International Journal of Paediatric Dentistry 2004; **14:** 409–416

Establishment and evaluation of a trauma clinic based in a primary care setting

S. M. STEWART[1] & I. C. MACKIE[2]
[1]*Halton Primary Care Trust and* [2]*University Dental Hospital, Manchester, UK*

Summary. *Objectives*. The aim of this study was to establish and evaluate a referral centre for the treatment of children with traumatized teeth in an area remote from a dental hospital.
Setting. The study was conducted in a Community Dental Service clinic in Cheshire, UK.
Methods. A dentist from the Cheshire Community Dental Service was trained in the treatment and management of traumatized teeth. Invite referrals to the trauma clinic in a health centre. The number and types of patients referred and treated at the trauma clinic were monitored. In addition, the parents of referred children and referring dentists were asked to comment on the acceptability of the service.
Results. During the first 12 months, 49 patients with 74 traumatized teeth were referred to the trauma clinic. The majority of the patients were referred by their dentist because problems arose following their initial management. Both parents and referring dentists were very satisfied with the service.
Conclusions. The trauma clinic fulfilled a clinical need, and was well received by the parents of children referred to the clinic and by the local dentists.

Introduction

The 1993 UK survey of children's dental health [1] reported that 16% of 10-year-old boys and 11% of 10-year-old girls were found to have one or more accidentally traumatized permanent incisor teeth. These results are similar to other comparable studies in other countries: a national survey in Ireland [2] found that 21% of 12-year-old boys and 12% of 12-year-old girls had evidence of trauma to their incisor teeth. In Denmark, 22% of 9–17-year-olds had traumatized permanent teeth [3]. For the permanent dentition, the peak incidence for trauma in boys is 9–10 years of age [4]. Thus, dental trauma is a common injury that occurs more frequently in boys than in girls.

The success rate for appropriately treated traumatized teeth is good. For enamel dentine fractures treated with acid etch composite tips, less than 5% lost their vitality [5]. For coronal fractures where the pulp is exposed, appropriate pulp capping can maintain the vitality of the pulp in 71–88% of cases. Meanwhile, for partial pulpotomies, the success rates are even better at 94–96% [6]. Delayed treatment, no treatment or poor treatment compromise the prognosis for the dental pulp.

Delayed treatment for children who had a crown fracture with pulp exposure resulted in 100% pulp necrosis, whilst teeth with enamel dentine fractures and delayed treatment suffered pulp necrosis in 53% of cases [7]. This result is remarkably similar to that of Ravn [5], who found that 54% of permanent incisor teeth with untreated enamel dentine fractures became non-vital.

The UK national survey [1], found that only 31% of 15-year-olds and 13% of 10-year-olds had their traumatized incisors treated. In South Wales [8], only 15% of 11- and 12-year-old children had had their traumatized teeth treated. In Ireland [2], it was

Correspondence: Dr I. C. Mackie, University Dental Hospital, Higher Cambridge Street, Manchester M15 6FH, UK. E-mail: Iain.Mackie@man.ac.uk

reported that 45% of 15-year-olds had not received treatment to their traumatized teeth.

In the light of these worrying figures, a detailed survey to investigate the prevalence of dental traumatic injuries in a population and the quality of treatment provided was conducted in the North-west of England by Hamilton *et al*. [9]. The sample involved 2022, 11–14-year-old children. Clinically, 12% of the children examined had evidence of trauma requiring treatment. Radiographic examination revealed that 32% of the children had further trauma or pathology not detected clinically. Only 47% of the traumatized teeth which required attention had any evidence of clinical care, and for those teeth which had been treated, 58% of treatments provided were inadequate. Of particular concern was the finding that only two out of 26 root fillings were of an acceptable standard.

This problem of lack of treatment or unsatisfactory treatment is not confined to the North-west of England. In the North-east of England, Maguire *et al*. [10] conducted a retrospective study of children attending a university dental hospital trauma clinic. The children had coronal fractures with pulpal involvement of their permanent teeth. There were 80 children with 98 complicated crown fractures, and half of them had received no treatment of their teeth prior to referral. For the other half who had received treatment, 67% of pulp caps and 47% of pulpotomies were relying on doubtful coronal seals, and thus, the success of the treatment was compromised.

Traumatized teeth require prompt immediate emergency management, and if this is undertaken, the teeth have a good long-term prognosis. Unfortunately, many traumatized teeth remain untreated and many of those which are treated have their prognosis compromised because of unsatisfactory restoration.

Currently, in the UK, clinics are available for the treatment of dental trauma in dental hospitals. Here, the staff treat trauma regularly, and have the skills and knowledge to provide quality care. Patients may need to travel large distances, however, in order to access these clinics in secondary tertiary care centres. The aim of this project was the establishment of a centre to provide care for children with traumatized teeth in an area remote from a dental hospital. The objectives were to evaluate the trauma clinic in terms of the numbers of referred patients, their socio-economic background, the work carried out, and the success of the clinic in terms of patient satisfaction and the satisfaction of the dentists who referred patients.

Methods

The dental officer providing the treatment at the trauma clinic received training by working at the trauma clinic at the University Dental Hospital of Manchester. She attended the trauma clinic on a weekly clinical attachment for 18 months. On completion of training, contact was maintained with the Dental Hospital via e-mail and telephone.

The trauma clinic was established in the primary care setting of a Community Dental Service clinic 40 miles (64 km) west of Manchester and 25 miles (40 km) east of Liverpool. The Community Dental Service employs dentists on a salary and one of their remits is to provide dental care to patients in special needs groups.

Initial questionnaire

As part of the preparatory work for this initiative, the local general dental practitioners (GDPs) and community dentists were asked to complete an initial questionnaire. This was to ascertain their experience of and confidence about treating dental trauma. In addition, it asked if they would welcome the introduction of a trauma clinic locally.

Encouragement of referrals to the trauma clinic

All the GDPs in the locality were invited to a briefing meeting about the new service, and given an information pack which gave details of the trauma clinic including contact name, address and telephone number. There were guidelines for the referral of children with traumatized incisor teeth which encouraged the dentist to carry out simple, appropriate emergency treatment prior to referral. A referral form was also distributed in order to ensure that relevant information was given about the nature of the injury, treatment already carried out and whether the child might require inhalation sedation to cope with treatment. All the local dentists attended the meeting. Dentists in the Community Dental Service were contacted and given the same information.

Evaluation of the trauma clinic

The evaluation of the trauma clinic was undertaken after one year, and the following information was collected about the patients:

- number referred;
- age and gender;
- socio-economic status (SES);
- reason for referral;
- type of injuries referred;
- stage at which referral occurred; and
- type and appropriateness of any treatment given prior to referral.

By using the postcode, children were categorized according to SES using the Super Profiles geodemographic indicator. This is a three-tier, hierarchical classification that classifies enumeration districts (the smallest geographical unit of the National Census, with a population of approximately 400 individuals) into area types based on Census and consumer data. The 'target market' tier of classification consists of 40 categories ranked on an ordinal scale according to income [11]. This scale was split into quintiles to produce a five-point scale ranging from 'affluent' to 'deprived'.

Patient satisfaction was evaluated by means of a postal questionnaire sent to the children's parents. Determining patient satisfaction is a complex issue, based on patient's expectations, communication skills of the dentist, dental anxiety and regular/irregular attendance [12]. The patient satisfaction questionnaire was designed to consider these issues. The questionnaire had been piloted at the University Dental Hospital of Manchester trauma clinic. The dentist satisfaction questionnaire was sent to all the 26 local GDPs and the six community dental service dentists in the area served by the community clinic.

The criteria for the adequacy and appropriateness of treatment prior to referral were based on current literature [13–15].

Data were entered into computer using identification numbers instead of patient names. Analysis was carried out using the SPSS computer program.

Results

Initial questionnaire

The initial questionnaire was completed by 20 of the 26 local dentists, giving a response rate of 77%. The estimated mean number of traumatized teeth treated annually by GDPs was 11, and this figure was nine for the clinical community dentists.

Over the previous 3 years, the vast majority of the dentists indicated that they had had very little experience of treating traumatized teeth (Table 1). This was coupled with the fact that they had encountered very few types of traumatic injuries to permanent incisor teeth in children (Table 2).

Table 1. Estimated number of treatments performed by the local dentists in the previous 3 years*.

	General dental practitioners		Community dentists	
Number of treatments	Number	Percentage	Number	Percentage
Partial pulpotomies:				
0	9	75	3	60
1	2	17	1	20
> 1	1	8	1	20
Cervical pulpotomies:				
0	9	82	5	100
1	0			
> 1	2	18		
Placed a splint:				
0	5	50	2	40
1			1	20
> 1	5	50	2	40
Replanted a tooth:				
0	9	75	4	80
1	2	17	1	20
> 1	1	8		
Apical closure technique:				
0	2	22	3	60
1	3	33		
> 1	4	45	2	40

*Not all dentists estimated the number of treatments they had performed.

Table 2. Estimated numbers of injuries to permanent teeth treated by the local dentists in the previous 3 years*.

	General dental practitioners		Community dentists	
Number of injuries	Number	Percentage	Number	Percentage
Root fracture:				
0	4	50	1	20
1	2	25	2	40
> 1	2	25	2	40
Intrusion:				
0	4	45	1	20
1	2	22	3	60
> 1	3	33	1	20
Extrusion:				
0	6	67	2	40
1	1	11	3	60
> 1	2	22		
Concussion:				
0	4	45	2	50
1	2	22		
> 1	3	33	2	50
Subluxation:				
0	2	25	1	25
1	1	13	1	25
> 1	5	62	2	50
Lateral displacement:				
0	8	67	4	100
1	3	25		
> 1	1	8		

*Not all dentists answered all the questions.

Table 3. Socio-economic status of the patients referred to the trauma clinic by source of referral: (1) most affluent; and (5) most deprived*.

	Target market quintile [*n* (%)]					
Source of referral	1	2	3	4	5	Total
General Dental Service	5 (22)	6 (26)	2 (9)	1 (4)	9 (39)	23 (100)
Community Dental Service	1 (5)	5 (23)	1 (5)	1 (5)	14 (62)	22 (100)
Total	6 (13)	11 (25)	3 (7)	2 (4)	23 (51)	45 (100)

*Postcodes were not available for four patients.

Evaluation of the trauma clinic

During the first year of the trauma clinic, 49 patients with 74 traumatized teeth were referred to the trauma clinic, 26 (53%) from GDPs and 23 (47%) from the Community Dental Service.

The trauma clinic was intended to treat children of 16 years of age or less; however, three patients were referred aged 17, 18 and 38 years. If these were excluded, the mean age of patients referred was 10·0 years.

The ratio of males to females referred was 2·5:1, with 35 (71%) being male and 14 (29%) female.

For determining SES, postcodes for 45 of the 49 patients were available. The results are given in Table 3. It can be seen that 23 (51%) of children were from target quintile 5, the most deprived category.

The main reason for referral was to undertake the management of the traumatic injury. For the 26 patients referred by GDPs, 19 (73%) were directed for management of their traumatic injury, two (8%) because they were uncooperative, two (8%) because the referring dentist could not control a chronic infection, one for an extraction under general anaesthesia, another for an apicectomy, and the last patient for advice only.

For the 23 patients referred by the community dental service dentists, 14 (61%) were directed for management of a traumatic injury, seven (30%) for follow-up care, one for a replacement acid etch

Table 4. Numbers of traumatized primary teeth, type of injury and source of referral to the trauma clinic*.

Injury	Source of referral		Total	
	General Dental Service	Community Dental Service	Number	Percentage
Intrusion	4	–	4	34
Lateral displacement	2	1	3	25
Subluxation	–	2	2	17
Root fracture	–	1	1	9
Original injury unknown (pathology present)	2	–	2	15
Total	8	4	12	100

*Some children presented with more than one injury.

Table 5. Numbers of traumatized permanent incisor teeth, type of injury or treatment, and source of referral to the trauma clinic.

Injury	Source of referral		Total	
	General Dental Service	Community Dental Service	Number	Percentage
Concussion	1	1	2	3
Subluxation	5	2	7	11
Enamel fracture	3	2	5	8
Enamel dentine fracture	6	10	16	26
Enamel dentine fracture with acute infection	–	1	1	2
Tooth restored with composite restoration	4	9	13	21
Tooth with composite restoration and chronic infection	2	–	2	3
Complicated crown fracture with chronic infection	1	–	1	2
Complicated crown root fracture	1	–	1	2
Complicated crown root fracture (root filled)	1	–	1	2
Root fracture	2	–	2	3
Alveolar fracture*	4	–	4	6
Root-filled traumatized tooth	–	2	2	3
Avulsion	1	1	2	3
Original injury unknown (pathology present)	3	–	3	5
Total	34	28	62	100

*Two patients sustained an alveolar fracture involving two teeth. Some patients sustained more than one injury.

Table 6. Stage at which the patients were referred to the trauma clinic.

Stage of referral	General Dental Service		Community Dental Service	
	Number	Percentage	Number	Percentage
Initial management	–	–	10	44
Initial management by dentist, but now problems	16	61	3	14
Immediate emergency care by dentist: referred for follow-up care	4	15	7	30
No treatment given: immediate referral	3	12	2	8
Initial management by hospital: referred for follow-up care	3	12	1	4
Total	26	100	23	100

composite tip and another for a replacement root filling.

Children referred to the trauma clinic had suffered trauma to either the primary or the permanent dentition. Injuries to the primary dentition are shown in Table 4. The most common injuries were intrusion and lateral luxation. Injuries to the permanent dentition are shown in Table 5. Some of the traumatized teeth had already received treatment from the referring dentist, and thus, the type of injury is excluded. Coronal fractures were the most common type of injury referred.

Most of the patients (19, 39%) were referred once problems arose following initial management (Table 6). This would imply that dentists often commenced the initial management; however, because of subsequent

problems, they referred the patients to the trauma clinic. The main problems were with root canal treatment, the cooperation of the child, and lack of confidence with the diagnosis and knowledge about appropriate care.

When considering the appropriateness of treatment, it was found that 10 (20%) patients had received no treatment whilst nine (18%) had received inappropriate treatment. For those 30 patients who received appropriate treatment, it was found that 19 (64%) had satisfactory treatment. In 11 (36%), it was unsatisfactory, and these cases included an inadequate splint, poor root canal dressings and fillings, and coronal fractures where the initial dressing fell off soon after placement.

Patient and dentist satisfaction

Patient satisfaction questionnaires were targeted to those patients who had attended for three or more visits and to those whose first contact clinician was not the first author (S.M.S.). The response rate was 81% (17 out of 21). All respondents realized why they had been referred to the trauma clinic and 94% were expecting their child to receive special treatment. The majority (89%) were happy to be referred to the trauma clinic. Although 22% thought that their child would be more nervous seeing a different dentist, all parents replied that their child had been happy seeing the first author (S.M.S.). All respondents thought that the treatment had been explained sufficiently, and that the clinic staff had been kind and courteous.

The response rate for the dentist satisfaction survey was better, with 17 out of the 19 GDPs in the area responding (89%). Out of these 17 dentists, nine had referred patients to the trauma clinic. They all reported that this was a useful additional service. They had found it easy to refer patients (78%), that the waiting time to appointment was acceptable (89%) and that they had received sufficient feedback about their patients (78%).

For the eight dentists who had not referred patients to the trauma clinic, seven preferred to treat trauma themselves and one thought their patients preferred not to be referred to another clinician.

Discussion

The initial questionnaire indicated that the vast majority of dentists in the locality of the trauma clinic had very little experience of treating children with traumatized permanent incisor teeth. In addition, some of the dentists recognized their own lack of experience, skill and knowledge with regard to dealing with these injuries. They were reluctant to treat traumatized teeth because of 'not enough experience', 'no experience', 'unsure about diagnosis – need education', 'I do not have the ability' and 'lack of knowledge/skills', although one was 'willing to treat all injuries, with clinical support for the more difficult cases'. On the whole, the dentists were very positive about the initiative of opening a trauma clinic, with 79% of the GDPs and 100% of the community dentists being in favour.

Interestingly, eight (47%) of the GDPs had not referred patients to the trauma clinic or to the dental hospital. Of these, seven preferred to treat trauma themselves. Whether these dentists had any greater ability to treat trauma than those dentists who did refer is not known.

Treatment of children's traumatized incisor teeth can be very successful. Some children, however, receive no or only inadequate treatment of their traumatized incisor teeth. This could be because the dentist lacks the knowledge or experience in the management of dental trauma. Therefore, it would seem logical that there should be a service provided locally by a dentist suitably trained to provide high-quality treatment.

The Community Dental Service provides routine treatment for patients with special needs and 'special' treatment for routine patients. The trauma clinic fulfilled the role of providing 'special' treatment, and links were already established with local dentists to refer patients for other forms of treatment such as sedation, surgical dentistry and general anaesthesia.

Over the first year, 49 patients with a total of 74 traumatized incisor teeth were referred to the trauma clinic. This means that the dentist running the clinic encountered over four times more traumatized incisor teeth in the year of the study than the average GDP. Hamilton [9] calculated that a GDP or community dental officer was likely to see approximately 10 children with dento-alveolar injuries per year.

Half of the children were from the most deprived target market quintile (TMQ5) and 13% were from the most affluent (TMQ1). This socio-economic spread mirrors the distribution in the locality. This is gratifying since it shows that families from the least affluent backgrounds would attend a trauma clinic.

Nearly every type of traumatic injury was referred to the trauma clinic: concussion, subluxation, lateral luxation, intrusion, avulsion, coronal fractures, root fractures, alveolar fractures, acute and chronic infections. The most common type of injury referred was an enamel dentine fracture (31%). This reflects the prevalence of these injuries.

Over one-third ($n = 19$, 39%) of the patients presenting at the trauma clinic were referred after problems had arisen following initial management by the dentist, and five of these patients had a persistent infection following attempted root canal treatment. These five patients were treated satisfactorily by the dentist at the trauma clinic. The infection was controlled, root end closure achieved and a satisfactory root filling placed.

A total of 20 (51%) of patients had received unsatisfactory or inappropriate treatment prior to referral, and this probably reflects the dentists' lack of knowledge and experience in treating dental trauma.

The service provided by the trauma clinic was well accepted by the parents of children referred to the clinic, and the dentists felt it was a useful additional service. All comments were very positive, expressing a desire for the service to continue.

Conclusion

This study has described the establishment of a trauma clinic to treat children with traumatized incisor teeth in a primary care setting remote from a dental hospital. The clinic was well received by the local dentists who referred patients as well as by the parents of the children treated at the clinic.

Résumé. *Objectifs.* Etablir et évaluer un centre référent pour le traitement des enfants avec dents traumatisées dans une zone éloignée d'un hôpital dentaire.
Mise en place. Community Dental Service Clinic de Cheshire, Nord-Ouest de l'Angleterre.
Méthodes. Former un dentiste du Service Dentaire Communautaire de Cheshire au traitement et à la prise en charge des dents traumatisées. Faire venir des référents à la clinique des traumas du centre de santé. Contrôler le nombre et les types de patients référés à la clinique. De plus, les parents des enfants référés et les dentistes les adressant ont été interrogés pour connaître leur perception du service.
Résultats. Durant les premiers 12 mois, 49 patients avec 74 dents traumatisées ont été adressés à la clinique. La majorité des patients ont été adressés par leur dentiste en raison de problèmes suivant leur prise en charge initiale. A la fois les parents et les dentistes ont été très satisfaits du service.
Conclusions. La clinique du traumatisme répond à un besoin clinique et a été très bien perçue par les parents des enfants adressés et par les dentistes locaux.

Zusammenfassung. *Ziele.* Die Einrichtung und Evaluation eines Überweisungszentrums zur Behandlung von Kindern mit Zahnverletzungen im Einzugsgebiet eines zahnmedizinischen Hospitals.
Studienumgebung. Kommunale Zahnklinik in Cheshire, Nordwestengland.
Methoden. Ein Zahnarzt der kommunalen Zahnklinik wurde speziell geschult zur Behandlung von Zahntrauma. Es wurde zur Überweisung von Patienten mit Zahntrauma aufgerufen. Die Zahl und Art der Patienten, die in die Traumasprechstunde überwiesen wurden, wurden überprüft. Zusätzlich wurden Eltern, überwiesene Kinder und die Überweiser gebeten, die sen Service zu bewerten.
Ergebnisse. Während der ersten 12 Monate wurden 49 Patienten mit 74 verletzten Zähnen überwiesen in die Traumasprechstunde. Die Mehrzahl wurde von den Hauszahnärzten überwiesen, da nach der Erstversorgung zu Problemen kam. Sowohl Eltern als auch Überweiser waren mit dem Angebot der Traumasprechstunde zufrieden.
Schlussfolgerung. Die Zahntraumasprechstunde deckte einen klinischen Bedarf ab und wurde von Eltern überwiesener Kinder ebenso gut angenommen wir von Zahnärzten der Umgebung.

Resumen. *Objetivos.* Establecer y evaluar un centro de referencia para el tratamiento de niños con traumatismos dentales en un área alejada de un hospital dental.
Lugar. Servicio Clínico Dental de la Comunidad en Cheshire, Noroeste de Inglaterra.
Métodos. Instruir a un dentista del Servicio Dental de la Comunidad de Cheshire en el tratamiento y manejo de dientes traumatizados. Fomentar las referencias a la Clínica de Traumatismos en el Centro de Salud. Monitorizar la cantidad y los tipos de pacientes referidos y tratados en la Clínica de Traumatismos. Además a los padres de los niños referidos, así como a los dentistas de referencia se les pidió que comentasen sobre la aceptabilidad del servicio.
Resultados. Durante los primeros 12 meses fueron referidos a la Clínica de Traumatismos, 49 pacientes con 74 dientes traumatizados. La mayoría de los

pacientes fueron referidos por su dentista porque los problemas aumentaron tras el tratamiento inicial. Tanto los padres como los dentistas de referencia estaban muy satisfechos con el servicio.
Conclusiones. La Clínica de Traumatismos complementó una necesidad clínica y fue bien recibida por los padres de los niños referidos a la clínica y por los dentistas locales.

References

1 O'Brien M. *Children's Dental Health in the United Kingdom, 1993*. London: Office of Population Censuses and Surveys, 1994.
2 Holland T, O'Mullane D, Clarkson J, O'Hickey S, Whelton H. Trauma to permanent teeth of children aged 8, 12 and 15 years, in Ireland. *Journal of Paediatric Dentistry* 1998; **4**: 13–16.
3 Andreasen JO, Ravn JJ. Epidemiology of traumatic injuries to primary and permanent teeth in a Danish population sample. *International Journal of Oral Surgery* 1972; **1**: 235–239.
4 Andreasen JO, Andreasen FM, Bakland LK, Flores MT. *Traumatic Dental Injuries. A manual*, 1st edn. Copenhagen: Munksgaard, 1999: 6–7.
5 Ravn JJ. Follow up study of permanent incisors with enamel-dentine fractures after acute trauma. *Scandinavian Journal of Dental Research* 1981; **89**: 355–365.
6 Andreasen JO, Andreasen FM. *Textbook and Colour Atlas of Traumatic Injuries to the Teeth*, 3rd edn. Copenhagen: Munksgaard, 1994.
7 Al-Nazhan S, Andreasen JO, Al-Bawardi S, Al-Rouq S. Evaluation of the effect of delayed management of traumatised permanent teeth. *Journal of Endodontics* 1995; **21**: 391–393.
8 Hunter ML, Hunter B, Kingdon A, Addy M, Dummer PMH, Shaw WC. Traumatic injury to maxillary incisor teeth in a group of South Wales school children. *Endodontics and Dental Traumatology* 1990; **6**: 260–264.
9 Hamilton F, Hill FJ, Holloway PJ. An investigation of dento-alveolar trauma and its treatment in an adolescent population. Part 1: The prevalence and incidence of injuries and the extent and adequacy of treatment received. *British Dental Journal* 1997; **182**: 91–95.
10 Maguire A, Murray JJ, Al-Majed I. A retrospective study of treatment provided in the primary and secondary care services for children attending a dental hospital following complicated crown fracture in the permanent dentition. *International Journal of Paediatric Dentistry* 2000; **10**: 182–190.
11 Tickle M, Williams M, Jenner T, Blinkhorn A. The effects of socio-economic status and dental caries experience and treatment patterns in 5-year old children. *British Dental Journal* 1999; **186**: 135–137.
12 Newsome PRH, Wright GW. A review of patient satisfaction: 1. Concepts of satisfaction. *British Dental Journal* 1999; **186**: 161–165.
13 Mackie IC, Blinkhorn AS. Dental trauma 2. Management of coronal fractures of immature permanent incisor teeth. *Dental Update* 1996; **23**: 104–108.
14 Mackie IC, Blinkhorn AS. Dental trauma 3. Splinting, displacement injuries and root fracture of immature incisor teeth. *Dental Update* 1996; **23**: 140–142.
15 Mackie IC. Management and root canal treatment of non-vital immature permanent incisor teeth. *International Journal of Paediatric Dentistry* 1998; **8**: 289–293.