

## Dilaceration of a primary maxillary incisor associated with neonatal laryngoscopy

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### Abstract

*Neonatal laryngoscopy and endotracheal intubation often are required for prematurely born, low birthweight children. Previous studies have shown that these procedures are associated with a high prevalence of enamel hypoplasia of the maxillary anterior teeth. The present case report, which describes dilaceration of a left maxillary primary central incisor probably resulting from laryngoscopy, strongly supports the hypothesis that irreversible trauma to the dentition may result from endotracheal intubation.*

### Introduction

The laryngoscope, used to expose the laryngeal opening for resuscitation purposes or for the administration of general anesthesia, has been associated with many local traumatic effects (Bamforth 1963; Wright and Manfield 1974; Lockhart et al. 1986). In adults, erupted maxillary anterior teeth, particularly those with compromised periodontal support, have been displaced by traumatic laryngoscopy (Lockhart et al. 1986). Breakage of prosthetic crowns also has been reported (Bamforth 1963).

Even in unerupted teeth, pressure from the laryngoscope blade may damage developing tooth buds lying beneath the alveolar mucosa. An uncontrolled study by Moylan et al. (1980) suggested that laryngoscopy during the neonatal period may be responsible for developmental defects of the enamel in maxillary anterior teeth. In controlled clinical studies of low birthweight, prematurely born children, Seow et al. have reported that localized enamel defects of the maxillary left primary incisors were four times more common in children with a history of neonatal laryngoscopy and endotracheal intubation than in those who were not intubated (Seow et al. 1984; 1987; 1989).

In this report, an extracted maxillary left primary central incisor that showed severe dilaceration of its crown was examined by light and electron microscopy

for evidence of disruption to odontogenesis by the traumatic effects of the laryngoscope.

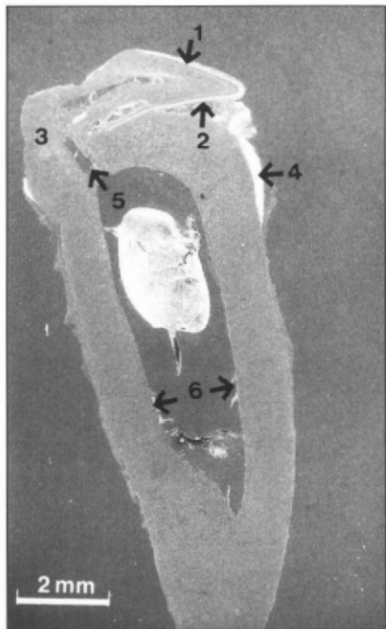
### Case Report

#### Medical findings

A 20-month old child was referred to the University of Queensland Dental School from the Growth and Development Clinic, Mater Children's Hospital, South Brisbane for treatment of an abscessed left maxillary primary incisor. He had been born prematurely at 26 weeks gestation by a normal delivery; his birthweight was 1055 g. He suffered moderate asphyxia and was intubated 3 min thereafter. An initial chest radiograph showed evidence of severe hyaline membrane disease and he was ventilated from birth for 14 days. In addition, severe intracranial hemorrhage was detected which subsequently resulted in hydrocephalus. This necessitated treatment with a ventriculo-peritoneal shunt. Other medical problems encountered during the neonatal period included neonatal sepsis, patent ductus arteriosus, and retrolental fibroplasia. At age 20 months, his weight was 10.4 kg (23rd percentile), height 82.8 cm (50th percentile), and head circumference 48.5 cm (70th percentile). He was a severely handicapped child with spastic quadriplegia and delayed development.

#### Dental clinical findings

On the first visit to the Dental School, the patient presented with a diffuse swelling of one day duration in his upper lip opposite the central incisors. No history of toothache could be elicited, although the mother reported that he was irritable for a few days preceding the swelling. Although there was a history of fever on the previous day, his body temperature was normal at presentation. A course of penicillin and paracetamol had been prescribed by his pediatrician on the previous day.



Dental examination revealed all maxillary and mandibular primary incisors, canines and first molars to be present. The maxillary left primary central incisor appeared grossly hypoplastic with enamel missing over most of its palatal surface. The enamel was thin on its labial surface and absent over a deep notch on the incisal third. The tooth was moderately mobile and pus exudated from the labial gingival sulcus on probing.

Due to the gross hypoplasia of the crown and the poor cooperation of this patient, it was decided to extract the abscessed tooth. This was performed successfully when the child was sedated with an antihistamine, and healing was uneventful.

### Materials and Methods

The extracted maxillary left central incisor was cleaned by immersion in an ultrasonic bath containing 30% hydrogen peroxide to remove

surface organic debris, rinsed in 100% alcohol, and dried with compressed air. The tooth was replicated for scanning electron microscopy (SEM) by a technique essentially the same as that of Barnes (1979), modified as follows. A negative replica was made using light-bodied, vinyl, silicone impression material. A positive replica was made using a room-temperature, curing, low-viscosity epoxy resin as the secondary cast. The hardened epoxy replica was mounted on an aluminium stub with copper conductive lacquer and sputter coated with 50 nm of pure gold. A Philips 505 scanning electron microscope® (Eindhoven, Holland) located at the Electron Microscope Centre, University of Queensland was used.

The original tooth was dehydrated in ethyl alcohol

and embedded in a polyacrylic resin (L.R. White — BioRad Sciences, Watford, U.K.).

The hardened plastic block then was cut longitudinally in a buccolingual plane into two equal halves. Using a Leitz Saw Microtome-1600® (Leitz, West Germany), sections 80 µm thick were then prepared from one half of the tooth. The other half was polished using a six-stage aluminium oxide procedure, etched using 1% phosphoric acid for 30 sec, then rinsed, dried, and sputter coated for SEM as above.

### Results

Approximately one-half (3 mm) of the normal anatomical crown had undergone morphodifferentiation before the tooth germ was displaced. Subsequent crown formation resulted in an irregular mass of dentin only partially covered by enamel of normal thickness, and the remainder of the root dentin formed at right angles to the palatal surface of the partially formed crown (Fig 1a). No new enamel appeared to have been formed on the facial aspect of the crown except at the cervical margin or on the dentin, which subsequently formed directly under the thin palatal enamel. Crown development appeared complete and the root apex was closed.

Dentin formation in both sites showed a clear delineation between that formed before trauma and after (Fig 1b). Changes in the distribution of dentinal tubules were particularly noticeable. Dentin formed pre-trauma had a regular distribution of tubules while that formed immediately post-trauma contained few regular tubules, but rather trapped vascular-sized spaces (Fig 1b) and a few irregularly branching tubules (Fig 1c, next page). Communication was maintained between the pulp chamber of the original crown tip and the developing root. However, the pulp cavity was large in the root. No enamel was found on the pulpal aspect of the root dentin (Fig 1b).

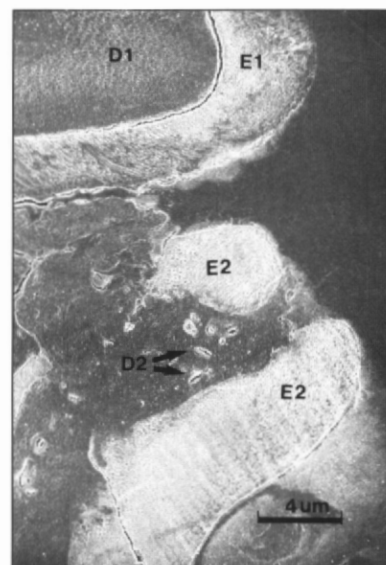
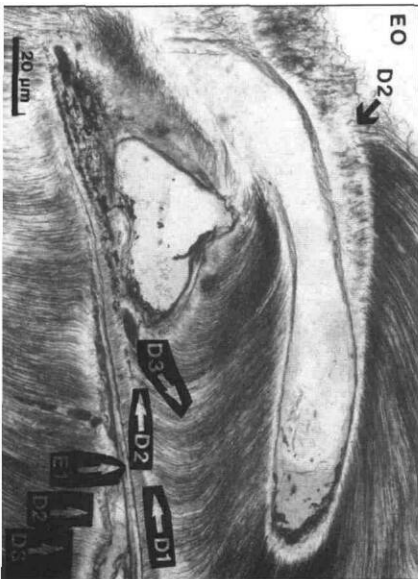


FIG 1b. Normal dentine (D1) and enamel (E1) of the tooth formed before trauma contrasted with the abnormal dentine containing vascular channels (D2) and irregular enamel (E2) formed after trauma.

## Discussion

As many prematurely born, very low birthweight infants suffer respiratory distress during the neonatal period, endotracheal intubation and mechanical ventilation often are required to assist respiration. The laryngoscope is used routinely to expose the laryngeal opening



**FIG 1c.** Ground section of enamel (E) and dentine (D) at the interface between the palatal enamel of the tip and the dentine of the crown formed after trauma. A thin shell of normal enamel is present at E1. The adjacent dentine is normal at D1, however a translucent zone, D2 upper crossed by relatively few tubules denotes the traumatic incident. This type of dentine also can be seen in the crown dentine which is not covered by enamel, EO. Subsequent dentine formation was essentially normal (D3).

Although all prematurely born children are also highly predisposed to enamel hypoplasia from a variety of systemic disturbances occurring during the neonatal period (Seow et al. 1984a; 1984b; 1987; 1989), the laryngoscope probably contributes significantly to a large number of local hypoplastic defects. While most of these defects involve loss of enamel only, deformation of crown resulting in dilaceration, as in this case, is rare. In this regard, it is of great interest to note that in a recent investigation, Seow et al. (1989) found that prematurely born infants with the most severe mineral deficiency of bone were also those at greatest risk to develop enamel defects from traumatic laryngoscopy.

This case report of enamel hypoplasia and crown dilaceration of a primary incisor tooth provides further clinical and histological evidence that neonatal laryngoscopy may damage developing teeth, and substantiates the previous investigations of Seow et al. (1984a; 1987;

1989). Although other studies have suggested that the orotracheal tube also may be traumatic to developing teeth (Boice et al. 1976; Wetzel 1980), in this case, it is unlikely that the dilaceration is due to the orotracheal tube for several reasons. First, during the neonatal period, the infant was turned alternately on the right and left sides so that any pressure would have been distributed equally to both sides of the maxilla, and not localized in the left incisor. Second, the histological evidence points to a single traumatic event that displaced the dental organ palatally, coinciding with the upward and backward forces resulting from the application of the laryngoscope.

The histology contributes insights into the range of reactions that occurred in the traumatized dental organ. The formed and partially calcified tip of the crown was displaced with respect to the enamel organ. A similar displacement was reported by Arwill (1962) in a permanent incisor. Enamel formation on this tip ceased; this was evidenced by the thinness of the enamel and from its absence on several dentin surfaces, where it was hypoplastic. However, the epithelial diaphragm of the enamel organ persisted in some sites to form a small amount of cervical enamel labially, enamel of normal thickness on the cingulum, palatally and continued as Hertwigs sheath, to induce the formation of root dentin. Dentin formation, which had proceeded normally in the crown tip before trauma, underwent a temporary but generalized interruption; a homogeneous matrix was formed in which blood vessels possibly were trapped, and contained fewer and initially irregular dentinal tubules. Subsequent dentin formation was essentially normal; both crown and root development appear complete in this tooth.

In conclusion, the present report supports previous studies which show that neonatal laryngoscopy contributes significant trauma to developing maxillary anterior primary teeth.

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## Dentistry profits from school health education

School health education has an impact on brushing habits and dental visits for children, according to a 1988 survey conducted by Louis Harris and Associates.

The survey of public school children in grades three through 12 revealed that the vast majority of children brush their teeth—67% twice or more a day, and 26% once a day. While 7% of all students indicated that they brush less than once a day or never, that number increased to 17% for youngsters with no school health education experience.

School health education also affects the frequency of dental visits, according to survey results. Almost three fourths of students indicated they have a dental visit once or more often a year. Only 67% of students with no health education had dental visits at least annually, while 84% of students who received comprehensive health education in school paid annual visits to the dentist.

This survey, commissioned by the Metropolitan Life Foundation, was designed and conducted by Louis Harris and Associates. A total of 4738 students in grades three through 12 from 199 schools around the country completed the survey.