ORIGINAL ARTICLE

OCCLUSAL PLANE EVALUATION IN DENTATE PATIENTS FOR COMPLETE DENTURE PROSTHODONTIC PRACTICE

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Background: Preclinical determination of occlusal plane is an important clinical step in construction of complete denture. Objective of present study was to find out the parallelism of occlusal plane to ala-tragus line in dentate subjects to provide a guideline for establishment of occlusal plane for edentulous patients **Methods:** In local dental College from April to October 2017 using purposive sampling technique this comparative study was conducted. After preliminarily examination, desired photographs of 120 subjects using fulfilling the inclusion criteria were taken biting on proper positioned Fox's Plan. Photographs were analysed through the computer software named Digimizer Image Analysis (Version 4.2.5.0) for three posterior reference points on the tragus of the ear at its superior (ATs), middle (ATm) and inferior (ATi) margin and one anterior reference point, i.e., Inferior margin of the Ala of the nose. Three lines were drawn with the help of the software that were extending from the posterior reference points to anterior reference point and fourth line Parallel to the upper level of the fox plane (FxP). Finally, the angles between the above-mentioned lines computed were analysed to check the parallelism. One sample t-test was utilized using SPSS. **Results:** Mean angles value on right side of subjects between FxP to three reference points ATs, ATm, ATi were 3.261, 2.720 and 2.245 and on the left they were 2.347, 2.558 and 2.029 respectively showing no parallelism (angle value zero). **Conclusion:** Major findings revealed no parallelism among these planes.

Keywords: Occlusion; Plane; Denture

Citation: Raza M, Ayub N, Imran M, Nawaz K, Sami A. Occlusal plane evaluation in dentate patients for complete denture prosthodontic practice. A clinical study J Ayub Med Coll Abbottabad 2020;32(1):54–7.

INTRODUCTION

Prognosis of the complete denture success depends on developing an occlusion that is compatible to functional movements of the stomatognathic system. Clinically for establishment of ideal occlusion, one of the important factors that help us is the orientation of the occlusal plane. The determination of angulation of occlusal plane is a vital clinical step in the construction of the complete dentures for the edentulous patients. The correct orientation of the occlusal plane of the complete denture will result in better denture stability. Use of stable complete dentures helps to avoid the transfer of undue stresses to the underlying residual ridges, retardation of their resorption, better aesthetics achievement in natural smile and function of final prosthesis.[1,2]

Several intra oral and extra oral methods can be employed to determine the angulation of the occlusal plane. The most commonly implemented clinical practice is the use of ala tragus line.[3]With regard to the orientation of the occlusal plane in the posterior region several controversies among the authors related to the posterior reference point of ala tragus line exist.[1–8] So rationale of the study to address this controversy. The aim of the present study is to determine the parallelism of occlusal plane to ala-tragus line in dentate subjects who had reported to Peshawar Dental College. To identify the exact location of the posterior reference point of the ala tragus line so to use as reference to orient the occlusal plane for complete denture construction for edentulous patients**.** This will help the clinician in establishment of proper occlusal plane for the benefit of edentulous patients.

MATERIAL AND METHODS

The study population of this research endeavour was belonging to different localities of Peshawar district which were close to hospital. The resident of these areas is used to visit the abovementioned hospital for dental and medical treatment. This comparative study was conducted from April to October 2017 in Dental College.

Total sample size for this consisted of 120 subjects. However, among these selected respondents 60 were male and 60 were female subjects. The sample design utilized in this research endeavour was Two-Stage sampling technique. In the first stage purposely subjects with full complement of teeth along with angle's class-1 occlusion were selected through purposely sampling technique. In addition, subject with no previous history of orthodontic and prosthodontic treatment, cosmetic surgery, facial a- symmetry and craniofacial anomaly were included. Moreover, the subject with Temporomandibular disorders, having

facial asymmetry, orthodontic treatment and over-jet and over bite (more than 2 mm) were excluded.

After purposive selection, in the second stage the subjects were examined and desired photographs were taken of each subject. Verbal consent was acquired from all subjects for ethical consideration. After the subject selection, they were asked to position the Fox's Plan covered with the dental wax intra- orally as demonstrated in Figure-1. They were further asked to bite on it evenly anterior as well as on posterior teeth bilaterally. This plane represented the inclination of the occlusion plane utilized for the fabrication of the complete dentures. Right and left lateral profile photographs were captured with a digital still Camera (Sony-22MP) of the sampled subjects standing straight with upright head position. An adjustable tripod (Fujitsu Video Triport 2002) was selected and utilized for positioning the camera at the level of Fox's plane in the subjects. Photographs of all the subjects were analysed through the computer software named Digimizer Image Analysis (Version 4.2.5.0) by two researchers. Photographic tracing includes marking of the three posterior reference points on the tragus of the ear at its superior, middle and inferior margins. Inferior margin of the Ala of the nose was taken as anterior reference point. Four lines were drawn with the help of the software that were extending from;

- The inferior border of the ala of the nose to superior point of the tragus (ATs).
- The inferior border of the ala of the nose to middle point of the tragus (ATm).
- The inferior border of the ala of the nose to inferior point of the tragus (ATi).
- Parallel to the upper level of the fox plane.

Finally, the angles were computed between these above-mentioned lines. Descriptive statistics like minimum value, maximum value, mean and SD values for all angles were recorded. To examine the angles between the occlusion plane and ala-tragus line with three different posterior reference points, the one sample t-test was utilized at less than 0.05 significance level. To check the validity among the inter-examiner variability cohen's-kappa test was applied.

RESULTS

The major findings revealed no parallelism among these planes, which implies that angle values diversified significantly from zero. (Table-1) However, the angle of the Fox Plane with the ala-tragus inferior showed the minimum mean angle value, i.e., 2.24° and 2.02° on both right and left sides, respectively. The confidence interval was considered as 5% (less than 0.05). The occlusion plane and ala-tragus line were hypothetically deemed as parallel to one another by expecting the mean value as zero in one sample t-test.

The t-test was run to investigate about the angles between the occlusion plane and ala-tragus line on both right and left side of all subjects. The computed results have reported that all the three superior, middle and inferior points of right side are significantly different from left side of the subjects. (Table-2)

The gender wise comparison of Angle between Fox Plane and Ala-tragus line with reference to three Posterior points of Right and Left side was made in Table-3. The results illustrate that the lowest mean angle value at right and left side of both female and male subject was found to be with ala-tragus inferior as 2.3090, 2.140, 2.180 and 1.910 respectively. Result of the Cohen's-kappa test was (k= 0.82), i.e., near perfect agreement among the both researchers.

Table-1: Descriptive statistics of angle between fox plane and ala-tragus line with reference to three posterior points of right and left side of the participants

Participants side	Angles	Total no of Participants (n)	Minimum	Maximum	Mean	SD
Right	Alatragus Superior	120	.000	7.456	3.26108	1.842088
	Alatragus Middle	120	.000	6.591	2.72051	1.634894
	Alatragus Inferior	120	.021	6.482	2.24527	1.470796
Left	Alatragus Superior	120	.000	7.524	2.34700	1.817030
	Alatragus Middle	120	.000	7.569	2.02957	1.491395
	Alatragus Inferior	120	.000	7.540	2.55828	1.869613

Table-2: Mean and t-test values of angle between fox plane and ala-tragus line with reference to three posterior points of right and left side of the participants

Participants side	Angles	Mean Value	t-value	*p*-value
Right	FxP-ATs	3.261	19.393	0.000
	FxP-ATm	2.720	18.229	
	FxP-ATi	2.245	16.723	
Left	FxP-ATs	2.347	14.150	
	FxP-ATm	2.029	14.907	
	FxP-ATi	2.558	14.989	

FxP=Fox Plane, ATs = Ala-Tragus line Superior, ATm = Ala-Tragus line Middle, ATi =Ala-Tragus line Inferior

Table-3: Gender wise descriptive statistics and one-sample t-test of angle of right and left side

Gender	Side	Angles	Mean value	SD	t-value
Male	Right	FxP-ATs	2.996	1.874	12.380
		FxP-ATm	2.772	1.613	13.313
		FxP-ATi	2.181	1.331	12.686
	Left	FxP-ATs	1.938	1.728	8.640
		FxP-ATm	2.858	1.961	11.291
		FxP-ATi	1.913	1.311	11.296
Female	Right	FxP-ATs	3.525	1.785	15.298
		FxP-ATm	2.668	1.668	12.390
		FxP-ATi	2.309	1.606	11.134
	Left	FxP-ATs	2.765	1.820	11.767
		FxP-ATm	2.257	1.737	10.064
		FxP-ATi	2.146	1.654	10.047

FxP=Fox Plane, ATs = Ala-Tragus line Superior, ATm = Ala-Tragus line Middle, ATi =Ala-Tragus line Inferior. (p= 0.000)

DISCUSSION

Occlusal plane forms an essential part of the concept of balanced articulation.[4] Position of occlusal plane in denture wearers should be like to the plane, which was previously occupied by the natural teeth.[5] This is evident from literature reviewed that the missing occlusal plane orientation is established in clinical practice for completely edentulous patients using the Ala-tragus plane between the inferior borders of Ala of the nose anteriorly and some specific point points on the tragus of the right and left ear posteriorly. The parallelism of such plane is helpful in the development of occlusal plane for complete dentures of completely edentulous patients. However, various schools of thoughts have a contradiction regarding the exact location of posterior reference point on ala tragus plane.[3–5]

The most controversial landmark for orientation of occlusal plane is the Ala Tragus line. Authors findings regarding Ala tragus line was found to be that the line joining the inferior portion of the tragus to the ala of the nose is more often than not parallel to the occlusal plane. [1,6–8]

Results of the mean angles of Fox-Plane with Ala Tragus on both right and left sides as mentioned in Table1are corroborated by previous study which has demonstrated that mean angle between Fox Plane and Ala Tragus was observed as 2.45° showing no parallelism between occlusal Plane and Ala Tragus line.[5,9]

However, in this study the lowest mean angle of occlusal plane with ala tragus inferior was observed as 2.24° and 2.02° on both right and left side respectively which is contrary to the results of previous study illustrated the lowest mean angle of superior posterior reference point on the tragus as 3.6° and 3.5° on each right and left side respectively.[10,11] However, Karkazis & Polyzois have reported middle of the tragus as posterior reference point.[5]

While comparing the left and right sides for the posterior reference points, it was obtained that posterior reference point of both left and right sides are significantly different from each other (Table-2). Previous research study of Rathee had conflicting results showing no significant difference between right and left side.[12] Ala-tragus inferior was observed as the lowest mean angle in both male and female subjects for both right and left sides of the face as mentioned in Table-3. These findings are again varied from the result of Rathee[12], Sadr and Sadr[4].

RECOMMENDATION

Therefore, it is recommended that for orienting the occlusal plane, along with the ala-tragus line combination of more than one landmark should be used.

Disclaimer: It is certified that the abstract/paper has not been previously presented or published in any conference.

Conflict of interest: None.

AUTHORS' CONTRIBUTION

MR: Literature search, objective setting, study design, proof reading. NA: Data collection, objective setting, write-up. MI: Literature search, write-up. KNS: Data collection and interpretation. AS: Photography and imaging.

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Submitted: 14 January, 2019	*Revised: 22 July, 2019*	*Accepted: 13 August, 2019*

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