to any recurrent case. Victims confronted with abuse should be examined by orthopedic, psychiatric, and gynecological specialists, and any findings they note should be reported to the local child protection service.

Over-reporting of abuse can also lead to families and children being placed in a difficult position. Therefore, physicians need to avoid both over- and under-reporting abuse cases.

Clinical relevance

Although detecting abuse has difficulties, it has vital importance for the victim. Therefore physicians need to be alert for possible abuse cases, especially patients that discussed above.

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