

Literature Review Article

Violence against children and adolescents: the importance of knowledge of the spectrum of bruise colors in its diagnosis

Lara Maria Herrera¹
Mônica da Costa Serra¹
Clemente Maia da Silva Fernandes¹

Corresponding author:

Mônica da Costa Serra
Faculdade de Odontologia de Araraquara – Unesp
Rua Humaitá, n. 1680
CEP 14801-903 – Araraquara – SP – Brasil
E-mail: mcserra@foar.unesp.br

¹ Department of Social Dentistry, School of Dentistry of Araraquara, Sao Paulo State University – Araraquara – SP – Brazil.

Received for publication: March 19, 2013. Accepted for publication: June 26, 2013.

Keywords: violence;
Forensic Dentistry;
bioethics.

Abstract

Introduction: One of the violence types more observed against children is the physical abuse, which produces many types of traumatic injuries. Contusions are common trauma signs and may indicate aggression when frequently present in locations where accidental injuries are rare. Contusions in skin undergo color changes with the passage of time, and such change in color is called “spectrum of bruise colors of Legrand du Saulle”. Thus, it is possible to estimate the age of the lesion based on the evaluation of color. Injuries caused by child abuse often reach regions of head, face and neck, because they are exposed and easily accessible. Therefore, the dentist is responsible with regard to the diagnosis and the actions to be undertaken against the cases of child abuse. **Objective:** To present and discuss the significance of the spectrum of bruise colors as a considerable visible trace in suspicion of violence against children and adolescents, during dentists’ clinical routine. **Literature review:** The study of the “spectrum of bruise colors of Legrand du Saulle” refers to the estimation of the age of the injury, in respect to the color change. The application of this study is of great value for

identify if a lesion occurred from a single incident or from multiple incidents, especially in cases where it occurs in the same region of the body, indicative of repetitive trauma. **Conclusion:** The spectrum of bruise colors is very important for health professionals, such as dentists, for the identification or suspicion of cases of abuse against children and adolescents. As great part of the lesions originated of abuse involve the areas of head and neck, it is unacceptable that these professionals are unaware of the basic signs to help in early diagnosis, which is the case of the colors of the lesions. However, concerning the chronology of the spectrum of bruise colors, it is not possible to establish rigorous times.

Introduction

The child is pure and dependent and deserves total protection and special care to develop. The article 5th of the Title I of the General Part of the Brazilian Child and Adolescent Statute (CAS) states that “none child or adolescent will be object of any type of negligence, discrimination, exploration, violence, cruelty and oppression” [5]. However, many children are victim of injuries inside their own home, mostly times executed by the parents, other relatives and caregivers [1, 26].

One of the violence types most common in children is physical abuse, directly (kicking, pinching, spanking) or indirectly (with the use of punishment instruments) performed, producing several traumatic lesion types [4, 6, 9]. The common signs of contusions coming from trauma may indicate aggression when they are frequently located where accidental lesions are rare [15]. In this context, it is important to distinguish an intentional contusion (abuse) from one that occurs for example when children are either playing or undergoing an accident.

The skin contusions undergo color alteration over time, and such color variation is so-called “spectrum of bruise colors of Legrand du Saule” [24]. Thus, it is possible to estimate the lesion age based on the color evaluation and this procedure has been executed by child protection agencies aiming to determine the probable origin of the lesion, and by legal agencies to investigate potential perpetrators [16].

The injuries caused by child abuse frequently are executed in the head, face and neck regions because these areas are exposed and of easy access. The oral cavity is also damaged by lip burning, frenulum lacerations, tooth fractures, and dental negligence. Therefore, the dentist is responsible with regard to the diagnosis and the actions to be undertaken against the cases of child abuse [17].

In 2005, the Brazilian Ministry of Health reported that 200,000 children had undergone physical aggression. However, these data are not reliable because only one in each 20 cases is notified to the authorities [14]. Studies have demonstrated that dentists hardly detect abuse manifestations because these lesions are not perceived during the clinical examination due to the uncertainty regarding the diagnosis because they do not know how to register the cases and they fear to get involve [3, 9, 11, 14, 17, 23].

Notwithstanding, according the article n. 245 of the Child and Adolescent Statute (CAS), if the dentist does not report child/adolescent abuse known or suspected he/she is committing a crime suffering a fine from three to 20 incomes increasing twice if the crime is committed again [5].

Thus, it is important that the health professionals be trained to recognize signs of violence against children, collect information, diagnose early and report these cases to the Child Protection Council of the city. The presentation and discussion of the significance of the color spectrum as a visible trace to be considered in the suspicion of violence against children and adolescents during the clinical routine of the dentists was the aim of this study.

Literature review

Among the abuse types, physical aggression is the most frequent [4, 6, 9]. According to Serra *et al.* [22], many countries, including Brazil, have employed the physical aggression to educate their children as punishment and discipline; however, to accept this practice makes easy the recurrence of domestic physical violence and its trivialization.

The physical violence results in body lesions, normally coming from mechanic energies. In Forensic Traumatology, these energies are represented by

weapons themselves (pistol, dagger), instruments intended to other purposes but used as weapons (knife, hammer, knife), natural weapons (hands, feet, teeth, nails), machinery, animals, other media (falls) etc. [8, 24].

Instruments classified as bruising produced superficial and deep lesions. The superficial lesions comprise contusions and contused wounds; the deep lesions comprise fractures and luxations. Contusions are formed by the application of a force (pressure, traction, suction) disrupting the blood vessels with blood extravasation that infiltrates within the tissue nets. When the force causes rupture in blood capillaries, the contusion lesions are called ecchymosis while in larger vessels involving larger blood collection they are called bruises [8].

The contusions are the most common signs of child abuse and mostly appear as its first signs [20]. Its characteristics differ regarding size, color, injury site, etc. Not always is the contusion at the trauma site. Also, it can appear immediately or after some days. The injury site, for example, may suggest the crime nature: contusions on both the sexual parts and the internal part of the thigh are indicative of sexual crimes; on the neck, they indicate attempts of either homicide or suicide [8, 27]. On the other hand, injuries at the knees and shins suggest accidental traumas [15].

The identification of differences in the contusion characteristics from abuse compared to those from accidental traumas was investigated by Pierce *et al.* [20]. The authors studied 95 children with less than 4 years-old. Of them, 71 exhibited contusions, comprising 33 individuals victims of abuse and 38 victims of accidental contusions. Differences were observed regarding to the regions affected, so that abuse contusions occurred on the chest, ears, neck, hands, arms and nates. Still, lesions in the face, head, scalp and legs were present in both abuse and trauma cases.

Ahmed and Youssef [1] emphasized the importance about distinguishing an accidental from abuse injury. They advise to question about the history of the injuries and compare it with the clinical examinations, injury evolution, and the behavior of the parents. The authors analyzed 200 children aging from 1 to 3 years-old, recording their gender, age, the presence of contusions and the history of lesions. Also, they evaluated whether such contusions indicate suspicion of abuse. Of the 200 individuals, 28 exhibited abuse suspicion. Still, 65% showed multiple contusions, and in some cases, other lesions were seen, such as fractures, hemorrhages, etc. The authors concluded that there

are differences in the characteristics of bruises due to abusive and accidental traumas. Also, they highlighted that the observation of the body region and bruise age could be employed as a screening tool sensible to identify the children who need a more profound evaluation due to abuse.

Maguire [15] also believed that it is fundamental the investigation of contusions in babies which were not explained adequately. The author affirmed that abusive contusions occur predominantly in the head and neck area (periorbital site, ears, cheeks), as well as specific areas such as the upper limbs and body which can be easily covered by the clothes. It was still emphasized the differential diagnosis mainly in relation to the bleeding disorders that appear as petechiae and bruises around the body. Concerning to the etiology of abusive contusions, it is necessary to pay much attention because these lesions may show the marks of the objects used as weapons (e.g.: belt buckle), as well as bite marks which have been a significant source of human identification, once the tooth arches display particular features of each individual. Pierce *et al.* [21] expose the importance of recognizing the contusions in children as early signs of physical abuse, attempting to prevent larger or even deadly traumas. The authors showed two cases in which babies were referred to a hospital presenting contusions in areas as their ankle, shins, and hands and symptoms as diarrhea, vomit and respiratory problems but they were diagnosed with bronchitis and gastrointestinal disorder. Notwithstanding, one of the child passed away due to a traumatic cerebral lesion and showed fractures and hemorrhagic lesions in the retina; the other child returned to the hospital exhibiting lethargy and agonizing breath who were further diagnosed with traumatic brain injury, hemorrhages in the retina, new and old bone fractures. The authors also reported a third case in which a child were examined and presented a mild chest contusion without history of traumas or genetic bleeding disorders. However, the father reported that the child was easily hurt. Before the results of the blood examination, the child passed away because of an inflicted trauma. The researchers concluded that the doctors and health professionals must be aware regarding to the presence of contusions in children with less than 3 years-old, because they are not physically independent.

Studies have reported that most of physical abusive cases against children and adolescents involve the regions of the head, face and neck. Massoni *et al.* [17] analyzed 30 studies to identify the child abuse aspects at the orofacial area and found

the following most frequent sites: lip lacerations; scars in labial commissures indicating the use of gags; lacerations on labial and/or lingual frenulum caused by kiss; forced feeding or oral sex; burning in the gingiva, tongue, palate caused by food or hot utensils; tooth fractures; tooth presenting either mobility or avulsion; ecchymoses on the ears; blepharoptosis; bite marks (sometimes presented as ecchymoses) associated to physical or sexual abuse; non-treated early childhood caries therefore demonstrating dental negligence, among others.

The prevalence and the characteristics of the injuries at the orofacial region were also evaluated in children victims of abuse in a city of the northeast of Brazil, based on the medical-forensic reports. The percentage of children with head and face lesions, regardless of the presence of lesions in other body sites, was 56.3%. Of the 133 intraoral lesions, 94.8% comprised lacerations in soft tissues, mainly on the upper lip. Tooth trauma was also observed (5.2%), with crown fracture within all cases [6].

In addition to the site, the lesion colors have been frequently employed to determine the period in which they were caused, corroborating the lesion etiology. The bleeding results in the rupture of the vessels so that the macrophages phagocytose the erythrocytes and start a process of hemoglobin degradation. The hemoglobin (red) is transformed into methemoglobin (red-brown), which is transformed into hematin (dark brown). Following this, the hematin is degraded into hemosiderin (blue) and hematoidin (yellow), respectively; this color evolution is the so-called "spectrum of bruise colors of Legrand du Saulle" [24].

Guidelines to estimate the lesion age are not easy to be found. Wilson [27], in 1977, cited some authors' guidelines such as Adelson, Glaister and Rentoul, Camps, Polson and Gee, Spitz and Fisher, on the relationship between the color and age of the bruises. Generally, red and bronze injuries are recent ones (from few minutes to hours); black, purple, and violet shades indicate injuries from two to three days; blue shades injuries from three to six days; green shades injuries from seven to 12 days; yellow shades injuries from 13 to 20 days, disappearing in 25 days approximately [24]. It is important to emphasize that factors as force intensity of the trauma, injury site, skin color, caliber of the affected vessels, individual type of bleeding, extravasation depth interfere in the duration of each color phase and can lead to errors [16, 27].

Because of the lack of consensus on both the duration of each color stage of the contusions and the correct order of the color change, Stephenson

and Bialas [25] sought to sequence the color change of accidental injuries through photographs. One examiner experienced in the subject, blinded regarding the age of the bruises, classified them in "fresh" (around 48 h), "intermediary" (more than 48 h until seven days) and "old" (more than seven days) through photographs and a color scale. Of the 44 photographs of the contusions, 24 were classified correctly. Purple, blue, grey and brown were colors given from the moment of the lesion to two weeks later. Blue was scored in five of 37 bruises with one week of age and in one with more than one week of age. Red was attributed only to photographs of lesions from one week to less than one week of age (15 out of 37 bruises with this age). Yellow was not seen in photographs with less than one day of age, but was scored in 10 of 42 bruises with more than one day of age. Moreover, green was not given to photographs of lesions with less than two days of age, yet it was observed in nine of 32 lesions with more than two days of age. This study showed that different colors can be within a same contusion.

Other study determined whether the lesion age could be well estimated based on observation from the physical examination when factors as tumefaction, abrasions, etc. – which can influence the estimative – were involved. Fifty children were enrolled in the research exhibiting accidental contusions with known times. To estimate the age, the following factors were employed: the color only (most used), contusion smoothness, and swelling (least used). A group of 16 emergency pediatricians, eight physicians and 39 undergraduates were asked to examine one lesion from each child and to provide an age for each lesion by classifying them as "fresh" (up to 48 h), "intermediary" (from 48 h to seven days) and "old" (seven days or more). The authors found a significant association between the contusion color and age: red, blue, purple was commonly seen in contusions with less than 48 hours, although they were also seen in contusions with more than seven days; the yellow, brown and green were the most frequent colors exhibited in contusions with more than seven days and in ones with less than, 48 hours. The associations of factors, such as the smoothness and swelling, were used as an attempt to improve the accuracy of the estimative of lesions age; notwithstanding, the use of the colors for this purpose prevailed [4].

Maguire *et al.* [16] conduct a systematic review on the accuracy in the age estimative of contusions in children. After analyzing the studies, they concluded that despite of the association among the

red, blue and purple with recent ecchymoses and yellow, brown and green with older ecchymoses, it was possible to find these colors in lesions of any period. They concluded that it is difficult to estimate the contusion age accurately through either clinical evaluation *in vivo* or with the use of photographs.

Similarly, Mimasaka *et al.* [18] affirmed that in clinical practice the age estimative of the contusions in children is unreliable and despite the photographs served as strong evidences the colors can change, they depended on the image conditions. The authors proposed a study employing spectrophotometry to evaluate the color of the contusions subtly and determine their age based on the color change over time. They observed 86 accidental contusions of known ages. The color change was measured by using a spectrophotometer gently placed on the skin for 5 seconds, daily, until the color disappears. The results exhibited that the characteristic standard of a contusion can be divided into three phases: increase in red content with decreasing of luminosity at the first phase, increase in blue content, followed by the increase in yellow content at the second phase, becoming stable at the third phase up to it disappears. This enabled an objective estimative of the age of contusions, an important fact in detecting of new and old injuries. However, there are limitations, for example, the amount of fat tissue and thickness of the subcutaneous tissue of the region, influencing on the solution of the contusions.

Although the spectrophotometry is a fast, non-invasive method of encouraging results, it demands expensive equipments. Grossman *et al.* [13] assessed the accuracy of the visual method to estimate the age of the contusions, focusing on the forensic experience which is of easier diffusion in this practice. Many photographs of contusions of known and varied ages were provided to 23 forensic experts. They had to estimate the age of these contusions, emphasizing the contusion features and colors were useful for the estimative by relevance order. All participants indicate the color as the most important factor in estimating the contusion age, yet some also considered the color intensity, contusion size, swelling, skin texture, etc. Considering that the experience degree of each participant could have affected the accuracy of the estimative, the individuals were divided into groups according to the experience time and submitted to statistical analysis. The results exhibited that a greater level of experience did not improve the ability in estimating the age. Also, for each photograph, the content of

red, green and blue was recorded with the aid of Adobe Photoshop® software and compared to verify whether the value was modified according to the time for each individual, assuming that the underlying skin color stayed the same. It was noted that the RGB (red, green, blue) rate varied over time, but the contusion color was not affected by that while the color saturation or force was.

França [10] understands that the "spectrum of bruise colors of Legrand du Saulle" is of great importance to verify the lesion age, according to its color:

- 1st day: red;
- 2nd and 3rd day: violet;
- 4th to 6th day: blue;
- 7th to 10th day: green;
- 11th to 14th day (around the 12th day): yellow;
- 15th to 20th day: returning to the original color.

The aforementioned chronology may vary regarding to the amount and depth of the extravasated blood, tissue elasticity (does or does not make easy the blood resorption), bleeding capacity, amount and caliber of the vessels damaged, age, gender, general state of the individual etc.

Because child abuse cases frequently involve the region of the head, neck and oral cavity, the bruise color spectrum plays a fundamental role in early diagnosing of this condition by the dentists during the appointment. It is essential that the interpretation of this color spectrum is associated to the clinical history (through detailed anamnesis of the child and the parents separately), complete physical examination (with the aid of radiologic and/or hematologic examinations if opportune), social condition (although studies have demonstrated that 42% of child abuse cases occurred in well-structured families) and the developmental level of the child to evaluate any suspicion [19].

A study conducted in the city of Cravinhos (SP) investigated whether the dentists had received information, felt capable of diagnosing child/adolescent abuse and which approach they adopted. Of the 24 dentists of the city, 19 accepted to answer the questionnaire. It was verified that 26.31% suspected of domestic or psychic aggression of their patients, 68.43% reported to be able to differentiate a lesion caused by violence, but the notification of violence cases by dentists had never occurred in the city. Concerning to the approach to be adopted, 42.10% of the participants would denunciate Child Protection Council and 40% would only notify the authorities if they were completely sure about the violence case. With regards to the information on this issue, 73.7% affirmed they had never been

oriented. It is noted that a training program on child abuse diagnosis is necessary [9].

In the city of Pelotas (RS) a study with 187 dentists evaluated their perception towards child abuse. Of the 175 dentists interviewed, most (118) believed that they were able to detect child abuse cases; 25 faced some suspected case, but only six dentists notified the authorities. According to the authors, these data indicated a lack of consciousness of the dentists towards adopting protective measures for aggression victims. They concluded that the dentists must receive interdisciplinary guidance to improve the ability of caring and protecting children and adolescents [2].

A study executed in Curitiba (PR) sent a questionnaire to 212 Pediatric dentists, to evaluate their knowledge on the signs of child abuse and on the obligation of reporting such condition (how and to whom) as well as to know whether they had faced some case. The study obtained 30% of response rate. Of this, 55% affirmed to be capable of identifying child abuse cases. Although 73% of the individuals affirmed to know the obligation of reporting such condition, only 48% answered that they would notify suspected cases to the authorities. Only 12% of the 36% affirming they had already suspected of a child abuse case would notify the authorities. The authors concluded that it is necessary more information on this issue in Dentistry Schools and among the Pediatric Dentists to recognize and notify child abuse cases [7].

Serra *et al.* [22] evaluated the level of knowledge on identifying and suspecting child/adolescent abuse cases as well as the requirement of notifying them. A questionnaire was sent to 63 dentists, in the city of Araraquara (SP), to assess the attitudes towards the ethical and legal demands of dentists in cases of suspicion and diagnosis of violence. The results showed that 62% of the respondents had information on identifying child abuse cases during their graduation. However, after that, the information received decreased (35%). It was verified that many dentists felt capable of identifying child abuse cases (62%), yet only 21% had experienced this during their professional life, mostly reporting physical violence cases (77%). Of the 13 dentists (21%) reporting experienced the child abuse diagnosis, four had difficulty in detecting the signs and ten were able to identify the aggressors, who were most the mother of the children (40%). Moreover, 62% notified the authorities, especially the Child Protection Council. Concerning to the motives by which the dentists notified the cases, 60% reported the uncertainties about the ethical

and legal implications. The authors concluded that the dentists are not obeying the law because they do not know the legal aspects of child abuse cases.

Because of the importance of the training of dentists on diagnosing child abuse cases by inserting the issue in the graduation courses, a study investigated the knowledge of 91 Dentistry undergraduates of a Brazilian State University. Only 94.5% of the undergraduates informed that they knew how to identify child abuse cases. The oral and body signs most cited were swelling (31.4%) and bruise (70.9%), respectively. Additionally, 59.3% of the undergraduates reported they knew how to act in child abuse situations and 83.3% would notify the Child Protection Council. It was verified that only 34.1% of the undergraduates had received information on this issue and most of the undergraduates (95.6%) would like to receive training [12].

Discussion

The violence against children and adolescents is a public health problem within all social classes, races, religions or professions [6].

The literature reported that the physical violence is the most frequent type of aggression against children. Probably, this occurs because of the punitive practices performed by the parents and the physical condition itself, once the children often do not react against these attitudes.

Notwithstanding, the children can express to any health professional during an appointment that they are suffering violence through the injuries they would exhibit. The contusions are the most common signs of child abuse and mostly are also the first signs [20].

Thus these professionals are obligated to notify the suspicion of child abuse to the authorities because otherwise they are committing a crime regarding to the CAS, which are punishable. Moreover, a tragedy involving the child can occur, resulting in death by abuse, as observed in the violence cases against babies reported by Pierce *et al.* [21].

The knowledge on the abuse origin of the lesions and their differential diagnosis regarding injuries from accidental traumas, which are frequent in children, are important. By analyzing the studies attempting to establish this difference, it can be concluded that the lesion site contributes in the detection of the cases. Special attention should be paid to the lesions found in the regions of the

face, head, neck, as well as areas covered by the clothes, such as upper limbs, chest and nates [1, 15, 20]. Thus, the dentist plays an important role in diagnosing cases of child abuse because most of the manifestations of physical violence are found in the orofacial area.

Other determinant factor that associated with the site may diagnose abuse cases is the assessment of the bruise color. The study of the "spectrum of bruise colors of Legrand du Saulle" comprises the age estimative of the lesion regarding its color change. This is valuable to identify whether the lesion came from a single accident or multiple events, especially in cases in which they occur at the same body area indicating repetitive trauma.

Many authors sought the development of guidelines/protocols to help in estimating the lesion age by establishing time intervals for each color. Generally, the sequence used determines the colors red and bronze to recent injuries (from few moments to hours); colors black, purple, violet to two-to-three day injuries; colors blue to three-to-six day injuries; color green to seven-to-twelve day injury; color yellows to 13-20 day injuries, disappearing in around 25 days [24, 27].

Although the red color is strongly related to the recent contusions and green blue and yellow to the older ones, it is possible that colors related to longer periods be present in recent lesions [16]. Perhaps, this occurs because of the different thickness of the tissues, the caliber and deepness of the traumatized vessels which may interfere in the duration of each color. Thus, the age estimative based on the color of the lesions must be carefully performed, always evaluating the local factors.

Considering the importance of the early diagnosis of child abuse, there is the need of training of the dentist on both interpreting the bruise color spectrum and performing the correct approach. The lack of information of the dentists on this issue was demonstrated by the studies of Serra *et al.* [22], El Sarraf *et al.* [7], Fracon *et al.* [9] and Azevedo *et al.* [2]. Also, the dentists are not fulfilling the requirements determine by law which is in agreement with the study of Sfikas [23], who reported that although the notification in cases of child abuse is a responsibility of the dentist, this professional accounts for 1% of the total number of notifications to the authorities.

To achieve an enough basic knowledge on the suspicion of child abuse cases, the Dentistry Schools must implement a discipline on this issue. The study of Gomes *et al.* [12], showed that only a small

number of undergraduates had received information on the recognition of child abuse signs despite of the fact that almost all undergraduates reported that they wanted to know more about it.

Sometimes, children and adolescents undergo repetitive episodes of violence which result in bruises of different ages and consequently of different colors. Therefore, many bruises of varied colors indicate recurrent abuse and the dentist must pay attention to that. Such lesions in addition to other information may lead to child abuse suspicion which must be notified to the authority by law.

Conclusion

The bruise color spectrum is of great importance for health professionals including the dentists either to identify or suspect child abuse cases against children and adolescents. Because great part of the lesions coming from abuse occurs in the head and neck area, it is unacceptable that the dentists do not know the basic signs to help in the early diagnosis, which comprises the colors of the lesions. However, regarding to the chronology of the bruise color spectrum, rigorous times cannot be assured.

References

1. Ahmed SA, Youssef AM. Study of child abuse through forensic analysis of contusions in toddlers as an indicative factor to the presence of abuse. *JMBS*. 2011;2(1):4-9.
2. Azevedo MS, Goettens ML, Brito A, Possebon AP, Domingues J, Demarco FF et al. Child maltreatment: a survey of dentists in southern Brazil. *Braz Oral Res*. 2012 Jan-Feb;26(1):5-11.
3. Bannwart TH, Brino RF. Dificuldades enfrentadas para identificar e notificar casos de maus-tratos contra crianças e/ou adolescentes sob a óptica de médicos pediatras. *Rev Paul Pediatr*. 2011;29(2):138-45.
4. Bariciak ED, Plint AC, Gaboury I, Bennett S. Dating of bruises in children: an assessment of physician accuracy. *Pediatrics*. 2003;112(4):804-7.
5. Brasil. Ministério da Saúde. Estatuto da Criança e do Adolescente. 7. ed. Brasília; 2010. Available from: URL:http://bd.camara.gov.br/bd/bitstream/handle/bdcamara/785/estatuto_crianca_adolescente_7ed.pdf?sequence=10.

6. Cavalcanti AL. Prevalence and characteristics of injuries to the head and orofacial region in physically abused children and adolescents – a retrospective study in a city of the Northeast of Brazil. *Dent Traumatol.* 2010;26:149-53.
7. El Sarraf MC, Marego G, Correr GM, Pizzatto E, Losso EM. Physical child abuse: perception, diagnosis, and management by Southern Brazilian pediatric dentists. *Pediatr Dent.* 2012 Jul-Aug;34(4):e72-6.
8. Fávero F. *Medicina Legal.* 1.º vol. 4. ed. São Paulo: Livraria Martins; 1951.
9. Fracon ET, Silva RHA, Bregagnolo JC. Avaliação da conduta do cirurgião-dentista ante a violência doméstica contra crianças e adolescentes no município de Cravinhos (SP). *RSBO.* 2011;8(2):153-9.
10. França GV. *Medicina Legal.* 9. ed. Rio de Janeiro: Guanabara Koogan; 2011.
11. Gawryszewski VP, Valencich DMO, Carnevalle CV, Marcopito LF. Maus-tratos contra a criança e o adolescente no Estado de São Paulo, 2009. *Rev Assoc Med Bras.* 2012;58(6):659-65.
12. Gomes LS, Pinto TCA, Costa EMMB, Ferreira JMS, Cavalcanti SDALB, Granville-Garcial AF. Percepção de acadêmicos de Odontologia sobre maus-tratos na infância. *Odontol Clín-Cient.* 2011;10(1):73-8.
13. Grossman SE, Johnston A, Vanezis P, Perrett D. Can we assess the age of bruises? An attempt to develop an objective technique. *Med Sci Law.* 2011;51:170-6.
14. Losso EM, Marengo G, Sarraf MCE, Baratto-Filho F. Child abuse: perception and management of the Brazilian endodontists. *RSBO.* 2012;9(1):62-6.
15. Maguire S. Which injuries may indicate child abuse? *Arch Dis Child Educ Pract.* 2010;95:170-7.
16. Maguire S, Mann MK, Sibert J, Kemp A. Can you age bruises accurately in children? A systematic review. *Arch Dis Child.* 2005;90:187-9.
17. Massoni ACLT, Ferreira AMB, Aragão AKR, Menezes VA, Colares V. Aspectos orofaciais dos maus-tratos infantis e da negligência odontológica. *Ciêns Saúde Colet.* 2010;15(2):403-10.
18. Mimasaka S, Ohtani M, Kuroda N, Tsunenari S. Spectrophotometric evaluation of age of bruises in children: measuring changes in bruise color as an indicator of child physical abuse. *Tohoku J Exp Med.* 2010;220:171-5.
19. Pau-Charles I, Darwich-Soliva E, Grimalt R. Signos cutâneos del maltrato infantil. *Actas Dermosifiliogr.* 2011;423:1-6.
20. Pierce MC, Kaczor K, Aldridge S, O'Flynn J, Lorenz DJ. Bruising characteristics discriminating physical child abuse from accidental trauma. *Pediatrics.* 2010;125(1):67-74.
21. Pierce MC, Smith S, Kaczor K. Bruising in infants. Those with a bruise may be abused. *Pediatr Emer Care.* 2009;25:845-7.
22. Serra MC, Tardivo TA, Fernandes CMS. Violence against children and adolescents: awareness and attitudes of Brazilian dentists. *Eubios J Asian Int Bioeth.* 2011;21:164-71.
23. Sfikas PM. Does the dentist have an ethical duty to report child abuse? *J Am Dent Assoc.* 1996;127:521-3.
24. Silva M. *Compêndio de Odontologia Legal.* 1. ed. Rio de Janeiro: Medsi; 1997.
25. Stephenson T, Bialas Y. Estimation of the age of bruising. *Arch Dis Child.* 1996;74:53-5.
26. Swerdlin A, Berkowitz C, Craft N. Cutaneous signs of child abuse. *J Am Acad Dermatol.* 2007;57(3):371-92.
27. Wilson EF. Estimations of the age of cutaneous contusions in child abuse. *Pediatrics.* 1977;60:750-2.