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Assessment of traumatic injuries to primary teeth in general practise and specialized paediatric dentistry

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Abstract – *Aim*: The aim of this prospective study was to compare diagnosis, severity of trauma and treatment of traumatic injuries to the primary dentition in two groups of children, the first recommended for treatment by general practitioners and the second referred for treatment by a specialist paediatric dentist. *Materials and methods*: A total of 323 children with traumatic injuries, 184 boys and 139 girls aged 7–83 months, participated in the study. All the children had first presented at a Public Dental Service clinic where they were examined by general dentists who decided, based on the severity of the trauma, to assign each child to one of the following two groups: Group A – recommended for treatment at the general practise (166 children with 257 traumatized incisor teeth). Group B – recommended for referral to a specialist in paediatric dentistry (157 children with 261 traumatized incisor teeth). Even in Group A, the specialist controlled the treatment decisions. The clinical diagnose and follow-up followed the recommendations presented by Andreasen & Andreasen. *Results*: The distribution of trauma by age was similar in both groups, with about 60% occurring between 1 and 3 years. More injured teeth were extracted in children in Group B ($n = 111$) than in Group A ($n = 33$). A higher percentage of intruded primary incisors were recorded in Group B (24%) compared with Group A (16%). Similarly, the percentage of concussions/subluxations, lateral luxations and complicated crown fractures was higher in Group B than in Group A. *Conclusions*: The group referred for specialist treatment had more severe injuries and needed more complicated treatment than the group recommended for care by general dentists. However, the rate of sequelae in permanent successors was the same in both.

Traumatic injuries to the primary dentition are common (1, 2). Approximately 30% of all children (1, 3–6) have experienced trauma to the primary dentition before the age of 6 years, which may lead to complications both to the primary teeth and their permanent successors. Most traumas affect primary incisors in the upper jaw (3).

As the same classification and nomenclature are now used worldwide, it is possible to compare the results of recent studies on traumatic injuries to primary teeth (2, 3). However, most fail to mention whether the study population was diagnosed and treated by specialists or general practitioners (GP). Given that the majority of published studies were performed by paediatric dentists at specialist clinics, the results probably reflect the clinical status of a specialist rather than general practise clientele (3–15). They, therefore, provide little information on the trauma clientele handled by dentists in general practise.

In most cases, injuries to the primary dentition are treated by GP. However, some children with more severe traumas are referred to specialist clinics for care. At present there is limited information on the differences in type of traumatic injury, severity of injury, treatment need and complications between these two treatment levels.

The aim of this study was, therefore, to compare and analyze the trauma diagnosis, severity of trauma, treatment and sequelae to the primary teeth and their permanent successors in a group of children who were recommended for care by GP and a group of patients referred to a specialist paediatric dentist.

Materials and methods

The study population consisted of 323 children, 184 boys and 139 girls, with 518 traumatized primary incisors. The mean age of the children at the time of trauma was 34.1 months, SD 15.0 (range 7–83 months). They lived in the city of Uddevalla, Sweden with well established Public Dental Service (PDS) clinics and one specialist clinic for paediatric dentistry. All the children had visited their PDS dentist, who after judgement of the severity of

the trauma decided whether they should be treated at the PDS clinic (Group A; 166 children, mean age 30.5 months) or referred to the specialist paediatric dentist (Group B; 157 children, mean age 39.1 months).

In all, 11 PDS dentists took part in the study. They were all trained in diagnosis and treatment of traumatized primary teeth. They had taken part in lectures on trauma given by the specialist before the study in order to standardize the use of diagnostic criteria. The decision to refer a patient to the specialist was when the dentist thought that the treatment was too complicated to be performed at the PDS.

The 157 referred children in Group B, 85 boys and 72 girls with a total of 261 injured teeth, were re-examined by the paediatric dentist (CG Rasmusson). For the purposes of this study, arrangements were made for the children in Group A, 99 boys and 67 girls with a total of 257 injured teeth, classified by the general dentists as patients who did not need referral, also to be re-examined and followed-up by the same specialist (CG Rasmusson). 16 children (9 in Group A and 7 in Group B) were excluded from the study because they had experienced more than one traumatic event. The examinations were performed at the time of the trauma, and again after 4 weeks, 8 weeks and 1 year, at 6 years of age, and finally following eruption of the permanent successors. If there were complications this schedule was modified. The examinations included classification of the trauma according to Andreasen & Andreasen (2), intraoral periapical radiographs and clinical photos. The treatment performed and any complications were recorded. Identification of the injured tooth or teeth was carried out most frequently by palpation. Electro-metrical pulp vitality testing was not used. Medications such as antibiotics and analgesics were not prescribed routinely but only when indicated by the clinical condition.

Twenty-five of the extracted teeth (9 from Group A and 16 from Group B) were selected randomly and sent to the Department of Oral Pathology, University of Gothenburg, in order to verify the clinical diagnosis by histological analysis. Seventy-five percentage of the study population was available for examination after eruption of the permanent successors.

The chi-squared test was used to determine any differences between the groups. The chosen level for significance was $P < 0.001$.

Results

Age distribution according to trauma and causes

The ratio of boys/girls was 1.3/1.0 in Group A and 1.0/1.0 in Group B. Detailed information on the age distribution of the children in both groups is presented in Table 1.

About 60% of the traumas occurred between 1 and 3 years of age with age distribution similar in both groups. The number of patients with two or more injured teeth was almost the same in the two groups, 108 and 100 in Group A and B, respectively.

The most frequent causes of trauma to the primary teeth are presented in Table 2. Falls against 'hard objects' such as tables or stairs were found to be the most common. Most occurred indoors where there was a low risk for contamination of the wounded area.

Table 1. Age distribution of the children at time of trauma in the two groups in percentage

Years	Group A (n = 166) %	Group B (n = 157) %
0–1	5	1
1–2	33	29
2–3	31	31
3–4	15	21
4–5	8	13
5–6	4	5
6–7	4	1

Table 2. Cause of injuries

Cause of trauma	Group A (n = 166) %	Group B (n = 157) %
Fall against hard object	43	32
Fall against table	12	9
Fall with pacifier in mouth	11	6
Fall (type not specified)	5	12
Fall on stairs	5	9
Tipped buggy, high chair etc.	5	3
Other causes	15	22
Not evaluated	3	7
	100	100

Type of luxation injuries

There was little difference between the two groups in the number of each type of luxation injury (Table 3). However, a higher percentage of concussions/subluxations and lateral luxations was recorded in Group A, while there were more intruded primary incisors in Group B.

Of the 40 intruded teeth, 8 (1 in Group A and 7 in Group B) had perforated the labial lamella. They showed no spontaneous re-eruption and had to be extracted.

Tooth fractures

There were very few fractures diagnosed as *infraction*, *fractura corona et radix non-complicata, fractura corona et radix complicata,* or *fractura radix* in either group.

Table 3. Type of luxation injuries

	Group A (n = 166) %	Group B (n = 157) %
No luxation	11	12
Concussion/subluxation	43	38
Extrusion	2	1
Intrusion	16	24
Lateral luxation	18	11
Exarticulation	7	9
Not evaluated	3	5

The following situations were more common although distributed differently in the two groups (numbers are in brackets):

No fracture: 72% (120) in Group A and 64% (100) in Group B.

Fractura corona dentis non-complicata: 22% (36) in Group A and 10% (16) in Group B.

Fractura corona dentis complicata: 2% (3) in Group A and 10% (16) in Group B.

Discolouration

Prevalence of discolouration of the traumatized tooth/teeth at the first visit is given in Table 4. There were a greater number of teeth with grey discolouration in Group B than Group A. While the number of children with no discoloured teeth was higher in Group A than Group B. The total number of children with discolourations was statistically significant higher in Group B compared with Group A ($\chi^2 = 18.0$, $P < 0.001$).

Extractions

In 33 children in Group A and 111 children in Group B, extractions of traumatized incisors had to be performed. This difference is statistically significant $\chi^2 = 34.9$, $P < 0.001$. The percentage and number of extractions during the follow-up period are shown in Table 5. There were three times as many extractions in Group B than in Group A. Indications for extraction included discolouration in combination with increased mobility, radiographic finding of a widened periodontal membrane and signs of periapical infection, abscesses and fistulas. Intruded teeth without spontaneous re-eruption were also extracted.

The histological analysis of the 25 randomly selected extracted teeth found that 18 had total or partial necrosis and seven had internal root resorption. These findings supported the clinical decision to extract the teeth.

Table 4. Children with discolouration of the traumatized tooth/teeth at the first visit

	Group A (n = 166)	Group B (n = 157)
No discolouration	142	94
Yellow	3	6
Red	3	
Grey	13	38
Not evaluated	5	19

Table 5. Diagnosis of extracted teeth in percentage (number of children in brackets)

Diagnosis	Group A %	Group B %
Concussion/subluxation	48 (16)	49 (55)
Extrusion	6 (2)	1 (1)
Intrusion	6 (2)	22 (24)
Lateral luxation	27 (9)	14 (16)
Other causes	12 (4)	14 (15)

Table 5 lists the reasons documented for extraction of teeth, the most common being concussion/subluxation in both Groups A and B (48% and 49%, respectively). The two groups differed most in the number of teeth extracted following intrusion. In total, 13 intruded teeth with no spontaneous re-eruption were extracted, 1 tooth in a boy in Group A and 12 teeth in 7 boys and 5 girls in Group B.

Sequelae in permanent successor

It was possible to re-examine about 75% of the study population after the permanent successors had erupted. Sequelae found in the permanent successors are shown in Table 6. They were classified as either minor (**0** or **I)** or major (**II),** where **0** represented no disturbance, **I** minor changes, e.g. small opacities or discolourations of the enamel, and **II** morphologic and discolouration defects of the dental hard tissues. The percentage of sequelae in Groups A and B was similar. Major changes occurred in about 15% of the children (Table 6). It was found that antibiotics were prescribed for just 1% of the cases in Group A and 5% in Group B.

Discussion

This is one of the first prospective studies to present information on children with traumatic injuries to the primary dentition where a GP decided which of the children should be treated by a GP (Group A) and which needed referral to a specialist (Group B).

In contrast to most earlier studies, which were retrospective (3, 7–9, 11, 15) and used data collected from specialist clinics, this investigation provides a more complete picture of type, severity, treatment and sequelae of traumatic injuries to the primary dentition, enabling comparison between GP and specialist clienteles. However, one should bear in mind that the results may have been influenced by the knowledge and experience of the individual GPs who made the primary examinations and referrals. Furthermore, the delay that often occurs between GP and specialist appointments might also have affected the diagnoses and treatment decisions, as well as clinical outcomes. This wait-time would have had an effect on injuries such as minor luxations, spontaneous realignment and colour alterations in particular (3, 8, 9). Borum undertook one of the most comprehensive studies of a paediatric dentistry specialist clientele (3). Her results were very

Table 6. Sequelae of injuries to the primary incisors on the permanent successors in percentage (number of children and teeth in brackets)

Grade of enamel disturbance	Group A %	Group B %
0	51 (children 63, teeth 94)	48 (children 56, teeth 82)
I	43 (children 49, teeth 53)	35 (children 41, teeth 50)
II	6 (children 29, teeth 31)	17 (children 20, teeth 23)

similar to those for Group B in this study (the referred children), and to a lesser extent to the general practise group.

In line with other studies, the incidence of trauma peaked in children between 1 and 3 years of age (1, 3, 6, 7). This has been explained by their poor motor co-ordination at this stage of development. The most common causes of trauma in this study, as in earlier studies (5–8), were falls indoors against hard objects such as tables or stairs, falls with a pacifier in the mouth and falls from seesaws or tricycles. When the data on luxation injuries was analyzed, the frequency of concussions/subluxations was found to be more or less the same in Groups A and B (43% and 38%, respectively). These figures are similar to those reported by Borum (3, 7) and Holan (9). In Group B the frequency of intruded teeth was about 30% higher than in Group A, supporting the finding that more severe cases were found in Group B compared with Group A.

Extractions, which were carried out according to indications presented by other authors (3, 7, 8, 11), were remarkably higher in Group B than Group A. This high extraction rate is as expected given the difference in trauma severity between the two groups. The greater number of necrotic teeth in Group B than Group A is also consistent with the higher frequency of grey discolouration in Group B (15, 16). Indirectly, it also supports the fact that the GPs had assigned the children correctly, i.e. they were good at recognizing the serious cases that needed specialist treatment.

A confusing finding was that the occurrence of sequelae was the same in both groups, although there were clear differences in the severity of trauma between the two. The higher extraction rate of severely traumatized teeth in Group B might explain the reduced risk of sequelae in these children.

In conclusion, this study found important clinical differences in the outcome of trauma cases recommended for treatment by GPs and specialist paediatric dentists. This should be kept in mind when comparing and evaluating earlier and future studies on this topic. It also underlines the importance of ensuring that competent specialist dental care is available for children, as well as providing GPs with the expertise required to identify correctly those cases that require referral for specialist treatment.

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