

ORIGINAL ARTICLE

Diagnosing abuse: a systematic review of torn frenum and other intra-oral injuries

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Introduction: A torn labial frenum is widely regarded as pathognomonic of abuse.

Methods: We systematically reviewed the evidence for this, and to define other intra-oral injuries found in physical abuse. Nine studies documented abusive torn labial frena in 30 children and 27 were fatally abused: 22 were less than 5 years old. Only a direct blow to the face was substantiated as a mechanism of injury.

Results: Two studies noted accidentally torn labial frena, both from intubation. Abusive intra-oral injuries were widely distributed to the lips, gums, tongue and palate and included fractures, intrusion and extraction of the dentition, bites and contusions.

Conclusions: Current literature does not support the diagnosis of abuse based on a torn labial frenum in isolation. The intra-oral hard and soft tissue should be examined in all suspected abuse cases, and a dental opinion sought where abnormalities are found.

Facial and intra-oral trauma has been described in up to 49% of infants and 38% of toddlers who have been physically abused.^{1,2} A torn labial frenum (often referred to as frenulum or phrenum) is widely believed by paediatricians to be pathognomonic of abuse,³ and has been described as the most common abusive injury to the mouth.^{4,5} Several abusive mechanisms have been proposed and include forced feeding,⁶ gagging, gripping and violent rubbing of, or a direct blow to, the upper lip.^{7,8} A torn labial frenum, however, is regarded as a trivial intra-oral injury by dental practitioners, as it is likely to heal spontaneously with minimal complications, and is not reported in large-scale dental trauma surveys.⁹

It is estimated that up to 50% of all school-age children sustain accidental dental injuries,¹⁰ challenging clinicians to distinguish between abusive and non-abusive injuries to the mouth.

We systematically reviewed the literature to establish the probability of a torn labial frenum being caused by physical child abuse and to define what other intra-oral injuries are found in physical abuse.

METHODS

Data sources and participants

We carried out an all-language literature search of research articles, conference abstracts, websites and references in all articles identified, including review articles and relevant textbooks from 1950 to June 2006. The key words and details of databases searched can be found in tables 1 and 2, respectively. Articles were scanned for duplication and relevance. Authors were contacted where necessary. The resulting studies were reviewed by members of the Welsh Child Protection Systematic Review Group, a panel of 31 people who were paediatricians, child health professionals with child protection expertise, or paediatric or forensic dentists. Each study was subjected to two independent reviews and a third if disputed. Standardised criteria for study definition, data extraction and critical appraisal were used.¹¹ Full critical appraisal and data extraction forms are available at <http://www.core-info.cf.ac.uk>.

Data extraction

We included all studies of children aged 0–18 years with intra-oral injuries due to physical child abuse, and torn labial frena of

any aetiology, in live and fatal cases. We defined intra-oral as the area between the vermilion border of the lips and the hypopharynx.

We excluded review articles, expert opinion or guidelines that did not include primary evidence, studies with mixed adult and child data where the children's data could not be extracted, studies that addressed complications or management of abusive injuries, intra-oral injuries due to sexual abuse, or thermal injuries (as these will be encompassed in separate reviews) or dental neglect.

Studies were ranked by study design and by the likelihood that abuse had taken place in the "abused" population. We used our own ranking of abuse, as previously described, where a ranking of 1 gave the highest security of diagnosis that abuse had taken place, and a ranking of 5 the least confidence (table 3).¹² We included studies with a ranking of 1–4. In the case of non-abusive injuries, we only included studies where authors had described methods to ensure that abuse had been excluded.

RESULTS

Of 154 studies reviewed, 19 met the inclusion criteria.^{1 13–30} These represented data on 591 children. There were no comparative cross-sectional or case-control studies of torn labial frena to enable a probability of abuse to be determined for this injury. The only mechanism described for an abusive torn frenum was a direct blow to the face, recorded in two children. No details of mechanisms were given in other cases. Likewise, there were no comparative studies to compare the characteristics of other abusive and non-abusive intra-oral injuries.

Abusive torn labial frenum

Nine studies documented torn labial frena in abused children (table 4): seven were case series or case studies,^{14 16–18 20 28 29} and one was a case-control study.²³ None of these studies were designed to address torn frena specifically; the case-control evaluated blunt abdominal trauma in association with cardiopulmonary resuscitation.

These studies represented data on 30 children, of whom 27 (90%) were fatally abused. Twenty two were 5 years of age or

Table 1 Keywords and phrases used for the electronic search

Child abuse	avulsion injur.:
child protection	intraoral adj3 burn:
(battered child or shaken baby	intraoral adj3 lesion:
or battered baby)	lip scars.
child maltreatment	lip or lips).
(child adj3 maltreatment)	scars adj3 lip
(child adj3 physical abuse)	vermilion border.
non-accidental injur:	tongue.mp.
soft tissue injur:	floor of mouth.
physical abuse.	Luxation injury or luxated tooth
physical punishment.	lateral luxation.
oral dental trau	displaced tooth or intruded tooth or
oral facial injur.:	extruded tooth or avulsed tooth
(oral or dental injur.:	intrusion injury or extrusion injury
(abrasion: or lesion: or laceration:).	subluxated tooth
(frenum or frenum or Frenulum).	Crown fract: or root fract:
(torn lingual or labial frenu:).	Crown adj3 fracture) or
labial frenum/	root) adj3 fracture
lingual frenum/	Alveolar injury or alveolar fracture
(lingual frenum or frenum or	dental traumatology.
frenum or phrenum).	oral traumatology.
(labial frenum or frenum).	Periodontal injury or gingival injury
((torn adj3 labial frenum) or	gingivae or gingival laceration:
frenum or frenulum).	gingival contusion.
phrenum	gingival tear
(torn lingual or labial frenum or	gingival bruise
frenum or frenulum or phrenum).	torn fraenum or frenum
alveol.:	Occlusion or malocclusion
avulsed teeth.	articulation or disarticulation

younger. The age range given was 0–10 years for five children in one study.²³ Four of these studies ranked 1 for abuse, three ranked 3 and two ranked 4.

Cameron was the first to report a torn labial frenum as a consequence of physical abuse in 1966.¹⁴ In a retrospective study of 29 fatally abused children between birth and 4.5 years, he noted “the presence in nearly half of the cases of laceration of the mucosa of the inner aspect of the upper lip near the phrenum [sic], sometimes with tearing of the lip from the alveolar margin of the gum was a striking feature of possible significance”.¹⁴ Later the same year, Tate²⁹ reported six cases with abusive facial injury, three of whom had a torn frenum. The mechanism was described as a direct blow in two cases: a 2.5-year-old child with a torn frenum of the upper and lower lips was shaken and her head struck against a fireplace several times, and a 23-month-old child with a torn upper labial

Table 3 Ranking of the definitions of child abuse

Ranking	Criteria used to define abuse
1	Abuse confirmed at case conference or civil or criminal court proceedings or admitted by perpetrator
2	Abuse confirmed by stated criteria including multi-disciplinary assessment
3	Diagnosis of abuse defined by stated criteria
4	Abuse stated as occurring, but no supporting detail given as to how it was determined
5	Abuse stated simply as “suspected”, no details on whether it was confirmed or not

frenum was struck about the face. Two of the three children were fatally abused with associated head injuries; multiple bruises and fractures were found in all three.

Of the remaining 11 reported cases, nine were fatally abused with associated head injury^{16 28 30} (personal correspondence with authors), five had fatal abdominal injuries and one had co-existent ano-genital sexual abuse with multiple fractures.¹⁸ The remaining two had other intra-oral injuries, and one later sustained an intracranial injury.^{17 20}

Non-abusive torn labial frenum

Two separate case studies documented a torn upper labial frenum occurring as a consequence of an intubation, both in fatally injured children.^{22 23} No further details were offered. When contacted, the authors of the larger series of dental trauma in children²¹ replied that they did not record a torn frenum as they regarded this as a trivial dental injury.

Abusive intra-oral injuries

Fourteen studies documented other types of abusive intra-oral injuries.^{1 13 15 17 19–21 24–30} They were all case series or studies, and 11/14 had a higher abuse ranking of 1 or 2. They represented data on 579 children (table 5). The most commonly recorded abusive injuries to the mouth were lacerations or bruising to the lips. The remaining injuries included mucosal lacerations, dental trauma (including fractures, intrusion and forced extraction), tongue injuries and gingival lesions. No characteristics of these lesions were specific to an abusive aetiology, apart from an adult bite to a child’s tongue.¹⁹

Becker recorded orofacial trauma in 49% of 260 abused children, 14 (6%) of whom had intra-oral injuries.¹ The largest series, by Naidoo, showed that 59% of 300 physically abused

Table 2 Databases used for the search strategy

Database	Information
ASSIA 1987–June 2006	ASSIA: Applied Social Sciences Index and Abstracts on the Web is an indexing and abstracting tool covering health, social services, economics, politics, race relations and education
CareData 1980–June 2006	Social work and social care knowledge base
ChildData 1958–June 2006	National Children’s Bureau database
CINAHL 1982–June 2006	The Cumulative Index to Nursing and Allied Health (CINAHL) database provides authoritative coverage of the literature related to nursing and allied health
EMBASE 1980–June 2006	The EMBASE family consists of three separate databases: (1) EMBASE: Excerpta Medica Database, and its subsets, (2) EMBASE Drugs and Pharmacology, and (3) EMBASE Psychiatry
MEDLINE 1950–June 2006	Biomedicine, allied health, biological and physical sciences, humanities and information science as they relate to medicine and health care, communication disorders, population biology and reproductive biology
Ovid MEDLINE June 2006	In-process and other non-indexed citations
SIGLE 1980–June 2006	System for Information on Grey Literature in Europe is a bibliographic database covering European non-conventional (so-called grey) literature in the fields of pure and applied natural sciences and technology, economics, social sciences and humanities
TRIP Database 1997–June 2006	The TRIP Database searches over 55 sites of high-quality medical information. It gives direct, hyperlinked access to the largest collection of “evidence-based” material on the web as well as articles from premier on-line journals
Sciences Citation Index 1981–June 2006	Sciences Citation Index is a multidisciplinary database, covering the journal literature of the social sciences
ISI Proceedings 1990–June 2006	Covers conference papers in all scientific and technical fields

Table 4 Studies of abusive torn frenum

Author/year	Abuse ranking (1–5)	Number of children (ages)	Co-existing injuries	Fatal/live
Cameron <i>et al</i> , 1966 ¹⁴	3	13 approx (0–4.5 years)	Some tearing of the upper lip, near the frenum	All fatal
Tate, 1971 ²⁹	1, 4	3 (23 months–4 years)	With/without intracranial injury	1 live, 2 fatal
Grace and Grace, 1987 ¹⁷	1	1 (18 months)	Later readmitted - multiple fractures, intracranial injury, pharyngeal puncture	Live
Symons <i>et al</i> , 1987 ²⁸	4	1 (3 years)	Contusion of eye/subdural haemorrhage, multiple bruises	Fatal
Manning <i>et al</i> , 1990 ²⁰	3	1 (4 months)	Lacerations to uvula, upper gum, hard palate, floor of mouth. Later retropharyngeal abscess	Live
Hobbs and Wynne, 1990 ¹⁸	1	1 (0.4 years)	Multiple bruises, sexual abuse, fractures and retinal haemorrhages, developmental delay	Fatal
Price <i>et al</i> , 2000 ²³	1	5 (0–10 years)	Extensive abdominal injuries, other injuries not detailed in these cases	All fatal
Cordner <i>et al</i> 2001 ¹⁶	1	1 (18 months)	Occipital skull fracture, intracranial haemorrhage, widespread bruising	Fatal
Phillips and van der Heyde, 2006 ³⁰	3	1 (5 years)	Tramline bruising to legs, also bruising to eyes, ear and scalp. Cerebral oedema	Fatal

children had facial injuries, 11% of whom had intra-oral injuries.²¹ The most common injuries recorded were to the lips (22 children). There were also seven fractured mandibles, and six injuries to oral mucosa, five to teeth, five to gingiva and three to the tongue. Torn frenum were not recorded specifically. The children were selected from those with known physical abuse and orofacial injury. No child was examined by a dentist in any of these studies, and the data were collected retrospectively from chart reviews, raising the question of how often the mouth was actually examined.

Injuries to the tongue included an adult bite to an infant's tongue in a 10-month-old child, with the arc of the bite pointing towards the lips, confirming it could not have been self-inflicted, with multiple fractures, bruises and subdural haemorrhages¹⁹ and abrasions and bruising.

In three studies oral bleeding was a presenting symptom.^{20 26 27} In one case the infant re-presented five times from the age of 4 months,²⁰ and was found to have a laceration of the uvula with several abrasions and lacerations of the upper gum, hard palate, floor of mouth and lingual frenum; the child developed a retropharyngeal abscess.

Injuries to teeth included displacement, chips, avulsions, intrusion and fractures.^{1 21 24 25 29 30} One bizarre case series included three siblings who had endured forced dental extraction of permanent incisors as a form of punishment.¹⁵

DISCUSSION

This study confirms that intra-oral injury occurs in a significant number of children who have been physically abused. Injuries are widely distributed to the lips, gums, tongue and palate and include fractures, intrusion and extraction of the dentition, bruising, lacerations and bites.

There is a paucity of published scientific literature about the torn labial frenum. There are no studies defining the incidence of torn labial frenum in abuse and none that compare the injury in abused and non-abused children. It is impossible, therefore, to ascribe a probability of abuse for a torn labial frenum. Published studies are limited to 30 highly selected cases where a torn labial frenum is described in predominantly pre-school children who had suffered serious abuse, and where the majority of cases were fatal with extensive associated injuries. The only substantiated cause of an abusive torn labial frenum was a direct blow. There were no recorded cases of forced feeding, twisting or rubbing causing this injury. The literature includes mention of torn labial frenum that were not abusive, and therefore a torn frenum in isolation cannot be described as pathognomonic of physical abuse. Clearly the finding of an

unexplained torn labial frenum in a young child warrants full investigation, but the paucity of data in the literature and the highly selected nature of cases reported precludes defining an age band where concern would be highest. A diagnosis of physical abuse should not be based on a single injury in isolation, but arrived at in the context of the child's medical, social and developmental history and the explanation offered for the injury.

Some of the largest series in the literature^{31 32} were not eligible for inclusion as they were only ranked 5 for abuse. They included cases of suspected abuse, with no separation of data on those cases where abuse was actually confirmed.

It is important when assessing a possible torn labial frenum to consider rarer congenital abnormalities of the labial frenum such as midline diastema,^{33 34} hypertrophic frenum in association with hypoplastic left heart syndrome,³⁵ and multiple frenum in other congenital heart syndromes such as Ellis-van Creveld or Pallister-Hall^{36 37} as possible explanations of the abnormality.

The most frequently reported abusive injury to the mouth is not a torn labial frenum, as has been suggested,⁴ but injury to the lips. This assumes that the mouths of all abused children in the various series were fully examined. As these were retrospective studies of case notes,^{1 21} this is far from clear. None of the described abusive intra-oral injuries had any diagnostic characteristics, except for a bitten tongue.^{1 13 15 17 19–21 24–29 31} It is clear that paediatricians should always examine a child's mouth when assessing a child for suspected abuse. As it is doubtful whether non-dental specialists would recognise the significance of grey discoloration of the teeth as a micro-fracture or previous injury,³⁸ or whether they would be able confidently to distinguish this from the characteristic yellow-brown to grey discoloration found in dentinogenesis imperfecta, it is important to involve dental colleagues. This would be particularly pertinent if co-existent skeletal fractures were found, as may be the case with combined osteogenesis imperfecta and dentinogenesis imperfecta.³⁹ It is important that paediatricians are aware of the appropriate primary and secondary dentition expected at a given age, in order to question the absence of permanent teeth, as described by Carrotte.¹⁵

Many of the intra-oral injuries described in abused children are likely to be seen by general dental practitioners, yet dentists make very few child protection referrals. This is highlighted by Cotton,⁴⁰ who noted that of 20 000 child abuse investigations only 12 were initiated by dentists. A survey by Becker *et al* of 1332 dentists in the USA, where there was mandatory reporting with a response rate of 40%, noted that 22 cases of child abuse were seen but only four (18%) were referred to social services,¹

Table 5 Abusive intra-oral injury

Authors/year	Abuse rank	Number of children (age)	Orofacial injuries found
Tate, 1971 ²⁹	1	2 (23 months and 4 years)	Case 1, chipped upper incisor, also torn frenum and fractures, killed 3 weeks later Case 2, severe laceration of upper lip and loose tooth. Multiple other soft tissue injuries
Becker <i>et al</i> , 1978 ¹	4	260 (not given by authors)	49% orofacial trauma, 14 intra-oral, 4 dental trauma, no other detail on location
Swann and Glasgow, 1982 ²⁷	2	1 (7 weeks)	Oral bleeding, bruise and ulcer to fauces, abrasions and bruising to gingiva and around tongue
Schuman, 1987 ²⁴	1	1 (10 years)	Midroot fracture of maxillary incisor
Sobel, 1983 ²⁵	1	1 (4 years)	Facial abrasions/bruises, bruising of upper and lower lip, laceration of gingival and alveolar mucosa, intrusion of one incisor and avulsion of incisor, fractured mandible
Grace and Grace, 1987 ¹⁷	1	3 (10–18 months)	Abrasions of hard palate with associated trauma to ear in one case, two cases of laceration to pharyngeal wall, one with associated intracranial injury and one trauma to ear
Symons <i>et al</i> , 1987 ²⁸	4	1 (3 years)	Fatally abused, abrasion of upper lip, laceration of frenum of upper lip, intracranial haemorrhage
Manning <i>et al</i> , 1990 ²⁰	1	1 (4 months)	Recurrent oral bleeding, abrasions and lacerations of upper gum, hard palate, floor of mouth and frenum. Retropharyngeal abscess
Carrotte, 1990 ¹⁵	1	3 (13 years, n/a)	Dental extraction of permanent teeth by parents as a punishment
Barrett and Debelle, 1995 ¹³	2	1	Tear on posterior pharyngeal wall, forcible removal of an impacted dummy
Naidoo, 2000 ²¹	2	300 (1 month–14.25 years)	22 lacerations to lips, 6 injuries to oral mucosa, 5 to teeth, 5 to gingiva, 3 to tongue. Also unspecified number of loose or missing teeth. Seven fractures of mandible/maxilla
Lee <i>et al</i> , 2002 ¹⁹	1	1 (10 months)	Adult bite to the infants tongue, herpetic lesions perioral and intra-oral, also multiple fractures, skin lesions and lacerations to ear and neck
Stricker <i>et al</i> , 2002 ²⁶	1	1 (9 days)	Bleeding lesion on hard palate, discharged, returned at 4 weeks with multiple fractures and intracranial haemorrhage
Phillips and van der Heyde, 2006 ³⁰	3	4 (20 months, 2.5 years, 3 years, 5 years)	Bruised lips, lacerated lips, bruised alveolar mucosa, avulsed teeth. All fatal cases, co-existent lacerations, bruises, burns, fractures, sexual abuse (one case) and scars to body, with fatal visceral and head injuries

despite a legal requirement to report suspected abuse. A similar study by Malecz⁴¹ showed that not only did few dentists report abuse cases, but 7% of 155 respondents said that under no circumstances would they report child abuse. Reasons cited included uncertainty about diagnosis and fear of litigation, although practitioners making a referral “in good faith” are protected from litigation in the United States.³ Even 12 years later, a survey of 250 dentists, 157 of whom responded, showed that 50% of dentists had suspected abuse but one third did not refer the case,⁴² and similar reluctance has recently been documented in the UK where 21% of dentists did not refer cases they suspected of having been abused.⁴³ There have been a number of initiatives in the United States to tackle this issue,^{44–45} and Welbury *et al* have developed a computer-assisted learning programme for general dental practitioners in the United Kingdom,⁴⁶ and the British Dental Council have recently published guidance.⁴⁷

There is no legal mandatory reporting of child abuse in the UK, but the British Dental Association has made it clear that dentists do have an ethical responsibility to report child abuse.⁴⁸ Clearly, those responsible for child protection training in each region must include dental practitioners and hygienists in such programmes, and offer ongoing support.

As in previous reviews,^{12–49} children with disability were not represented. This is particularly disappointing as disabled children are recorded as being three times more likely to be abused than their able-bodied counterparts.⁵⁰

Whilst this review did not deal with dental neglect, a notable number of cases presented co-existing neglect with resulting dental caries, likely to cause severe pain to the child.^{25–28} Dental neglect while variably defined,³⁸ should be considered in any child with extensive dental caries or early childhood caries where appropriate dental care has not been sought.^{51–52} This subject merits a review in its own right, in view of the potential implications in relation to pain, morbidity and faltering growth.⁵³

Future research should be directed at determining the sensitivity and specificity of intra-oral injuries in abuse by well

designed comparative studies. It is clear that we need to define those children who sustain accidental torn frena, in isolation or otherwise, by age, developmental stage and co-existent injury and cause, in order to aid the distinction from abusive torn frena. Attention should be given specifically to documenting the full extent of intra-oral injuries in physically abused children and their co-existent injuries, and this should include disabled children.

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REFERENCES

- 1 **Becker DB**, Needleman HL, Kotelchuck M. Child abuse and dentistry: orofacial trauma and its recognition by dentists. *J Am Dent Assoc* 1978;**97**(1):24–8.
- 2 **McMahon P**, Grossman W, Gaffney M, *et al*. Soft-tissue injury as an indication of child abuse. *J Bone Joint Surg Am* 1995;**77**(8):1179–83.
- 3 **Jessee SA**. Detecting and reporting child maltreatment: dentists' obligations. *Gen Dent* 1994;**42**:218–21.
- 4 **Benusis K**. Child abuse: what the dentist should know. *Northwest Dent* 1977;**56**:260–3.
- 5 **Laskin DM**. Editorial: the battered-child syndrome. *J Oral Surg* 1973;**31**(12):903.
- 6 **McNeese MC**. When to suspect child abuse. *Am Fam Physician* 1982;**25**(6):190–7.

- 7 **Anon.** Dentists should be alert for child abuse evidence. *J Am Dent Assoc* 1979;**99**(1):116–17.
- 8 **Macintyre DR**, Jones GM, Pinckney RC. The role of the dental practitioner in the management of non-accidental injury to children. *Br Dent J* 1986;**161**(3):108–10.
- 9 **Gassner R**, Vazquez Garcia J, Leja W, *et al.* Traumatic dental injuries and Alpine skiing. *Endodont Dent Traumatol* 2000;**16**:122–7.
- 10 **Andreassen JO.** Challenges in clinical dental traumatology. *Endodont Dent Traumatol* 1985;**1**:45–55.
- 11 **Centre for Reviews and Dissemination.** *Undertaking systematic reviews of research on effectiveness. CRD's guidance for those carrying out or commissioning reviews*, CRD Report No.4, 2nd edn. York: University of York, 2001.
- 12 **Maguire S**, Mann MK, Sibert J, *et al.* Can you age bruises accurately in children? *Arch Dis Child* 2005;**90**:187–9.
- 13 **Barrett TG**, Debelle GD. Near-fatal aspiration of a child's dummy: design fault or deliberate injury? *J Accid Emerg Med* 1995;**12**:154–5.
- 14 **Cameron JM**, Johnson HRM, Camps FE. The battered child syndrome. *Med Sci Law* 1966;**6**:2–21.
- 15 **Carrotte PV.** An unusual case of child abuse. *Br Dent J* 1990;**168**(11):444–5.
- 16 **Cordner SM**, Burke MP, Dodd MJ, *et al.* Issues in child homicides: 11 cases. *Legal Med* 2001;**3**:95–103.
- 17 **Grace A**, Grace S. Child abuse within the ear, nose and throat. *J Otolaryngol* 1987;**16**(2):108–11.
- 18 **Hobbs CJ**, Wynne JM. The sexually abused battered child. *Arch Dis Child* 1990;**65**:423–7.
- 19 **Lee LY**, Ilan J, Mulvey T. Human biting of children and oral manifestations of abuse. A case report and literature review. *ASDC J Dent Child* 2002;**69**(1):92–5.
- 20 **Manning SC**, Casselbrant M, Lammers M. Otolaryngologic manifestations of child abuse. *Int J Pediatr Otorhinolaryngol* 1990;**20**:7–16.
- 21 **Naidoo S.** A profile of the oro-facial injuries in child physical abuse at a children's hospital. *Child Abuse Negl* 2000;**24**:521–34.
- 22 **Patel F.** Artefact in forensic medicine: childhood iatrogenic oral injury. *Police Surgeon* 1992;**41**:8–9.
- 23 **Price EA**, Rush LR, Perper JA, *et al.* Cardiopulmonary resuscitation-related injuries and homicidal blunt trauma in children. *Am J Forensic Med Pathol* 2000;**21**(4):307–10.
- 24 **Schuman NJ.** Child abuse and the dental practitioner: discussion and case reports. *Quintessence Int* 1987;**18**(9):619–22.
- 25 **Sobel RS**, Kerns DL. A case of child abuse. In: Sanger RG, Bross DC, eds. *Clinical management of child abuse*. Chicago: Quintessence, 1983:159–64.
- 26 **Stricker T**, Lips U, Sennhauser FH. Oral bleeding: child abuse alert. *J Paediatr Child Health* 2002;**38**(5):528–9.
- 27 **Swann A**, Glasgow J. Child abuse - we must increase our level of suspicion. *Ulster Med J* 1982;**51**(2):115–20.
- 28 **Symons A**, Rowe PV, Romaniuk K. Dental aspects of child abuse: review and case reports. *Aust Dent J* 1987;**32**(1):42–7.
- 29 **Tate RJ.** Facial injuries associated with the battered child syndrome. *Br J Oral Surg* 1971;**9**(1):41–5.
- 30 **Phillips VM**, van der Heyde Y. Oro-facial trauma in child abuse fatalities. *S Afr Med J* 2006;**96**(3):A213–15.
- 31 **Jessee SA.** Physical manifestations of child abuse to the head, face and mouth: a hospital survey. *ASDC J Dent Child* 1995;**62**:245–9.
- 32 **da Fonseca MA**, Feigl RJ, ten Benschel RW. Dental aspects of 1,248 cases of child maltreatment on file at a major county hospital. *Pediatr Dent* 1992;**14**(3):152–7.
- 33 **Chan L**, Hodes D. Images in paediatrics. When is an abnormal frenulum a sign of child abuse? *Arch Dis Child* 2004;**89**:277.
- 34 **Asahina I**, Sakakibara T, Miyashin M, *et al.* Congenital midline sinus of the upper lip: case report and review of literature. *Cleft Palate Craniofac J* 1997;**34**(1):83–5.
- 35 **Lovell MA**, McDaniel NL. Association of hypertrophic maxillary frenulum with hypoplastic left heart syndrome. *J Pediatr* 1995;**127**(5):749–50.
- 36 **Iafolla K**, Fratkin JD, Spiegel PK, *et al.* Case report and delineation of the congenital hypothalamic hamartoblastoma syndrome (Pallister-Hall syndrome). *Am J Med Genet* 1989;**33**:489–99.
- 37 **da Silva E**, Janovitz D, de Albuquerque SC. Ellis-van Creveld syndrome: report of 15 cases in an inbred kindred. *J Med Genet* 1980;**17**:349–56.
- 38 **American Academy of Pediatrics.** Oral and dental aspects of child abuse and neglect. *Pediatrics* 1999;**104**(2):348–50.
- 39 **Wright J**, Thornton J. Osteogenesis imperfecta with dentinogenesis imperfecta. A mistaken case of child abuse. *Pediatr Dent* 1983;**5**:207–9.
- 40 **Cotton EE.** Steps in child protection: reporting, social services and the judicial system (part of a panel presentation). In: *Proceedings: Dentists C.A.R.E. (Child Abuse Recognition and Education) Conference*; 31 July to 1 August 1998, Chicago: American Dental Association, 1999:21–2.
- 41 **Malecz RE.** Child abuse, its relationship to pedodontics: a survey. *ASDC J Dent Child* 1979;**46**:193–4.
- 42 **Saxe MD**, McCourt JW. Child abuse: a survey of ASDC members and a diagnostic-data-assessment for dentists. *ASDC J Dent Child* 1991;**58**(5):361–6.
- 43 **Cairns AM**, Mok JYQ, Welbury RR. The dental practitioner and child protection in Scotland. *Br Dent J* 2005;**198**:517–20.
- 44 **Herbert FL.** A report on the first national conference on the "implications of child abuse and neglect for dental education and dental health care". *ASDC J Dent Child* 1981;**48**:311–12.
- 45 **Kairys SW**, Alexander RC, Block RW, *et al.* Oral and dental aspects of child abuse and neglect: joint statement of the American Academy of Pediatrics and the American Academy of Pediatric Dentistry. *Pediatrics* 1999;**104**(2):348–50.
- 46 **Welbury R**, Hobson R, Stephenson J, *et al.* Evaluation of a computer-assisted learning programme on the oro-facial signs of child physical abuse (non-accidental injury) by general dental practitioners. *Br Dent J* 2001;**190**:668–70.
- 47 **Harris J**, Sidebotham P, Welbury R. Child protection and the dental team: an introduction to safeguarding children in dental practice. Sheffield: Committee of Postgraduate Dental Deans and Directors (COPDEND), 2006. Available at: http://www.cpdt.org.uk/f_info/download/CPDHT.pdf (accessed 13 May 2007).
- 48 **Welbury RR**, Murphy JM. The dental practitioner's role in protecting children from abuse. 3. Reporting and subsequent management of abuse. *Br Dent J* 1998;**184**(32):115–19.
- 49 **Maguire SA**, Kemp AM, Mann MM, *et al.* Are there patterns of bruising which are diagnostic or suggestive of abuse in children? A systematic review. *Arch Dis Child* 2003;**88**(Suppl 1):A3.
- 50 **Sullivan PM**, Knustson JF. Maltreatment and disabilities: a population based epidemiological study. *Child Abuse Negl* 2000;**24**(10):1257–73.
- 51 **Curzon M.** Non-accidental injury (NAI). *Eur J Paediatr Dent* 2003;**4**(2):58.
- 52 **Loochtan RM**, Bross DC, Domoto PK. Dental neglect in children: definition, legal aspects, and challenges. *Pediatr Dent* 1986;**8**(1):113–16.
- 53 **Blumberg ML**, Kunken FR. The dentist's involvement with child abuse. *NY State Dent J* 1981;**47**(2):65–9.