

## ORIGINAL ARTICLE

# EVALUATION OF RELATION BETWEEN OCCLUSAL PLANE AND ALA-TRAGUS LINE WITH THE HELP OF CEPHALOMETRY

V Bondekar<sup>1</sup>, SB Wagh<sup>2</sup>, PN Attal<sup>3</sup>, VR Pandey<sup>4</sup>

<sup>1</sup>Professor, Department of Prosthodontics, <sup>2,3,4</sup>Postgraduate students of Department of Prosthodontics, Yashwantrao Chavan Dental College and Hospital, Ahamednagar, Maharashtra, India

### ABSTRACT:

**Background:** Orientation of occlusal plane is one of the most important clinical step in removable partial denture patients. Accurate establishment of occlusal plane and the effect of its inclination on function, esthetics and speech, a method to guarantee the success of removable partial denture. **Material and method:** A Cephalometric Study was carried out in 15 subjects of age group from 20 to 25 years from YCMM & RDF'S Dental College Ahmednagar. Barium sulfate was used to mark ala tragus line in which anterior reference point is lower border of the nose and posterior reference point was superior, middle and inferior surface of the tragus. Angles created between the Camper's, Palatal, and Occlusal planes with SN were measured to give SN-Camper's (C), SN-Palatal (P), and SN-Occlusal (O) respectively. **Results and conclusion:** Camper's plane closely imitates the occlusal plane of fully dentate subjects with skeletal Class I maxillo-mandibular relationship therefore it may be a better guide to re-establish the occlusal plane and Middle border of the tragus with inferior border of the ala of the nose can be most accurate in locating artificial occlusal plane

**Keywords:** Occlusion, Cephalometric, Plane, Orientation.

**Corresponding author:** Dr. V Bondekar, Professor, Department of Prosthodontics, Yashwantrao Chavan Dental College and Hospital, Ahamednagar, Maharashtra, India

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### INTRODUCTION:

Orientation of the occlusal plane is one of the most important clinical step in removable prosthodontic treatment for edentulous patients. In completely edentulous patients the occlusal plane orientation is lost and should be relocated if complete dentures are to be esthetic and to function satisfactorily. There is tendency for accumulation of food in buccal and lingual sulci and if the occlusal plane is placed too low it could lead to tongue and cheek bite.<sup>1</sup>

The occlusal plane in complete dentures has often been oriented anteriorly to fulfill esthetics and posteriorly parallel to Camper's line, which is a horizontal line drawn through the lower part of the nose and the orifice of the ear.<sup>2</sup>

According to surveys,<sup>3-5</sup> occlusal plane orientation differs considerably among various countries, however, the most widely used method in determining the plane of occlusion was the ala-tragus line method. Zarb et al<sup>6</sup> suggested that the occlusal plane should be parallel to the hamular notch-incisive papilla plane, whereas other researchers have reported a close relationship between the ala-tragus line and occlusal plane.<sup>5</sup> There are differences in the literature concerning which part of the tragus to use, since some researchers believe in using the lower border of the tragus, others believe in using the middle part of the tragus, and still others believe in using the upper part.<sup>5,6</sup>

The use of a number of anatomical landmarks as

guides from life or biometric guides for artificial tooth position has been suggested by many authors.<sup>7-9</sup> Anatomical landmarks suggested to clinically determine the position of the occlusal plane are the upper lip, corner of the mouth,<sup>9</sup> lateral margins of the tongue, two-thirds of the height of the retromolar pad, parallel to the ala-tragus (Camper's plane) and interpupillary lines,<sup>5,6</sup> parallel to the hamular notch-incisive papilla plane and 3.3 mm below the parotid papilla.<sup>10</sup>

## AIM AND OBJECTIVES

### AIM:

The purpose of this study is to determine, relation between occlusal plane, ala-tragus line and palatal plane and which part of the tragus should be used while locating occlusal plane with the help of cephalometry

### OBJECTIVES-

- To evaluate the relationship between Occlusal plane and Palatal plane.
- To evaluate the relationship between Occlusal plane and Campers plane.
- To determine appropriate part of the tragus to orient the occlusal plane.

## MATERIALS AND METHODS

Study was carried out in 15 subjects of age group from 20 to 25 years from YCMM & RDF'S Dental College Ahmednagar.

### Inclusion criteria

- Permanent components with ideal arch form and alignment
- Angles class 1 relationship.
- Normal tooth form.
- Age group: 20-25 years

### Exclusion criteria

- History of orthodontic treatment
- Class 2 operative restorations
- Missing teeth
- History of facial fractures

### Cephalometric analysis of camper's plane, palatal plane, and occlusal plane with SN plane

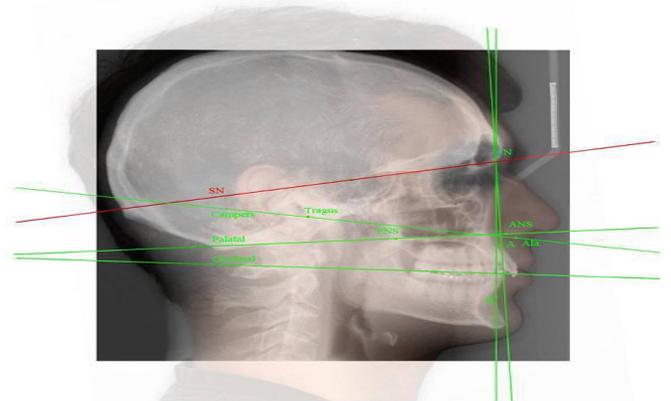
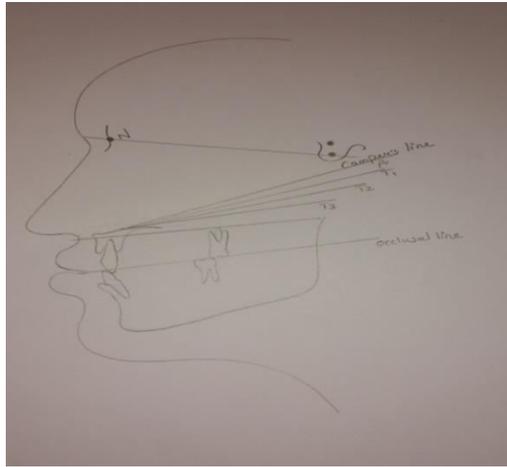
This analysis was aimed at determining the most reliable anatomical landmark as a guide for the orientation of the occlusal plane in removable prosthesis and the use of cephalometric landmarks to predict the occlusal plane orientation in edentulous

patients. Left lateral cephalograms were taken by a standard technique with the mandible closed in maximum intercuspation. Barium sulfate creamy mix was applied to the teeth, one drop on the incisal edge of the left maxillary central incisor, and another drop painted to cover the mesiopalatal cusp of the left maxillary first molar. Another creamy mix of barium sulfate was painted on the skin on the left side of each patient's face in the shape of a triangle to mark required landmarks to be shown in the final radiograph. The apex of the triangle superiorly pointed to the lower border of the ala of the nose, and the other one was applied to mark the whole tragus of the ear. The apex of the painted triangle of the tragus pointed posteriorly to the tragus so that the lowest Angle between occlusal plane and ala-tragus line at the superior, middle and inferior border of the tragus could be identified. Angles created between the Camper's, Palatal, and Occlusal planes with SN were measured to give SN-Camper's (C), SN-Palatal (P), and SN-Occlusal (O) respectively. All measurements were performed by one operator.



## THE CEPHALOMETRIC LANDMARKS USED:

- Sella-Nasion (SN) Plan
- Palatal Plane: From ANS – PNS
- Occlusal Plane
- Camper's Plane



**THE ANGLES TO BE STUDIED WERE AS FOLLOWS**

- Camp1 OP-superior border of tragus
- Camp2 OP-middle border of tragus
- Camp3 OP-inferior border of tragus

**RESULTS:**

**Values For Different Angles Obtained For 15 Subjects: (Table No 1)**

- P – Angle between SN plane and Palatal plane
- C- Angle between SN plane and Campers plane
- O- Angle between SN plane and Occlusal plane
- O-C – Angle between Occlusal plane and Campers plane
- O-P- Angle between Occlusal plane and Palatal plane

P	C	O	O-C	O-P
8	2	-1	8	8
13	1	1	6	8
13	1	4	8	7
5	2	-1	14	7
7	1	-2	3	8
14	3	2	1	8
7	3	2	13	8
12	3	1	1	7
12	3	2	15	8
11	4	2	3	8
15	4	3	9	7
15	2	0	1	8
11	4	-1	2	7
10	3	0	8	7
7	4	1	13	8

**Table 1:** Values For Different Angles Obtained For 15 Subjects

**Table 2:** Statistical Analysis For The Values Obtained

	<i>P</i>	<i>C</i>	<i>O</i>	<i>O-C</i>	<i>O-P</i>
<i>Minimum</i>	5	1	-2	1	7
<i>Maximum</i>	15	4	4	15	8
<i>Mean</i>	10.67	2.67	0.87	7.00	7.60
<i>SD</i>	3.20	1.11	1.68	5.06	0.51

*Simple t test was applied*

**p value- 0.0287**

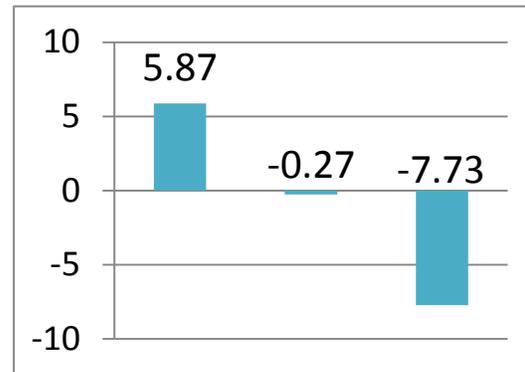
Occlusal plane and SN Plane angle is more close to camper plane and SN plane angle, followed by palatal plane angle therefore camper plane was more reliable guide while locating artificial occlusal plane in completely edentulous patient to arrange artificial teeth in harmony with masticatory system

**Table 3:** The Values Obtained For 15 Subjects Considering Superior Middle And Inferior Point Of The Tragus as a posterior Reference Point

<i>Inferior</i>	<i>Middle</i>	<i>Superior</i>
5	-2	-7
6	0	-10
5	-3	-8
7	2	-9
7	1	-7
6	0	-7
5	-2	-9
6	0	-8
6	0	-7
7	-2	-7
6	1	-8
6	2	-7
5	0	-7
6	-1	-7
5	0	-8

**Table 4:** Descriptive Analysis Were Done for the values obtained for Posterior Reference Point

<b>Mean</b>	<b>5.87</b>	<b>-0.27</b>	<b>-7.73</b>
<b>Median</b>	<b>6.00</b>	<b>0.00</b>	<b>-7.00</b>
<b>Mode</b>	<b>6.00</b>	<b>0.00</b>	<b>-7.00</b>
<b>SD</b>	<b>0.74</b>	<b>1.49</b>	<b>0.96</b>



**P value-1.861141**

The lowest mean angle formed between occlusal and camper 1 plane was 5.87, angle between occlusal plane and camper 2 plan was -0.27 and angle between occlusal plane and camper 3 plan was -7.73. therefore the angle between middle border of the tragus and occlusal plane was close to Zero hence middle border of the tragus can be used as a posterior reference point.

## DISCUSSION

cephalometric analysis provides useful information on the craniofacial skeleton and the orientation of the occlusal plane in dentulous and edentulous subjects. The plane of occlusion has been recognized as an essential functional part of the craniofacial skeleton.<sup>13-15</sup>

Artificial occlusal plane (AOP) orientation can be done using various angular variables in relation to other craniofacial planes and to determine the validity of the use of the ala-tragus line as a reference point for occlusal plane orientation. Part of designing the complete denture is orienting the occlusal plane in the most acceptable cant for esthetics and function. Investigators have suggested various concepts and methods for the orientation of the occlusal plane in complete dentures based on morphologic studies on natural and artificial dentitions and on clinical experience.<sup>5,16-18</sup> The ala-tragus line was the most commonly used and widely taught method for the orientation of the plane of occlusion.<sup>3</sup>

In the literature, there is controversy in defining Camper's plane, which is considered the most popular plane used to orient the occlusal plane in edentulous patients. Definition of the Camper's line causes confusion, because the exact reference points are controversial. For example, the glossary of prosthodontic terms<sup>19</sup> states that the Camper's line

runs from the inferior border of the ala of the nose to the superior border of the tragus, while for Spratley it runs from the center of the ala to the center of the tragus. Among seven of the most famous prosthodontic textbooks, only Boucher's provide a definition.<sup>7</sup>

Two other textbooks recommend the concept without defining it, while Basker et al, Grant and Johnson, and Neill and Naim provide only pictorial representation, illustrating Camper's line as extending to a point, not at the superior border, but at the center of the tragus of the ear, corresponding to the definition of Ismail and Bowman,<sup>17</sup> which predates Boucher's definition. However, investigations into the clinical reliability of Camper's line serve only to compound the confusion, as Ismail and Bowman<sup>17</sup> compared the use of an ala-tragus line oriented to the middle of the tragus with the occlusal plane of natural teeth, and concluded that dentures constructed accordingly would have an occlusal plane set far too low posteriorly. This is contraindicated by Abrahams and Carey,<sup>20</sup> who concluded that the occlusal plane of complete dentures conforming to a line oriented to the superior border of the tragus results in the occlusal plane being leveled far too high posteriorly. The results of cephalometric study<sup>12</sup> found that the superior border of the tragus is the most acceptable point to orient the occlusal plane, which complies with Boucher,<sup>7</sup> the glossary of prosthodontic terms<sup>19</sup> and Trapozzano. On the other hand, cephalometric study<sup>12</sup> does not agree with the findings of other studies. Van Niekerk<sup>5</sup> has suggested the use of the inferior part of the tragus rather than middle or superior, while Ismail and Bowman<sup>18</sup> suggested the use of the middle part of the tragus.<sup>11</sup>

In the cephalometric study,<sup>12</sup> three Camper's planes were used, based upon the superior, middle and

inferior part of the tragus; as Camper's plane I is the line extending from the inferior border of the nose to the superior border of the tragus of the ear, Camper's plane II is the line extending from the inferior border of the ala of the nose to the middle border of the tragus of the ear, and Camper's III is the line extending from the inferior border of the ala of the nose to the inferior border of the tragus of the ear. The lowest mean angle formed between Camper's I and the natural occlusal plane was  $2.1^\circ$ , Camper's II was  $3.2^\circ$ , and Camper's III was  $6.1^\circ$ . Nissan et al,<sup>21</sup> on the other hand, recorded the angle formed between occlusal plane and Camper's line as  $7.08^\circ$ . Abrahams and Carey<sup>20</sup> reported the angle formed between the natural occlusal plane and Camper's plane to be  $9.66^\circ$ . Augsburger<sup>16</sup> found the angle of the occlusal plane deviated from Camper's plane by  $3.2^\circ$  to  $7.85^\circ$  in dentate patients of different facial types.

In this study, according to cephalometric and statistical analysis ala tragus line is most reliable landmark which is close to occlusal plane and the middle part of tragus is used as the posterior reference point in Indian population.

## CONCLUSION

Within the limits of cephalometric analysis we concluded that :-

- 1) Camper's plane closely imitates the occlusal plane of fully dentate subjects with skeletal Class I maxillo-mandibular relationship therefore it may be a better guide to re-establish the occlusal plane.
- 2) Middle border of the tragus with inferior border of the ala of the nose can be most accurate in locating artificial occlusal plane

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