

## Effect of digit-sucking habits on root morphology in primary incisors

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### Abstract

*The purpose of this paper is to determine if digit sucking causes root resorption on primary central incisors. Randomly selected dental records of 98 patients, ages two to four years, were examined. The presence or absence of a digit habit, as determined from the history, was compared to anterior occlusal radiographs for evidence of root resorption on maxillary primary central incisors. The three- and four-year-old age groups contained 39 and 37 subjects, respectively. The digit habit patients had 86% of the atypical resorptions in the three-year-old group and 84% in the four-year-old group. Fifty-nine per cent of patients with habits demonstrated unusual resorptive patterns, compared with 8% of those without habits. The association between atypical resorptive patterns and the presence of digit habits was significant in both groups and when the groups were combined ( $p < .0005$ ). The presence of digit sucking appears to contribute to atypical resorptive patterns on maxillary primary central incisors.*

**D**igit sucking is one of several oral habits which have garnered attention among health professionals for many years, particularly because of the harmful effects upon the dentition and supporting structures. There is little doubt that digit sucking can result in malocclusion if the intensity, duration, and frequency of the habit are pronounced.

Popovich and Thompson, in a study involving 1,258 children, found that there was a significant association between the incidence of Class II malocclusions and persistent digit sucking.<sup>1</sup> It also appears that digit habits can create strong anterior forces on the maxillary arch, causing more anteriorly positioned maxillae in sucking than in nonsucking groups.<sup>2</sup> Furthermore, children with digit habits tend to have increased frequencies of posterior crossbite.<sup>3</sup>

No studies have been done which fully examine the effect of digit habits on the morphology of the tooth root. It is well established as part of orthodontic theory that excessive orthodontic forces, in terms of duration and amount, will cause external root resorption.<sup>4</sup> Therefore, if a digit habit is of sufficient intensity, duration, and frequency, it is reasonable to speculate that root resorption might occur. The rationale for this study is that an increased frequency of digit habits demonstrates a circumferential or semilunar root resorption on the primary central incisors. The purpose of this paper is to investigate any such effect.

### Methodology

Dental records of 98 randomly selected patients, ages two through four years, were examined. The presence or absence of digit habits was compared to radiographic evidence of atypical root resorption on maxillary primary central incisors. Size 2 maxillary anterior occlusal radiographs were used to evaluate all cases. The radiographs were taken using standard pedodontic technique and under the supervision of a certified dental assistant and an x-ray technician.

A dichotomous categorical scale was devised for evaluation of root resorption. The categories were: (1) normal root appearance or normal resorption, and (2) atypical, or "circumferential" root resorption. (Author's term; because radiographs are only two-dimensional, it is difficult to ascertain in this study if the resorption actually surrounds the entire root.) Normal root appearance or normal resorption was defined as roots exhibiting no evident resorptive activity or roots which were blunted only slightly, i.e., very mild apical resorption (Figure 1). The roots categorized as having circumferential resorption were those showing resorptive activity or indentations along the side of the root, according to the pictorial criteria in Figure 1. It was decided that the atypical, or circumferential resorptive activity must be present on

**Figure 1.** Categories of root resorption.

1. Criteria for assignment into the "normal root appearance or normal resorption category":
  - A. No resorption is evident (root end is tapered)
  - B. Slight blunting (mild resorption) may be present at the root ends.
2. Criteria for assignment into the "circumferential or atypical resorption category"—resorption (indenting along the lateral aspect of the root).

three of the four root surfaces of the central incisors to be categorized as circumferential resorption. This eliminates local factors affecting only one small area of the root from consideration.

There were several important considerations in the evaluation of the morphology of the tooth root. The first was the improbability of normal root resorption in the age groups under consideration. In other words, an analysis of atypical root resorptive patterns ordinarily would not be complicated by normal resorptive patterns in these age groups. Secondly, in three cases the resorption pattern was so severe that virtually no root remained. This is certainly atypical, and these cases all involved habit patients. However, since the resorptive pattern did not coincide with the study's criteria, the cases were discarded. This was an intentional attempt toward conservatism, since the patterns probably represented "advanced" circumferential resorption.

Thirdly, all cases were eliminated which involved a history of any of the following: (1) trauma to the anterior maxillary segment, (2) caries and/or restorations, and (3) pulp therapy. These subjects were eliminated because of the potential for root resorptive activity being unrelated to a digit habit. Seventy-seven of the 98 randomly selected patients met these criteria.

Patients were identified as to the presence of a digit habit from the medical/dental history, which contained a question for parents regarding the presence of such habits. There were two limitations which emerged in this part of the study. First, it was possible that some parents denied the presence of a digit habit. Second, it was possible that some children had digit habits in the past, which were absent at the time of the study. These children would be "counted" as nonhabit cases, in spite of the fact that the old habit may have influenced the shape of the root. The nature of this study makes these deficiencies uncorrectable. However, both deficiencies skew the results toward a more conservative result. In other words, these considerations would tend to mathematically favor a dilution of the amount of resorptive activity in the habit group, while increasing the amount of resorptive activity in the nonhabit group.

Two pedodontist judges evaluated all radiographs, without knowledge of the absence or presence of a digit habit. Their assessments of the types of resorptive patterns were totalled into habit and nonhabit groups, and analyzed for association between these variables by Chi

square. The Yates correction for  $2 \times 2$  tables was used. An assessment of inter-rater reliability was determined by kappa, which is defined as the proportion of agreement that is corrected for chance agreement.

## Results

The kappa score was 0.752, resulting in a rater reliability significance factor of  $p < .0001$ . Table 1 shows the number of patients in each age group having digit habits and which of those had either normal or abnormal resorptive patterns. Cells that contain observed frequencies in fractional terms represent averaging of disagreements between raters. There were too few patients in the two-year-old age group to make any assessments. The three- and four-year-old age groups contain 39 and 37 subjects respectively, with 41.0% and 40.6% of the patients in those respective groups having digit habits. The digit-habit patients had 86% of the atypical resorptions in the three-year-old group and 84% in the four-year-old group. It also is apparent that the number of atypical resorptions among digit-habit children increased from the three-year-old group to the four-year-old group (56% of the digit-habit children in the three-year group demonstrated atypical resorption versus 70% in the four-year group). Conversely, there was almost no increase between the rate of resorptive activity in the nonhabit three- and four-year-old groups. The association between atypical resorptive patterns and the presence of digit habits was significant in both age groups ( $p < .005$  and  $p < .0005$  respectively).

Not surprisingly, the same trends are noted when groups are combined and two-year-olds are included (Table 2). In this case, 42.8% of the patients had digit habits. Fifty-nine percent of those with habits demonstrated unusual resorptive patterns, compared to 8% of those without habits. The higher prevalence of atypical resorption among those with digit habits was significantly associated ( $p < .0005$ ).

## Discussion

The overall rate of digit sucking found in this investigation (43%) appears to conform with other studies. The prevalence of thumb sucking in child populations has been reported between 13 and 45% by other authors.<sup>5-7</sup> One of the most comprehensive investigations observed 2,650 infants and children from birth to 16 years of age and calculated that 45.6% had digit habits at some point during the observation.<sup>8</sup>

An association seems to exist between the presence of a digit habit and atypical types of root resorption on primary maxillary central incisors as seen radiographically. In particular, the presence of digit sucking seems to contribute to circumferential resorptive patterns, as evidenced by increased resorption on the lateral aspects of the roots. This has interesting clinical relevance, because it potentially adds another etiology for root re-

**Table 1.** Root Resorption and Habit Prevalence in Three- and Four-Year-Old Patients

	Three-Year-Olds		
	Habit	No Habit	Total
Circumferential Resorption	9 (23.1%)	1.5 ( 3.8%)	10.5 (26.9%)
Normal	7 (17.9%)	21.5 (55.1%)	28.5 (73.0%)
Total	16 (41.0%)	23 (59.0%)	
	Four-Year-Olds		
	Habit	No Habit	Total
Circumferential Resorption	10.5 (28.4%)	2 ( 5.4%)	12.5 (33.8%)
Normal	4.5 (12.2%)	20 (54.1%)	24.5 (66.3%)
Total	15 (40.6%)	22 (59.5%)	

sorption along with those already known, such as trauma, deep caries, failed pulp treatments, etc. Consequently, the presence of a digit habit may complicate diagnostic assessments in trauma cases and in cases involving questions regarding the success or failure of pulp therapy.

It also is interesting that there is an increased prevalence of atypical resorption patterns in the four-year-old group versus the three-year-old group. This may be a result of habits that are of longer duration, eventually affecting the root morphology. Furthermore, it also is possible that exfoliation-related root resorption might be hastened and/or accentuated by digit sucking habits.

### Conclusion

Atypical root resorption, as evidenced by radiographic signs of lateral root resorption appears to be greater in

**Table 2.** Root Resorption and Habit Prevalence in All Age Groups

	Habit	No Habit	Total
Circumferential Resorption	19.5 (25.3%)	3.5 ( 4.5%)	23 (29.8%)
Normal	13.5 (17.5%)	40.5 (52.6%)	54 (70.1%)
Total	33 (42.8%)	44 (57.1%)	

children two to four years old who have a history of a digit habit as compared to those children who do not.

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### Quotable Quote

It is fashionable for persons to write of the appalling illiteracy of this generation, particularly its supposed inability to write grammatical English. But what of the appalling "innumeracy" of most people, old and young, when it comes to making sense of the numbers that run their lives? As Senator Everett Dirksen once said, "A billion here, a billion there; soon you're talking real money. . . ." It is numbers of this size that we are dealing with when we talk about a Defense Department overrun of \$750 billion over the next four years. A really fancy single-user computer costs approximately \$75,000. With \$750 billion to throw around we could give one to every person in New York City, which is to say we could buy about 10 million. Or, we could give \$1 million to every person in San Francisco and still have enough left over to buy a bicycle for everyone in China. There is no telling to what good uses we could put \$750 billion. But, instead, it will go into ammunition, tanks, fighters, war games, missile systems, jet fuel, and so on.

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