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PROPORTIONATE VALUE OF MESIODISTAL DIMENSION OF MAXILLARY LATERAL INCISOR WITH RESPECT TO MAXILLARY ANTERIORS IN PERMANENT DENTITION OF NEPALESE POPULATION

Dental Science

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ABSTRACT

Maxillary lateral incisors are third most commonly missing or malformed tooth. Determining width of this tooth is of utmost importance to create esthetic smile. Only few studies are available that mention the proportional value of mesiodistal width of maxillary lateral incisor with respect to central incisor and canine which would simplify the calculation of mesiodistal width of missing or malformed lateral incisor to restore.

This study was conducted on 200 samples (100 male and 100 female) with an aim to determine mesiodistal width of maxillary anterior teeth and proportionate value of mesiodistal width of lateral incisor with respect to central incisor and canine of Nepalese population, and to determine any sexual dimorphism.

The results revealed the mean mesiodistal crown dimension of central incisor, lateral incisor and canine to be 9.12mm (0.53), 7.33mm (0.65), 8.40mm (0.46), for male and 8.93mm (0.63), 7.36mm (0.63), 8.14mm (0.50) for female respectively. The ratio of lateral incisor to central incisor and lateral incisor to canine was 80.39 % (5.24) and 87.35% (7.1) for male and 82.71% ± 5.98 and 90.64% ± 7.33 for female respectively and this difference in ratio in male and female was found to be statistically significant.

Mesiodistal dimension of maxillary anteriors were found to be slightly larger than the previous studies and sexual dimorphism was found to be evident in width of central incisor and canine, and in ratio of lateral incisor to central incisor and of lateral incisor to canine.

During restoration of malformed or missing lateral incisor it is important to take sexual dimorphism into consideration while still maintaining proper proportion with central incisor and canine so that smile becomes esthetic and natural.

KEYWORDS

Maxillary lateral incisors, Crown width, Proportionate width

Introduction

Maxillary anterior teeth are the key for esthetic smile. For smile to be esthetic, they should be in harmony with each other and their width should be in proper proportional relationship. Maxillary lateral incisors are third most commonly missing or malformed teeth[1,2]. Treatment option for missing maxillary lateral incisors include orthodontic space closure and reshaping canine to substitute for lateral incisor or orthodontic space opening and prosthetic rehabilitation[3,4,5]. It is also important to restore malformed lateral incisor by restorative or by prosthetic treatment for smile to become esthetic[4]. In both the cases it is important to determine the mesiodistal width of lateral incisor.

There are three methods to determine the required mesiodistal width of lateral incisor: the first is to use golden proportion[6,7,8] which utilizes the perceived mesiodistal width. It is difficult to determine absolute width utilizing perceived width hence this method does not seem to be practical. Second is to use contralateral lateral incisor as a reference[5]. If contralateral lateral incisor is not missing and is not malformed then it can be taken as a reference. But agenesis of maxillary lateral incisor often occurs bilaterally[1] which puts orthodontist in dilemma to determine length of space to open for prosthesis or amount of interproximal reduction of canine to be done if space closure is the treatment plan. The third method is to use Bolton's anterior ratio[9] which is 77.2% for teeth to have ideal alignment, interdigitation, overbite and overjet. The ratio is given by the formula:

$$\text{anterior ratio} = \frac{sum\ of\ mandibular\ 6}{sum\ of\ maxillary\ 6} \times 100$$

This ratio can be used if lower anteriors are normally aligned and are of normal size, not missing or are not malformed. Also obtaining width of one tooth using width of other ten teeth is a tedious job.

If it is possible to calculate the optimum mesiodistal width of maxillary lateral incisor using that of maxillary central incisor and canine, it would simplify the treatment plan for orthodontist to manage the space requirement. This study aims to determine the mesiodistal width of maxillary anterior teeth, the relative mesiodistal width of the maxillary lateral incisor with respect to maxillary central incisor and canine in Nepalese population and to check for any sexual dimorphism.

Materials and Method

The study was conducted in Department of Orthodontics and Dentofacial Orthopedics, Kathmandu Medical College – BDS program, Bhaktapur, Nepal. The Nepalese patients within the age of 14 to 30 years with no history of previous orthodontic treatment or trauma, fully erupted and intact maxillary permanent central incisors, lateral incisors and canines free from caries, restoration, attrition, abrasion or malformation were included in the study. The study models prepared as diagnostic record for patients seeking orthodontic treatment and meeting all the inclusive criteria were selected for the study.

Sample size was calculated using following formula

80% 'Z' score = 1.28

Standard Deviation (SD) = 0.5

Margin of Error = 5%

$$\text{Sample size} = \frac{(Z\ score)^2 \times SD(1-SD)}{(Margin\ of\ Error)^2}$$

$$= \frac{(1.28)^2 \times 0.5(1-0.5)}{(0.05)^2}$$

$$= 164$$

This is a standard formula for calculating sample size in a cross-sectional study. SD has been kept at 50% or 0.5 since we anticipate the data to be normally distributed and not skewed. Hence, a sample size of 200 was taken (100 males and 100 females).

Mesiodistal width of maxillary anterior teeth were measured using digital Vernier calipers accurate to 0.01mm. The beaks of the calipers were held perpendicular to the long axis of tooth and maximum mesiodistal width was measured. Measurement was carried out in both right and left side of maxillary arch. All the measurements were done by single investigator. All the measurements were repeated twice in 2

weeks interval to determine the consistency in measurement (test-retest reliability). A third measurement was done if the variation in repeat measurement was greater than 0.2mm. Repeat measurements that varied by 0.2mm or less were averaged[10,11]. To avoid fatigue maximum of 10 samples were measured in a day.

Ratio of mesiodistal width of maxillary lateral incisor (LI) to maxillary central incisor (CI) and canine (C) and ratio of mesiodistal width of canine to central incisor in percentage, i.e. LI/CI × 100, LI/C × 100 and C/CI × 100 was calculated on both the sides. The measured mesiodistal width and calculated ratios were compared for intra-arch and sexual variation.

Results

Teeth on right side were slightly larger than on the left side except for canine but the Independent-Samples T test showed the difference to be statistically insignificant for both males and females. Hence, all the calculation were done taking mean value for right and left. Mean mesiodistal width of maxillary anterior teeth on right and left along with the mean of right and left for male and female is given in Table 1. The descriptive statistics for ratios in percentage for male and female is shown in Table 2.

Males showed greater mesiodistal width for CI and C than females whereas for LI, females showed greater mesiodistal width. Mean mesiodistal width of CI was 9.12mm ± 0.53 for male and 8.93mm ± 0.63 for female. Mean mesiodistal width of LI was 7.33mm ± 0.65 for male and 7.36mm ± 0.63 for female. Mean mesiodistal width of C was 8.40mm ± 0.46 for male and 8.14mm ± 0.50 for female. The ratio of LI to CI was 80.39% ± 5.24 for male and 82.71% ± 5.98 for female. The ratio of LI to C was 87.35% ± 7.1 for male and 90.64% ± 7.33 for female. The ratio of C to CI was 92.26% ± 4.96 for male and 91.45% ± 5.11 for female.

Independent sample T test was performed to test the sexual dimorphism for all the variables. Test of significance is summarized in Table3. Mesiodistal width of CI and C showed statistically significant difference for male and female ($p<0.05$), whereas the width of LI showed statistically insignificant difference ($p>=0.05$). The ratio of width of LI to CI and that of LI to C showed statistically significant difference between male and female ($p<0.05$), whereas, the ratio of width of C to CI was statistically insignificant.

Table 1: Mesiodistal width of maxillary anteriors

Gender	Tooth	Right			Left			Average		
		Mean	SD	SE	Mean	SD	SE	Mean	SD	SE
Male	CI	9.128	0.534	0.053	9.120	0.531	0.053	9.124	0.531	0.037
	LI	7.351	0.662	0.066	7.321	0.648	0.064	7.336	0.654	0.046
	C	8.405	0.466	0.053	8.405	0.466	0.046	8.405	0.465	0.032
Female	CI	8.932	0.640	0.064	8.912	0.628	0.062	8.932	0.638	0.045
	LI	7.392	0.629	0.062	7.345	0.641	0.064	7.369	0.633	0.044
	C	8.144	0.498	0.049	8.138	0.507	0.050	8.141	0.501	0.035

Table 2: Descriptive Statistics of Ratios

Gender		Lateral Incisor/Central Incisor*100	Canine/Central Incisor*100	Lateral Incisor/Canine*100
Male	Mean	80.396	92.269	87.354
	SD	5.246	4.964	7.104
	SE	0.370	0.351	0.502
Female	Mean	82.710	91.455	90.640
	SD	5.986	5.119	7.334
	SE	0.423	0.362	0.518

Table3: Test of significance between male and female

	male		female		P value	Significance
	mean	SD	mean	SD		
CI	9.128	0.534	8.932	0.640	0.001	S
LI	7.351	0.662	7.392	0.629	0.613	NS
C	8.405	0.466	8.144	0.498	0.000	S
LI/CI*100	80.396	5.246	82.710	5.986	0.000	S
LI/C*100	87.354	7.104	90.640	7.334	0.000	S
C/CI*100	92.269	4.964	91.455	0.518	0.108	NS

(S = significant, NS= Non significant)

Discussion

It has been stated from several studies that dimension of teeth is not same for men of different races [11,12,13,14]. Bishara et al[11] found no sexual dimorphism for central and lateral incisors in Iowa population, whereas in North Mexican population, they found females having smaller incisors. Other studies[12,14,15] have found males to have larger teeth than female. The mean mesiodistal width for all teeth in our study is higher than that of previous studies[14,11,16,15] and males have bigger central incisor and canine, and smaller lateral incisor than female.

The mean mesiodistal width of maxillary anteriors in this study is greater than in previous study[12] done on same population, i.e. Nepalese. Nepalese consist of mixture of various ethnicity which was not considered in previous study as well as in this study. Shrestha[12] had included only class I malocclusion cases whereas, this study did not take malocclusion as consideration. The sample size in this study is also greater and the population was limited to Bhaktapur district, whereas, no particular area for sample collection was mentioned in the study of Shrestha[12]. These reasons might have contributed for the difference.

Singh et al in their study[15] found ratio of lateral incisor to central incisor to be78% in male and 80% in female and Asad et al[14] found it to be 80.7% in male and 78.6% in female, whereas in our study it was 80.39% in male and 82.71% in female. The ratio is greater for female than for male in our study which supports the study of Singh et al but contradicts that of Asad. The ratio of lateral incisor to canine and canine to central incisor in our study is 87.35% and 92.26% in male, 90.64% and 91.45% in female respectively, while Asad et al[14] in their study found the ratio to be 88.93% and 90.77% in male, 89.36% and 87.95% in female respectively.

Conclusion

Management of space for missing or malformed lateral incisor is challenging for an orthodontist. Calculation of the proportionate width of lateral incisor with respect to present anterior teeth would simplify the treatment plan to create pleasing smile for patient. While restoring malformed or missing maxillary lateral incisor sexual dimorphism should be taken into consideration.

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