ORIGINAL ARTICLE

FREQUENCY OF DEVELOPMENTALLY MALFORMED PERMANENT MAXILLARY LATERAL INCISORS IN PATIENTS VISITING THE THREE TEACHING DENTAL HOSPITALS OF PESHAWAR

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Background: The permanent maxillary lateral incisor (PMLI) shows morphological variations, in the form of different crown shapes such as peg-shaped, cone-shaped, barrel-shaped and canine-shaped. The frequency of developmentally malformed permanent maxillary lateral incisors varies among different populations. The aim of this study was to document the frequency of different shapes of developmentally malformed permanent maxillary lateral incisors in patients visiting the three teaching dental hospitals of Peshawar. **Methods:** It was a cross-sectional study conducted in the Oral Diagnosis department of Peshawar Dental College, Sardar Begum Dental College, and Khyber College of Dentistry from 1st Sep 2018 to 15th June 2019. A total of 82 subjects were included that fulfilled the inclusion criteria. Shape of the malformed PMLI was determined using Computer-aided design/Computer-aided manufacturing software. Descriptive statistics including frequencies and percentages for observed developmental malformation and their types were computed and Chi-square test was applied to see the relation between various shapes and their occurrence with respect to site and position within the jaws. **Results:** The peg shaped PMLI was seen in 81 (98.87%) patients and barrel shaped was present in 1 (1.22%) patient. The malformed PMLIs was found to be unilateral in 38 (46.3%) and bilateral in 44 (53.7%) patients, with more common presence on both sides 44 (53.7%) followed by right side 20 (24.4%) and left side 18 (22.0%). **Conclusion:** The subjects having predominant developmental malformation in case of permanent maxillary lateral incisor was peg-shaped permanent maxillary lateral incisor.

Keywords: Tooth Morphology, Permanent maxillary lateral incisors (PMLI), Peg shaped lateral incisor, Barrel shaped lateral incisor, Computer-aided design/Computer-aided manufacturing software (CAD-CAM).

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INTRODUCTION

Developmental malformation of a tooth is defined as disturbances during early stages of tooth development due to genetic and environmental factors.[1,2] The maxillary lateral incisor shows morphological variations, in the form of different crown shapes such as peg-shaped, cone-shaped, barrel-shaped and canine-shaped.[3] Studies also suggest that shape malformation is associated with same genetic mechanism that causes tooth agenesis.[4] The most common developmentally malformed teeth are third molars followed by maxillary lateral incisors and peg-shaped maxillary lateral incisors are most common among these variations.[5]

The frequency of peg-shaped maxillary lateral incisors varies among different populations. A study reported different frequencies of malformations based on different geographical locations with more common occurrence in Saudi (1.6%) followed by Egyptian (1.5%), Pakistani (1.0%) and Bangladeshi (0.4%) populations.[6] The barrel shaped anomaly in maxillary lateral incisors is generally considered to be a more pronounced manifestation of a thickened or elevated cingulum found on the gingival aspect of lingual surfaces of some upper incisors.[7] A study done to investigate the prevalence of incisal morphologies in southern Chinese population, reported Peg-shaped and barrel-shaped maxillary lateral incisors in one percent of the sample.[8]

Malformed teeth highly compromise appearance, personality and psychological well-being of an individual.[9] Tooth malformation affects the function and causes problems such as difficulty in biting, malocclusion, periodontal damage and alteration in the occlusion.[10] Dental specialist should be aware of these implications prior to dental treatments, so that alternative treatment modalities can be designed and performed.[11]

To our knowledge there is no published data available on frequency of developmentally

malformed permanent maxillary lateral incisors in our region of Khyber Pakhtunkhwa. The aim of this study was to collect data regarding frequency of various types of developmental malformations in permanent maxillary lateral incisors in a sample of local subjects visiting the three teaching dental hospitals of Peshawar. This will help the dental practitioner in developing alternative treatment modalities with a multidisciplinary team approach.

MATERIAL AND METHODS

A cross-sectional study was carried out in the outpatient department of Peshawar Dental College, Sardar Begum Dental College and Khyber College of Dentistry Peshawar from 1st Sep 2018 to 15th Jun 2019. Ethical approval was obtained from the ethical committee (IRB) of RIPHAH International University Islamabad. Sample size was calculated on Open Epi Info using the following parameters: Hypothesized percentage frequency of outcome factor in population *p*=5.6%, Confidence level 95% and Design effect=1.[12] A total of 82 patients having one or both developmentally malformed PMLI using convenience type sampling aged 10–40 years and both genders, males and females, were included in the study. An informed written consent was taken from all the patients. Patients who had permanent maxillary lateral incisors loss, trauma or caries, restored and crowned, orthodontically treated, unerupted permanent maxillary lateral incisor and restored with direct and indirect restorations were excluded from the study.

The jaw cast of the patient was obtained using alginate impression material. The shape of PMLI was determined by doing the cast analysis using Ceramill CAD-CAM 2012 version software. Cast was placed on Ceramill fixator in Ceramill Map 400 scanner in 2 plate height. It was scanned by the Ceramill Map 400 scanner and the scanned model was downloaded into the CAD software; image was saved. From tool box on the image, the option "measurement tools" and "select distance" was selected. Now two points were selected on the crest of curvature of mesial and distal margin for mesiodistal width measurement and two points on crest of curvature of labial and lingual margins for buccolingual width measurement in millimetres. The distance between the points was given in millimetres (Figure-1).

The data for the developmentally malformed PMLI was recorded on data sheets; it was analysed using the software SPSS version 21. Chi square test was applied. Descriptive statistics including mean age and standard deviations as well as the frequencies and percentages were computed for observed developmental malformation and their types. 5% level of significance was used, *p*-value less than 0.05 was considered significant.

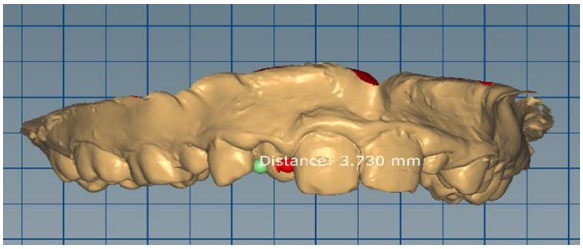

Figure-1: Downloaded image in CAD software

RESULTS

This research study consisted of 82 subjects out of whom the frequency of peg shaped PMLI was seen in 81 (98.87%) and barrel shaped in 1 (1.22%) patient (Table-1).

The malformed PMLIs was found to be unilateral in 38 (46.3%) and bilateral in 44 (53.7%) patients, with more common presence on both sides 44 (53.7%) followed by right 20 (24.4%) and left 18 (22.0%) sides (Tables-2 & 3).

Table-1: Frequency and percentage of various shapes of PMLI's in the sample population (n=82)

Shape	Frequency (%)
Peg	81 (98.8%)
Barrel	1 (1.2%)
Others	0 (0%)
Total	82 (100.0%)

Table-2: Frequency and percentage of the distribution of PMLI's as Unilateral or Bilateral in the sample subjects (n=82)

Unilateral/Bilateral	Frequency (%)
Unilateral	38 (46.3)
Bilateral	44 (53.7)
Total	82 (100.0%)

Table-3: Frequency and percentage of the distribution of PMLI's as Right or Left in the sample subjects (n=82)

Right/Left	Frequency (%)
Right	20 (24.4)
Left	18 (22.0%)
Both	44 (53.7%)
Total	82 (100.0%)

DISCUSSION

Developmental disturbances or tooth abnormalities are the aberrations in the normal morphological or structural characteristics of teeth which are frequently caused by genetic, epigenetic or environmental factors.[13] Malformed teeth highly compromise the aesthetics which affects the appearance, personality and psychological wellbeing of an individual.[14,15] These anomalies may be symptomless but can also cause clinical problems like attrition, compromised aesthetics, occlusal interferences, temporomandibular joint pain and dysfunction, fracture of tooth, dental

caries, post eruptive tooth breakdown, accidental fracture, malocclusion, periodontal problems, and interference with tongue space, difficulty in speech and mastication and excessive occlusal forces on the tooth.[16,17]

Different methodologies have been used to determine the shape malformation like visual screening clinically, dental cast analysis and panoramic radiographs with measurements carried out by digital caliper. In this study dental cast analysis was done using latest CAD/CAM software. Which gives an accurate scale for measuring the tooth size and the model can be viewed in 2D and 3D image. Data can be saved and the drawback of mechanical changes occurring in dental casts is eliminated.

This study showed the presence of peg shaped and barrel shaped PMLI only. The peg-shaped malformation is more common (98.8 %) in this population as compared to other shapes followed by barrel-shaped (1.2%). This result was consistent with the study reported by Yemiten[18] in a Nigerian orthodontic population which showed that peg-shaped was a commonest (4.6%) abnormality; the author used dental casts and panoramic radiographs with measurements carried out by digital calliper. Similarly, Yan[19] showed increased prevalence (2.8 %) of peg-shaped in different races of Malaysia and Hagiwara[20] in a mass dental screening carried out in eight high schools in Japan showed it as a commonest (0.77%) abnormality among other abnormalities. Another survey in Nigeria showed increased prevalence (0.2%) of peg shaped permanent maxillary lateral incisors in children with permanent teeth and total 1.5% in both primary and permanent dentition, whereas barrel shaped was seen in 0.3% children.[21] A clinical and radiographic study done in India on anomalies of maxillary lateral incisor tooth number and shape, showed peg shaped malformation with more common (2.8%) occurrence. Other shapes of maxillary lateral incisors included incisal notching, increased labiolingual and mesiodistal diameter, conical morphology and presence (0.18%) of enlarged palatal cingulum (barrel-shaped) of maxillary lateral incisors.[22] The results of current study are in accordance with the study done by Durrani[23] in our population showing increased prevalence (15.6%) of peg-shaped maxillary lateral incisors in orthodontic patients. The increased percentage in this study is because of a case series study which included all developmentally malformed permanent maxillary lateral incisors.

In this study the distribution of bilateral (53.7%) malformation was present more commonly than unilateral (46.3%) malformation of PMLIs. This difference was not statistically significant (p=0.7) which is consistent with the study results of Hua[24] showing same value for unilateral and bilateral (0.8%) distribution of peg-shaped maxillary lateral incisors. Similarly, Kim[25]showed bilateral presence of peg-shaped maxillary lateral incisors more common (53.0%) than unilateral (47.0%) peg shape with left side (30.3%) more commonly affected than right side (16.7%). In contrast a study conducted by Alhabib[26] showed that right side (6.7%) was affected more commonly when compared to left side (1.2%).

It is recommended that future studies should be directed towards the genetic information makeup of individuals with malformed PMLI. The root morphology of PMLI should be studied along with the crown morphology using newer methods of identification of malformed PMLI like CBCT to study the tooth as a whole.

This study is limited by its small sample size of 82 subjects and being a convenience sampling only that may be the cause of only barrel-shaped and peg-shaped abnormality noticed. It is a hospital-based study and not a community-based study, use of single racial/regional population may be the cause of no other shapes present.

CONCLUSION

Within the limitations of the study, it was concluded that the subjects having predominant developmental malformation in case of PMLI was peg-shaped PMLI. Bilateral presence of PMLIs malformation was more common than unilateral with right side affected more commonly than the left side.

AUTHORS' CONTRIBUTION

FI: Conceptualization of study, literature search, data collection, write-up. MAK: Write-up, critical analysis, proof reading. NA: Proof reading data interpretation, bibliography. SA: Conceptualization of study design. SAS, IA: Critical analysis, proof reading.

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