To Evaluate the Co-relation Between Distance of Supraorbital Notches and Interdental Distances

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ABSTRACT

Introduction: Earlier various studies were conducted on cadavers for mouth width prediction. This type of study has been first time conducted on living humans. The present study aimed to find the correlation between supraorbital notches and interdental distances using vernier caliper and thread measurement.

Material and methods: Distance between supraorbital notches (SON) was recorded using digital vernier caliper and readings were noted down and it is used as control group. Intercanine (IC), Inter 1st premolar (IP) and Inter 1st molar (IM) distances was recorded by placing the external jaws of vernier caliper (straight reading) on the distal aspect at middle third of the respective teeth. Similarly same parameters were recorded with thread (Curvilinear reading).

Result: In vernier caliper group moderate positive correlation between Supraorbital notch and Intercanine distance (r= 0.53, p=0.00) and Supraorbital notch and Inter 1st premolar distance. (r= 0.49, p=0.00). There was weak positive correlation between supraorbital notch and Inter 1st molar distance. (r= 0.33, p=0.00). In thread group a moderate positive correlation was found between Supraorbital notch and Intercanine distance. (r= 0.41, p=0.00). There is a weak positive correlation between Supraorbital notch and Inter 1st premolar distance. (r= 0.35, p=0.00). There is no correlation between Supraorbital notch and Inter1st molar distance. (r= 0.15, p=0.14).

Conclusion It can be concluded that the distance between supraorbital notches is statistically more significant to Intercanine distance and formulas can be used to calculate Intercanine width- SON distance = 1.80 + 0.63 IC distance with vernier caliper and SON distance = 1.97 + 0.46 IC distance with thread.

Keyword: Supraorbital notch, Intercanine, Inter 1st premolar, Inter 1st Molar, arch width

INTRODUCTION

Teeth are hardest mineralized structure in human body which plays important role in mastication, speech and aesthetics. Teeth also support labial and buccal musculature of face. Edentulism can cause loss of vertical dimension of face and decreased lip muscle tonicity, difficulty in speech and mastication, poor aesthetics, residual ridge resorption and collapse of facial musculature. Various methods are applied to estimate teeth size like pre-extraction records which include old photographs, radiographs, dental cast etc. and efforts are made by dentist to give as natural appearance with the help of artificial teeth. Proper shade selection, shape and size of teeth are necessary as per Sex, Personality and Age. Interdental arch width and arch length have been helpful in various studies for gender determination, anthropometric analysis and orthodontic treatment planning.

Supraorbital notch is a groove or indentation in the orbital margin of the frontal bone, around the junction of the medial 1/3rd and lateral 2/3rd, through which supraorbital nerve and vessels passes. In some cases the ligament that bridges across the notch become ossifies converting the easily palpabal supraorbital notch into less easily palpabal supraorbital foramena.[1] Webster et al mentioned that 25% individual notches are transformed into foramina by ossification of ligaments crossing it.[2] Knowledge of variations of supraorbital foramen in maxillofacial surgery is helpful in providing meticulous approach and helps to facilitate the surgeon's innervations. Even the anatomical variation of these regions has special considerations for oculoplastic surgery.[3]

Earlier various studies were conducted on cadavers for mouth width prediction. A study on 50 cadavers was conducted by Song et al who found out that the distance between the bilateral infraorbital foramina is 54.9±3.4 mm was greater than the distance between bilateral mental foramina 45.2±5.5mm The provided data was helpful for facial surgery in patients with missing teeth.[4] A study conducted by Amin F et al who found a high co-relation between intercanine width and intermolar width for both arches and weak co-relation between upper intercanine width and upper and lower arch length and high co-relation was observed between upper and lower arch length.[5] In a study conducted by M. Jonathan Daniel et al conducted a study on fifty subjects consisting of 25 females and 25 males, with age ranging between 18 to 25 years to compare the inter-canine and inter-molar width as an aid in gender determination concluded that inter-molar arch width may be useful in determining the gender of dental remains accurately, of individuals with missing canine teeth and also it may be more accurate in gender determination than inter-canine arch width, with maxillary inter-molar arch width being more specific.[6]

This type of study has been first time conducted on living humans. The aim was to find the co-relation between infraorbital notches and interdental distances. The result obtained were interpreted with p<0.05 as significance value.

Materials and method

The study was conducted in department of Prosthodontics Crown and Bridge in School of dental sciences, Krishna institute of Medical Sciences Deemed University, Karad. 100 Students were screened out of which 77 were female and 23 were male, aged between 21 to 25 years who met the inclusion and exclusion criteria.

The Inclusion criteria were no missing tooth/teeth and absence of malocclusion in maxillary arch. The Exclusion criteria were

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Parameters	Distance between Supraorbital notch (cm) (control)	Interdental Distances measured using Vernier Caliper (cm) (Group A)			Interdental Distances measured using Thread (cm) (Group B)		
		Inter canine distance	Inter premolar distance	Inter molar distance	Inter canine distance	Inter premolar distance	Inter molar Distance
Mean	4.31	4.00	4.66	5.40	5.04	6.08	10.20
Std Dev	0.50	0.42	0.47	0.43	0.44	0.59	0.35
Minimum	3.04	3.16	3.04	4.09	4.12	4.24	9.15
Maximum	5.36	4.96	6.73	6.41	5.93	7.36	10.96

Table-1: Showing mean and standard deviation of the control and study group.

Distance between Supraorbital notch	Distance measured using Vernier Caliper (cm)			Distance measured using Thread (cm)		
	Intercanine distance	Interpremolar distance	Intermolar distance	Intercanine distance	Interpremolar distance	Intermolar Distance
Co-relation Coefficient (r)	0.53	0.49	0.33	0.41	0.35	0.15
p-value	0.00	0.00	0.00	0.00	0.00	0.14

Table-2: Showing co-relation between distance of supraorbital notches and interdental distances

Predictor	Coefficient	T	P
Constant	1.40	2.49	0.01*
Intercanine distance	0.43	2.98	0.00*
Interpremolar distance	0.24	1.65	0.10
Intermolar distance	0.01	0.10	0.92
S=0.42		$R^2 = 30.6$	

Table-3: Regression Analysis: Intersupraorbital notch distance versus Intercanine, Inter 1st Premolar and Inter 1st Molar Distance measured with vernier caliper

Predictor	Coefficient	T	P
Constant	1.85	1.39	0.17
Intercanine distance	0.35	2.71	0.01*
Interpremolar distance	0.16	1.67	0.09
Intermolar distance	-0.02	-0.20	0.84
S=0.46		$R^2 = 18.9$	

Table-4: Regression Analysis: Intersupraorbital notch distance versus Intercanine, Inter 1st Premolar and Inter 1st Molar distance with thread

Malaligned teeth (crowding/spacing), missing dentition due to caries, impacted or congenitally missing teeth and patients undergoing orthodontic treatment, decayed/restored proximal surfaces, attrition or abrasion in maxillary arch.

The study was conducted after obtaining ethical clearance from ethical committee of KIMSDU. The procedure was explained to the patient and consent was obtained before proceeding.

Supraorbital notch of right side was palpated bare handedly with left index finger. Marking was made using marking pencil. Similar procedure was repeated on left side. Distance between supraorbital notches was recorded using digital vernier caliper (aerospace) and readings was noted down and it is used as control group.

For intraoral measurements vernier caliper was disinfected using bacilol solution. With gloved hand Intercanine distance was recorded by placing the external jaws of vernier caliper on the distal aspect at middle third of both canines. Similarly Inter 1st premolar and Inter 1st molar distances were recorded and noted (Served as Group A).

Another parameter was measurement of interdental distance by using thread. Free end of thread was placed on distal aspect at middle third of right canine and other end on distal aspect of left canine at middle third covering the Intercanine arch length. Marking was made on thread. Thread was then straightened and measurement was taken using external jaw of vernier caliper. Similar process was repeated for 1st premolar and 1st molar. Readings were noted down (Served as Group B).

STATISTICAL ANALYSIS

All the readings were noted and underwent for statistical analysis. Regression analysis and Chi square test were used to calculate the significance.

RESULT

Group A: Distance measured using Vernier Caliper
Statistically there was a moderate positive co-relation between Supraorbital notch and Intercanine distance (r= 0.53, p=0.00) and Supraorbital notch and Inter 1st premolar distance. (r= 0.49, p=0.00) and a weak positive co-relation between supraorbital notch and Inter 1st molar distance (r= 0.33, p=0.00).

Group B: Distance measured using Thread
Similar measurements were found between supraorbital notches and Intercanine distances measured using thread. A moderate positive co-relation was found between Supraorbital notch and Intercanine distance (r= 0.41, p=0.00) and a weak positive co-relation between Supraorbital notch and Inter 1st premolar distance (r= 0.35, p=0.00) However no co-relation between Supraorbital notch and Inter1st molar distance (r= 0.15, p=0.14) was found. (Table 1 & 2)

Regression analysis
In Vernier Caliper group the regression analysis was as follow
Regression Analysis: Intersupraorbital notch distance versus Intercanine, Inter 1st Premolar and Inter 1st Molar Distance measured with vernier caliper (Table 3)
The coefficient with vernier caliper of Intercanine distance is 0.43 cm, for inter 1st premolar distance is 0.24cm and for inter 1st molar distance is 0.01cm
The regression equation is
Intersupraorbital notch distance with vernier Caliper = 1.40 + 0.43 Intercanine + 0.24 Inter 1st Premolar + 0.01 Inter 1st Molar
Regression Analysis: Intersupraorbital notch distance versus Intercanine Distance with vernier caliper

International Journal of Contemporary Medical Research
ISSN (Online): 2393-915X; (Print): 2454-7379 | ICV (2015): 77.83 | Volume 3 | Issue 10 | October 2016

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The equation shows that the coefficient for Intercanine distance is 0.63 cm. The coefficient indicates that for every additional cm in Intercanine distance you can expect Intersupraorbital notch distance to increase by an average of 0.63 cm.

The regression equation is

Intersupraorbital notch distance = 1.80 + 0.63 Intercanine distance with vernier caliper

For Thread the regression analysis is as follow

Regression Analysis: Intersupraorbital notch distance versus Intercanine, Inter 1st Premolar and Inter 1st Molar distance with thread (Table 4)

The coefficient with thread of Intercanine distance is 0.35 cm, for inter 1st premolar distance is 0.16cm and for inter 1st molar distance is -0.02cm

The regression equation is

Intersupraorbital notch distance with Thread = 1.85 + 0.35 Intercanine + 0.16 Inter 1st Premolar - 0.028 Inter 1st Molar.

Regression Analysis: Intersupraorbital notch distance versus Intercanine Distance with thread

The regression equation is

Intersupraorbital notch distance = 1.97 + 0.46 Intercanine distance with thread

The equation shows that the coefficient for Intercanine distance is 0.46 cm. The coefficient indicates that for every additional cm in Intercanine distance you can expect Intersupraorbital notch distance to increase by an average of 0.46 cm.

DISCUSSION

Relation between the various fixed anatomical landmarks can be helpful in various clinical medical and dental fields. Earlier various studies have been conducted on dry skulls, Cadavers, photographic and radiographic studies which aimed to find the relationship between various anatomical landmarks.

Stephen and Henneberg (2003) conducted a study on predicting mouth width from Inter-canine width – A 75% Rule. Photographs of 93 participants in smiling and relaxed poses were measured for distance between the most lateral aspects of the canines and the width of the mouth (chelion to chelion). Overall, inter-canine width averaged 39.5 mm, and mouth width averaged 52.5 mm. Intercanine width was therefore equivalent to 75.8% of mouth width (or mouth width was about 133% of canine width).[7] In the present study average Intercanine width was 40 mm with vernier caliper and that of thread is 50.4 mm.

In 2008, Stephen and Murphy conducted a study on 9 cadavers; mean mouth width for all the cadavers was found to be 55.1mm, SD 4.4mm. The mean width between the lateral aspects of the canines as measured in three individuals was 40.8mm. The canine width symbolized 72% of the mouth width approximating the 75% reported by Stephan and Henneberg. The error producing from use of the 75% rule was -2.4mm for the three individuals for whom mouth width and canine width could be measured.[8]

In 2013, Swaminathan S et al determined the morphology and morphometric distance of supraorbital foramen/ notch(SOF/N) and infrorbital foramen(IOF) from different important anatomical landmark he found that the mean width of S0N/F and IOF was 2.86mm and 3.85 respectively. The mean distance of SOF/N was 25.9mm lateral to nasion, 28.5mm medial to temporal crest of the frontal bone, 0.92mm superior to supraorbital rim. The distance between right and left SOF/N was 49.6mm.The

IOF was at an average of 44.08mm lateral to nasion,41.36mm lateral to maxillary midline, 6.82mm below infraorbital rim, 2.8mm medial to zygomaticomaxillary suture,34.8mm lateral to anterior nasal spine and 27.45mm from the alveolar crest.[9]

In 2016, Jaiswal sonia et al. conducted a study on the anatomy of supraorbital notch and foramen and its clinical co-relations on one hundred dry human skulls of unknown age and gender Notches were found to be greater in number (43.8%), followed by foramen (17.7%) and depressions were found to be (13.5%). Certain combinations were found out of which the combination of foramen and notch was the highest (21.9%), notch and depression was (2.1%) while presence of a depression and foramen was (1%).[10]

The present study has been conducted on humans in order to find the relationship between the distance between supraorbital notches and dental parameters like Intercanine distance, inter 1st premolar distance and inter 1st molar distance. We have made an effort to derive a formula which can be helpful in selection of size of teeth in completely or partially edentulous patients. Out of all three dental parameter, Intercanine width with vernier caliper and thread has been found closest to the distance between supraorbital notches. In the absence of pre-extraction records co-relation between distance of supraorbital notches and Intercanine distance can be helpful to determine the size of teeth.

CONCLUSION

It can be concluded that the distance between supraorbital notches is statistically more significant to Intercanine distance. Following formulas can be used to calculate Intercanine width-
Intersupraorbital notch distance = 1.80 + 0.63 Intercanine distance with vernier caliper
Intersupraorbital notch distance = 1.97 + 0.46 Intercanine distance with thread

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International Journal of Contemporary Medical Research
Volume 3 | Issue 10 | October 2016 | ICV (2015): 77.83 | ISSN (Online): 2393-915X; (Print): 2454-7379

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International Journal of Contemporary Medical Research
ISSN (Online): 2393-915X; (Print): 2454-7379 | ICV (2015): 77.83 | Volume 3 | Issue 10 | October 2016

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