

REALITY OF LEON WILLIAM'S CONCEPT IN INDIAN SCENARIO-A RETROSPECTIVE STUDY

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ABSTRACT

Selection of maxillary anterior teeth for complete dentures is crucial in clinical practice and controversy about the validity of even the best method to employ still exists. Leon Williams formulated and publicized a method called the "Geometric theory" which is still widely used. Williams believed that there exists a relationship between the face-form and the form of the maxillary central incisor in most people and that this relationship should be taken into account in the tooth selection procedure. A Cross-sectional, descriptive study was conducted in an institution, on randomly selected individuals. The study group consisted of adult patients who attended the outpatient Department of Prosthodontics from June 2019- March 2020. 86000 case sheets were evaluated and Chi-square test and frequency analysis was used to explore the relationship between two variables. Leon Williams criteria was fulfilled by only 41% individuals. Ovoid face form 41% is more common in Indian population as compared to other forms. Ovoid and square tapering tooth forms are more common compared to other tooth forms 30% with square tooth form being the least 12%. In females Leon Williams criteria was more matched than males. But the difference was not significant. This study concludes that there is a much greater percentage of dissimilarity between incisor and face-form, in sample Indian population. The "Williams' law of harmony" to select artificial teeth stands inconclusive in the sample Indian population both in males and females.

KEY WORDS: Face form; Geometric theory; Law of harmony; Leon Williams criteria; Tooth form.

INTRODUCTION

A smile enhances the facial esthetics. Dentist is popularly known to be smile architect who plays an important role in creating a natural looking restoration which allow completely uninhibited smile (Luthra, Sharma and Kaur, 2015; Nallaswamy, 2017; Ariga *et al.*, 2018). The prime requisite to achieve good dental aesthetics is the harmonious relationship between facial form and tooth shape (Bansal *et al.*, 2016; Jyothi *et al.*, 2017). The selection of teeth becomes far more difficult for the patients with no pre-extraction records available. Thus, a prosthodontist must rely on his/her own clinical judgement, along with the patient's aesthetic preferences for teeth selection. Thus, an ultimate goal of an esthetic makeover is to develop a stable masticatory system, teeth,

tissues, skeletal structures, muscles and joints all function in harmony (Seluk, Brodbelt and Walker, 1987; Sudhakar *et al.*, 2014; Duraisamy *et al.*, 2019).

For a long time the choice of artificial teeth was left to chance. It was dependent on the sets available in dental stores and upon the subjective judgement of the dentist. In the past few centuries, dentists continually tried to reconstruct and recover the function of chewing, while aesthetics were neglected. Probably the oldest theory for the choice of frontal artificial teeth is the temperamental theory (Lowery, 1920; Selvan and Ganapathy, 2016), which was used in the last century, before the theory of Leon Williams. Patients were divided into sanguinic, lymphatic, neurotic and biliar types, depending on their temperament. The temperamental theory was replaced by William's theory of harmony, i.e. geometric theory, which determines the tooth form according to the face shape (Wegstein *et al.*, 2014; Ganapathy *et al.*, 2016). According to Williams, the shape of the upper central incisor is in accordance with the form of the face. If one central upper incisor is increased in size and rotated upside down and superimposed to the face in such a way that the incisal edge is parallel to the eyebrows and the cervical part of the tooth is parallel to the lower part of the face, then the forms of the tooth and the face would be identical. For simplicity, Williams (Wegstein *et al.*, 2014; Ganapathy *et al.*, 2016; Subasree, Murthykumar and Dhanraj, 2016) classified all forms in three basic forms: tapering form, ovoid form and square form. To find out which form is suitable for each individual, it is necessary to imagine a line on each side of the face, which runs downward 2.5 cm anterior to the tragus of the ear and through the angle of the lower jaw (Wegstein *et al.*, 2014; Mehndiratta, Bembalagi and Patil, 2019). If the lines are parallel, then the face form is square, if the lines converge toward the chin, then the face form is tapering, and if the lines diverge towards the chin then the face shape is ovoid. It was in 1914 that Williams (Soratur, 2006; Ganapathy, Kannan and Venugopalan, 2017; Jain, Ranganathan and Ganapathy, 2017) proposed his theory, which became famous under the name of geometrical theory. The theory connected the shape of the tooth and the face. Williams believed that the contour line of the upper central incisors has to be of opposite direction from the contour line of the face. William's theory (10-13) is based on an anthropometric study, performed on more than one thousand skulls at the University of the "Royal College of Georgia". Williams apostrophised that many face shapes exist, depending on the race, and all the shapes in all the races, even in apes, can be categorised into three basic types: ovoid, square and tapering (Figure 1), which are in accordance with reversed and increased tooth contour. Face form is a useful reference in numerous clinical prosthodontic procedures for nearly ten decades since the postulation of Leon Williams typical form theory (Satapathy, 2013; Vijayalakshmi and Ganapathy, 2016). Several authors have related the harmony of face form with central incisor tooth (Seluk, Brodbelt and Walker, 1987; Ibrahimagić *et al.*, 2001; Wegstein *et al.*, 2014; Mehndiratta, Bembalagi and Patil, 2019) a few have related face form to upper edentulous arch form and classified edentulous arch form as square, tapering, ovoid (Lindemann, Knauer and Pfeiffer, 2004; Ashok and Suvitha, 2016). Face form has also been related to an individual's smile pattern (Wright, 1942; Lindemann, Knauer and Pfeiffer, 2004).

This study aims at verifying the relationship between tooth forms that were proposed by Leon Williams for the selection of artificial teeth and their association with the tooth forms in natural dentition.

MATERIAL AND METHODS

The study setting for this study is a university study setting which was done on Indian population to study validity of Leon Williams criteria on Indian population. Approval for the study was taken from the ethical board of Saveetha Institute Of Medical And Technical Sciences (SIMAT).

The data included in the study was from February 2019-MARCH 2020.1200case sheets were reviewed.Cross verification of data was done through photographic information. Measures which are taken to minimize sampling bias are simple random sampling.sample size of 105 was selected for the study.

Data collection from the database of Saveetha dental college all the case sheets were reviewed and hence a final number of patients were selected for the study. Patients who reported in the Department of Prosthodontics were selected for the study. Google sheet tabulation and SPSS importing of the data was done.

Descriptive statistics test was used to perform the evaluation of the study. Software used - SPSS version 26 was used. Independent variable being race, age and time; Dependent variable being gender and choice for treatment.Chi square test and frequency analysis was used to evaluate the data.

RESULTS AND DISCUSSION

Leon Williams criteria was fulfilled by only 41% individuals(Figure 2). Ovoid face form 41% is more common in indian population as compared to other forms(Figure 3).Ovoid and square tapering tooth forms are more common compare to other tooth forms 30% with square tooth form being the least 12%(Figure 4).In females leon williams criteria was more matched than males. But there was no statistically significant association between gender and its association with matching of tooth form with facial form [$p>0.05$](Table 1).There is a statistically significant association of tooth form with facial form [$p<0.05$] but the association is weak as the Phi value is 0.4(Figure 5, Table 2).

“Beauty is power; a smile is its sword”. Just a simple smile on your face can help people feel better. To stay positive from inside out a pleasing oral and facial expression is important. The overall esthetic impact of a smile can be improvised by cosmetic restorative procedure and a doorway to this is a successful prosthodontist who replaces the denture aesthetically. The term esthetics originated from the Greek word *aisthetikos*, meaning perceptive(Lindemann, Knauer and Pfeiffer, 2004; Ashok *et al.*, 2014; Ashok and Suvitha, 2016). The most imperative factors contributing to esthetics are the size, shape, and arrangement of the maxillary anterior teeth, particularly the maxillary central incisors from frontal aspect(Beder, 1971; Gayatri *et al.*, 2018)

The study conducted by Mavroskoufis F et al and Sellen PN et a revealed no correlation between the shape of the face and the inverted shape of the maxillary central incisor (Mavroskoufis and Ritchie, 1980; Venugopalan *et al.*, 2014).However, the results obtained in the present study are in disagreement with Wright WH et al and DeSouza et al who found similar shapes in 64% and 70.2% of the individuals respectively (Wright, 1936; Venugopalan *et al.*, 2014; Kannan and Venugopalan, 2018).Thus, the theory advised by Williams, in spite of the wide use, seems not to be completely reliable None of the significance levels are low enough to establish any correlation between the form of the face and the form of the maxillary central incisors. Therefore, the geometric theory is invalid. The question that remains is why does the theory work? Tooth size and arrangement are apparently far more important than tooth form. In testing the radiographic technique, central incisors that were to be extracted for periodontal ' reasons, were first radiographed and then extracted. The three dentists used in the study were asked to classify the form of the tooth on the radiograph by any method they chose. Without knowing that the extracted teeth were the ones radiographed, the dentists were asked to classify them as well. Although the classification differed among the dentists, they all classified the radiograph and the extracted tooth identically according to their classification. French(French, 1951)showed that one mold of teeth when arranged according to different arch forms could be made to appear square,

tapering, or ovoid. Casts and intraoral photographs are not good guides for selection of anterior teeth as gingival contour and arrangement of teeth can be misleading in classifying the form of the tooth. A single periapical radiograph made by the paralleling technique is a more accurate guide to the true form of the patient's tooth. As aesthetics is the primary consideration for patients seeking prosthetic treatment. The prosthodontist needs to understand beauty, harmony, balance, and proportion as perceived by society while planning the restoration design (Hasanreisoglu *et al.*, 2005; Basha, Ganapathy and Venugopalan, 2018). Extensive research is being carried out regarding facial form and tooth form in designing a perfect smile as a standard protocol while restoring the structure, morphology and function of a maxillary anterior segment (Hughes, 1951; Sterrett *et al.*, 1999; Ajay *et al.*, 2017). Standardization is not possible in the existing methods of classification of face form as it is dependent on operator's perception.

The limitation of this study is that it was done on a small sample of population which might not be the representatives of the population. Extensive research needs to be carried out and then a conclusion can be drawn.

In my opinion merely choosing teeth on the basis of facial form won't give the perfect esthetic result there are several factors which are to be considered before reaching to a conclusion so being a prosthodontist it is our responsibility to justify the treatment and to justify the fact that people call prosthodontists smile makers.

CONCLUSION

Quite a good number of theories have been proposed on selection of artificial teeth in dentistry each being considering the correlation of facial forms, anatomical landmarks and teeth form. But soft tissues tend to have more age changes compared to hard tissues. Hence to place undue importance on the relationship between the teeth and face is not defensible. Standardization is not possible in the existing methods of classification of face form as it is dependent on operator's perception.

AUTHOR CONTRIBUTIONS

First author, Dr. Sanjog Agarwal, performed the analysis, and interception and wrote the manuscript as per guidelines, alignments and formatting. Second author Dr. Subhabrata Maiti contributed to conception, data design, analysis interpretation and critically revised manuscript. Both the authors have discussed the results and contributed to the final manuscript.

CONFLICT OF INTEREST

There was no conflict of interests.

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Figure 1: Showing different facial forms A: Square; B: Square tapering; C: Ovoid; D: Tapering

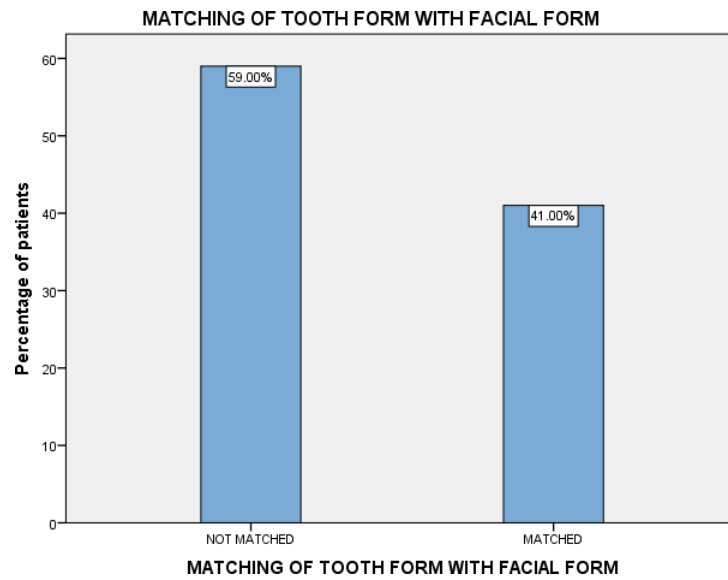


Figure 2: Bar graph depicting the prevalence of matching between facial form and tooth form .X axis represents matching and Y axis represents percentage , there is more prevalence of non matched cases in comparison to matched cases.

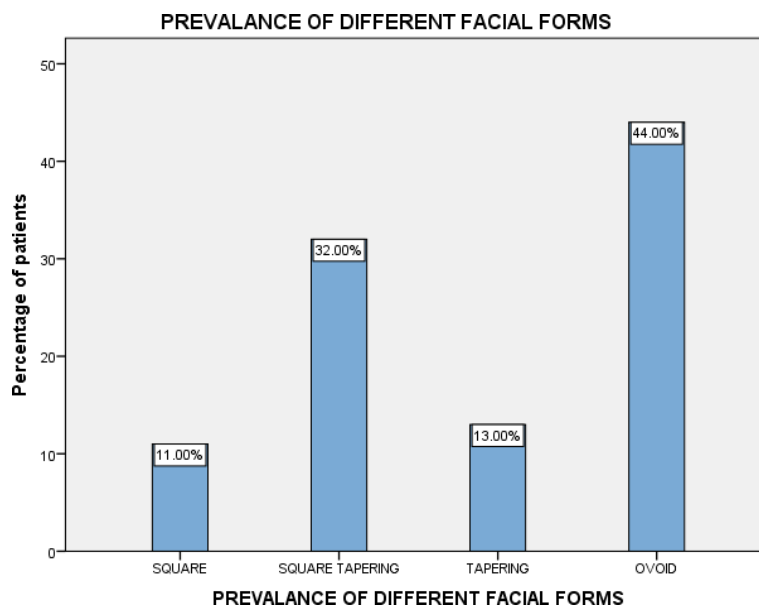


Figure 3: Bar graph depicting the prevalence of different facial form .X axis represents different facial forms and Y axis represents percentage , there is more prevalence of ovoid face form in comparison to other forms.

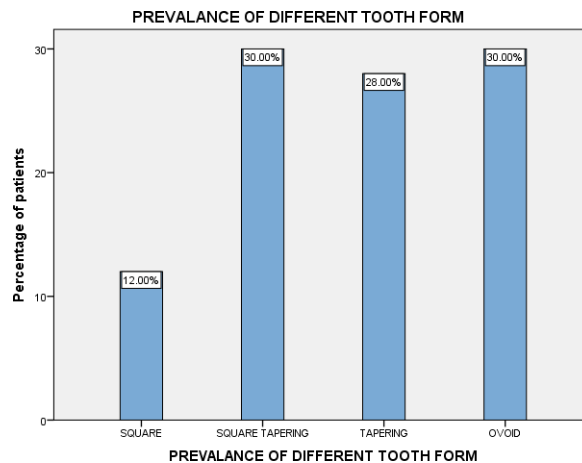


Figure 4: Bar graph depicting the prevalence of different tooth form .X axis represents different tooth forms and Y axis represents percentage , there is more prevalence of ovoid and square tapering tooth forms and square form being least common(12%) in comparison to other forms.

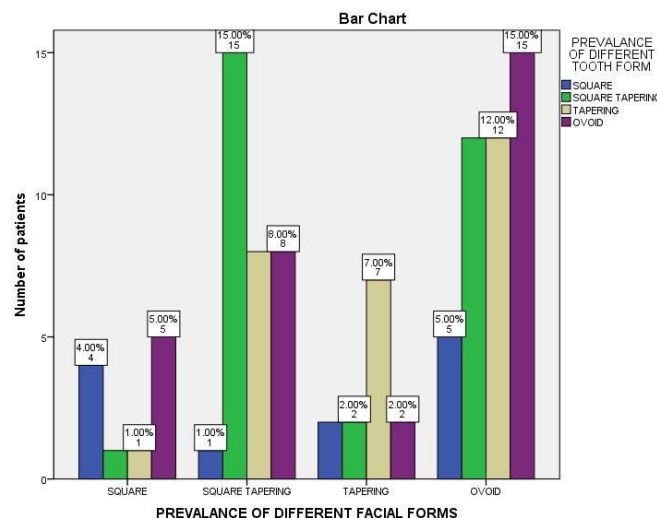


Figure 5: Bar graph depicting the association between tooth form and face form ,X axis represents type of face forms and Y Axis represents percentage of patients,there is statistically significant association between different tooth forms and facial forms.Pearson Chi Square value=20.28, p value=0.016(p<0.05, statistical significant),phi value=0.4 (weak correlation).

GENDER * MATCHING OF TOOTH FORM WITH FACIAL FORM		MATCHING OF TOOTH FORM WITH FACIAL FORM		Total	STATISTICAL VALUES
		NOT MATCHED	MATCHED		
GENDER	MALE	29%	20%	49%	Pearson Chi-Square =0.001
	FEMALE	30%	21%	51%	

Total	59%	41%	100%	P VALUE=0.971
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Table 1: This table represents association between gender and matching of tooth form with facial form. Since the p value is more than our chosen significance level=0.05 , we can accept the null hypothesis, and conclude that there is no statistically significant association between gender and its association with matching of tooth form with facial form. There was no statistically significant association between gender and its association with matching of tooth form with facial form [p>0.05].

PREVALENCE OF DIFFERENT FACIAL FORMS * PREVALENCE OF DIFFERENT TOOTH FORM Crosstabulation							STATISTICAL VALUES
		PREVALENCE OF DIFFERENT TOOTH FORM				Total	
		SQUARE	SQUARE TAPERING	TAPERING	OVOID		
PREVALENCE OF DIFFERENT FACIAL FORMS	SQUARE	4	1	1	5	11	Pearson Chi-Square =20.28 P value =0.016 Phi value =0.4
	SQUARE TAPERING	1	15	8	8	32	
	TAPERING	2	2	7	2	13	
	OVOID	5	12	12	15	44	
Total		12	30	28	30	100	

Table 2: This table represents association of tooth form with facial form. Since the p value is less than our chosen significance level=0.05 , we can reject the null hypothesis, and conclude that there is a statistically significant association of tooth form with facial form. There is a statistically significant association of tooth form with facial form [p<0.05].