Traumatized primary anterior teeth

Prognosis related to calcific reactions in the pulp cavity

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The frequency of a complicating pulp necrosis and the process of the physiologic root resorption were studied in traumatized primary teeth exhibiting partial or total pulp obliteration. The material comprised 88 incisors in 72 children aged 0.7–5.7 years (mean 2.9 years) at the time of injury. Trauma had resulted either in subluxation (25 teeth), or luxation (13 teeth), whereas the type of injury was unknown in 50 teeth. All cases were observed until eruption of the permanent incisors. Forty-four teeth initially displayed a reversible greyish color. The ultimate finding observed in all teeth was, however, varying degrees of yellow discoloration. Periapical pathologic findings indicative of pulp necrosis were observed in 9 teeth, from 1.6–4 years (mean 3 years) after the time of injury. Extraction was performed immediately, and none of the successional teeth showed developmental disturbances. The process of root resorption was classified as normal in all primary teeth. Subsequent eruption of the permanent successors occurred without any registered complications.

Keywords: Obliteration; root resorption; pulp necrosis

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The term obliteration is commonly used to specify the radiographic observation of calcific reactions in the pulp cavities. Long-term prognosis of traumatized permanent teeth demonstrating such pulpal complications have been studied by Stålhane (12) and Jacobsen & Kerekes (6). These authors observed periapical radiolucensies indicating pulp necrosis in 16 % and 13 %, respectively, of all teeth exhibiting pulp obliteration. Limited information is available on the long-term prognosis of similar conditions in primary teeth. Schröder et al. (11) observed periapical osteitis in 3 of 23 obliterated teeth during on observation period of 2 years. The literature has also been concerned with the exfoliation of primary teeth showing pulp obliteration. However, the opinions are conflicting. According to Bennett (3) the root resorption proceeds normally, while Ravn (10) claims that the resorption is often delayed, causing ectopic eruption of the successional permanent tooth.

In the present study a series of injured primary teeth showing abnormal hard tissue formation in the pulp cavity were followed until eruption of the corresponding permanent incisors.

The purposes of the investigation were 1) to obtain further information about the frequency of a complicating pulp necrosis,

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and 2) to study the possible effect of obliteration on the process of root resorption.

MATERIAL AND METHODS

The material was collected from the Department of Pedodontics, University of Oslo. Radiographs of all injured primary teeth registered in the period 1971–1974 were examined. One hundred and thirty teeth exhibiting abnormal hard tissue formation in the pulp cavities were considered for the investigation. Forty-two of these teeth were not incorporated in the material for various reasons (Table 1). However, questionnaires were sent to the patients excluded due to limited follow-ups. The present material comprised the remaining 88 teeth which had been re-examined at six monthly intervals until eruption of their permanent successors. The time interval from trauma to examination at the dental clinic varied, and information concerning the period immediately following the accident was sometimes incomplete. However, in general the records contained the required data. The 88 teeth were distributed among 41 boys and 31 girls. The age distribution at the time of accident is shown in Table 2. With the exception of 10 maxillary laterals or mandibular incisors, the affected teeth were maxillary central incisors.

Type of injury (Table 3) was classified as subluxation (loosening) or luxation (dislocation) either in an intrusive or palatal direction. In a great number of cases the type of injury was recorded as unknown. The calcification in these teeth were discovered at a routine examination of a greyish discolored tooth, at a control of an adjacent injured tooth, or at a later injury.

Root formation (Table 4) at the time of injury was rated as incomplete, complete or unknown.

Treatment such as reduction of luxated teeth or immobilization was not performed.

Table 1. *Distribution of teeth not included in the material*

	No. of teeth
Lost from follow-up before eruption of permanent incisors	36
Exarticulation	2
Extraction due to repeated severe injury	4
Total	42

Table 2. *Distribution according to age at time of injury of 72 patients showing obliteration of pulp cavity*

Age (years)	1	1–2	2–3	3–4	4	Unknown
No. of patients	1	12	26	13	9	11

Table 3. *Distribution of teeth according to type of injury*

Type of injury	No. of teeth
Subluxation	25
Luxation	
Intrusive	10
palatal	3
Unknown	50
Total	88

Table 4. *Distribution of teeth according to stage of root development at time of injury*

Root development	No. of teeth
Incomplete	6
Complete	63
Unknown	19
Total	88

In the follow-up period special attention was paid to tooth mobility, reaction to percussion tests and to the color of the tooth crown. Due to lack of co-operation the radiographs were not obtained under standardized conditions. All radiographs were evaluated independently by the authors. If discrepancy existed, a radiologist was consulted. The findings in the pulp cavity, the periradicular observations and the pattern of root resorption were classified as follows:

Pulp cavity – Total obliteration: pulp chamber and root canal hardly or not discernible. Partial obliteration: the entire pulp cavity markedly narrowed, root canal always clearly visible.

Periradicular area – Normal: periodontal space of normal width. Pathologic: changes in normal structures varying from widened periodontal space to distinct radiolucent area.

Root resorption – Normal or delayed compared to non-traumatized contralateral tooth. If the contralateral was affected or extracted, the shedding sequence or expected time of exfoliation was evaluated.

RESULTS

Thirty teeth were classified as totally obliterated while partial obliteration was observed in 58 teeth. The only clinical symptom was discoloration which was observed in all teeth. At the end of the control period the color was described as various shades of yellow. However, 44 teeth had initially displayed a greyish discoloration recorded within 2 weeks to 2 months of the injury. Over an extended period of time the grey tone gradually faded and the tooth crowns assumed a yellow hue concomitant to the radiographic manifestation of a pulp obliteration.

Nine teeth (10 %) were extracted due to periapical pathologic findings (Fig. 1). The pathologic process was detected on the radiographs from 1.6–4 years (mean 3) after the injury. At the time of extraction the age of the children varied from 3 to 6 years (mean 5). Hypoplasia or discoloration of the enamel was not observed in any of the corresponding permanent teeth.

The pulp obliteration was not found to influence the process of exfoliation. The root resorption was classified as normal in all teeth (Fig. 2) and the subsequent eruption of their permanent successors proceeded without any registered complications.

Thirty-four of the 36 questionnaires were answered. Information given by the parents revealed that none of the teeth with a limited control period had been extracted, neither had any irregularities as to the exfoliation been observed.

DISCUSSION

Discoloration of traumatized teeth is considered to be of diagnostic value. An example is the yellowish coronal discoloration indicating partial or total obliteration of the pulp cavity (6, 12). Another example is the grey or bluish discoloration which, according to Bennett (3), is a sign of pulpal death and should lead to extraction of primary teeth. In the present study necrosis was suspected in 44 primary teeth displaying this particular discoloration early in the control period. However, upon further observation normal or almost normal color returned. Therefore, the grey tooth color as an isolated observation may be misleading as an indication of pulp necrosis. More probable, the discoloration of these teeth reflected a pulpal bleeding rather than necrosis (11). Hence a grey color should be accompanied by other clinical and/or radiographic signs before an extraction is performed.

According to Fish (4) intrapulpal bleeding may be induced by minor injuries to the

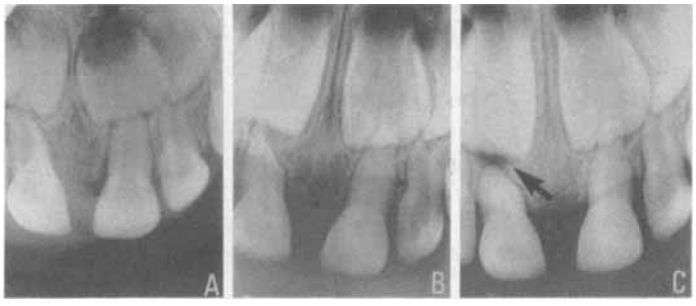

Fig. 1. Subluxation of maxillary central incisors leading to partial obliteration in both teeth and late pulp necrosis in right incisor. A, condition at time of injury. B, 2 years after injury. Apical condition of right incisor recorded as uncertain. C, 6 months later the radiolucent area is evident (arrow).

Fig. 2. Total obliteration and normal root resorption of both maxillary central incisors. A, radiograph taken 2 weeks after subluxation of left incisor. Obliteration of right incisor due to previous accident. B, at follow-up 1 year later. C, 2 years after injury showing almost total obliteration and normal periapical findings. D, 9 months later, at time of shedding.

supporting structures of the tooth, effecting the veins of the apical foramen. In his opinion the arteries may not be disrupted, leading to continued blood flow into the pulp cavity and hemorrhage into the dentinal tubules. Thirty-nine of the 44 teeth showing the immediate greyish discoloration had either been subluxated, or the type of injury was recorded as unknown. In many of the latter cases the parents did recall a specific accident with bleeding from the oral soft tissues. It is likely that such injuries were accompanied by minor injuries of the teeth such as concussion or subluxation.

Periapical osteitis affected 10% of the involved teeth (9 out of 88) versus 3 of a total of 23 teeth in the study reported by *Schröder et al.* (11). Their observations indicated that the risk of periapical osteitis was minimal during the first year. This view was confirmed in the present study, showing an average observation time of 3 years for teeth extracted due to periapical radiolucencies.

In a study on permanent teeth (6) the development of pulp necrosis was found to be significantly related to total obliteration, to severe types of injury and to complete root formation at the time of injury. Neither of these findings could be verified for primary teeth. Total obliteration developed only in 2 of the 9 teeth exhibiting periapical radiolucencies, and the type of injury was either subluxation or unknown. The material comprised few teeth with incomplete root formation. Thus the influence of this variable could not be established. The assumption that new traumas may

cause necrosis secondary to obliteration (12) was not supported. Several patients had sustained repeated injuries to their teeth. However, repeated injuries were equally frequent in teeth with and without periapical pathologic findings.

Developmental disturbances in the permanent dentition following injuries to the primary teeth are observed in approximately 50 % of the cases (2). Such disturbances may be caused by mechanical traumatization of the permanent tooth germ or of the adjacent tissues. Harmful effect of a periapical inflammation following trauma to primary teeth, is another possibility. (For general review on periapical inflammation see Valderhaug (13)). In the present study periapical pathologic findings were observed in 9 primary teeth, but no changes in the morphology or mineralization of the permanent successors were registered. However, it should be noted that the primary teeth were extracted immediately after the diagnosis of periapical changes, reducing the exposure time to a minimum. In addition, the average age of the patients at the time of extraction (5 years) might imply complete or almost complete crown formation of the permanent incisors. Both factors would tend to reduce the possibility of developmental disturbances of the corresponding permanent teeth (9, 1).

The most important finding in the present study was presumably the observation that normal root resorption occurred in all teeth with pulp obliteration. It appears, therefore, that pulp obliteration has no significant effect on the pattern of shedding. This is in accordance with the view that the pulp is of minor importance in the process of resorption of primary teeth (5, 7). Ravn (10) reported that the resorption of primary teeth showing pulp obliteration often was delayed, leading to ectopic eruption of the corresponding permanent tooth. However, ectopic eruption of permanent incisors are not infrequent in general, and the findings of Ravn may well be related to other factors such as malposition of the tooth germ (8).

From the present study the following conclusions may be drawn:

The prognosis of primary teeth showing pulp obliteration is generally favorable.

Normal root resorption of such teeth may be expected.

The frequency of periapical radiolucencies following pulp obliteration seems to be low. However, re-examination should take place at regular intervals. If periapical changes are detected, immediate extraction is the treatment of choice.

Post-traumatic greyish discoloration may reflect an intrapulpal bleeding and should not be taken as diagnostic of pulp necrosis.

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