

Assessment of the morphology of apical area in Iraqi Arabic first molars

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ABSTRACT

One hundred twenty mandibular first molars and (96) maxillary first molars of Arabic permanent dentition were studied morphologically in vitro, using visual examination to detect number of roots, and apical foraminae, a radiographic investigation was formed to detect number of canals and a clearing or (transparent) technique was performed to emphasize the results obtained, the clearing technique was performed by decalcification of teeth and injecting them with a dye, number of roots, root canals and apical foraminae were detected and calculated as follow (98.33%) of the mandibular first molars had two roots and (1.66%) had three roots (one distal & two mesial), the maxillary first molars had three roots (one palatal & two buccal) in (100%) of teeth examined, (10%) of the mandibular first molars had two canals, (86.7%) had three canals and (3.3%) had four canals. The maxillary first molars did not have two canals, (82.3%) had three canals & about (17.7%) had four canals. The number of apical foraminae in the mandibular first molar were found to be two in (15%) of the teeth, three in about (84%) and four apical foraminae in less than (1%) of the teeth. The maxillary first molars had three apical foraminae in about (85.4%) four apical foraminae in (14.6%) of the teeth examined.

Key words: Apical area, first molars, radiograph.

الخلاصة

تمت دراسة (١٢٠) ضرس أولي في الفك السفلي و (٩٦) ضرس أولي في الفك العلوي تشكيباً لظهور الاسنان الدائمة لدى العرب ، واجرين الدراسة على الأضراس خارج الجسم وباستخدام الفحص البصري للكشف عن عدد الجذور ، وشكل الفحص الشعاعي لعدد الفتحات الفمية ولفحص عدد قنوات الجذور، أجريت تقنية تخلية (أو شفافية) لتأكيد النتائج التي تم الحصول عليها ، أجريت تقنية التخلية بواسطة إزالة الكلس عن الاسنان وحقنها بصبغة ، وتم فحص عدد الجذور وقنوات الجذر والفتحة الفمية وحسبت كالآتي: (٩٨,٣٣%) من الأضراس الأولى في الفك العلوي امتلكت جذران و (٧,٦%) امتلكت ثلاثة جذور أحدهما بعيد والأخران في الوسط ، وامتلك الأضراس الأولى في الفك العلوي ثلاثة جذور (الأولى حنكي والأخران وجني) وفي الاسنان المفحوصة، امتلك (١٠%) من الأضراس في الفك السفلي قناتين، (٨٦,٦%) ثلاث قنوات و (٣,٣%) أربعة قنوات والأضراس الأولى في الفك العلوي لم تمتلك قناتين وان (٨٢%) امتلكت ثلاث قنوات وحوالي (١٧,٧%) أربعة قنوات ووجد بان عدد الفتحات الفمية في الضرس الأول في الفك السفلي بأنه اثنين في (١٥%) من الاسنان وثلاثة في (٨٤%) وأربعة في اقل من (١%) وامتلك الأضراس الأولى في الفك العلوي ثلاثة فتحات فمية في حوالي (٨٥%) وأربعة في حوالي (١٤,٥%) من الاسنان المفحوصة.

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INTRODUCTION

The main objectives of endodontic therapy are the thorough mechanical and chemical cleansing of the entire pulp cavity and its complete obturation with an inert filling material.

The dentist must have a thorough knowledge of root canal morphology before start of a successful tooth endodontic therapy ⁽¹⁾.

In the literature, there is divergence of opinions to the anatomy of the pulp cavities of the human permanent teeth ⁽¹⁾.

Discrepancies, are in part, the result of the marked variations in anatomy that are present and in part the result of the very real difficulties that are always encountered when root canal morphology is studied, because of the main dissimilarities in selection of material and classification of canal configurations, the results of most reports can not be compared directly with one another ⁽¹⁾.

A many descriptions of the root and canal forms of permanent teeth are presented by Burns and Weine ^(2,3). The studies upon which these description are based were conducted in Europe and North America, and involved teeth of a predominantly Caucasoid origin ^(2,3). In the United States endodontic studies may involve the examination of teeth of more than one racial group and where reports have been made with references to race, clear differences have been found. An example, there is a higher prevalence of mandibular first premolar with two canals in the American black populations ^(4,5), while the mandibular second molar has appearance which resembles the first molar and occasionally the roots may be fused ^(6,7).

Anthropologically based studies of the Arctic people indicated that the fusion of roots in the mandibular second molar is a prevalent condition ^(8,9). The extent to which this tendency directly influences the endodontic morphology of these teeth has not been reached ⁽¹⁰⁾.

MATERIALS AND METHODS

One hundred twenty mandibular first molars and (96) maxillary first molars were collected and stored in normal saline immediately after extraction. Information concerning the patient's sex and race (Iraqi Arabic people) were recorded ⁽¹¹⁾.

Each specimen was examined beneath a quartz halogen light with the aid of a hand lens, the number of single and multirooted teeth were recorded. Each root was not considered separate and distinct unless it was independent to other roots for at least one-half of its length.

The teeth were radiographed from different horizontal angles using buccal, buccal-oblique and proximal views. At least two radiographs were taken for each tooth. The radiographs were examined on a viewer using a magnifying lens (figure 1). Data relating to numbers of root canals and apical foraminae were collected.

Teeth were stored in normal saline for (4) weeks, then an access opening was performed for every tooth. Teeth were stored in normal saline for another (2-4) weeks, so that autolysis and maceration of the pulp could continue, the teeth were soaked in a (2%) ficin solution for (14) days to remove pulpal tissue. Ficin is derived from fig tree latex and its proteolytic action assists in the removal of organic tissue. The teeth were washed thoroughly and black ink with a (10%) black gelatine solution was then introduced into the canal system and fixed in place with formalin. Following this, the roots were demineralized in a decalcifying solution using (10%) hydrochloric acid for

(7) days. They were then dehydrated in ascending grades of alcohol (70 percent, 90 percent and 100 percent) as technique described by Manning⁽¹¹⁾.

The teeth were cleared in cedar wood oil for (1-2) days, prior to examination with magnifying hand lens (figure 2). Data were collected according to the following categories:- number of roots, number of apical foraminae and number of canals.

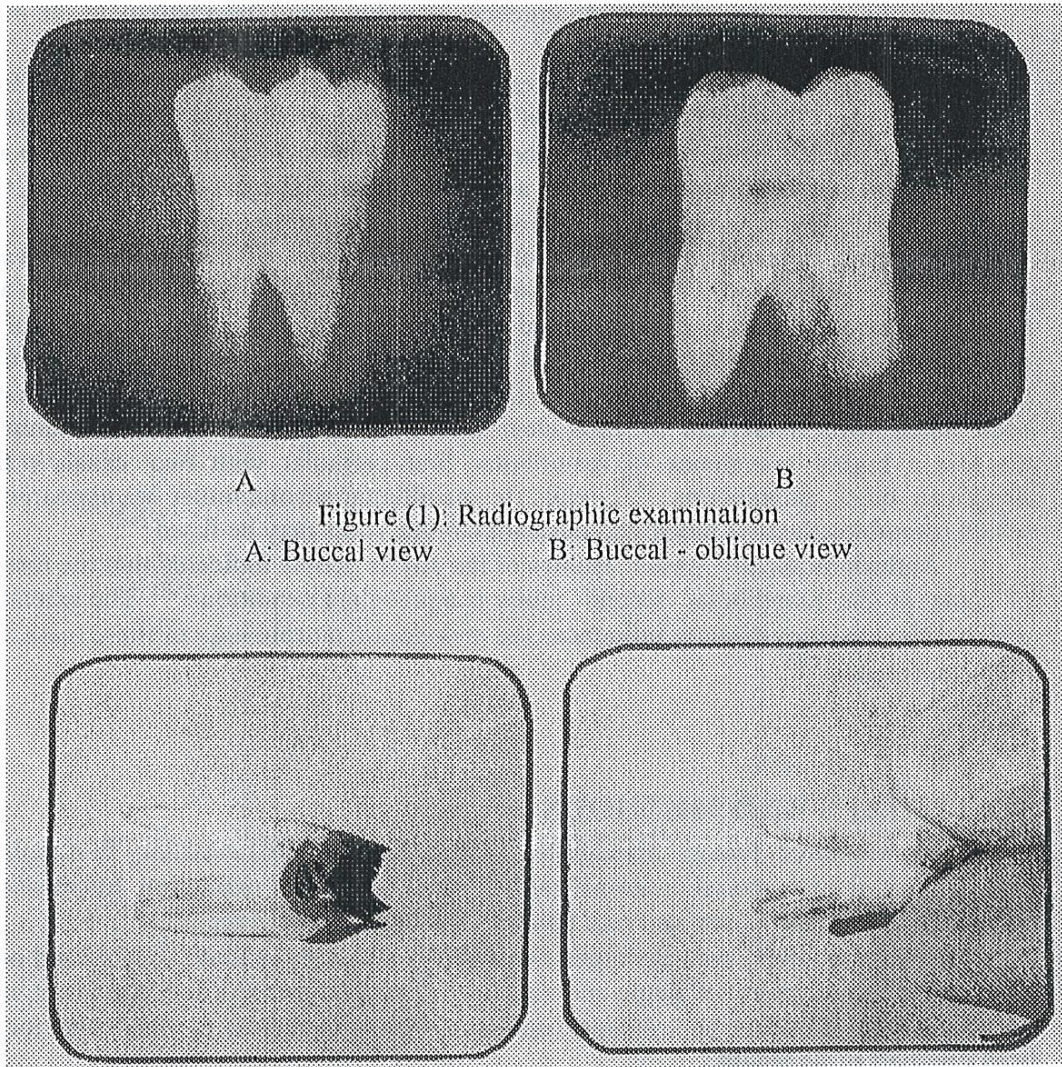


Figure (1): Radiographic examination
A: Buccal view B: Buccal - oblique view

Figure (2): Clearing (transparent) technique of the examined teeth

RESULTS

More than (98%) of the mandibular first molars had two roots and the remaining a bout (1.6%) had three roots (one distal and two mesial), while in the maxillary first molars (100%) of the teeth had three roots (two buccal and one palatal) (table 1).

Table (1): Number and percentage of roots in maxillary and mandibular first molars

Teeth	Total No.	Two Roots		Three Roots	
		No.	%	No.	%
Mandibular First Molars	120	118	98.33	2	1.66
Maxillary First Molars	96	----	----	96	100

The number of canals was considered radiographically and by the transparent technique (table 2).

Table (2): Number and percentage of root canals
in the mandibular and maxillary first molars

Teeth	Total No.	Two Canals		Three Canals		Four Canals	
		No.	%	No.	%	No.	%
Lower First Molar	120	12	10	104	86.666	4	3.333
Upper First Molars	96	----	----	79	82.291	17	17.708

Considering the number of canals, the mandibular first molar teeth had two canals in (10%) of its teeth, three canals in (86.66%) of its teeth and about (3.33%) of its teeth had four canals. The maxillary first molar teeth did not have two canals, about (82.33%) of its teeth had three canals and about (17.7%) of its teeth had four canals.

The number of apical foraminae was considered visually and by the transparent technique. It was found that the mandibular first molars had two apical foraminae in only (15%) of its teeth and three apical foraminae in about (84.2%) of its teeth and four apical foraminae in less than (0.8%) of its teeth.

The maxillary first molars had three apical foraminae in about (85.4%) of the teeth examined and four apical foraminae in (14.6%) of the teeth examined (table 3).

Table (3): Number and percentage of apical foraminae

Teeth	Total No.	Two Canals		Three Canals		Four Canals	
		No.	%	No.	%	No.	%
Mandibular First Molars	120	18	15	101	84.166	1	0.833
Maxillary First Molars	96	----	----	82	85.416	14	14.583

DISCUSSION

It is imperative that dentists engaged in endodontic therapy be aware of the anatomic variations exist within the root canal system if they are to achieve satisfactory result in treatment ⁽¹²⁾.

Also it is apparent that all teeth in the dental arch have a certain frequency of extra root occurrence. These teeth are easier to detect radiographically than those containing extra root canals. The reasons for the difficult detection of extra root canals are mainly due to their small size and their super position over another root canal ⁽¹²⁾.

The clearing or (transparent) technique has considerable values in the study of root canal anatomy, as it gives a three dimensional view of the pulp cavity in relation to the exterior of the tooth, in addition it is not necessary to enter the specimens with instruments, thus, original form and relationship of the canals are maintained.

In this morphological study of the maxillary and mandibular first molars, where (120) mandibular first molars and (96) maxillary first molars were taken from an Iraqi, Arabic population and no other community was taken (e.g. Kurdish). It was found that the high majority of the mandibular first molars were two rooted while only about (1.6%) were by Manning ⁽¹¹⁾ with other races, were the majority had three canals about (86.6%) while only (10%) had two canals and about (3.3%) had four canals.

This leads us that almost the same percent is seen in the number of apical foraminae, where (84.1%) of teeth had three foraminae and (15%) had two foraminae and less than (1%) had four foraminae, results considering the maxillary first molars indicated no tooth has been seen with two roots of the (96) teeth examined i.e. all teeth examined (100%) were with three roots, it is also important to consider that taking a larger number of samples is important, although studies like those Pameranz and Fishelberg ⁽¹³⁾, took a total of (71) teeth in a study of maxillary first molars and (29) teeth in a study of maxillary second molars. The search for root canals found no tooth with two roots was found, i.e. every root should have at least one canal or more in certain situations and a root with no obvious canal is rare and mostly caused by complete calcific degenerations, (32%) of teeth had three root canals and this is a high percentage and considerable (17%) of teeth had four canals, when comparing these results with other studies, like the study of Hartwell and Bellizzi ⁽¹⁴⁾, where (18.6%) of the teeth had four canals, but the total number of teeth examined was (538), also the technique of their study very different from that used in this study, as Hartwell & Bellizzi used a clinical investigation of teeth treated *in vivo*.

The number of foraminae revealed, the majority of teeth have three foraminae i.e. (85.4%), while (14.6%) of maxillary first molars had four foraminae, when comparing this with the number of root canals, this may reveal that some canals may unite at the apical area of the root and extrude as one canal, also the study reveal 1% of teeth have two foraminae, this may be explained by the uniting of root canals at this area.

CONCLUSION

An accurate knowledge of the morphology of the pulp cavity is essential before an endodontic procedure can be approached rationally. The frequency of four canal is low, but they do occur.

Different morphological studies may show different results, its therefore important to compare results only when similar methods and sample sizes are used,

also racial differences have shown morphological differences in the field of endodontics this is why a modification in the access opening and a thorough radiographic examination with different horizontal angulation is important to enhance this field of dentistry.

REFERENCES

1. Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg.* 1984; 5: 58.
2. Burns RC. Access openings and tooth morphology. Pathways of the Pulp. 3rd Edn. St Louis. CV Mosby. 1984: 118-174 .
3. Weine FS. Endodontic Therapy. 3rd Edn. St Louis. CV Mosby. 1982: 208-211.
4. Amos ER. Incidence of bifurcated root canals in mandibular bicuspids. *J Am Dent Assoc.* 1955; 50: 70-71.
5. Trope ME, Trunstad L. Mandibular premolars with more than one canal in different race groups. *J Endo.* 1986; 12: 343-345.
6. Dubrul EL. Sicher's Oral Anatomy. 7th Edn. St Louis. CV Mosby. 1980; 265.
7. Woelfel JB. Dental Anatomy. 3rd Edn. Philadelphia, Lea & Febiger. 1984: 168.
8. Pedersen PO. The East Greenland Eskimo dentition. Numerical variations and anatomy. *Med Gronl.* 1949: 167-173.
9. Turner CG. The dentation of the Arctic peoples (PhD Dissertation) Madison, Wisconsin, University of Wisconsin. 1976: 140-143.
10. Walker RT. Root form and canal anatomy of mandibular second molars in a southern Chinese population. *J Endo.* 1988; 7: 14.
11. Manning SA. Root canal anatomy of second molars. Part1. *J Int Endo.* 1990; 23: 1.
12. Captain MA. Apical root canal anatomy of human maxillary central incisors. *Oral Surg.* 1970; 5: 20.
13. Pomeranz HH. Fishelberg G. The Secondary mesio-buccal canal of maxillary molars. *J Am Dent Assoc.* 1973; 87: 6.
14. Hartwell G, Bellizzi R. Clinical investigation of *in vivo* endodontically treated mandibular and maxillary molars. *J Endo.* 1982; 8: 7.