A Cephalometric Study on the Relationship between the Occlusal Plane, Ala-Tragus and Camper’s Lines, in Patients with Angle’s Class III Malocclusion

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Abstract:
Statement of Problem: Considering the importance of the occlusal plane orientation in complete denture prostheses, a study was conducted on the relationship between this plane with ala-tragus and Camper’s lines in soft tissue among individuals with class III malocclusion, in Mashhad School of Dentistry.

Purpose: The aim of the present study was to define the best soft tissue index by which the location and inclination of the occlusal plane in complete dentures could be established.

Materials and methods: The participants consisted of 13 males with Angle’s class III occlusal relationship. Radiopaque markers were attached to the intended points on soft tissue and then standard lateral cephalograms were obtained from each subject. The angles between the following lines were measured: Occlusal line (OL), Camper’s line (ala-porion), AT1 (ala-superior border of tragus), AT2 (ala- mid-tragus) and AT3 (ala-inferior border of tragus).

Results: The mean values and standard deviations calculated from the measured variables are as follows: OL-^AT1, 5.65 (3.95) degrees; OL-^AT2, 3.19 (2.45) degrees; OL-^AT3, 2.92 (2.42) degrees and OL-^Camper, 8.5 (3.83) degrees. Comparison of the results by the ANOVA test exhibited a significant difference (F=3.7, P=0.05). As the OL-^AT3 angle had the lowest value, the occlusal line had a stronger tendency to be parallel to the AT3 line.

Conclusion: According to the present study, the inferior border of the tragus is suggested as the posterior point for ala-tragus line orientation.

Key Words: Occlusal plane, Ala-tragus, Cephalometry

INTRODUCTION
Orientation of the occlusal plane is an essential part of clinical complete denture preparing procedures. Considering the importance of the accurate establishment of its location and the effect of its inclination on function, esthetics and speech, a method to guarantee its conformity with the occlusal plane of the missing teeth seems necessary.

Van Niekerk et al [1], in their study on 33 complete dentures, found the mean value of the occlusal line (OL)-ala tragus (AT) angle 3.45 (2.24) degrees.

In a cephalometric study on 28 Chinese-
Singaporean patients, by OW and colleagues [2], the occlusal line orientation exhibited a steeper anterior inclination to the ala-tragus and Camper’s lines in Angle’s class II malocclusion, as compared to class I occlusal relationship. These investigators, in another study [3] reported the mean values of OL-AT and OL-Camper’s angles as 2.1 degrees and 8.3 degrees, respectively.

In prosthodontic reference books, there is a consensus on the ala–tragus anterior point, however, different viewpoints regarding its exact posterior location exists. In our former study on the orientation of the occlusal plane to the ala-tragus line in subjects with Angle’s class I relationship, the inferior border of the tragus was recommended as the posterior point of the ala-tragus line[4].

Considering the probable difference between the inclination of the occlusal line in Angle’s class II and III as compared to class I subjects, the present study was performed to distinguish the relationship of ala-tragus and Camper’s lines to the maxillary occlusal line in Angle’s class III malocclusion. The aim of the present study was to define the best soft-tissue index by which the location and inclination of the occlusal plane in complete dentures could be established.

MATERIALS AND METHODS
In this cross-sectional study, 13 male students with a mean age of 21.92 and Angle's class III occlusal relationship were selected from Mashhad School of Dentistry and Ferdosi University of Mashhad, in order to determine the angles between the ala-tragus and Camper's lines with the occlusal line. Written consents were obtained from all subjects. Inclusion criteria were as follows:
1- A normal SNA angle and SNB angle 3 degrees greater than the mean value of the Iranian population (78.12) for all subjects.
2- No previous orthodontic treatment.
3- Not more than one molar or premolar missing.
4- No restoration or crown on the anterior teeth.
5- Lack of amalgam restoration on the first or second molars due to the similar opacity between radiopaque markers and amalgam.

Following case selection, radiopaque rubber markers containing lead, were attached to the superior, mid and inferior tragus points of the ear, the inferior border of the ala, over the facial surface of the distobuccal cusp margin of the maxillary first molar or the mesiobuccal cusp of the maxillary second molar and the labioincisal margin of the maxillary central incisor on the left side of the face (due to short distance to the film cassette) (Fig. 1). Subsequently cephalometric radiographs were obtained from each patient (Fig. 2).

Two examiners simultaneously reviewed the various points on the radiographs to standardize their actual location. Afterwards, the tracing and the measurement of the points, lines and angles were performed independently. The angles between the following lines were measured: (1) occlusal line (OL) (joins the incisal edge of the maxillary central incisor to the distobuccal cusp apex of the maxillary first molar),
(2) Camper's line (ala- porion), (3) AT1 line (ala-superior border of tragus), (4) AT2 line (ala-mid-tragus), and (5) AT3 line (ala-inferior border of tragus). All lines are illustrated on Figure 3. The differences in angular values were analyzed by repeated measure ANOVA. Anteriorly projected angles were considered to be positive values and posteriorly projected ones were regarded as negative. For statistical analysis the absolute numbers were estimated.

RESULT
Cephalometric tracing values and analysis of the data are presented in Table I. In this study, the mean value of OL^-AT1, OL^-AT2 and OL^-AT3 angles were compared with repeated measure ANOVA, and a significant difference was found between OL-AT1, OL-AT2 and OL-AT3. (F= 3.7, P=0.05).

DISCUSSION
The plane of occlusion has been recognized as an essential functional part of the craniofacial skeleton. [3] It plays an important role in complete denture success.

Historically, the assessment of the patient's occlusal line has been performed by comparing its inclination with selected craniofacial reference lines. In this study the occlusal line orientation to Camper's line is demonstrated by the OL-Camper angle. The mean value for OL-Camper angle was 8.5 (3.83) degrees which is similar to the results obtained by Ow et al who reported it as being 8.3 degrees [2]. This result corroborated our previous findings (mean =7.34 and SD=3.34) concerning individuals with class I occlusal relationship [4]. In order to investigate the inclination of the occlusal line to the ala-tragus line, radiopaque markers were attached to the skin to mark the superior, mid and inferior tragus points. The lines reflected between these points and the lower edge of the ala of the nose were named AT1, between the occlusal line and these three lines (OL-AT1, OL-AT2 and OL-AT3) were

Table I: Cephalometric tracing values

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>OL-AT1</td>
<td>5.65</td>
<td>3.95</td>
<td>0.5</td>
<td>13.5</td>
<td>13</td>
</tr>
<tr>
<td>OL-AT2</td>
<td>3.19</td>
<td>2.45</td>
<td>0</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>OL-AT3</td>
<td>2.92</td>
<td>2.42</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>OL-Camper</td>
<td>8.50</td>
<td>3.83</td>
<td>4</td>
<td>15</td>
<td>11</td>
</tr>
</tbody>
</table>

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Comparison of these angles using repeated measure ANOVA exhibited a significant difference (F=3.7, P=0.05). As the OL-AT3 had the lowest mean value, 2.92 (2.42), the occlusal line had a stronger tendency to be parallel to the AT3 line. This result is in accordance with our previous study concerning individuals with class I jaw relationship [4] but contrasts with an investigation conducted by Ow et al [6]. The above mentioned finding is also in agreement with Van Niekerk, suggesting the inferior border of the tragus point as a posterior point in complete denture fabrication [1].

CONCLUSION
According to the present study, the inferior border of the tragus can be suggested as the posterior point for ala-tragus line orientation.

REFERENCES