Reliability of intra oral anatomical landmarks in establishing occlusal plane in edentulous subjects

Original Article

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ABSTRACT

Statement of Problem: Difficulty in accurate location of occlusal plane due to individual variability and uncertainty of landmarks among edentulous subjects.

Purpose: To establish the reliability of certain intraoral anatomical landmarks in establishing the occlusal plane in edentulous subjects.

Materials and Methods: Samples of 75 edentulous subjects of both the sexes were selected randomly. A vestibular impression to record the corner of the mouth and buccinator groove was made in 25 subjects. In 50 subjects, parotid papilla and retromolar pad were located and the relation of both the landmarks was recorded to the established ala-tragus plane.

Results: Analysis showed the consistency of occlusal plane established from the corner of the mouth through the buccinator groove using a vestibular impression method. The retro molar pad also showed a consistent relation with the occlusal plane. However, the parotid papilla showed a variable relation with the occlusal plane.

Conclusion: Corner of the mouth, buccinator groove and retro molar pad are reliable guides in accurate location of the occlusal plane in edentulous subjects whereas parotid papilla can only be used as an adjunctive aid in the determination of occlusal plane.

KEY WORDS: Buccinator groove, occlusal plane, parotid papilla, vestibular impression

CLINICAL IMPLICATIONS

The plane, starting from the corner of the mouth through the buccinator groove, is a reliable guide for accurate location of occlusal plane in edentulous subjects. The vestibular impression method is recommended as a routine clinical procedure to determine occlusal plane. This method eliminates individual variability in establishing the occlusal plane for edentulous subjects.

INTRODUCTION

The location of occlusal plane in complete denture construction is very subjective as it is widely variable depending upon the uncertainty of reference landmarks and the individual judgment of the Prosthodontist.[1] One of the challenging aspects of treating patients with complete dentures is accurate establishment of occlusal plane.[2] There have been several guidelines for the precise orientation of occlusal plane in edentulous patients. The commonly used ala-tragus plane and its relative parallelism to occlusal plane has been the basis to establish the occlusal plane in complete denture. However, in recent years, the validity of Camper's line as an accurate guide for orienting and positioning the occlusal plane has been questioned.[3] There are a few other guidelines to orient occlusal plane in complete denture, which include[4]:

- positioning occlusal plane parallel to and midway between the residual ridges
- positioning occlusal plane on the same level as the lateral border of the tongue
- terminating occlusal plane posteriorly at the middle or upper third of the retro molar pad.[3,5]
- orienting occlusal plane with buccinator groove and commissure of the lips.[1]

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- maintaining a specific relation with parotid papilla.[2]
- following some cephalometric criteria[6-8]

This study was conducted with the following aims and objectives:

- To identify intra oral landmarks such as parotid papilla, retro molar pad, buccinator groove and corner of the mouth and correlate them to occlusal plane.
- To determine the degree of deviation if any, of each of these references to the established ala-tragus plane and determine the feasibility of these landmarks to obtain accurate occlusal plane.

MATERIAL AND METHODS

Selection of subjects

Seventy-five edentulous patients of both sexes with class-I ridge relationship were selected from the out patient department of A.B. Shetty Memorial Institute of Dental Sciences, Mangalore.

Vestibular impression to record buccinator groove and corner of the mouth was made in 25 subjects. Parotid papilla and retro molar pad were located in 50 subjects and their relation to the established ala-tragus plane was recorded

Procedure:

Plane of occlusion was adjusted parallel to the interpupillary line anteriorly, taking visibility (mobility, form of the lip, competence of lips), labial fullness and phonetics into consideration. The posterior occlusal plane was adjusted parallel to the ala-tragus line [Figure 1]. Occlusal vertical height of the mandibular occlusal rim was adjusted considering the inter occlusal rest space and phonetics.

Maxillary and mandibular occlusal rims were sealed in centric relation position. It was removed from the mouth and a layer of cotton fibers was impregnated on the lateral surface of the occlusal rim to facilitate irreversible hydrocolloid to adhere to the wax rim.

Sealed occlusal rims were then placed in the mouth and a thin creamy mix of irreversible hydrocolloid was injected with a 20cc syringe in to the vestibule on both sides, taking care that the distal part of the vestibule was completely filled with irreversible hydrocolloid.

The patient was instructed to suck, pucker and protrude the lips. After irreversible hydrocolloid was completely set, the occlusal rims with the vestibular impression were removed and washed to remove saliva. The corner of the mouth and distal termination of the buccinator groove were identified in the impression, these were marked on the vestibular impression with an indelible pen [Figure 2]. These two references were joined with a straight line. Using a sharp Bard Parker blade an irreversible hydrocolloid impression was cut along the line joining the corner of the mouth and the buccinator groove, so that a sharp cut line was marked on the buccal surface of the occlusal rim [Figure 3]. The irreversible hydrocolloid impression was removed from the lateral surface of the occlusal rims to expose the line connecting corner of the mouth to buccinator groove.

Now, the relation between the occlusal plane obtained from vestibular impression method using the corner of the mouth and buccinator groove as guidelines, and the plane obtained by using ala-tragus line was recorded on the left and right sides. In this manner, recordings were made for 25 subjects.

Transfer of Parotid Papilla Contact on Occlusal rim

After carefully retracting the cheek, a small droplet of creamy mix of zinc oxide eugenol cement was placed on the previously located parotid papilla, and the subject was asked to relax with cheeks in contact with the occlusal rims. When the cheek came in contact with the facial surface of the occlusal rim, zinc oxide eugenol mix left a mark on the occlusal rim. The vertical distance between the occlusal surface of the rim and the mark left by the parotid papilla on the right side of the rim was measured and recorded [Figure 4]. The same procedure was repeated on the other side. In this manner the distance between parotid papilla and occlusal rim was obtained in 50 subjects.

Relating Occlusal Plane with Retro Molar Pad

For the purpose of reference the retro molar pad was divided into an upper and a lower half. The mandibular occlusal rim was placed in position in the mouth. Heel of the denture base which was covering the retromolar pad was trimmed with the help of an acrylic trimmer to be at level with the adjusted occlusal plane on the occlusal rim. A sterilized stainless steel scale was placed on the posterior occlusal plane extending posteriorly from the cuspid area to a little beyond the posterior end of the occlusal rim. Its relation to the upper and lower halves of retro molar pad on both sides was recorded [Figure 5]. In this manner relation of the occlusal rim with retro molar pad was obtained for 50 subjects.

RESULTS

Data collected was tabulated and analyzed.

Table 1 shows the correlation between the occlusal plane (established using the ala-tragus line method) and the plane established from the corner of the

Figure 1: Posterior occlusal plane adjusted parallel to ala-tragus plane

Figure 2: Identification and marking of buccinator groove and corner of mouth on vestibular impression

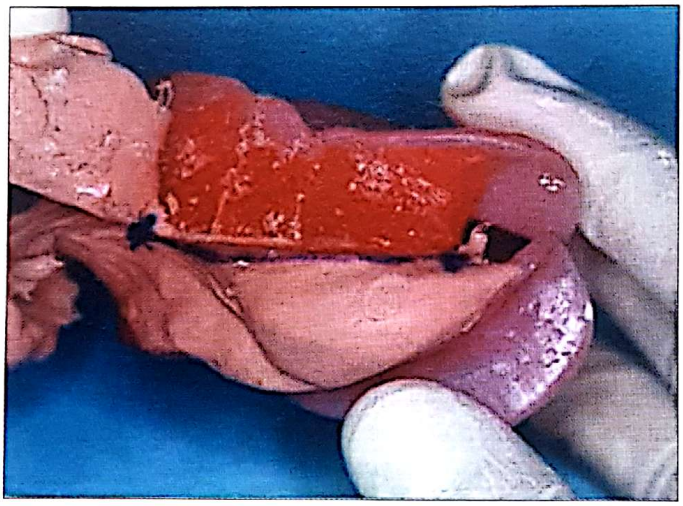

Figure 3: Cutting vestibular impression along straight line

Figure 4: Measuring distance between mark left by parotid papilla and occlusal surface

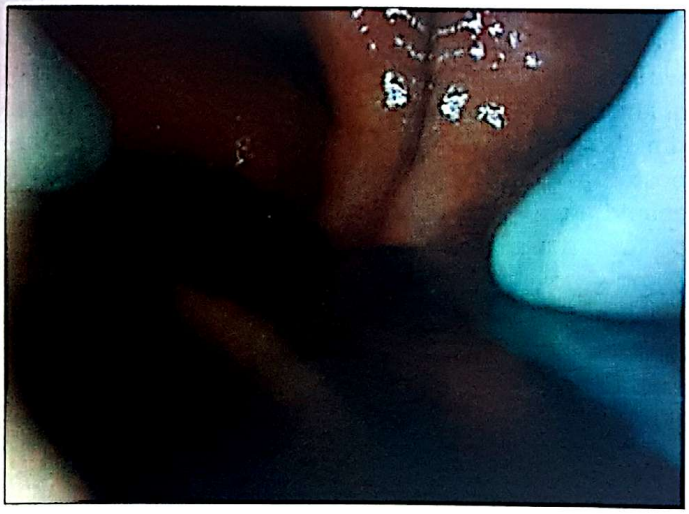

Figure 5: Relation of occlusal plane with retro molar pad

mouth through the buccinator groove on left and right sides. In 84% of the subjects on the left side and 68% of the subjects on the right side, the occlusal plane established using vestibular impression method coincided with the occlusal plane established using ala- tragus line. In 16% of the subjects on the left side and 32% of the subjects on the right side, the plane established using vestibular impression method was located superiorly to the plane established using the ala- tragus line. The variation of 16% and 32% shown in the results is statistically not significant (p=0.185).

Table 2 shows the maximum, minimum, mean and standard deviation of the vertical distance between the parotid papilla and the occlusal plane. The maximum distance was 9 mm on left and right sides, whereas minimum distance was 0 mm on both the sides, with

a mean value of 3.94 on left side and 3.52 on right side. Standard deviation was 2.34 and 2.24 for the left and right sides respectively.

Table 3 shows the relation between occlusal plane and retro molar pad on left and right sides. On the left side, in 90% of the subjects, the occlusal plane terminated in the upper half and in 10% of the subjects the occlusal plane terminated in the lower half. On the right side, in 88% of the subjects, the occlusal plane terminated in the upper half and in 12% of the subjects the occlusal plane terminated in the lower half. From these readings it was found that the relationship of the occlusal plane to the retro molar pad on both the sides was significantly not different.

DISCUSSION

The study presented here was to determine the reliability of the intraoral anatomical landmarks - buccinator groove, corner of mouth, parotid papilla and retromolar pad to establish the accurate occlusal plane in edentulous subjects.

A plane running from the corner of the mouth through the buccinator groove (obtained by making vestibular impression) and occlusal plane established on occlusal rim using ala- tragus line for parallelism and visibility of teeth for position coincided in 84% of the subjects on the left side and 68% of subjects on the right side. It was also revealed that the plane was located superior to the established ala-tragus plane, on the occlusal rim in 16% of the subjects on the left side and 32% of the subjects on right side.

Studies by Merkely.H.J,[9] show that the bottom of the buccinator groove coincides with the occlusal plane in natural dentition. The discrepancy in correlation of occlusal planes on the left and right sides can be attributed to the varying tragus forms on left and right sides, and also to the posterior reference point of ala-tragus line. An unpublished study conducted at research center, A.B. Shetty Memorial Institute of Dental Sciences, Mangalore by Shetty. N.S.[10] *et al.* in 1996 has shown that

in 9.8% of the subjects, the superior border of the tragus was not precisely definable

middle portion of the tragus as a reference was not easily definable in rudimentary, rounded and notched tragus forms

appreciable differences were observed between left and right side; on the right tragus the reference point was closer to middle of the tragus than it was on the left tragus

Table 1: Correlation between occlusal plane established using ala-tragus line with plane established from corner of mouth through buccinators groove

Plane	Group		Total
	Left	Right	
Superior	4	8	12
	16%	32%	24%
Same	21	17	38
	84%	68%	76%
Total	25[a]	25	50
	100%	100%	100%

a. $X^2=1.751$ $P=0.185$ not significant

Table 2: Maximum, minimum, mean value and standard deviation of distance (in mm) between parotid papilla and occlusal plane established using ala-tragus line

	Maximum	Minimum	Mean	Std. Deviation
Left	9.00	00	3.94	2.34
Right	9.00	00	3.52	2.24

Table 3: Relation between occlusal plane and retro molar pad on left and right sides

Plane	Group		Total
	Left	Right	
Upper half	45	44	89
Count%	90%	88%	89%
Lower half	5	6	11
Count%	10%	12%	11%
Total	50	50	100
Count%	100%	100%	100%

$X^2=0.102$ $P=0.749$ not significant

Linear measurement between parotid papilla and the established ala- tragus plane varied from 0 - 9 mm superior to the occlusal plane. The mean distance from parotid papilla to the occlusal surface on left side was 3.94 mm and on right side was 3.52 mm. The standard deviation was 2.34 for left and 2.24 for right side. These findings were consistent with the results of Lundquist.D.O.[1] and Latta.G.H.[2]

Position of the parotid papilla in relation to the ala-tragus plane varies widely in different individuals, and on the left, right sides of the same individual. However, because of the variability and difficulty in location of soft tissue landmarks, parotid papilla can only be classified as an adjunctive aid and not an accurate determinant of the occlusal plane.[1] The ala-tragus plane position established on the occlusal rim was also compared with another anatomical landmark, the retromolar pad.

Data indicates that the occlusal plane terminated in upper half of the retromolar pad in 90% of the subjects on the left side and 88% of the subjects on the right side. In 10% of the subjects of left side and 12% of the subjects on right side, the occlusal plane terminated in the lower half of the retromolar pad. These findings coincide with the results of Ismail.Y.H

[3] and Celebic.A. [5]

Analysis of results of this study revealed that the parotid papilla can only be an aid in the location of occlusal plane. Some interesting findings of this study are:

- A plane starting from the corner of the mouth through the buccinator groove is a reliable method for establishing the occlusal plane.
- Ala-tragus plane terminates in the upper half of the retro molar pad on both the sides

It is recommended that a vestibular impression may be made as a routine clinical procedure for locating the occlusal plane and used as a reliable method to establish the occlusal plane.

CONCLUSIONS

The following conclusions can be drawn from our study:

- A plane starting from the corner of the mouth through the buccinator groove is a reliable guide for accurate location of occlusal plane; the vestibular impression method is recommended as a routine clinical procedure for occlusal plane determination.
- The mean vertical distance between the parotid papilla and occlusal plane is 3.94 mm on the left side and 3.52 mm on the right side. Because of its variation and difficulty in accurately measuring the soft tissue landmark, the parotid papilla can only be used as an adjunctive aid in the determination of the occlusal plane.
- The occlusal plane terminated in the upper half of the retro molar pad in 89% of the subjects, implying that the orientation of the occlusal plane to the upper half of the retro molar pad can also be used as a reliable landmark in the determination of the occlusal plane.

ACKNOWLEDGMENT

The author wishes to thank Prof. (Dr) Thirumurthy Sri Ramakrishna Dental College, Coimbatore and Dr. Adarsh for collecting data.

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Source of Support: Nil, **Conflict of Interest:** None declared.