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Evaluation of root canal configuration on mandibular third molar

Shalini N
Saveetha Dental College and Hospitals
Saveetha Institute of Medical and Technical Sciences, Saveetha University,Chennai.
E-mail: 152001041.sdc@saveetha.com

Dr. Kalaivani
Senior Lecturer
Department of conservative dentistry
Saveetha Dental College and Hospital,
Saveetha Institute of Medical and Technical Sciences
Saveetha University,
Chennai-600077

Corresponding author:
Dr. Kalaivani
Senior Lecturer
Department of Pathology
Saveetha Dental College and Hospital,
Saveetha Institute of Medical and Technical Sciences
Saveetha University,
Chennai-600077

ABSTRACT

Introduction - The third molar must frequently be considered as a strategic abutment due to the loss of the first and second mandibular molars. It is described that the anatomy of the third molars is unpredictable and are nonstandard teeth. Third molars with endodontic involvement are thus extracted and rarely given a chance to undergo root canal therapy.

AIM - The aim of the study is to evaluate root canal configuration for mandibular third molar.

Materials and methods - A total of 40 CBCT scans were selected from patients at Saveetha Dental College. Cases with absence of mandibular third molars were excluded. The root canal configuration was evaluated using Vertucci's classification. Each scan was assessed twice to minimize observer bias and ensure accuracy of findings.

Result - Among the 40 mandibular third molars analyzed, the majority showed two roots (84.2%), followed by one root (12.9%) and three roots (8.9%). Most teeth (64.3%) exhibited three canals. Variations included two canals (19.9%), four canals (8.2%), one canal (5.8%), and rare cases with five (1.2%) and seven canals (0.6%).

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Conclusion - Mandibular third molars exhibit significant variations in root and canal morphology. CBCT proves to be a valuable tool in identifying these complex configurations. Understanding these variations is essential for improving the success of endodontic treatment in third molars.

INTRODUCTION

The third molar must frequently be considered as a strategic abutment due to the loss of the first and second mandibular molars. It is described that the anatomy of the third molars is unpredictable and are nonstandard teeth. Third molars with endodontic involvement are thus extracted and rarely given a chance to undergo root canal therapy. The minimal amount of intervention and the preservation of every functional tooth in the dental arch, including third molars, are the main goals of modern dentistry practice. The first and second permanent molars are the teeth that undergo root canal therapy the most frequently, and the dentistry literature has devoted a great deal of time to studying them [1].

The morphology of third molars, on the other hand, is unpredictable and atypical. Some anatomical aspects of the teeth may not be evaluated by radiographic images because they only provide a two-dimensional examination of the teeth and the third dimension cannot be precisely analyzed with standard radiographic procedures, such as changing the X-ray beam [2]. It is necessary to understand the root canal anatomy of the tooth before initiation of root canal treatment. Autotransplantation of third molars helps in replacement of non restorable teeth [3].

In the 1990s, Cone-beam computed tomography systems (CBCT) was developed by an Italian and Japanese group. Unlike radiographic images which provide two dimensional evaluation, CBCT helps in the visualization of the root canal anatomy in three dimensions [4]. To evaluate the three dimensional anatomy of the pulpal anatomy sectioning and clearing techniques are used but in this process the morphology of the tooth exteriors are destroyed [5].

Root canals are cleaned and shaped as part of endodontic treatment, inflamed or necrotic pulp tissues are removed, and then the prepared canals are sealed. Sometimes failure of endodontic treatment may be due to undetected or missed canals due to the complex morphology of the tooth.

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The three-dimensional nature of CBCT makes it superior to traditional periapical radiography and one of the advanced imaging modalities that may overpower the superimposition of nearby structures [6]. The aim of the study is to evaluate the root canal configuration of mandibular third molar.

MATERIALS AND METHODS:

A total number of 40 CBCTs were selected for the present study in saveetha dental college. CBCTs with the absence of a third molar either on one or both the sides were excluded from this present study. Evaluation of the root canal configuration of the third molar was carried out using vertucci's classification twice to reduce bias and to validate the findings.

RESULTS

A total number of 40 CBCTs were selected for the present study in saveetha dental college. When 40 mandibular third molars from different individuals were analyzed using CBCT scans, it was discovered that 23.2% of the teeth belonged to men and 16.8% to women, with the right side having 29.8% of the teeth and the left having 10.2%. Three roots made up 2.3% of the maximum mandibular third molars (n=40), which had two roots (84.2%), one root (12.9%), and three roots (8.9%). The majority of mandibular third molars (64.3%), 19.9% of which had two canals, 8.2% of which had four canals, 5.8% of which had one canal, and 1.2% of which had five and 0.6% of which had seven canals, respectively, were found to have three canals.

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Parameter	Category	Percentage
Roots	One root	12.9
Roots	Two roots	84.2
Roots	Three roots	8.9
Canals	One canal	5.8
Canals	Two canals	19.9
Canals	Three canals	64.3
Canals	Four canals	8.2
Canals	Five canals	1.2
Canals	Seven canals	0.6
Side	Right	29.8
Side	Left	10.2

DISCUSSION

Mandibular third molars are known for their highly variable root canal morphology, which makes endodontic treatment challenging. In the present study, the majority of teeth exhibited two roots and three canals, which aligns with previous literature suggesting that third molars often show more complex anatomy compared to first and second molars. Such variations highlight the importance of thorough preoperative evaluation.

The use of CBCT in this study provided a three-dimensional assessment of root canal morphology, overcoming the limitations of conventional radiography. Traditional two-dimensional imaging often fails to detect additional canals or unusual root configurations due to superimposition. CBCT, therefore, plays a crucial role in identifying anatomical complexities, thereby improving diagnosis and treatment planning.

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The presence of rare canal configurations, such as five and seven canals, although minimal, emphasizes the unpredictability of third molar anatomy. These findings reinforce the need for clinicians to approach third molar endodontics with caution and a comprehensive understanding of possible variations. Incorporating advanced imaging techniques like CBCT can significantly enhance treatment outcomes.

CONCLUSION

Within the limitations of this study, mandibular third molars demonstrate considerable variability in both root number and canal configuration. The predominance of two-rooted teeth with three canals suggests a common pattern; however, the presence of complex and rare anatomical variations cannot be overlooked.

CBCT serves as an effective diagnostic tool in evaluating these variations, aiding clinicians in accurate diagnosis and improved endodontic management. A detailed understanding of root canal morphology is essential to enhance treatment success and avoid procedural failures.

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