

## SCANNING ELECTRON MICROSCOPE STUDY OF THE ROOT CANAL SURFACE IN HUMAN DECIDUOUS UPPER CANINE

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*ABSTRACT: Characteristics of the dentine surface of the root canal of human deciduous upper canine are studied by using scanning electron microscope. The dentine surface showed relatively smooth containing a regular distribution of numerous holes of dentine tubules. These foraminae present different diameters ranging from 3 to 5  $\mu$ m. Some areas are covered by a network of thin bundles of collagen fibers, disposed in several directions.*

*UNITERMS: Deciduous tooth; dentinal surface; dentine tubule; scanning electron microscopy.*

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### INTRODUCTION

The structures of pre-dentine, odontoblastic processes of a tubular form, peritubular zones and the intertubular substance are reported by FRANK<sup>4</sup>. SHROFF *et alii*<sup>10</sup> described the ultrastructure of the dentine. FURSETH & MJOR<sup>6</sup> studied the dentine in the region of the tooth crown; TAKUMA<sup>11</sup> and FRANK<sup>5</sup> reported about odontoblast and the tubular dentine.

Recently, some characteristics of dentinal surface of human teeth such as permanent lower incisor, permanent upper canine, permanent lower molar and pulp chambers of deciduous teeth were reported<sup>8,12,13,14</sup>.

Our aim in this paper is to describe some of the ultrastructure characteristics of the dentine surface, using the scanning electron microscope.

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## MATERIAL AND METHODS

Ten human deciduous upper canines were used in this investigation. All the teeth were immersed in a 50% ethanol solution and kept at 4°C. Then, the teeth were sectioned and fractured along their long axis and were immediately washed and treated in a solution of 5% acetic acid, in order to eliminate some remaining material<sup>13</sup>.

Following reduction of the teeth to appropriate sizes, they were dehydrated in ethanol and afterwards coated with ions of gold. The electronmicrographies were obtained on a scanning electron microscope Jeol, JSM-P<sub>15</sub> regulated at 15 Kv.

## RESULTS

In the general aspect of a longitudinally fractured canal of human deciduous upper canine can be observed a relatively smooth area (Fig. 1). Low power photomicrographs show that the dentine surface presents a great number of holes corresponding to the dentin tubulis. The dentin tubuli are easily detected on the surface and constitute deeply the extension of the dentinal tubule.

In high magnification (Fig. 2), shows a series of foraminae which present different diameters ranging from 3 to 5  $\mu\text{m}$ . The dentine surface are almost uniform in thickness. The aspects of the intertubular and peritubular dentine and their distribution are noted with collagen fibers investment (Fig. 3).

The microprojections of the outlines of the dentin tubuli foraminae have a regular surface covered by thin bundles of collagen fibers. In some areas, these fibers form a network containing many bundles of collagen fibers oriented longitudinally, circularly and in irregular directions (Fig. 4).

## DISCUSSION

Our results revealed clearly the characteristics of the root canal dentinal surface of the human deciduous upper canine. All the specimens fractured in longitudinal sections, demonstrated a smooth area containing numerous foraminae of the dentin tubuli.

Our results also showed that the dentin tubuli were arranged in the wall of the root canal. These dentin tubuli present different sizes and diameters, which are ranging from 3 to 5  $\mu\text{m}$ . WATANABE & KONING<sup>12</sup> reported that the dentin tubuli of the permanent central lower incisor present similar sizes; WATANABE<sup>14</sup> reported that human molar teeth contain foraminae disposed in globular formations and the holes possess their diameters which range from 0.8 to 1.7  $\mu\text{m}$ , and MORABITO & DELRIO<sup>8</sup> also described the holes of human molars containing foraminae with 0.1 to 0.3  $\mu\text{m}$  in diameter.

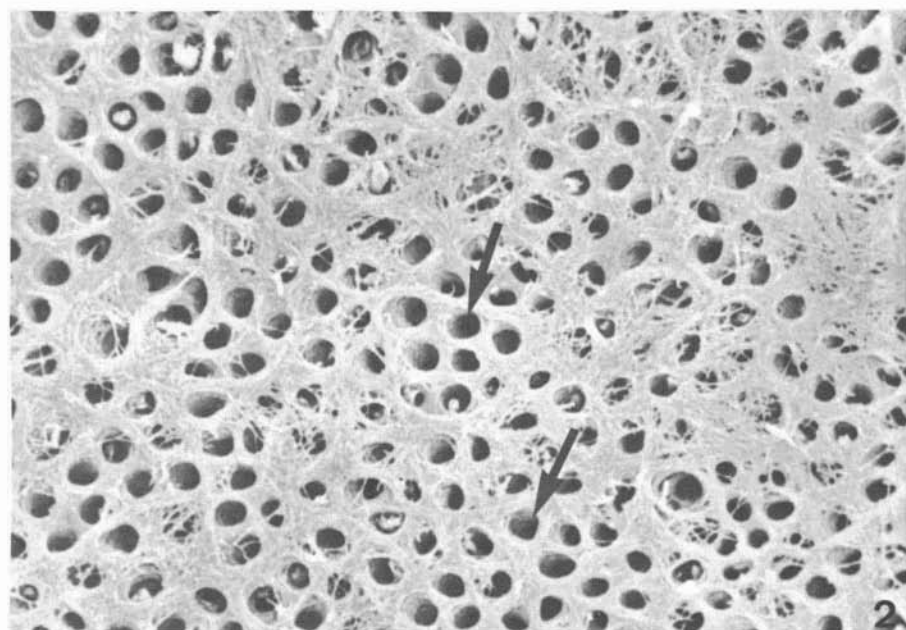
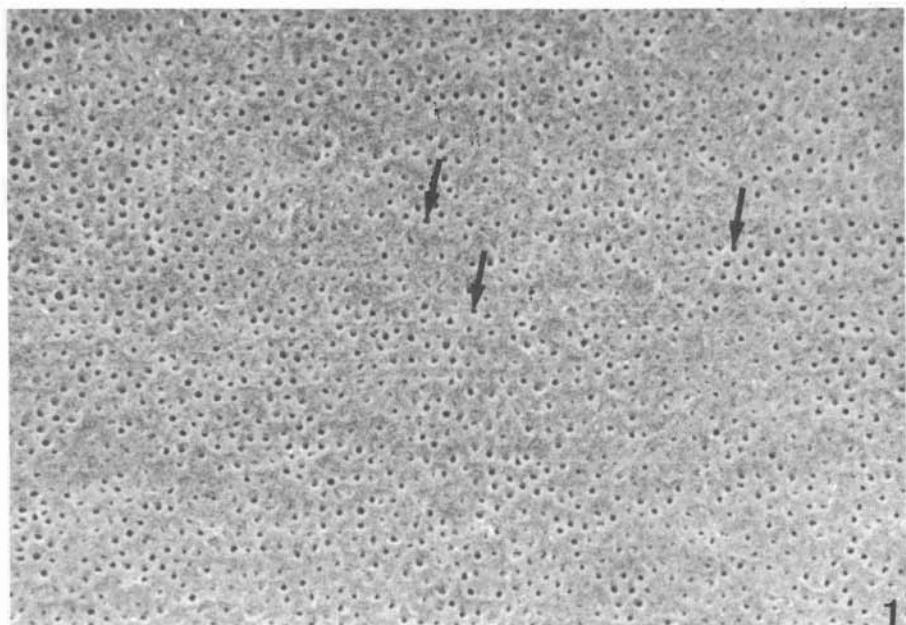


FIG. 1 - General aspect of the root canal surface longitudinally fractured. Human deciduous upper canine, showing numerous dentin tubuli of several diameters (arrows). 600 X

FIG. 2 - Foraminae of dentin tubuli presenting 3 to 5  $\mu$  m in diameter (arrows) are noted. 2,400 X

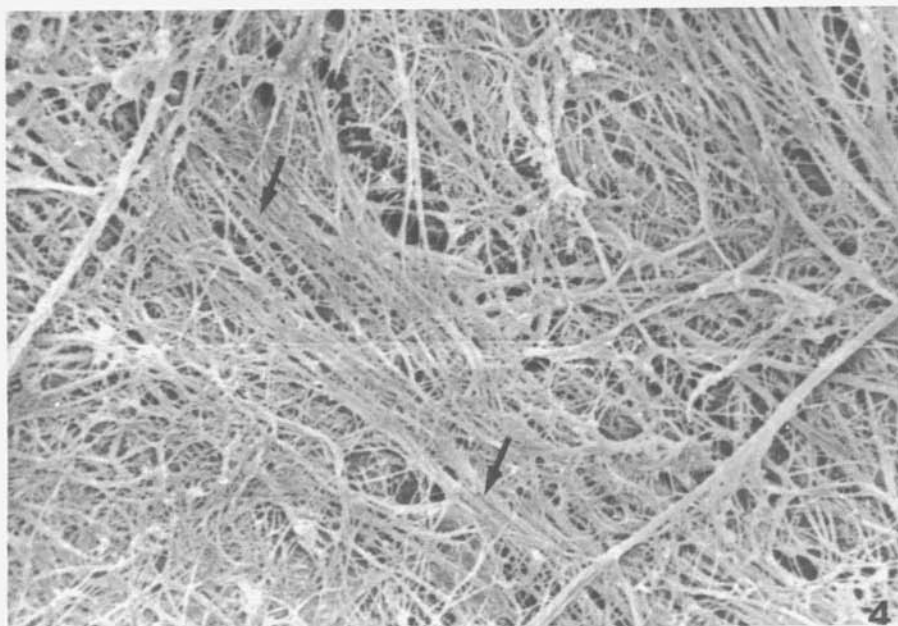
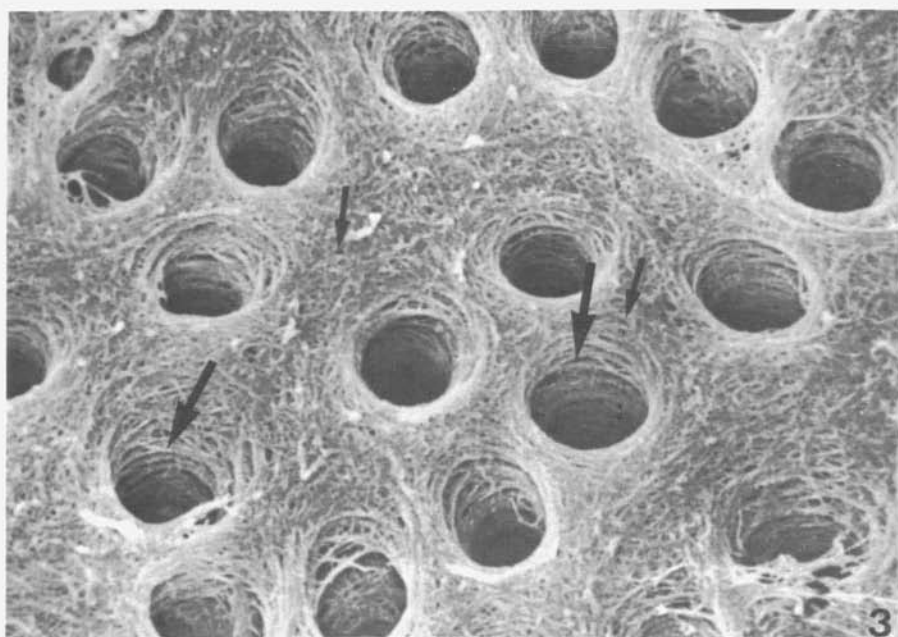


FIG. 3 - High magnification photomicrograph showing intertubular fibers (small arrows), and peritubular fibers (large arrows). 7,500 X

FIG. 4 - Parallel disposition of a bundle of collagen fibers (arrows). 5,000 X

On the other hand, we can emphasize that numerous holes observed on the surface of root canal in our data are very similar to those reported by WATANABE<sup>13</sup> in the dentine surface of the root canal of the human permanent upper canine. The presence of the dentine foraminae was also described in several conditions by the authors<sup>1,2,5,7,9,11</sup>. Also, the matrix of the peritubular dentine has been reported by FRANK<sup>4</sup> and EDA & TAKUMA<sup>3</sup>.

Comparing our findings with those of the above mentioned authors, we can state that the internal surface of the root canal is not completely uniform in some cases, but in other teeth it may present an almost smooth surface like that observed in our material. Also, it is interesting to say that we noted the presence of a numerous networks formed by bundles of collagen fibers. These fibers are generally oriented in several directions which are demonstrated in our results.

According to the form of the root canal surface observed in our data, we hope that it could even give some informations for better understanding of the mechanisms employed in the endodontic treatment techniques.

## CONCLUSIONS

According to our results, we can conclude that:

1. The dentinal surfaces present smooth area and regular distribution of numerous holes of dentin tubulis.
2. The foraminae, characterized by different diameters, range from 3 to 5  $\mu\text{m}$ .
3. The network of thin bundles of collagen fibers are observed on the dentinal surfaces.

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WATANABE, I.; IYOMASA, M. M.; ALBERTI, M. D. & HANADA, E. – Estudo ao microscópio eletrônico de varredura da superfície do canal radicular de caninos decíduos superiores humanos. *Rev. Odont. UNESP*, São Paulo, **18**: 21-26, 1989.

*RESUMO: Características da superfície dentinária do canal radicular de caninos decíduos superiores foram estudadas através da microscopia eletrônica de varredura. A superfície dentinária mostrou-se relativamente lisa, contendo uma distribuição regular de numerosos forames de túbulos dentinários. Estes forames apresentam diâmetros que medem de 3 a 5  $\mu\text{m}$ . Algumas áreas mostraram-se cobertas por uma camada de fibras colágenas, dispostas em várias direções.*

*UNITERMOS: Dente decíduo; superfície dentinária; túbulo dentinário; microscopia eletrônica de varredura.*

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