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RESEARCH ARTICLE
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EXPLORING MORPHOLOGY OF MAXILLARY WISDOM TEETH USING CONE BEAM COMPUTED TOMOGRAPHY IMAGING

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ABSTRACT

Objective: The objective of this study was to explore morphology of maxillary wisdom teeth using Cone Beam Computed Tomography Imaging.
Study design: Descriptive study
Place and duration of study: Study was done in Oral Biology department, Rehman college of Dentistry, Peshawar, from 15th July 2022 till 15th January 2023.
Materials and methods: 120 patients between 18 and 60 years of age were included in this study. Cone beam computed tomography images were studied for type of cusps and roots of maxillary 3rd molars. SPSS version-26 was used for analysis.
Results: Results showed 69 females and 51 males. Mean age of patients was 32 years, ranging from 18-55 years with a standard deviation of 13.46 years. Most of the maxillary 3rd molars were tricuspid (33.33%), followed by fourcuspid (32.5%) and teeth with enamel projections (29.12%). Teeth with five cups were rare (5%). Most of teeth had single roots (51.66%) followed by three roots (34.16%) and bifid roots (10.83%). Teeth with four roots were rare (3.35%). None of the teeth showed sinus approximation.
Conclusion: Maxillary 3rd molars show great variation from three cusps to four cusps and even teeth without cusps are present. Type of roots also vary from single roots to multiple roots.

Keywords: Cusps, roots, molar, morphology, maxilla, cone beam computed tomography,

INTRODUCTION

Maxillary third molars which are also known as wisdom teeth are present at the posterior end of the dental arches.[1] These teeth are notorious for their potential to cause various dental complications due to their late eruption, anatomical variations, and limited available space within the oral cavity.[2] Third molars which are also called wisdom teeth are very difficult to manage clinically due to their proximity to critical structures such as the maxillary sinus and adjacent tooth roots.[3] The morphology of these teeth is so diverse that management of these teeth require effective treatment planning for prevention of potential complications.[4]

Dental imaging has revolutionized in past years. Cone Beam Computed Tomography (CBCT) has provides three-dimensional images of dental structures, through which dental practioners can understand the complex morphology of teeth which are hidden in bone and soft tissues.[5] CBCT has improved our ability to visualize the crown and root morphology of upper wisdom teeth, enabling clinicians to make more vital decisions in various fields of dentistry.[6]

Upper wisdom teeth exhibit considerable variability, ranging from fully erupted to impacted or semi-impacted teeth with different orientations within the alveolar bone.[7] Roots of these teeth also show diverse patterns, including single or multi-rooted teeth, curved or dilacerated roots.[8] Usually this tooth has 4 cusps i.e. 2 buccal and 2 palatal but there is great variation in the coronal morphology of these teeth. Such variations have direct implications for management of these teeth during various dental procedures. CBCT provides detailed assessment of these teeth in various planes which are vital in predicting the risk of complications particularly when they are in close proximity to the maxillary sinus.[9]

This research is justified as it will analyze CBCT scans from a representative patient population and will find out prevalence and patterns of crown and root variations. The information from this research will be important for dental practitioners, enabling them to manage these teeth with awareness of the diverse anatomical challenges that they may encounter. This knowledge will also help in the development of more precise treatment planning ultimately leading to patient satisfaction.

The objective of this study was to explore morphology of maxillary wisdom teeth using CBCT Imaging.

MATERIALS AND METHODS

120 patients between 18 and 60 years of age were included in this study after getting ethical approval from the institute ethical review board(RCD-10-06-124). Descriptive cross-sectional study was done in Oral biology department at Rehman College of Dentistry. Peshawar from 15th July, 2022 till 15th January 2023. Cone beam computed tomography images were studied for type of cusps and roots of maxillary 3rd molars. Patients were registered in this study using consecutive sampling technique. Patients who had restorations or caries in their maxillary wisdom teeth and those CBCT scans which had irregular images were excluded. CBCT images were taken by "Carestream Ger, model 90003D". Standard Radiology Protocol was followed for patients with different ages and sexes according to manufacturer. 2 different examiners having experience with CBCT imagines studied the scans using CS Imaging Browser 7.0.20 software. Sample size was determined using G* Power software version 3.1.9.4 at a p-value of 0.05, medium-power (0.3) and confidence level of 95.1%. The CBCT scans were studied and number of cups and types of roots were noted. Scans were also evaluated for proximity of maxillary 3rd molars to the maxillary sinus. Teeth were classified into 2 classes. Those which exhibited sinus approximation i.e. no bone was present between maxillary 3rd molar and maxillary sinus. And no sinus approximation where 2mm or more bone was present between maxillary 3rd molar and maxillary sinus.[10] SPSS version-26 was used to analyze the results. This software and version was used because of its userfriendly interface and its ability of doing comprehensive statistical analysis and data management.

RESULTS

Results showed 69 females and 51 males (n=120). Mean age of patients was 32 years, ranging from 18-55 years with a standard deviation of 13.46 years (Table-I).

Most of the maxillary 3rd molars were tricuspid (n=40, 33.33%), followed by fourcuspid (n=39, 32.5%) and teeth with enamel projections (n=35, 29.12%). Teeth with five cups were rare (n=6, 5%). Most of teeth has single roots (n=62, 51.66%) followed by three roots (n=41,34.16%) and bifid roots (n=13, 10.83%). Teeth with four roots were rare (n=4, 3.35%). These results are presented in Table-II.

Table I: Demographic data (n=120)

Age(years)	Gender
Range:18-55	Males: (42.5%)51
Mean: 32 (± 13.46)	Females: (57.5%)69

Table II: Maxillary wisdom teeth cusp and root type (n=120)

Type of cusp	Prevalence	Type of root	Prevalence
Tricuspid	40(33.33%)	Single root	62(51.66%)
Fourcuspid	39(32.5%)	Bifida	13(10.83%)
Fivecuspid	6(5%)	Three roots	41(34.16%)
Enamel projections	35(29.12%)	Four roots	4(3.35%)
Total	120(100%)	Total	120(100%)

Table III: Sinus approximation of maxillary 3rd molar (n=120)

Maxillary 3rd molars with Sinus approximation	0(0%)
Maxillary 3rd molars with No sinus approximation	120(100%)

Figure I: CBCT image of maxillary 3rd molar

Figure I a: Sagittal view

Figure Ib: Coronal view

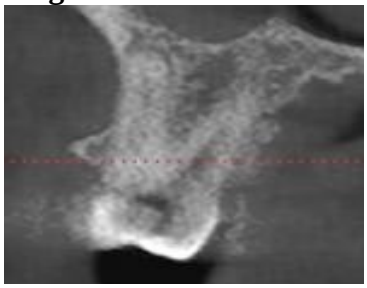
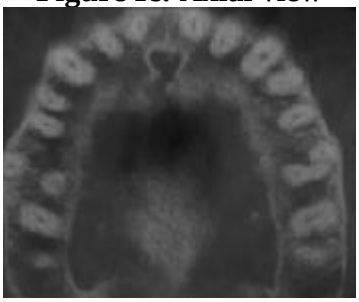


Figure Ic: Axial view



DISCUSSION

The present study aimed to provide an in-depth exploration of the crown & root morphology of maxillary wisdom teeth using Cone Beam Computed Tomography (CBCT) imaging. Our results showed a spectrum of morphological variations ranging from differences in crown morphology to variations in root configuration. CBCT imaging provided accurate assessment of the relationship between teeth, their morphology and surrounding anatomical structures. This information is vital to decrease risk of complications which might occur during management of such teeth.

The coronal morphology is very important for tooth function and occlusion.[11] Many factors have been identified which lead to variation in cuspal morphology of which the most important are diet, stress and genetics.[12] This has been shown by researches done on twins which provided evidence of genetic influence cuspal morphology.[13] Genetic studies have identified specific gene regions associated with variations in tooth morphology, which likely extend to cuspal features.[14] Upper wisdom teeth, also known as maxillary third molars, can exhibit a variety of cusp patterns.[15] These cusps are the elevated points on the occlusal (chewing) surface of the tooth that aid in the grinding and processing of food.[16] In the literature maxillary third molars have been described with 3 cusps, 4 cusps, cuspless to even six cusps.[17] Our study revealed the tricuspid pattern to be the most common form. This is in accordance with studies done world wide which show tricuspid pattern to be the most common for maxillary 3rd molars.[18]

The root patterns of maxillary third molars, also known as upper wisdom teeth, can vary widely among individuals. These variations are influenced by genetics, developmental processes, and other factors.[19] In literature many types of roots have been described such as 3 roots, 2 roots, fused root and teeth with multiple roots.[20] Our study revealed single rooted maxillary 3rd molars to be the most prevalent form. Qiao X et al. in a study done in china showed similar results with the single root form to be the most common type.[21] How ever in a study done by Mirza MB et al. showed the 3 root form to be the most common root form for maxillary 3rd molars.[22] Although the exact reason for this diversity in root form among different populations is not know, These variations in root forms observed across different populations can be due to genetic, evolutionary, environmental & developmental factors. These factors interact with each other in a complex way for these diverse root patterns to be seen in different groups of individuals.[23] Our study did not find any maxillary 3rd molars to be in sinus approximation. All of them did not have any sinus approximation. These are in accordance with other studies done world wide.[24]

CONCLUSION

Maxillary 3rd molars show great variation from three cusps to four cusps and even teeth without cusps are present. Type of roots also vary from single roots to multiple roots.

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