ROLE OF CEPHALOMETERY IN EVALUATION OF VERTICAL DIMENSION

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ABSTRACT

The objective of the present study was to determine the vertical dimension by comparing hard and soft tissues through lateral cephalographs. To show that these measures are compatible with the routinely used methods plus records for future complete denture fabrications. It is a descriptive study and was carried out at the Prosthodontic Department of Lahore Medical and Dental College, Lahore from July 2011 to January 2012.

A total of twenty completely edentulous patients of both genders were selected and age range was 40 years and above. Demographic data and informed consent of all the patients were obtained. The exclusion criteria included any facial asymmetry, congenital and acquired orofacial deformity and patients not willing to undergo radiography. The cephalographs of each patient was carried out at 2 stages, before and after the insertion of the complete dentures. With the help of lateral cephalographs the hard and the soft tissues were compared. The Rickets cephalometric analysis was to analyze the hard tissues from both the first and second lateral cephalographs for measuring the vertical dimension. The Burstone analysis was used to analyze the soft tissues.

The results of the present study showed that the pre and post difference of the skeletal proportions when compared from both the cephalographs was insignificant. Furthermore the stability in the skeletal vertical dimension was observed in Pakistani population. In addition the soft tissue proportions remained near 1 (G-Sn/Sn-Me).

It was concluded that the lateral cephalographic method can be used to evaluate the vertical dimension in the Pakistani population and is complementary to the routinely used methods for the complete denture fabrication.

Key Words: Vertical dimension, Cephalometery, Edentulisim, Facial proportions.

INTRODUCTION

The patients among the lower socioeconomic groups especially in rural areas may become edentulous at relatively earlier ages, hence requiring prosthesis to carry out oral functions.1 The long term edentulous patients also presented with changes in soft tissues profile as well as loss of vertical dimension.2

The basic objectives of complete denture prosthodontics are the restoration of facial appearance, function and the maintenance of the patient’s health and masticatory ability.3 This could be achieved by taking correct impressions and recording accurate maxillomandibular relation records. One of the records among the maxillomandibular records was recording vertical relation4, defined as the points on the maxilla and mandible when the teeth are in maximum intercuspation.5

Patient’s speech, appearance and mastication all depends on recording appropriate vertical relation.6 Different facial references such as center of the pupil to the corner of the lips, minimal speaking space, from glabella to base of ala, has been used to measure the vertical relations.7 Unfortunately soft tissue based
facial references are not stable and show variations with increasing age. However cephalometric analysis had been used to relate craniofacial landmarks to profile and occlusion in a meaningful way. Among the most used were the Rickets and McNamara cephalometric analysis that had been employed to record occlusal vertical relations by using stable and reproducible bony landmarks.

The aim of this study was to determine the vertical dimension of edentulous patients by using lateral cephalography. This may contribute in recording vertical dimension of edentulous patients in a simple, inexpensive and atraumatic way.

The same vertical dimension may also be used for future prosthetic reconstruction. Furthermore this method may also be complementary to the routinely used methods prescribed for the complete dentures fabrication.

METHODOLOGY

In this study a total of 20 edentulous patients seeking complete denture treatment were selected from the Outdoor Prosthodontics Department of Lahore Medical and Dental College, Lahore. Ten male and ten female patients were selected. The age range was 40 years and above. Demographic data and informed consent of all the patients were obtained. The exclusion criteria included any facial asymmetry, congenital and acquired orofacial deformity and patients not willing to undergo radiography.

Cephalography of the patients was carried out at two stages. The first lateral cephalograph was taken prior to the insertion of the complete denture while the second lateral cephalograph after the insertion.

The cephalogram manufactured by Villa (Italy) model number MRO5 with standardized ear plugs, nose clamp and chin support was used to carry out lateral cephalography. First lateral cephalographs of patients were carried out where every patient was asked to swallow and hold the mouth in relaxed closed position without complete dentures.

Complete dentures were fabricated for all the patients. After the insertion of the complete dentures a second lateral cephalograph was taken.

Rickets cephalometric analysis was employed to measure the vertical dimension from both the first and second lateral cephalographs, by using linear measurement (Fig 1). The soft tissue structures taken for the profile were the glabella, nose, lips and chin (Fig 2). The Burstone analysis was used to evaluate the soft tissues.

HARD TISSUE REFERENCE POINTS

- ANS (Anterior nasal spine): Anterior point of nasal floor; the tip of the pre maxilla in the mid sagittal plane.
- Me (Menton): Lowest point of contour of mandibular symphysis.
- N (Nasion): Most anterior point of fronto nasal suture in mid sagittal plane. (Fig 1)

SOFT TISSUE REFERENCE POINTS

- G (glabella): The most prominent point in the mid sagittal plane of the forehead.
- Me (soft tissue menton): Lowest point on the contour of the soft tissue chin;
- Sn (sub nasal point): The point at which the nasal septum merges with the upper cutaneous lip in the mid sagittal plane. (Fig 2)

RESULTS

Out of 20 completely edentulous patients, 10(50%) were female and 10(50%) were male. The average age of the patients was 59.50±9.01 years. The proportion of 0.8±0.2 was present between the middle third and the lower third facial heights (N-ANS/ANS-Me) Tab 1. The stability in the skeletal vertical dimension was observed. In addition the soft tissue proportions was obtained near 1 (G-Sn/Sn-Me) Tab 2. Significant difference in values was not observed in both pre and post cephalograms of the same patient when compared.

DISCUSSION

The present study was an attempt to evaluate the reliability and reproducibility of the relatively stable cephalometric landmarks and their role in determining vertical dimension. However this study was not applicable on patients with any congenital and acquired orofacial deformity, facial asymmetry or patients not willing to undergo radiography.
Role of Cephalometery in evaluation of vertical dimension

Bhat\(^6\) checked the reliability of the conventional methods for recording vertical relations by considering lateral cephalograph as a standard method.

In the present study Niswonger’s method was used to record the vertical dimension, and verified with the closest speaking space method. The combination of these methods was used to minimize the chances of errors in recording the occlusal vertical dimension. McCord\(^15\) also recommended the combination of different methods. Koller\(^7\) and Silverman\(^16\) used closest speaking space method to verify occlusal vertical dimension.

The skeletal landmarks used in the present study to evaluate the proportion between middle and the lower third through lateral cephalographs were (N-ANS/ANS-Me). Brzoza, Barrera, Contasti and Hernández\(^9\) had also used the same references and the soft tissue proportion was obtained by considering G-Sn/ Sn-Me, just as in the present study. In the present study a proportion of 0.8±0.2 was present between the middle and the lower third and the stability in the vertical dimension was observed (Fig 1). Similar results were shown in a study done by Legan and Burstone.\(^9\) This value was obtained by dividing the measure of the middle third between the one of the lower third, being the first one little smaller than the latter. Similarly Brzoza et al\(^9\) have reported similar proportion in their study. Furthermore no significant difference in values were obtained when compared with lateral cephalographs of the same patient with and without dentures as reported in the present study.

Brzoza and coworkers\(^8\) had also carried out a similar study to predict occlusal vertical dimension through cephalometery in edentulous patients. Ciftci\(^10\) also used the same 2 cephalographs to record the vertical dimension. Zeng and coworkers\(^11\) in year 2003 also used cephalographs to evaluate the lower facial heights. They also used swallowing method to record mandibular rest position.

Koller\(^7\) used swallowing method for recording rest position. Pinto and coworkers\(^12\) and Tallgren\(^13\) and Orthlieb\(^14\) in their study on edentulous patients checked the vertical height through lateral cephalometery and cephalographs at 2 stages were carried out as in the present study.

Ricketts analysis was used to analyze the skeletal proportions and Burstone for the soft tissue proportion as done by Brzoza and coworkers.\(^9\) Orthlieb\(^14\) also used Ricketts analysis to study lower facial height. It was found that cephalographs could be used as a reliable diagnostic aid in patients who had lost their occlusal vertical dimension.

Brzoza Barrera, Contasti and Hernández\(^9\) in their study used similar landmarks to measure the soft tissue proportion as in the present study. The soft tissue proportion obtained in the present study remained nearly 1±0.2 (Tab. 2) and this was observed with and without dentures. The results of the present study showed that and it was possible to predict the vertical dimension through lateral cephalometery as...
Role of Cephalometry in evaluation of vertical dimension

The cephalometric landmarks were reliable and stable. This method is also a simple and inexpensive method that is complementary to the conventional methods used to evaluate the vertical dimension.

This study coincides with the study done by Zeng and coworkers\(^1\) who used swallowing method for recording vertical and cephalographs at 2 stages and found no difference in values of both cephalographs and concluded that swallowing method is an efficient method of recording vertical.

Present study also coincides with the study done by Bhat VS\(^6\) where he used Niswonger’s method and concluded that this method had strong correlation with cephalometric method.

**CONCLUSION**

From the results of the present study it was concluded that with the use of lateral cephalographs one can evaluate the vertical dimension of edentulous patients in Pakistani population. This method is an additional method that is inexpensive, simple and complementary to the conventional methods used to evaluate the vertical dimension. The same vertical dimension may also be used for future prosthetic reconstruction.

**REFERENCES**


**TABLE 1: SKELETAL PROPORTION BETWEEN THE MIDDLE AND LOWER THIRD OF THE HEAD WITH AND WITHOUT DENTURE**

<table>
<thead>
<tr>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>St.deviation</th>
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<td>0.6</td>
<td>1.0</td>
<td>0.822</td>
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<tr>
<td>Skeletal proportion without denture</td>
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<td>0.6</td>
<td>1.0</td>
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**TABLE 2: SOFT TISSUE PROPORTION BETWEEN THE MIDDLE AND LOWER THIRD OF THE HEAD, WITH AND WITHOUT DENTURE**

<table>
<thead>
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<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>St.deviation</th>
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<tbody>
<tr>
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<tr>
<td>Soft tissue proportion without denture</td>
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<td>0.7</td>
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