
FREQUENCY OF FOUR-ROOTED MOLARS IN 1,775 EXTRACTED UPPER MOLAR TEETH: A BIOLOGICAL EXPLANATION OF THIS CHALLENGING CLINICAL ANOMALY

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ABSTRACT

Background: *Tooth development starts after the rupture of the buccopharyngeal membrane, establishing communication with the primitive digestive tract. Tooth development undergoes descriptive stages of initiation, bud, cap, bell and apposition. Root formation begins after crown formation by the Hertwig's epithelial root sheath.*

Methodology: *The study material was the extracted 1,775 upper molar teeth. Each tooth was examined for the occurrence of four roots, using the clinical index for upper molar; possession of three roots; an extra root is an anomaly. The normal positions of the roots are two buccally and one palatal root.*

Result: *Out of a total of 1,775 upper molar teeth examined 8 (0.451%) were four-rooted. This makes a frequency of 0.451%.*

Conclusion: *We conclude that endodontist should have a pre-knowledge of anatomic variation in root canals, especially an awareness and understanding of the possible presence of an additional root and unusual root canal morphology. This is essential in determining the successful outcome of endodontic treatment.*

Keyword: *Four-rooted, molars, Biological, anomaly.*

INTRODUCTION

Tooth development starts after the rupture of the buccopharyngeal membrane, establishing communication with the primitive digestive tract.¹ The surface oral ectoderm which has an underlying neural or ectomesenchyme cells are instructed by

these cells to start tooth development,^{2,3} this is through signaling networks mediating the epithelial-mesenchymal interactions. This affects tooth morphogenesis and patterning⁴ mammalian tooth development and it is largely dependent on sequential and reciprocal epithelial – mesenchymal interactions. These processes involve a series of inductive and permissive interactions that results in the determination, differentiation, and organization of odontogenic tissues.⁵ Tooth development undergoes descriptive stages of initiation, bud, cap, bell and apposition.⁶ After the crown formation is nearly complete, tooth root begins to develop with the guidance of the double layer of the epithelial sheath, called the Hertwig's epithelial root sheath, which is formed from the outer and inner enamel epithelium at the neck ring of the crown and grows in the apical direction⁷ determining the root length, while the growth and fusion of the horizontal diaphragm determine the number of root. Four-rooted upper molars are not uncommon. Peikoff et al⁸ revealed a frequency of (1.4%), and Libfield and Roststein's⁹ a frequency of (0.4%). Even maxillary second molars with six been reported by Branlio et al.¹⁰ clinical endodontic practices are some times challenged by the presence of a fourth root in the upper molar region. These archived teeth therefore offers opportunity of determining its frequencies. This is a retrospective study of teeth collected over 10 years period from Department of Oral Surgery and Pathology, College of Medical Sciences, University of Benin.

MATERIALS AND METHODS

The study material was the extracted 1,775 upper molar teeth (Fig. I), stored into 10%

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formative bottle in line with Centre for Disease Control and Prevention guidelines for infection control of extracted teeth used for research and teaching.^{11,12} Each tooth was examined for the occurrence of four-roots. The clinical index for upper molar was possession of three roots, an extra root is an anomaly. The normal positions of the roots are two buccally (mesio-buccal and disto-buccal) and one palatal root. Individual upper root, identification was not of prime consideration as it bears no direct specific relevance to overall clinical treatment outcome.

RESULTS

Table 1: Percentage of Upper Molar with Four Roots

S/N	Type of Teeth	Number	Percentage (%)
1.	Upper molar	1,775	100%
2.	Four-rooted upper molar	8	0.451%

Out of a total of 1,775 (100%) upper molar teeth examined, 8 (0.451%) were four-rooted (Fig. II). This makes a frequency of 0.451%.

Fig 1 Source of extracted 1775 upper molar teeth.



DISCUSSION

Variation in root or root canal morphology, especially in multi-rooted, is challenging for diagnosis and successful endodontic therapy.¹³ The knowledge of common anatomic characteristics and their possible variation is fundamental.¹⁴ Uncommon variation may lead to failure of endodontic treatment, like the presence of extra-root. This unforeseen if unidentified will lead to patient complaint of persistent post medicament pain.¹⁵ The possibility of an extra canal or root has to be borne in mind, especially aberrant anatomical situation.¹⁶ Our finding revealed 0.451% frequency of four-rooted upper molar, which is in tandem

with Libfield and Roststein result.⁹ A successful endodontic treatment depends on thorough cleaning, shaping and obturation of the canal system. The main reasons for

Fig 2 apical view of four-rooted upper molar



endodontic failure are apical presence of microorganisms caused by incomplete instrumentation, inadequate cleaning, insufficient canal obturation and the presence of untreated canals.¹⁷ An undetected canal will remain untreated and will lead to failure of root canal therapy.¹⁷⁻¹⁹ We conclude that endodontist should have a pre-knowledge of anatomic variation in root canals, especially an awareness and understanding of the possible presence of an additional root and unusual root canal morphology. This is essential in determining the successful outcome of endodontic treatment.

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