

Relationship between ala-tragus line and natural occlusal plane. Implications in denture prosthodontics

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Introduction

Correct determination of the artificial occlusal plane on the upper occlusion rim during jaw registration procedures is an important step in complete denture construction. Although it is generally recognized that the vertical height of the occlusal plane in the anterior region is governed by aesthetic and phonetic requirements, there are contrasting views on the orientation of the artificial occlusal plane in the posterior region.

The ala-tragus line (ATL), or Camper's line, is a widely used guide for this purpose. Levin and Sauer in 1968 surveyed 33 U.S. and Canadian dental schools on the complete denture procedures being taught.¹ Levin and Sanders later surveyed again all but one of those schools to investigate the changes that had occurred in the teaching and fabrication of complete dentures.² Both surveys revealed that the ATL was, and still is, the most commonly used guide to the orientation of the artificial occlusal plane. It was noted in the second survey, however, that the majority of dental schools frequently used a combination of the ATL, the height of the retromolar pad, and aesthetics in determining the occlusal plane.

Williams in 1982 reported the results of a questionnaire circulated among dentists attending the 19th Annual Conference of the British Society for the Study of Prosthetic Dentistry.³ Just over 50% of the respondents stated that they always used the ATL as a guide for the orientation of the artificial occlusal plane. Approximately 56% of the participants agreed on the position of ATL (lower border of the ala to the middle of the tragus). There was slightly less than 77% agreement on the posterior landmark (the middle of the tragus).

Table 1 Points of reference used for defining the ATL

Anteriorly	Posteriorly
Ala, unspecified point	External auditory meatus, unspecified point
Ala, lower margin	External auditory meatus, superior border
Ala, maximum posterior convexity	External auditory meatus, center
	External auditory meatus, inferior border
	Tragus, superior border
	Tragus, inferior border
	Tragus, middle

Although the technique for using the ATL in this way is well documented, there is much confusion over the reference points of the ATL. The Glossary of Prosthodontic Terms, for example, states that the ATL runs from the inferior border of the ala of the nose to the superior border of the tragus of the ear,⁴ while Spratley describes it as running from the center of the ala to the center of the tragus. The various points used in defining the ATL can be seen in Table 1.

The purpose of this study was to determine the relationship between the natural occlusal plane and Camper's plane, which was established by using three common definitions of the ATL.

Material and method

A sample of 20 dental students (10 men and 10 women) was selected. To be included in the study, the students had to have 28 to 32 teeth in an acceptable arch form, an Angle's Class I jaw relationship, and no

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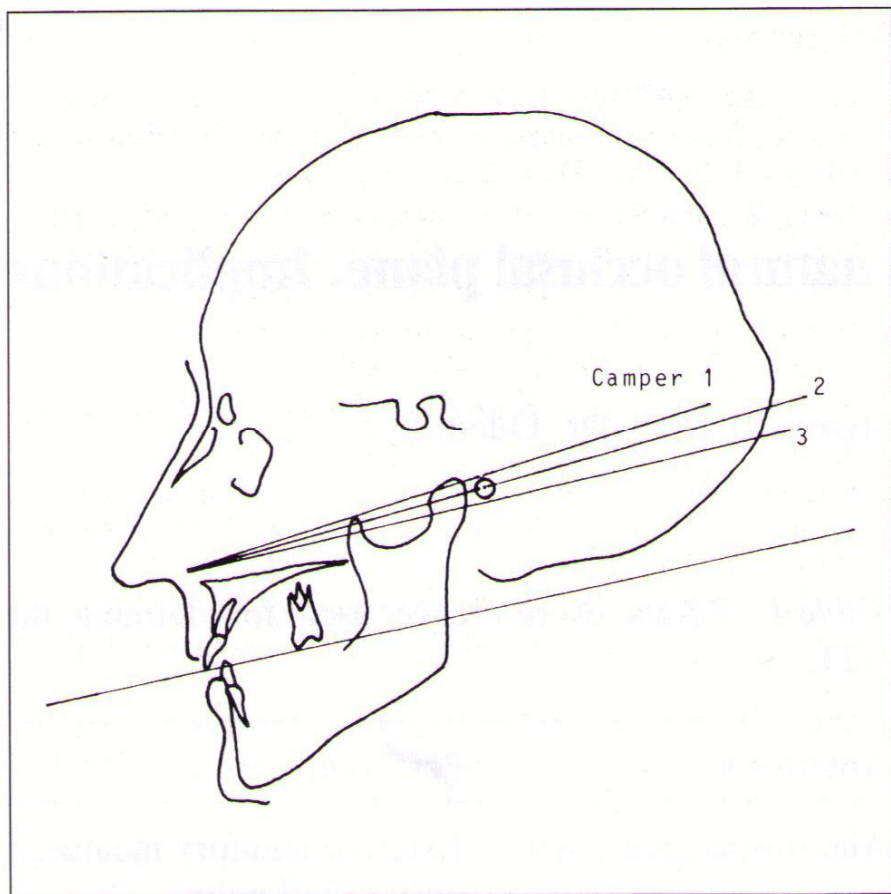


Fig. 1 Tracing of a cephalogram showing reference points used, as well as the position of the natural occlusal plane and the three Camper's planes.

history of orthodontic treatment. Lateral cephalometric radiographs were obtained for all subjects, using standard radiological techniques. All radiographs were made with the mandible in a rest position.

The landmarks used in this study were as follows:

1. *Natural occlusal plane*: The line extending from the mesioincisal angle of the maxillary central incisor to the mesiopalatal cusp of the first maxillary molar.
2. *Camper's plane 1*: The line extending from the lower margin of the ala of the nose to the superior border of the external auditory meatus.
3. *Camper's plane 2*: The line extending from the lower margin of the ala of the nose to the center of the external auditory meatus.
4. *Camper's plane 3*: The line extending from the lower margin of the ala of the nose to the inferior border of the external auditory meatus.

To enable identification of exact anterior or posterior reference points of the natural occlusal plane and the three Camper's planes, we used small, radiopaque, ball-shaped lead pellets 1 mm in diameter, attached (1) with adhesive tape to the lower margin of the ala of

the nose and (2) with sticky wax to the mesiopalatal cusp of the maxillary first molar. The three different posterior points of reference for the Camper's plane were identified directly on the radiographs by means of the superior (Camper's plane 1), center (Camper's plane 2), and inferior (Camper's plane 3) borders of the metal rods of the ear fixation pins (Fig. 1). Tracings were made on acetate from all the radiographs, and the deviation between the two planes was measured for each case. The angles formed in the anterior region were given a positive value.

Results

The angle formed by the natural occlusal plane and Camper's plane 1 had a mean of 5.25° , a standard deviation of 3.35° , a standard error of 0.74° , and a range of -2.00° to $+11.50^\circ$.

The angle formed by the natural occlusal plane and Camper's plane 2 had a mean of 2.75° , an SD of 3.64° , an SE of 0.81° , and a range of -5.00° to $+9.00^\circ$.

The angle formed by the natural occlusal plane and Camper's plane 3 had a mean of 0.50° , an SD of 3.55° , an SE of 0.79° , and a range of -8.00° to $+6.50^\circ$.

Discussion

In this study the natural occlusal plane was checked against the Camper's plane. Using the lower margin of the external auditory meatus to establish first the Camper's plane and then, accordingly, the artificial occlusal plane posteriorly, we found the ATL to have the closest relationship to the natural occlusal plane. The use of Camper's plane 3 in trimming the upper occlusion rim to the occlusal plane also provides sufficient space to arrange the maxillary posterior artificial teeth.

Using the upper border of the tragus and the lower border of the ala to define the ATL, or Camper's line, Abrahams and Carey reported the angle formed by the natural occlusal plane and Camper's plane to be 9.66° .⁶ We found the angle formed between the natural occlusal plane and Camper's plane 1, as defined in our study, to be 5.25° . The discrepancy is probably due to the different determination of the posterior landmark of the ATL. In 1985 Van Niekerk et al. reported a close relationship between the artificial occlusal plane and Camper's plane, although the latter was established with criteria that excluded the ATL.⁷ When these criteria were used patients reported that their dentures were satisfactory in aesthetics, function, and

comfort. In the same study the artificial occlusal plane was checked at the final visit against the ATL, which was described as being the line extending from the lower margin of the ala to the inferior border of the tragus.

Conclusion

In this study the ATL, or Camper's line, extending from the lower margin of the ala to the inferior border of the external auditory meatus presented the closest relationship to the natural occlusal plane. Although the posterior point of reference for the ATL was reproduced on the radiographs as the lower border of the ear fixation pins, we believe that the inferior border of the tragus is an equivalent soft tissue landmark which, from a clinical standpoint, can be used safely.

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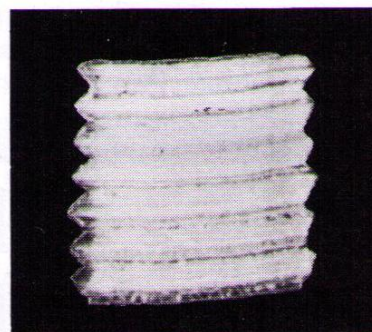
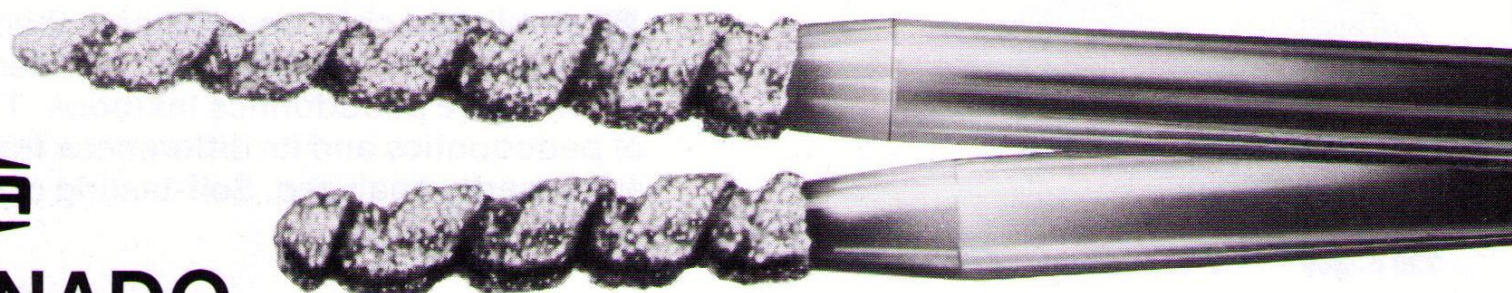


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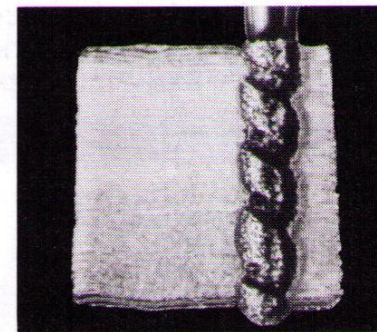
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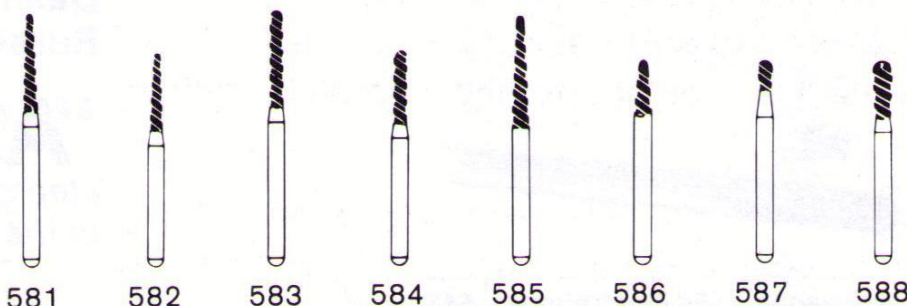
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