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Analysis of the relation between lip length, free way space, closest speaking space, arch size concerning palatal-depth relativity

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Abstract

This study was conducted to determine clinically if there is a correlation between lengths of upper lip and inter occlusal distance, closest speaking space concerning palatal depth relativity and to develop a technique for measuring occlusal vertical dimension.

The sample consisted of 88 subjects, irreversible hydrocolloid impressions, stone models, vernier calipers, modified plastic rulers were used in the measurements of lip length, transverse and vertical arch dimensions. The speaking method was used for measuring the free way space by pronouncing m sound while the closest speaking space was measured by asking the subject to pronounce s sound.

Statistical analysis was carried out using a standard t-test to compare between males and females; the result reveals possible gender difference related to lip length and palate depth. Also r-test used to find the correlation between the parameters used in the study (lip length, free way space, closest speaking space, inter canine distance, inter molar distance, and palatal depth) , the results analyze and found that there is a positive correlation between the parameters.

When selecting a method to be used for OVD measurements, the criteria to be considered are accuracy, repeatability of the measurements and the length of the time required to secure the measurements.

The results of this investigation indicate that new method for measuring occlusal vertical dimension may be suggested .It was based on the observed correlation, normally found in individuals with natural teeth, between lip length and different parameters.

Introduction

The determination of vertical dimension in edentulous patients is a procedure based clinically on the judgment of the dentist rendering this service, the exact measurement of the natural vertical dimension is most essential in the successful practice of many phases of dentistry ⁽¹⁾.

The dental profession realizes that it has never had an accurate, scientific, and practical method with which to measure the patient's natural vertical

dimension. It is now possible by relating free way space to the length of the upper lip, there is a difference among individuals in the length of upper lip. In some individuals the upper lip is so short that full length of upper anterior teeth is visible with resting upper lip , in others the upper lip may be so long that no part of upper anterior teeth can be seen with resting upper lip^(2,3).

Another method is the use of speaking method (phonetic method) to measure the patients natural vertical dimension before the loss of remaining natural teeth, and to record this in terms of millimeters, and to reproduce this measurements in full dentures at a later dates ^(4,5).

The rest position of the mandible can be obtained by having the patient make the "m" sound which brings the lips together in light contact ^(6,7).

The mandibular rest position is an un reliable means of re establishing the vertical dimension of occlusion that existed before extraction of the natural teeth ⁽⁶⁾.

The closest peaking space is the distance between centric occlusion line (when the upper and lower teeth brings together in maximum occlusal contact) and closest speaking line which marked on the lower anterior teeth when the subject pronounced sound "s" and this distance has been considered stable over time and therefore useful to determine the vertical dimension of occlusion in edentulous patients ^(8,9).

The closest speaking space may vary in different individuals, the measurement ranged from 0 to 10 mm, which proves that there is no an average in measuring vertical dimension ⁽⁵⁾.

The closest speaking space measures vertical dimension when the mandible and muscles involved are in the active full function of speech while the free way space establishes vertical dimension .when the muscles involved are at complete rest ^(5,10).

Free way space (FW) and closest speaking space (CSS) do not appear to be correlated, closest speaking space (CSS) appears to be more reliable parameter than free way space (FW) as it is not influenced by the patients will ⁽⁴⁾.

Raquel ⁽¹¹⁾ revealed in the upper arch, the inter canine width did not

show significant change among genders, no significant change was observed for the upper inter molar width.

This study determined the relation of upper lip length with various variables (free way space, closest speaking, inter canine distance, inter molar distance and palatal depth) to use them as guides and as a pre extraction records to aid for comfortable denture construction with pleasing esthetic result.

Material and Methods

Values for the measurements were generated from 88 subjects, 44 male and 44 female between 21 and 33 years of age. They had their entire natural teeth (retained their 12 anterior teeth), having normal jaw relation and presented stable maximal inter cuspatation.

The subjects are seated in an upright position without use the of head rest, with the eyes forward, and the occlusal surfaces of the upper posterior teeth parallel to the floor.

The lip length measurements were done when the upper lips at rest by using modified plastic rulers, the rounded upper end was rested against the muco labial reflection and the reading of the millimeter scale was taken to the horizontal level of the lower border of the upper lip.

While in the speaking method measurement, we ask the patient to speak in a calm and relaxed manner, checking the rest position was made by asking the patient to say "m" and to remain motionless after saying it, and we measure the distance between the nasal spine (below the nose) and the base of the chin by using vernia Gauge, then the OVD also was measured using the same gauge.

The patient was directed to close into centric occlusion , the centric

occlusion line was identified with a sharp pencil on the lower anterior teeth at the horizontal level of the incisal edge of the opposing upper anterior teeth, the closest speaking space was measured as the distance between two lines marked on lower anterior teeth, the first line represent centric occlusion line and the second line represent the closest speaking line which drawn when the patient pronounce sound "s" which marked on the same lower anterior teeth at the horizontal level of the upper incisal edge as shown in fig. (3) and fig. (4).

Irreversible impressions were taken from the patients, stone models were obtained. Vernier calipers were used to measure the arch width (inter canine and inter molar distances), the inter canine (IC) distance measured between the tips of right and left maxillary canines, the inter molar (IM) distance measured between the distobuccal cusps of right and left maxillary first molars, palatal depth (PD) was measured by using modified plastic rulers , the horizontal ruler was rested against the occlusal surfaces of the posterior teeth of the stone cast while the vertical ruler was adjusted to measure the depth of the palate as shown in fig. (5) .

Data were analyzed using SPSS version 15, r- correlation and standard t- test were employed.

Results

Data presented in table (1) and table (2) showed that the mean lip length (LL) was 21.04 mm for males and 19.09 mm for females , the difference was statistically significant , no gender dimorphism was revealed in relation to free way space (FW) and closest speaking space (CSS) measurements .

The mean palate depth measurement was 22.54 mm in males

and 20.52 mm for females which is high significant. The difference was not statistically significant for males and females related to inter canine (IC) and inter molar (IM) distances as shown in table (3) and table (4). The parameters (LL),(FW),(CSS) appear to be correlated positively among males and females , but the relation between (LL) and (FW) also the relation between (FW)and (CSS)appear to be high significant among females as shown in table (5).

The parameters (LL), (IC), (IM) and (PD) appear to be correlated in both genders. But among male, the relation between (LL) and (PD) was significant also the relation between (IC) and (IM) distances was significant among males and females.

The relation between (IM) and (PD) was high significant among males as shown in table (6) .

Discussion

Various clinical parameters, as well aesthetics, must be taken into account in determining the vertical dimension of occlusion (VDO) when rehabilitating edentulous subjects. These include the free way space (FW), the physiological rest position (PRP) and the closest speaking space (CSS).

A significant gender dimorphism was found in the upper lip length, the upper lip of the female subjects was shorter than the upper lip of the male subjects ($p < 0.05$), the mean difference was 1.954 mm. This result was in agreement with Pecks⁽¹²⁾.

The mean measurements of (FW) in dentate subjects found in this study were within the recommended 2-4 mm, however (27.3) % of the subjects in the study had (FW) measurements out side this range, a similar finding was reported by Johnson⁽¹⁰⁾ .

This study would suggest that the range of (FW) measurements could more realistically be 2-7 mm, this result in agreement with lambadkis⁽⁶⁾ and Johnson⁽¹⁰⁾.

The (CSS) has been considered stable over time, and therefore it is useful to determine the (VDO) In edentulous patients⁽⁸⁾, results revealed that the mean value of (CSS) was 3.15 mm in male and 3.52 mm in female, the difference was not statistically significant ($p > 0.05$).

A high significant sexual difference was found in the palate depth ($p < 0.01$), this result do not support the findings of Hsu⁽¹³⁾ that revealed a similar trends were found for both sexes, while the difference between male and female related to (IC) and (IM) distance was not significant, this finding not in agreement with Graig⁽¹⁴⁾ study which showed a statistically significant difference between the genders related to (IC) distance.

The correlation coefficient between (LL), (FW) and (CSS) are shown in table (5), this table illustrate that all correlations between variables (LL,FW,CSS) among male and female were in positive direction, among male the relation was in significant while among female, the relation between the variables (LL,FW) as well as (FW,CSS) was high significant, these results not support the findings of Bassi⁽⁴⁾.

The result demonstrate that the correlation between variables (LL,IC,IM,PD) among male and female were in positive direction, among male all correlations were in positive direction with only significant relation between (LL) and (PD) as well as between (IC) and (IM) in addition a highly significant relation between (IM) and (PD) was found.

The same picture was found among female as all correlations were in

positive direction with only significant relation between (IC) and (IM).

The difference in (PD) may appear to be due to genetic differences in addition to the differences of pronunciation and eating habits.

Conclusion

An investigation was conducted to evaluate and compare the relation between lip lengths with different parameters to find a new method for determination of occlusal vertical dimension (OVD). The result of this study demonstrate that the correlation between (FW) with both (LL) and (CSS) was high significant among females. A significant positive correlation was found between (LL) & (PD) and between (IM) with (IC) & (PD), so the variables used in this study can provide a starting point to determine (OVD).

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Table (1) Means and standard deviation values of the lip length (LL), free way space (FW) and closest speaking space (CSS) related to gender.

Male	LL	FW	CSS
Mean	21.045	3.636	3.1591
SD	2.710	1.432	1.624
SE	0.408	0.216	0.245
Female	LL	FW	CSS
Mean	19.091	3.386	3.522
SD	2.734	0.993	1.408
SE	0.412	0.148	0.212

Table (2) t-test between male and female

	LL	FW	CSS
t-test	3.37	0.95	1.12
P-value	0.011	0.34	0.27
Sig	S	NS	NS

LL=lip length, (FW) = free way space, (CSS)=closest speaking space.

*P>0.05 Non significant (NS) **P<0.05 Significant (S)

Table (3) Mean, standard deviation values of lip length (LL), inter canine distance (IC), inter molar distance (IM) and palate depth (PD) related to gender.

Male	LL	IC	IM	PD
Mean	21.045	33.136	52.091	22.545
SD	3.108	3.714	6.076	2.161
SE	0.468	0.560	0.916	0.326
Female	LI	IC	IM	PD
Mean	19.091	33.5	53.841	20.523
SD	2.526	4.106	4.615	1.810
SE	0.381	0.619	0.696	0.273

Table (4) t-test between male and female

	LL	IC	IM	PD
t-test	4.03	0.44	1.52	4.76
P-value	0.001	0.66	0.13	0.000
Sig	S	NS	NS	HS

*P>0.05 Non significant (NS) **P<0.01 High significant (HS)

Table(5) correlation between lip length (LL), free way space (FW) and closest speaking space (CSS) related to gender.

	Male		Female	
	r	p-value	R	p-value
LL&FW	0.229	0.134	0.543	0.000
LL&CSS	0.244	0.110	0.090	0.678
FW&CSS	0.185	0.229	0.551	0.000

p>0.05 Non significant (NS).
P<0.01 High significant (HS).

Table (6) correlation between variables lip length (LL) , inter canine distance (IC),inter molar distance (IM) and palatal depth (PD) related to gender.

	Male		Female	
	r	p-value	r	p-value
LL&IC	0.115	0.459	0.089	0.568
LL&IM	0.041	0.792	0.049	0.824
LL&PD	0.337	0.025	0.120	0.438
IC&IM	0.420	0.005	0.379	0.048
IC&PD	0.111	0.474	0.048	0.730
IM&PD	0.562	0.000	0.279	0.066

p>0.05 Non significant (NS).
P<0.01 High significant (HS).
P<0.05 Significant (S).

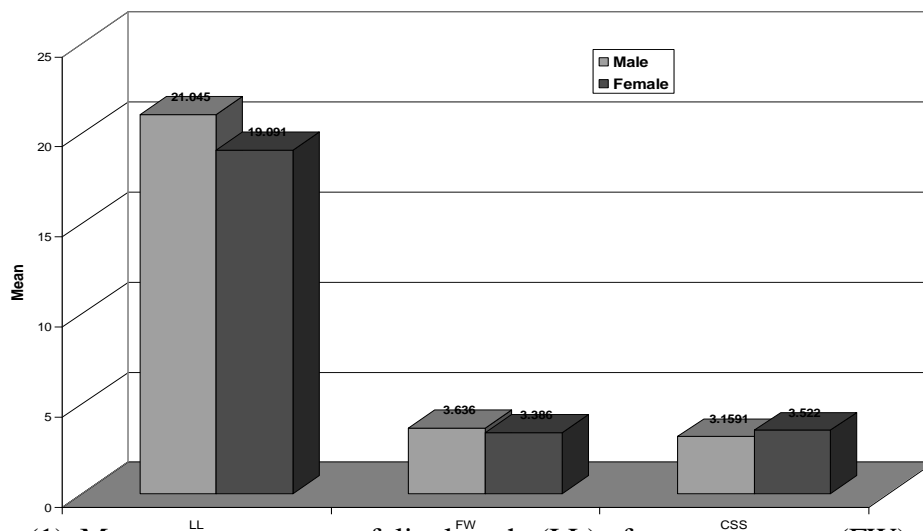


Fig. (1) Mean measurement of lip length (LL), free way space (FW) and closest speaking space (CSS) related to gender.

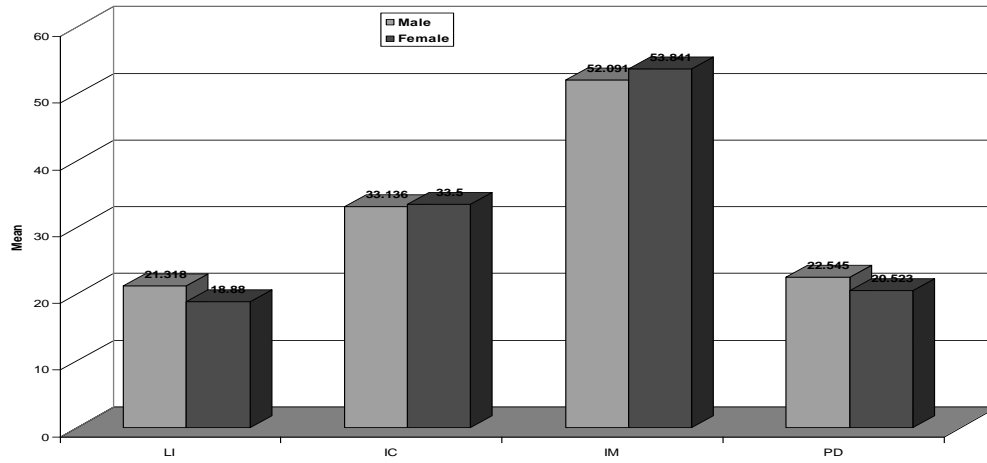


Fig.(2) Mean measurement of (LI), (IC), (IM) and (PD) related to gender.



Fig.(3) The first dark line represent the centric occlusion line.



Fig.(4) The dark line on the incisal edge of mandibular central incisors represent the closest speaking line

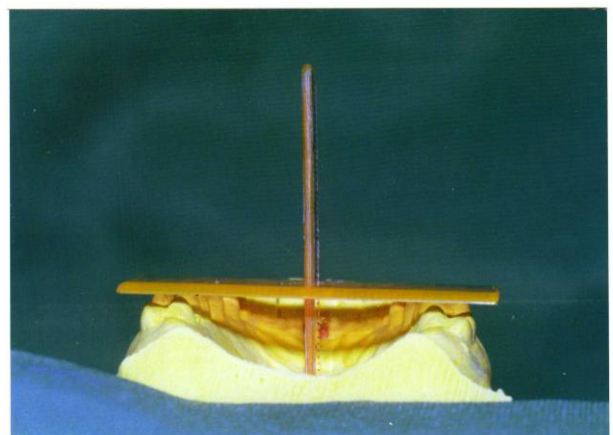
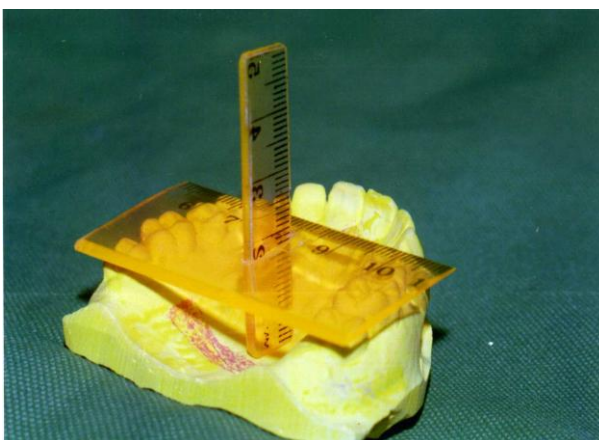


Fig.(5) Palatal depth measurements on the dental cast.