

In Vitro Study of Root Canal Anatomy of Maxillary Second Premolars

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The external anatomy of 435 maxillary second premolars and the internal anatomy of 300 of these premolars were studied *in vitro*. For the study of the internal anatomy, the teeth were decalcified and cleared. One canal was found in 67.3% of the second premolars, two canals in 32.4% and three canals in 0.3% of these premolars. A total of 90.3% had one root and 9.7% two roots. A predominance of root curvature toward the distal was found in maxillary second premolars with both one or two roots.

Key Words: maxillary second premolars, root canal, anatomy.

Introduction

The success of endodontic treatment depends on numerous factors such as: knowledge of internal anatomy of the root canals, knowledge of instrumentation techniques, use of antiseptic solutions, filling of the root canals and also the biocompatibility of materials used.

The objective of this study is to analyze *in vitro* the external anatomy of maxillary second premolars (length of tooth, number and direction of roots) and the internal anatomy of these teeth (number of root canals).

Material and Methods

A total of 435 human maxillary second premolars extracted from the population of Ribeirão Preto, State of São Paulo, Brazil, were studied. The length of these teeth was measured by a digital pakimeter (TESA, Switzerland) from the buccal cusp tip to the root apex. The number and the direction of root curvature were observed and recorded.

Only 300 of these premolars were decalcified and cleared for study of the internal anatomy according to the method described by Pécora et al. (1991). The internal anatomy was clearly shown by stained gelatin (Figure 1A,B,C).

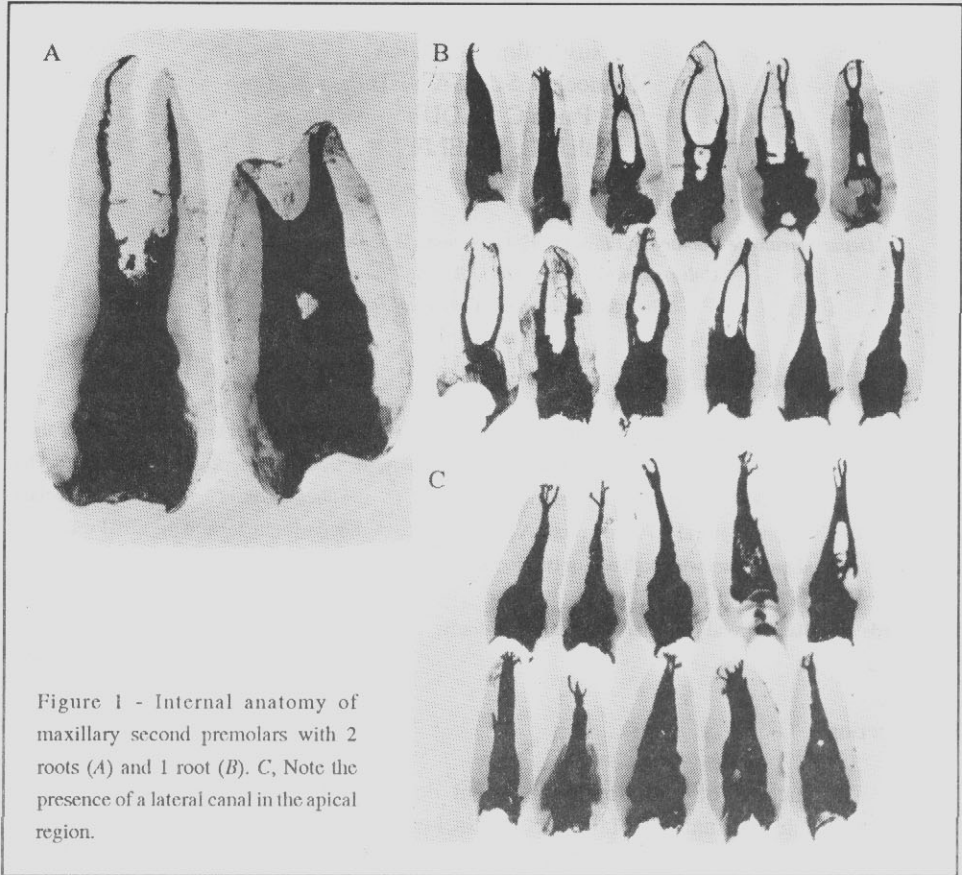


Figure 1 - Internal anatomy of maxillary second premolars with 2 roots (A) and 1 root (B). C, Note the presence of a lateral canal in the apical region.

Results

A total of 90.3% of the maxillary second premolars had a single root and 9.7% two roots. The teeth with two roots bifurcated at the apical third. Table 1 compares these findings with those of other researchers.

The average length of these second premolars was 21.5 mm, ranging from 15.8 mm to 30.5 mm. Table 2 compares data of root length of various authors.

The direction of root curvature of the 393 maxillary second premolars with one root was toward the distal (67.9%) and in the 42 teeth with two roots both the buccal and lingual roots also curved toward the distal (57.1%) (see Table 3).

Table 1 - Percent of roots observed by various authors in maxillary second premolars. Note that three roots were not reported in any of these studies.

Author	Year	Number of teeth	One root	Two roots
Mueller	1933	128	97.7	2.3
Pucci and Reig	1944	203	90.3	9.7
De Deus	1986	108	94.6	5.4
Present study	1992	435	90.3	9.7

Table 2 - Length of maxillary second premolars reported by various authors (in mm).

Author	Year	Average	Overall length	
			Maximum	Minimum
Muhreiter	1870	-	27.0	16.0
Black	1902	21.5	27.0	16.0
Pucci and Reig	1944	21.6	26.0	17.0
De Deus	1986	21.8	-	-
Carlsen	1987	23.0	28.0	16.0
Woelfel	1990	21.2	28.4	15.2
Present study	1992	21.5	30.5	15.8

Table 3 - Types of root curvature (in percent) found in maxillary second premolars.

Number of roots	Direction of curvature (%)					
	Straight	Toward lingual	Toward buccal	Toward mesial	Toward distal	"S" curve
One (393)	-	0.5	1.8	2.0	67.9	6.8
Two (42)						
Buccal	16.6	2.4	7.1	9.5	57.1	7.2
Lingual	23.8	2.4	4.8	11.9	57.1	-

Of the 300 teeth studied internally, 67.3% had one canal, 32.4% two canals and 0.3% three canals. These data are compared with data found in the literature in Table 4.

Table 4 - Percent of root canals found in maxillary second premolars by various authors.

Author	Year	Number of teeth	One canal	Two canals	Three canals
Hess	1925	260	56.0	42.0	2.0
Pineda and Kuttler	1972	282	55.0	45.0	-
Green	1973	50	72.0	28.0	-
Vertucci and Gregauff	1979	200	75.0	24.0	1.0
Bellizzi and Hartwell	1985	630	40.3	58.6	1.1
De Deus	1986	108	53.7	46.3	-
Present study	1992	300	67.3	32.4	0.3

Discussion

Before beginning endodontic treatment, the dental surgeon needs to carefully analyze the anatomy of the tooth to be treated. In the clinic, this analysis can only be carried out radiographically; thus, at least two radiographs at different angles should be made. Knowledge of internal anatomy and data from the radiographs permit a more secure endodontic intervention by the professional.

Table 2 shows that the average length of the maxillary second premolars in this investigation is in accordance with that found by other researchers.

Curvature toward the distal in the maxillary second premolar can be easily detected by radiographic examination. The incidence of root curvature toward the buccal and toward the lingual was very small.

Our data concerning the number of roots agree with the data of Pucci and Reig (1944) and do not differ greatly from data of other authors (Table 1). Observe that none of the authors cited in this Table encountered a maxillary premolar with three roots.

Only one premolar was found to have three canals (0.3%). Table 4 shows the incidence of three canals to be very small. The differences among data concerning the number of canals in second premolars may be due to various factors: number of teeth in the sample, method, variation in internal anatomy, and even racial factors.

The study of the internal anatomy of teeth is always interesting because the variations found help to elucidate problems in Endodontics.

Conclusions

1. The average length of the 435 maxillary second premolars was 21.5 mm, ranging from 15.8 mm to 30.5 mm.

2. In this study, 90.3% of the maxillary second premolars had one root.

3. In the premolars studied, 67.3% had one canal, 32.4% two canals and 0.3% three canals.

4. The maxillary second premolars with one root curved toward the distal in 67.9% of the cases and 57.1% of the buccal and lingual roots curved toward the distal in premolars with two roots.

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