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Original Research Article

Changing Maxillary Intercanine, Interpremolar and Intermolar Distance in Male and Females in the Age Range of 16 to 30 Years: A Preliminary Study of Sexual Dimorphism

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Abstract

Objective: To determine age and sex from the maxillary dimensions.

Methods: The study was conducted on 90 patients (45:45, M:F) in the age range of 16 to 30 years, each of known chronological age and sex were collected, In the group I, II and III, subjects were in the age range of 16 to 20 years, 21 to 25 years and 26 to 30 years respectively with 15 (50%) males and 15 (50%) females in each group. Maxillary plaster cast of each subject was prepared and each cast was assessed and measured, a minimum of two times using digital Vernier caliper and intercanine distance, interpremolar distance intermolar distance and depth of palate are used to measure maxillary dimensions and to evaluate the reliability of it in age and sex determination.

Results: mean maxillary intercanine width was statistically said to be significant for sex determination in group I (p value-0.0171), mean maxillary interpremolar width in 2nd premolar region was statistically said to be significant for sex determination in group I (p value-0.0323) and group II (p value-0.0503), mean maxillary intermolar width in the 1st and 2nd molar region was statistically very significant for sex determination in group I (p value-0.0068, 0.0043 respectively).

Conclusion: All maxillary arch width parameters except mean interpremolar width in the 1st premolar region helps to determine sex of chronological age between 16 to 20 years while mean interpremolar width in the 2nd premolar region helps to determine sex of chronological age between 21 to 25 years. However, not a single parameter helps to determine sex of chronological age between 26 to 30 years.

Keywords: Intercanine, interpremolar, intermolar, sexual dimorphism.

Introduction

The growth and development of maxillary arch dimensions are of special interest in medical and forensic sciences. Information concerning the direction of change in dimensions is somewhat meager. Most of the studies of these dimensional changes with age were carried out in the growth period [1] as the changes in size and shape of skeleton-dental-craniofacial complexes do not cease with attainment of biologic maturity.

Even though the rates of changes are much slower and variable, directions of growth with age may be different from those in children and adolescent. [2]

Bony and dental structures of palate are often well preserved even in face of serious body injury. Coupled with statistical difference in palatal dimensions between sexes, there is the opportunity to establish criteria by which forensic scientists can predict sex of unknown individual from fragmentary craniofacial remains. [3] Sex, age and racial affinity are the three most vital determinations that must be made when dealing with skeletal remains.

Gender determination of skeletal remains is a part of archeological and many medico-legal examinations.

Sexual dimorphism is the expression of secondary sexual characteristics that are defined after puberty and during adolescent years. [5] Most researchers have found greater changes in the maxillary arch dimensions in the male component.

Therefore, the present study was carried out with the aim of evaluating the usefulness of maxillary intercanine, interpremolar and intermolar distance in determining the sexual dimorphism.

Material and Methods

The study was conducted on 90 patients (45:45, M: F) in the age range of 16 to 30 years, each of known chronological age and sex were collected.

The subjects included were Under Graduate students, Interns, Post Graduate students and patients from the Department of Orthodontics, GDCH, and Ahmedabad. In the group I, II and III, subjects were in the age range of 16 to 20 years, 21 to 25 years and 26 to 30 years respectively with 15 (50%) males and 15 (50%) females in each group.

The inclusion criteria for the study were:

- Subjects with full complement of teeth and all the permanent teeth erupted. (possible exception of 3rd molar)
- Subjects with minor or no malalignment.
- Absence of pathologic periodontal conditions and proximal caries.
- Subjects with skeletal and dental class I and class II.

The exclusion criteria for the study were:

- History of previous orthodontic treatment, systemic disease, deleterious oral habit, cleft palate, anterior or posterior crossbite and severe crowding.
- Maxillary arch having partially erupted and attrited teeth.
- Subjects having extensive restorations, cast restorations or cuspal coverage in the maxillary arch.
- Subjects having any type of prosthesis.

Maxillary plaster cast of each subject was prepared and each cast was assessed and measured, a minimum of two times using digital Vernier caliper, having 0.01mm resolution and ≤1.5m/s measuring speed. Following maxillary arch width parameters as shown in (Fig.1) were measured in both the sexes of age group I, age group II and age group III:

1. Intercanine distance was measured between the cusp tips of canine on both the sides.
2. Interpremolar distance was measured between the buccal cusp tips of 1st premolar on both the sides.
3. Intermolar distance was measured between the mesiobuccal cusp tips of 1st molar on both the sides.

Most posterior width of palate was measured between the distobuccal cusp tips of 2nd molar on both the sides.

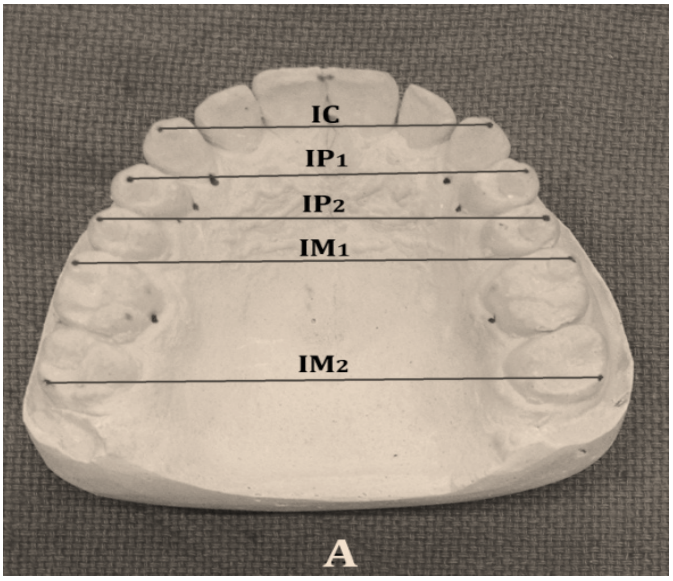

Figure 1:

Results

Table 1: Sex wise comparison of maxillary arch width parameters (in mm)

Maxillary arch width parameters					
Sex	**Inter canine width Mean ± SD**	**Inter-premolar Width, 1st premolar region Mean ± SD**	**Inter-premolar Width, 2nd premolar region Mean ± SD**	**Inter-molar width, 1st molar region Mean ± SD**	**Inter-molar width, 2nd molar region Mean ± SD**
Males (n=45)	34.93± 3.09	41.12± 3.59	46.81± 3.43	52.45± 3.45	58.55± 3.63
Females (n=45)	33.14± 2.47	40.19± 2.39	44.84± 2.29	50.28± 2.68	55.92± 2.73
P value (paired t test)	**0.0031****	0.1527	**0.0019****	**0.0015****	**0.002*****

* - Data is said to be significant, ** - Data is very significant, ***- Data is extremely significant.

Table 1 showed that among the maxillary arch width parameters, mean maxillary intercanine width, mean maxillary interpremolar width in 2nd premolar region and mean maxillary intermolar width in 1st molar region were statistically very significant (p value- 0.0031, 0.0019 and 0.0015 respectively) to determine sex. Mean maxillary intermolar width in the 2nd molar region was statistically extremely significant (p value- 0.002) to determine sex whereas maxillary interpremolar width in the 2nd premolar region was statistically non-significant to determine sex.

Table 2: Age and sex wise comparison of Maxillary arch width (in mm)

Maxillary Arch width parameters	**Group I (16-20years) 30 subjects**		**Group II (21-25years) 30 subjects**		**Group III (26-30years) 30 subjects**	
	Males Mean ± SD	**Females Mean ± SD**	**Males Mean ± SD**	**Females Mean ± SD**	**Males Mean ± SD**	**Females Mean ± SD**
Intercanine width	35.32±3.14	32.52±2.91	34.77±2.31	33.33±2.50	34.69±3.82	33.57±1.95
P value	0.0171*		0.111		0.3188	
Interpremolar Width, 1st premolar region	41.58±3.53	39.99±2.61	40.84±2.84	40.03±2.66	40.95±4.39	40.55±1.97
P value	0.1739		0.4338		0.7539	
Interpremolar Width, 2nd premolar region	47.02±3.10	44.67±2.59	46.67±2.71	44.86±2.08	46.75±4.47	45±2.31
P value	0.0323*		0.0503*		0.1883	
Intermolar width, 1st molar region	52.8±2.89	49.84±2.66	52.28±3.57	50.58±2.36	52.13±4.00	50.41±3.09
P value	0.0068**		0.1349		0.1981	
Intermolar width, 2nd molar region	58.91±3.89	55.18±2.55	58.43±3.67	56.6±2.57	58.3±3.54	55.97±3.05
P value	0.0043**		0.1250		0.0637	

* - Data is said to be significant, ** - Data is very significant, ***- Data is extremely significant.

Table 2 showed that mean maxillary intercanine width was statistically said to be significant for sex determination in group I (p value-0.0171), mean maxillary interpremolar width in 2nd premolar region was statistically said to be significant for sex determination in group I (p value-0.0323) and group II (p value-0.0503), mean maxillary intermolar width in the 1st and 2nd molar region was statistically very significant for sex determination in group I (p value-0.0068, 0.0043 respectively).

Mean of all maxillary arch width parameters except mean interpremolar width in the 1st premolar region helps to determine sex of chronological age between 16 to 20 years while mean interpremolar width in the 2nd premolar region helps to determine sex of chronological age between 21 to 25 years. But not a single parameter helps to determine sex of chronological age between 26 to 30 years.

Discussion

Human identification is one of the most challenging subjects that man has been confronted with. Dental identification remains one of the most reliable and frequently applied methods of human identification, predominantly by the comparisons of ante-mortem and post-mortem records.

In forensic cases, it is common to recover partial remains like fragmented skull, jaws and other bones of the body. The teeth being the strongest human tissues are known to resist a variety of ante-mortem and post-mortem insults and are one of the most commonly recovered remains. Teeth are extremely durable even at high temperatures, chemically most stable and may be identified even when the rest of the body has undergone decomposition.[15] Even after severe facial damage, bony and dental structures of palate are often well preserved at or following death. These types of remains are most commonly found in cases of mass fatality.[4] In situations, where only fragments of skeletal remains are found for e.g. fragments of the jaws remains, in such situations only the odontometric features will help in recognition of an individual.

Sexual dimorphism refers to those differences in size, stature and appearance between male and female that can be applied for individual identification. In this sense, the identification of gender takes precedence over age.[5] Overall, in craniofacial growth females attain the maturity faster and earlier than males. In addition, sexual dimorphism is greater in maxilla than in mandible. In maxilla, the differences in palatal dimensions between sexes establish an opportunity by which forensic scientists can predict sex of an unknown individual from fragmentary craniofacial remains. [4]

The growth of the dental arch width is completed first, followed by arch length and finally growth in arch height. Arch width naturally change with age during adulthood, but the magnitude of changes may be small and variable. In the present cross sectional study, various maxillary parameters were determined by using maxillary cast models. For that, 90 subjects were included and equally divided into 3 different age groups. Individuals of each group showed difference in maxillary parameters because of various factors like life style, genetic, environmental, nutrition etc.

Mean values of males were greater than females. However, almost all the findings were statistically non-significant in group III, whereas in group I mean intercanine width, mean interpremolar width in the 2nd premolar region and mean intermolar width in the 1st and 2nd molar region and in group II mean interpremolar width in the 2nd premolar region appeared statistically significant. This finding was in accordance with[5,6,7] in the group I for mean intercanine width and in accordance with[5,7,12,13]for mean intermolar width in the first molar region.

Mean interpremolar width in the 2nd premolar region was significant between males and females of group I which was in accordance with [4,8] It was non-significant in the 1st premolar region for group I, which was in contrast to [1,2,10,11,8]In the present study, mean molar width in the 1st molar region was very significant in group I for sexual dimorphism which was in accordance with [1,2] for the same age group [11] reported it for 18 to 25 years.

Mean intermolar width in second molar region was very significant for males and females of group I, which was in accordance with [13]. In the study by [5,11,12] sexual dimorphism was more in the 1st molar region than the intercanine region in the age group of 18 to 25 years which was somewhat correlated with the present study in the group I. According to [14]mean intercanine and intermolar width in the 1st molar region were useful parameters for sex determination in the age group of 18 to 30 years but findings of the present study were somewhat not correlating with them as it was not significant for sexual dimorphism for subjects more than 21 years of age.

Conclusion

All maxillary arch width parameters except mean interpremolar width in the 1st premolar region helps to determine sex of chronological age between 16 to 20 years while mean interpremolar width in the 2nd premolar region helps to determine sex of chronological age between 21 to 25 years. However, not a single parameter helps to determine sex of chronological age between 26 to 30 years.

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