



Evaluation of Golden Proportion For Optimal Esthetics In Complete Denture: An Original Research Study

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ABSTRACT

Aim: Evaluation of whether Golden Proportion could be used as a gold standard to satisfy esthetics in complete denture. **Method & Methodology:** A cross-sectional study involving assessment of 30 completely edentulous individuals for complete denture aesthetics. Denture aesthetics assessment was done at the trial denture clinical visit. Width of the central incisor was selected using Pound's formula. Central incisor thus selected was used along with a golden proportion grid for proportioning the width of lateral incisor and canines respectively. This grid further helped in arrangement of maxillary anterior teeth in golden proportion ratio. The esthetic evaluation of the smile of the participants was carried out during denture trial. Of the 30 patients, smile evaluation of 15 patients was done by dentist and of the other 15 patients were done by the patient themselves, using a 3-point questionnaire. **Results:** Descriptive statistics included calculation of means and standard deviation using multivariate analysis. Patient's perspective (Group 1) of fifteen smile analysis revealed 93.3% of the denture smile better than their natural smile, 80% of denture teeth size better than their natural teeth predecessor, and 78% of their denture teeth proportionally gratifying. The dentist's perspective (Group 2) of fifteen smile analysis revealed 92% of denture smile better than the natural teeth smile seen in the patient's photograph, 93% and 90% smile better as on the denture teeth size and proportionality. **Conclusion:** The overall evaluation inferred that golden proportion used in arrangement of teeth for complete denture was in harmony with aesthetics. A perfect half-smile could be conveniently created on the patient using this technique. Denture smile analysis inferred that beautiful smiles and that the principle used for creating one, could be systematically applied to improve denture esthetics.

Keywords: Facial Measurements, Complete Denture, Esthetic Evaluation, Smile

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INTRODUCTION

An appreciation and reaction to the beauty of nature involves aesthetics. Aesthetics plays an important role in dental care. Mouth is the center of facial communication and smile is the visible part of facial charm. In today's competitive world, appearance often defines success and failure in personal and professional life. When replacing lost teeth, patients' main concern would be that how well their smile restored.¹ The maxillary anterior teeth's size, form, and placement are the key components of a pleasing appearance when viewed from the front. It can be challenging for dentists to restore these anterior teeth in an appropriate and cosmetic manner.² It is well known that oral health plays a very important role in our health and losing teeth often causes a great deal of psychological trauma to patients. However, prosthetic dentistry plays a very crucial factor on our mental health. One will never be confident enough to show themselves in crowd with poor dental esthetics.³ Prostheses can either enhance or impair a patient's personal appearance, depending on the naturalness and attractiveness of their appearance. Frush once said: "When prosthesis meets two basic aesthetic needs, i.e., reproduction of physiological criteria and true improvement of an attractive smile, treatment acceptance by patients is greatly facilitated." Meeting both needs should be the goal of the dental professionals.⁴ For creation of

aesthetically pleasing restoration, several authors have suggested the use of geometrical or mathematical ratios to describe the relationship between the maxillary anterior teeth across the midline. Lombardi was the pioneer in describing Golden proportion and stated that the golden proportion was "too strong" for use in the determination of tooth size. He explained the use of "repetitive ratio" in the maxillary anterior teeth, that was applicable in optimizing dentofacial composition of the width of the lateral incisor to the central incisor and canine to lateral incisor width which is repeated proportionally.^{5,6}

MATERIALS AND METHOD

The current cross-sectional study was carried out at Rama Dental College Hospital and Research Centre, Kanpur, Uttar Pradesh. Assessment of 30 completely edentulous individuals was done with the purpose of evaluating their denture esthetics at the denture trial stage. The goal of the study was that whether Golden Proportion could be used as a gold standard to achieve esthetics in complete denture smile. For the assessment, the central incisor width was calculated by using H Pound's formula. Each participant was seated in a dental chair in an upright position with occlusion plane parallel to the floor. Bizygomatic width for each participant was measured between two most prominent points on the zygomatic bone with the help of a face bow (Fig 1).



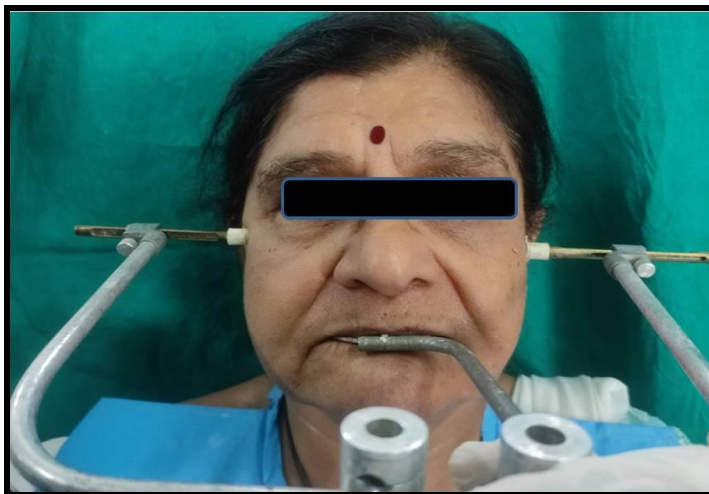


Fig: 1 Bizygomatic distance measured using face-bow

Bizygomatic width, when divided by 16 (H Pound) gave us the width of maxillary central incisor. With the help of central incisor width, a Golden grid in golden proportion ratio, for each of the 30 participants was fabricated (Fig 2). Golden grid further helped in the arrangement of maxillary anterior teeth in golden proportion ratio (Fig 3). The esthetic evaluation of the denture smile was done during try-in of denture. (Fig 4, Fig 5). The smile assessment for 15 patients was done by dentist and the other 15 patients were done by the patient themselves, using a 3-point questionnaire. A questionnaire each was given to the dentist and the patient requiring to be answered about previous natural dentition smile as seen on the patient photographs and the present denture teeth smile; size and proportion of the denture teeth selected when compared to the natural teeth as felt by the patient themselves. The feedback/observations were collected and summarized. Statistical assessment of all the results were performed by an SPSS software version 18.0.



Fig: 2 Golden grid using Golden proportion ratio of 1:618





Fig 3: Golden grid in mouth for the assessment of teeth arrangement



Fig 4: Evaluation of denture aesthetics during denture trial



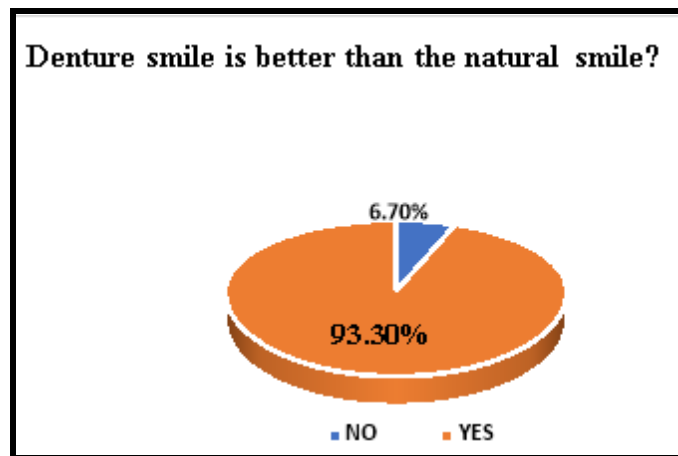
Fig 5: Evaluation of denture aesthetics during denture trial

RESULTS

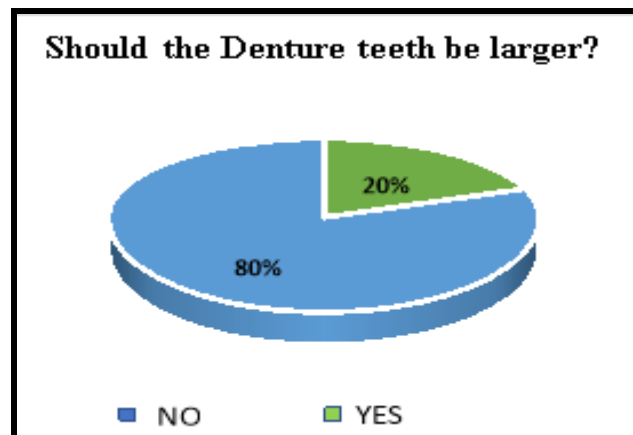
The participants were divided into two groups and questionnaire was made for both the groups. **Group 1-** Esthetic evaluation of first 15 participants was done in this group by participants themselves using a questionnaire. **Group 2-** Esthetic evaluation of the next 15 participants was done in this group by a second dentist, also using a questionnaire. Descriptive analysis of the data for both the groups was carried out to evaluate the esthetic satisfaction levels.



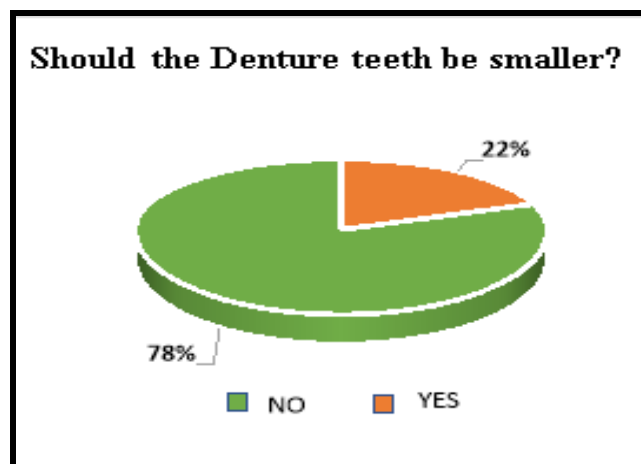
GROUP 1- PATIENT'S PERSPECTIVE



Graph 1: a) 93.30% of the participants was happy with their denture smile. b) 6.70% of the participants said that they were not very happy with the denture smile.



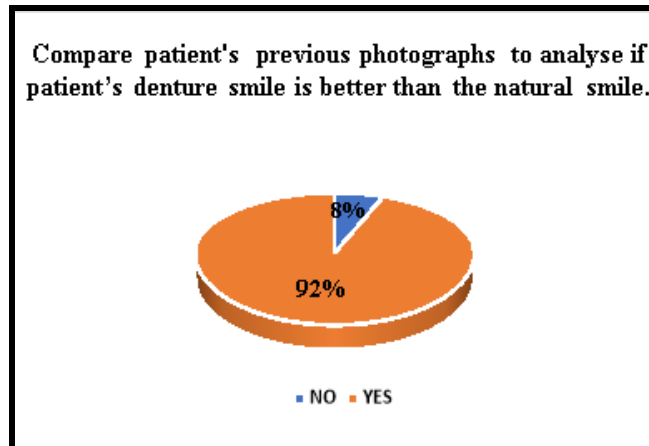
Graph 2: a) 80% of the participants believed that their denture teeth need not be larger than it is. b) 20% of the participants believed that their denture teeth need be larger than it is.



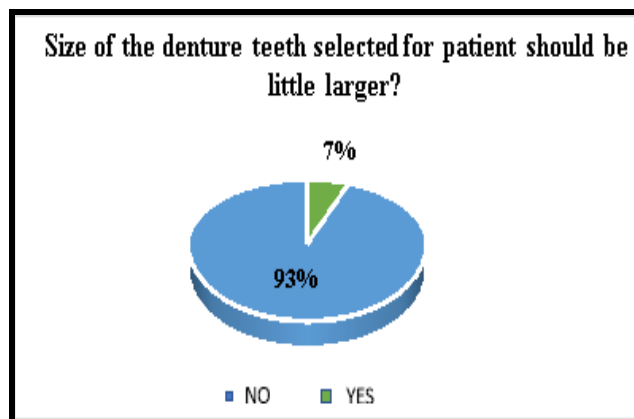
Graph 3: a) 78% of the participants believed that their denture teeth need not be smaller than it is. b) 22% of the participants believed that their denture teeth need be smaller than it is.



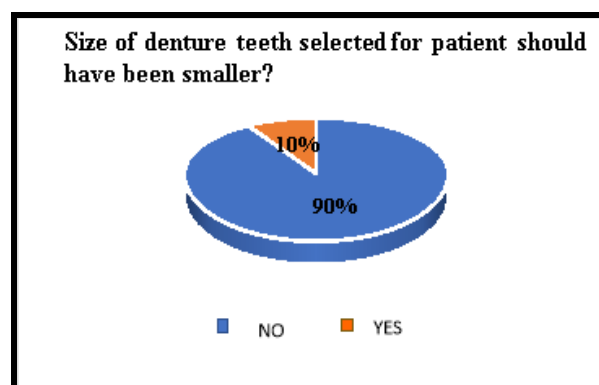
GROUP 2 – DOCTOR'S PERSPECTIVE



Graph 4: a) Dentist was satisfied with the denture smile of 92% of the cases. b) Dentist was not satisfied with the denture smile of 8% of the cases.



Graph 5: a) 93% of the cases, denture teeth selected need not be larger than it was b) 7% of the cases denture teeth needed to be larger than it was.



Graph 6: a) 90% of the cases denture teeth need not be smaller than it was. b) 10% of the cases denture teeth needed to be smaller than it was.



DISCUSSION

Due to geographic location and historical background, different populations genetically varied resulting in numerous dental and morphological variances. Therefore, knowing the size of a tooth could be helpful to clinicians when restoring anterior teeth.² Measurements such as inter-commissural width, bizygomatic width, inter-alar width, and interpupillary distance have been introduced to determine the correct size of the anterior teeth. Width of central incisor was determined mostly by using H Pound's formula and uses bizygomatic width to calculate the width of central incisor. H Pound's Formula for evaluation of width of central incisor: "Width of the maxillary central incisor = Bizygomatic width / 16."⁷ The current study used H Pound's formula to calculate the width of central incisor; was done with the reference of the study done by Rawat A et al where the relationship between the size of an Indian population's maxillary central incisor and its bizygomatic width was investigated and the study determined that there was a positive correlation between the measured value and H Pound's formula.⁵ Parciak EC et al conducted a study to determine the association between the bizygomatic width, interpupillary distance, intercanthal distance, inter-alar width, and inter-commissural width of people of Asian, African-American, and white ancestry and the result concluded that with the exception of the central incisor width-to-bizygomatic width ratio, no ratios were consistent between the investigated face measurements and the mesiodistal dimensions of the six maxillary anterior teeth among the three ethnic groups.⁸ After the selection of central incisor width, a grid was fabricated for each participants and used for arrangement of teeth in golden proportion. This was done in accordance with the study done by Perieanu VS et al; utilized the "golden section grid" (created by Dr. E. Levin) to place the artificial teeth in an aesthetically

pleasing manner.⁹ Levin EI in his article described an ancient system of aesthetic forecasting, by demonstrating examples from nature and how artists and designers use it, the system's naturalness is highlighted. The description and inclusion of a dental grid for the anterior teeth arrangement assisted in application of this technology in improving dental aesthetics.¹⁰ The golden proportion (1:618) describes the ratio between the adjacent teeth. Dr. Richard Lombardi in 1973, was the pioneer to introduce golden proportion in dentistry, rejecting the evolution of dental aesthetics that was burgeoned in the 1980s. The arrangement of maxillary anterior tooth in the current study, was done according to golden proportion ratio similar to the study done by Perieanu VS et al, who also had arranged the maxillary anteriors in golden proportion concept and had concluded that this idea enhances the cooperation between the dentist and technician when it comes to selecting and positioning teeth for prosthesis.⁹ The Golden proportion ration in the form of golden grid carrying a corresponding central incisor width, can be used as a valuable tool for determining anterior esthetics of complete dentures.^{11,12} In the current study, both the patients and the doctors were highly satisfied with the denture esthetics. It is evident that there is a strong positive correlation between the bizygomatic width, golden proportion and maxillary anterior teeth widths. The use of H. Pounds formula of bizygomatic width and golden proportion for selection and arrangement of teeth. Golden proportion can be effectively used as a gold standard technique to achieve esthetics in complete denture patients.

CONCLUSION

In most of the cases, the decision is purely subjective (considering only the patient's desire) but can be strongly influenced by the dentist.¹¹ Thus, the incorporation of "golden proportion"



can eliminate many sources of errors during teeth selection, arrangement and at the same time, it offers the patients a natural smile.

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