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Review Article

Maxillary Anterior Teeth Width Proportion a Literature Review

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Abstract

Aim: This article reviews some of the most common dental proportion and the relation between maxillary anterior teeth width to achieve pleasant esthetic appraisal.

Methods and Materials: In this study we reviewed articles from 1970 till October of 2017 with Keywords: Maxillary anterior teeth width, dental proportion, Golden Proportion, Recurrent Esthetic Dental (RED) and Preston Proportion in sources such as Pubmed, Goggle Scholar and Scopus.

Initially we found 26 articles and after excluding studies which were using unreliable data or anterior teeth restoration such as crowns, veneers, fillings and etc. we had 9 articles to review.

Results: Within these articles 4 of them talked about absence of Golden proportion in the study group, 2 of them compared different proportions and 1 article per each proportion that we discus here.

Conclusion: A pleasant anterior Maxillary Teeth proportion is different based on teeth height, which for normal height best proportion is 70% RED proportion and for tall teeth using Golden Proportion (62%) reported most esthetic. Also the width/height ratio of 0.75 to 0.78 has reported the most esthetic.

Keywords: *Maxillary Anterior Teeth; Dental Proportion; Golden Proportion; Preston Proportion*

Introduction

Teeth proportion was a major concern for dentists and dental technician for a long time. In 1973 Lombardi published his theory which dental and therefore facial esthetic are at most pleasant when width of central to lateral and lateral to canine have a repeated proportion, when viewed from the front. He used the term "Golden Proportion" and the ratio is 1.61803 to 1 [1].

But recently more dentists are publishing articles and studies suggesting of lacking evidence to back up the Golden Proportion theory Such as Mahshid., *et al*. in 2004 [2] or Basting., *et al*. in 2006 [3] or Rosenstiel., *et al*. in 2000 [4] which say either Golden Proportion doesn't exist or it's not esthetically accepted.

In this article we review articles which talk about the new theories about proportion.

Method and Material

In this study we reviewed articles from 1970 till October of 2017 with Keywords: Maxillary anterior teeth width, dental proportion, Golden Proportion, Recurrent Esthetic Dental (RED), esthetic and smile design in sources such as Pubmed, Goggle Scholar and Scopus.

Initially we found 26 articles and after excluding studies which were using unreliable data or anterior teeth restoration such as crowns, veneers, fillings and etc. we had 9 articles to review.

Discussion

Several tooth proportion theory have been advocated thorough years:

- Golden Proportion (62%)
- Golden Mean
- Preston Proportion
- RED
- Plato Beauty Proportion (57%)
- Esthetic norm Proportion (71%)
- Quarter 3:4 Proportion (75%)
- Human norm 5:6 Proportion (80%)

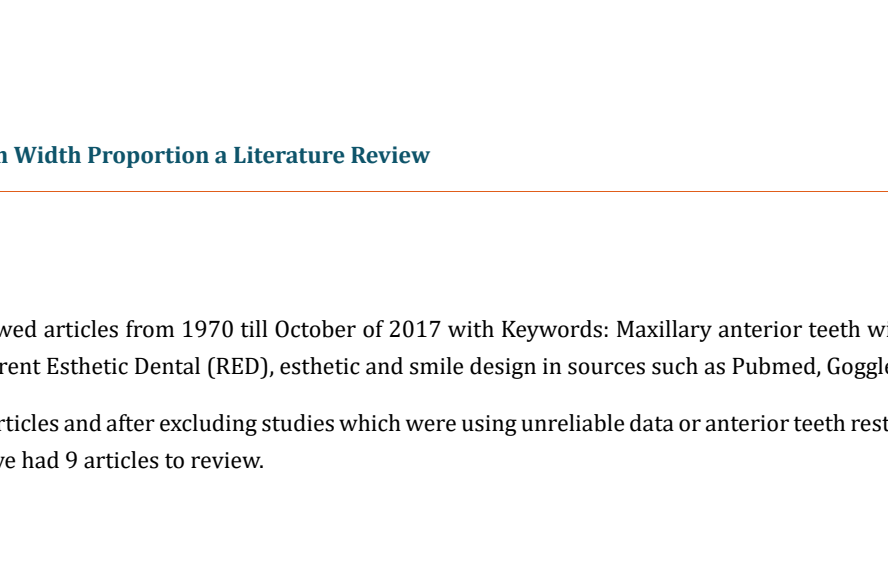
In this study we compared only 4 of them:

Golden Proportion

The golden proportion is based on the theory that a relationship exists between beauty in nature and mathematics.

Golden Proportion first brought by Lombardi and states that the existing proportion between the width of the central incisor and lateral incisor should be constant, progressing from anterior teeth to the posterior teeth in the mouth.

Applied to smile design, it says that the width of the maxillary lateral incisor, from frontal view, should be in golden proportion to the width of the maxillary central incisor The maxillary lateral incisor should be 62% of the width of the maxillary central incisor, and the width of the maxillary canine should be 62% of the width of the resulting lateral incisor.



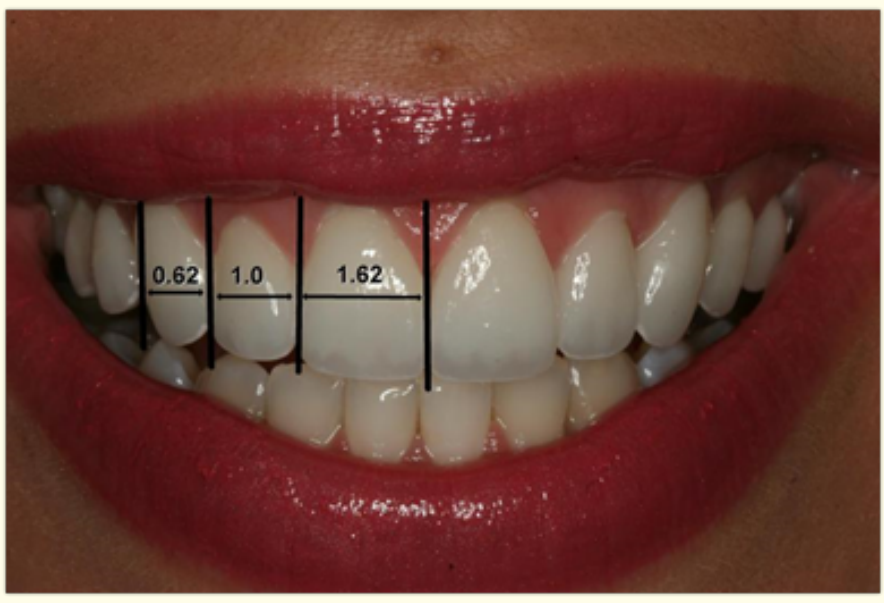


Figure 1: *Golden Proportion.*

Golden Mean

It states that the width of the maxillary central incisor must be 25% of the distance of distal of the maxillary canine on one side to the distal of the canine on the contralateral side. Each maxillary lateral incisor must be 15% and each maxillary canine 10% of the intercanine distance as viewed from the front [5].

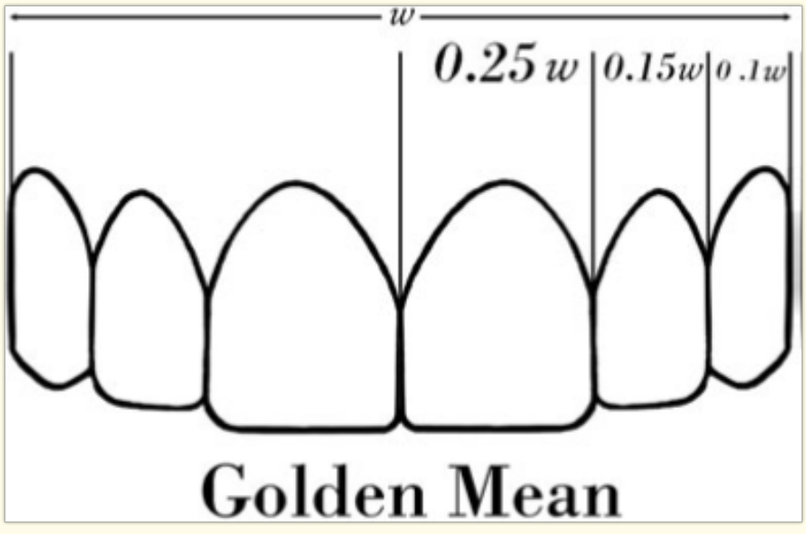


Figure 2: *Golden Mean.*

RED

A concept of proportional smile design has been proposed that factors variability among individuals and factors the proportions of the tooth, face, and body into the calculations.

Smiles designed using this principle are based on a linear coefficient progression in which the width of each successive tooth as viewed from the front diminishes by the same proportion. The width of the lateral incisor is reduced by a selected percentage from the width of the central incisor, and the width of each tooth distally is reduced by this same percentage from its mesial tooth.

The 70% RED proportion has been recommended for normal length teeth with a 78% width/height ratio of the maxillary central incisors.

Different RED proportions may be used on different people as long as the same RED proportion is used consistently with the same individual smile [6,7].

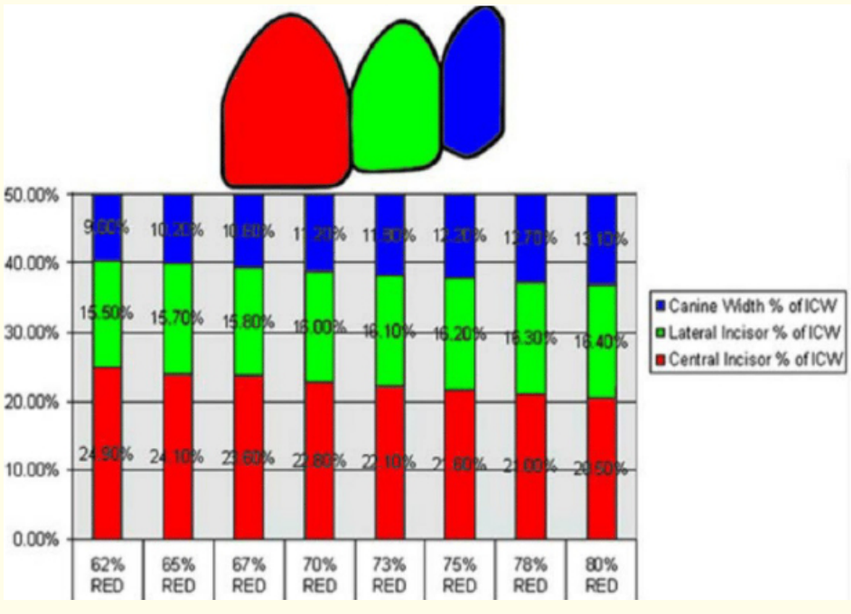


Figure 3: *If the teeth is taller we use a smaller RED proportion.*

If the teeth is shorter we use a larger RED proportion.

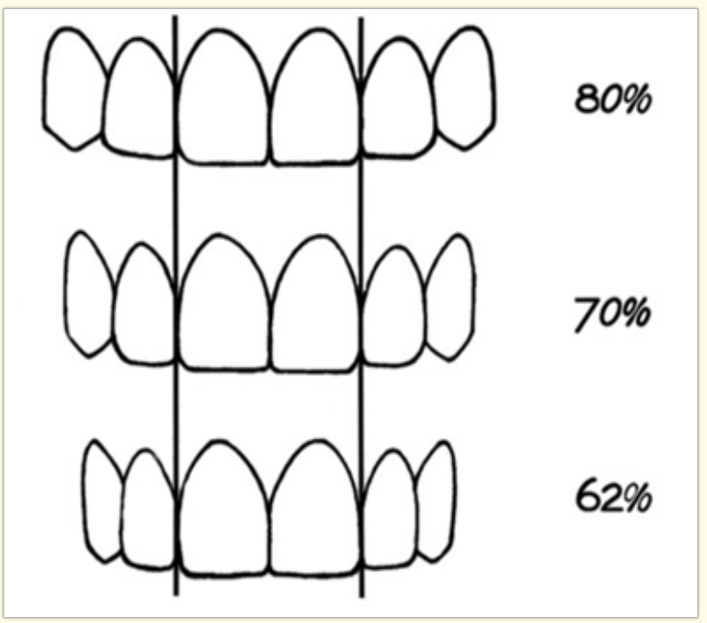


Figure 4: *RED with same central incisor width.*

The RED proportion is not just one particular proportion but it allows the desired RED proportion to be chosen and consistently applied for each individual case.

Studies have shown that smiles with a constant 78% width/height ratio of the maxillary central incisors are most desired. Therefore if teeth is taller, a wider central incisor is preferred resulting in a more dominant central incisor and a smaller RED Proportion. Conversely if the teeth is narrower then central incisor and the front teeth are more similar in size.

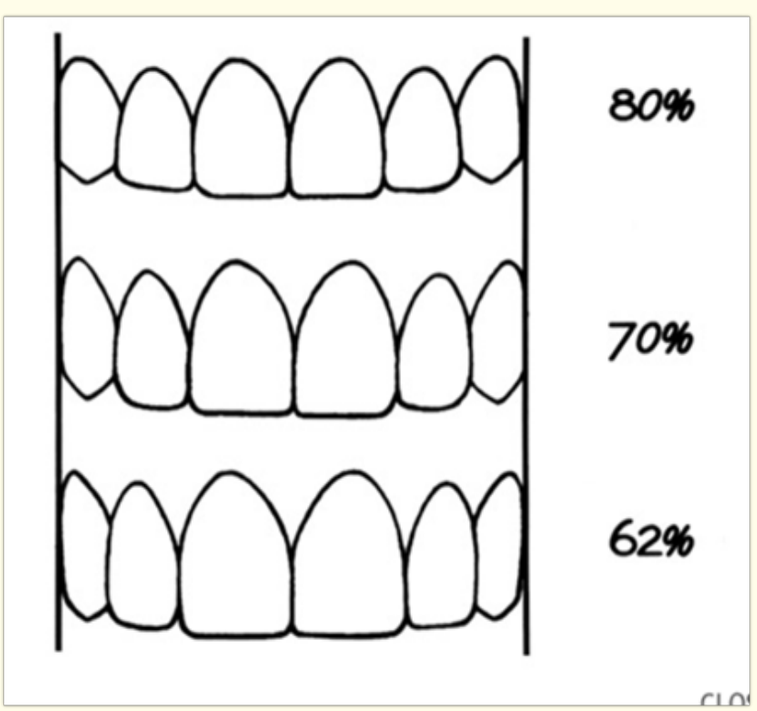


Figure 5: *RED with same canine width.*

For normal length teeth we use RED with 70% ratio:

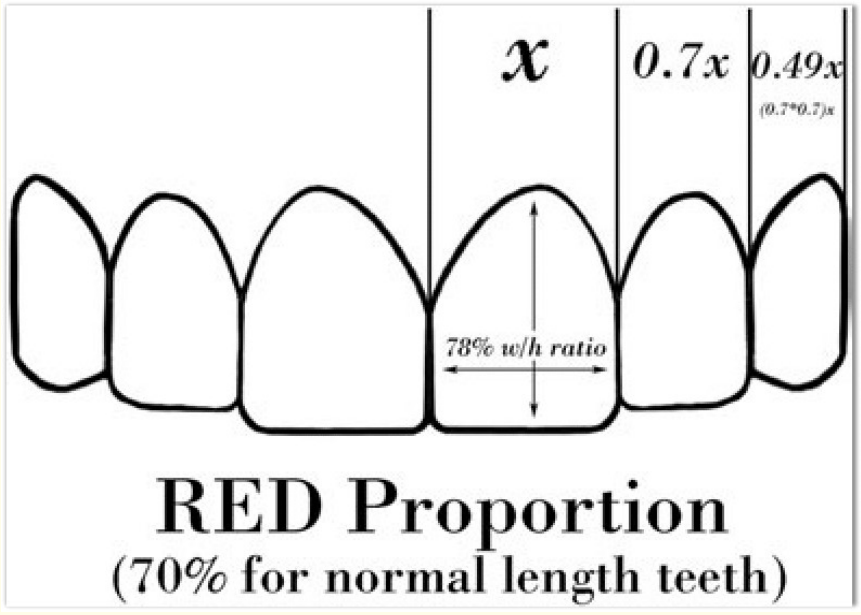


Figure 6: *RED 70% proportion.*

Preston (natural) Proportion

It was reported in one surveyed North American population by Preston, that the width of the average maxillary lateral incisor was approximately 66% of the width of the average maxillary central incisor and that the average maxillary canine was approximately 84% of the width of the average maxillary lateral incisor [8].

In a Summary published by Ward:

FORMULAS USED FOR TOOTH WIDTH CALCULATIONS

Tooth-to-Tooth Width Proportion	Central Incisor(CI) Width	Lateral Incisor (LI) Width	Canine Width
Golden proportion	IC width × 0.25	CI width × 0.62	LI width × 0.62
Golden mean	IC width × 0.25	IC width × 0.15	IC width × 0.10
Preston proportion	Preston CIW*	CI width × 0.66	LI width × 0.84
70% RED proportion	RED CIW†	CI width × 0.70	LI width × 0.70

RED = recurring esthetic dental; IC width = intercanine width of six maxillary teeth (as viewed from the front).
RED expressed as a decimal: a 70% RED is entered as 0.7.

$$*\text{Preston CIW} = \frac{\text{Total intercanine frontal view width}}{2(1+0.66+(0.66\times 0.84))}$$

$$\dagger\,\text{RED CIW} = \frac{\text{Total intercanine frontal view width}}{2\left(1+\text{RED}+\text{RED}^2\right)}$$

Note: Solving the two equations reveals that the maxillary central incisor width of the 70% RED proportion (1/4.38 rounded to 0.23) is similar to the width of the maxillary central incisor using the Preston proportion (1/4.42 rounded to 0.23).

Table 1: *Formulas for tooth width calculations.*

But to choose between all of these proportions, Ward has done a study in 2007 and compared teeth proportion in 5 different group with a survey from 301 North American dentists, the survey set was as below [9]:

SURVEY SETS OF WIDTH PROPORTIONS		
Survey Set	**View A**	**View B**
1	Golden proportion (same length maxillary anterior teeth as Preston proportion)	Golden mean (same length maxillary anterior teeth as Preston proportion)
2	Preston proportion (78% w/h ratio central incisor)	Golden proportion (same length maxillary anterior teeth as Preston proportion)
3	Golden proportion (same length maxillary anterior teeth as Preston proportion)	70% RED proportion (78% w/h ratio central incisor)
4	Preston proportion (78% w/h ratio central incisor)	70% RED proportion (78% w/h ratio central incisor)
5	Tall Preston proportion (same length maxillary anterior teeth as tall golden proportion)	Tall golden proportion (78% w/h ratio central incisor)

RED = recurring esthetic dental; w/h = width/height.

Table 2: *Ward's Survey.*

Ward took a picture form a full-smile frontal image and then used image manipulation program (Adobe Photoshop CS) to produce other proportions for anterior maxillary teeth.

Then in the survey each 2 proportion were put in a survey set and asked the dentists to rate each one of the sets.

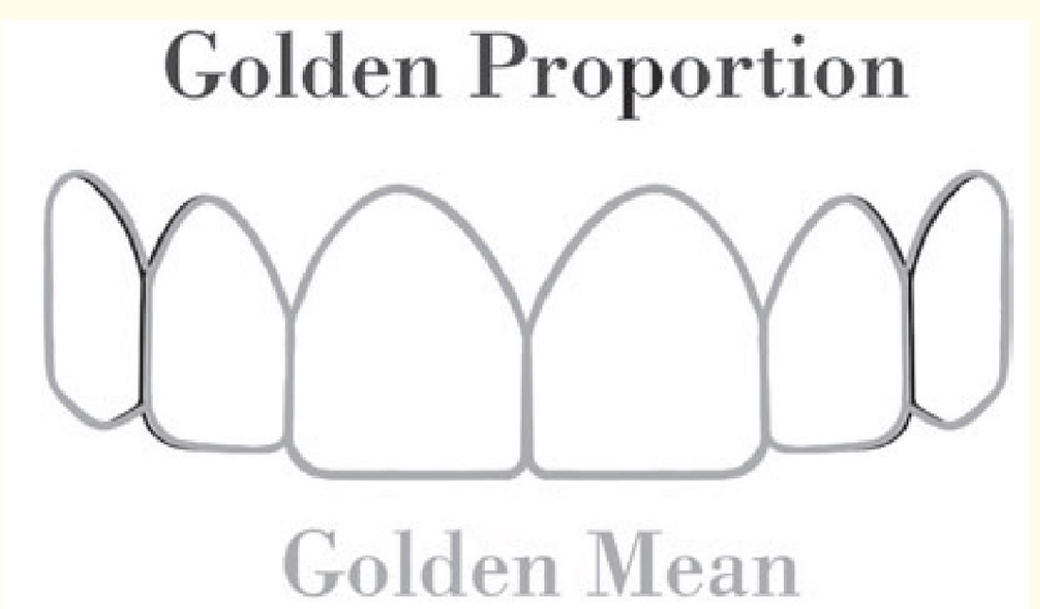


Figure 7: *Golden Proportion vs. Golden Mean.*

Golden Mean 55% and Golden Proportion 45%.

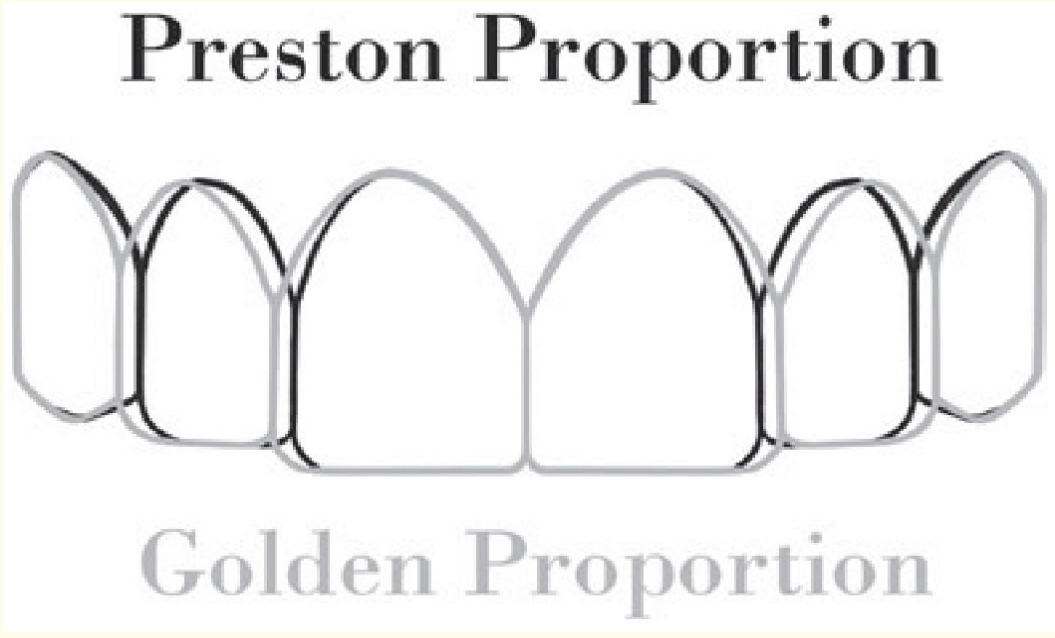


Figure 8: *Preston Proportion vs. Golden Proportion.*

Preston Proportion 70% and Golden Proportion 30%.

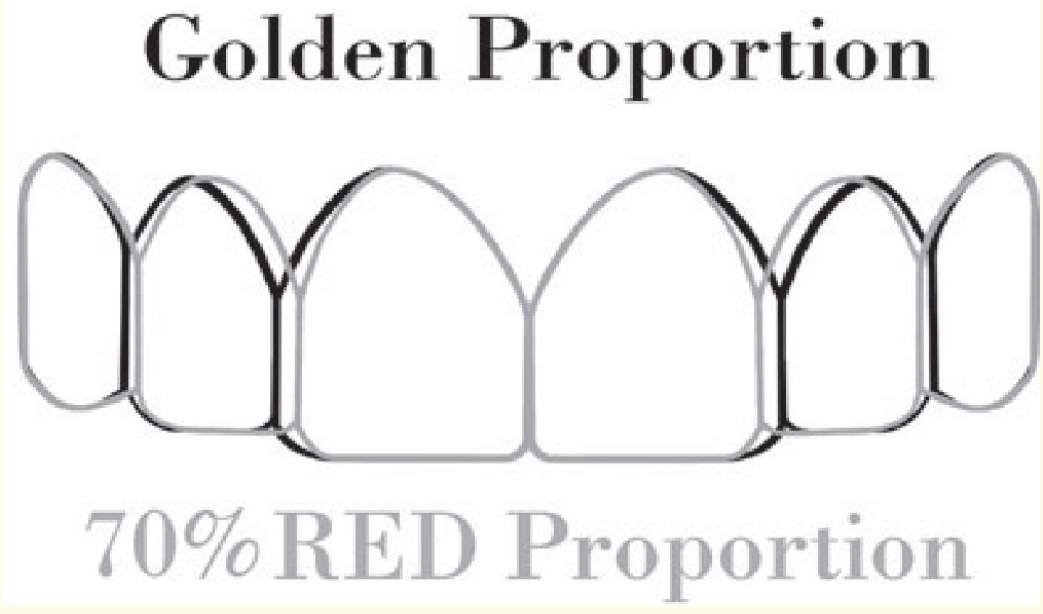


Figure 9: *Golden Proportion vs. 70% RED Proportion.*

70% RED Proportion 75% and Golden Proportion 25%.

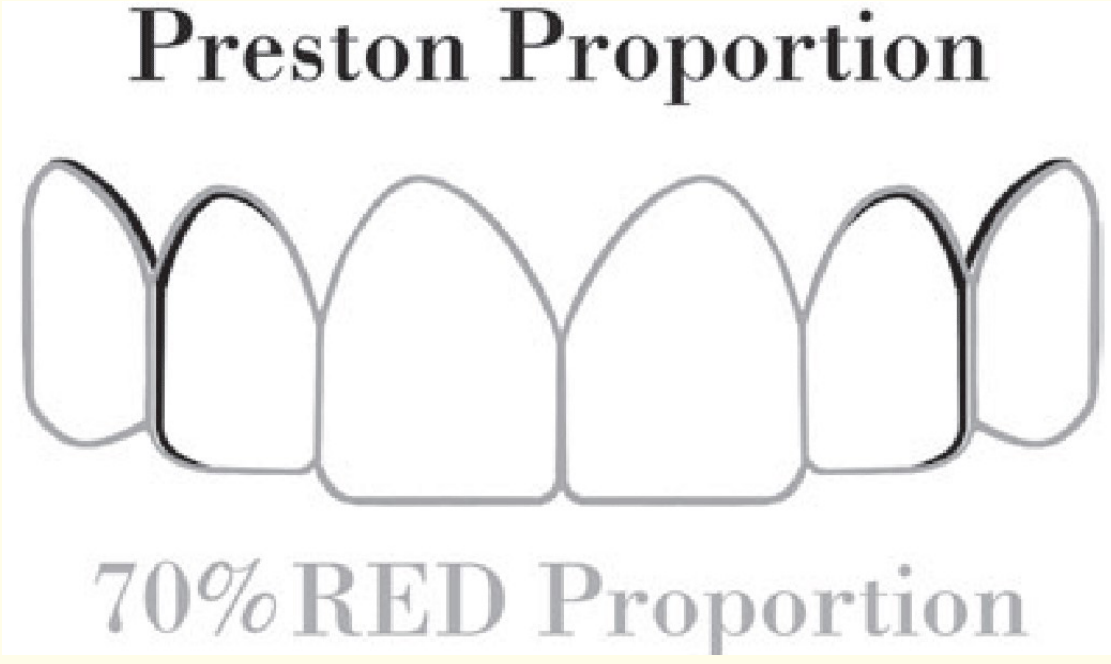


Figure 10: *Preston Proportion vs. 70% RED Proportion.*

70% RED Proportion 57% and Preston Proportion 43%.

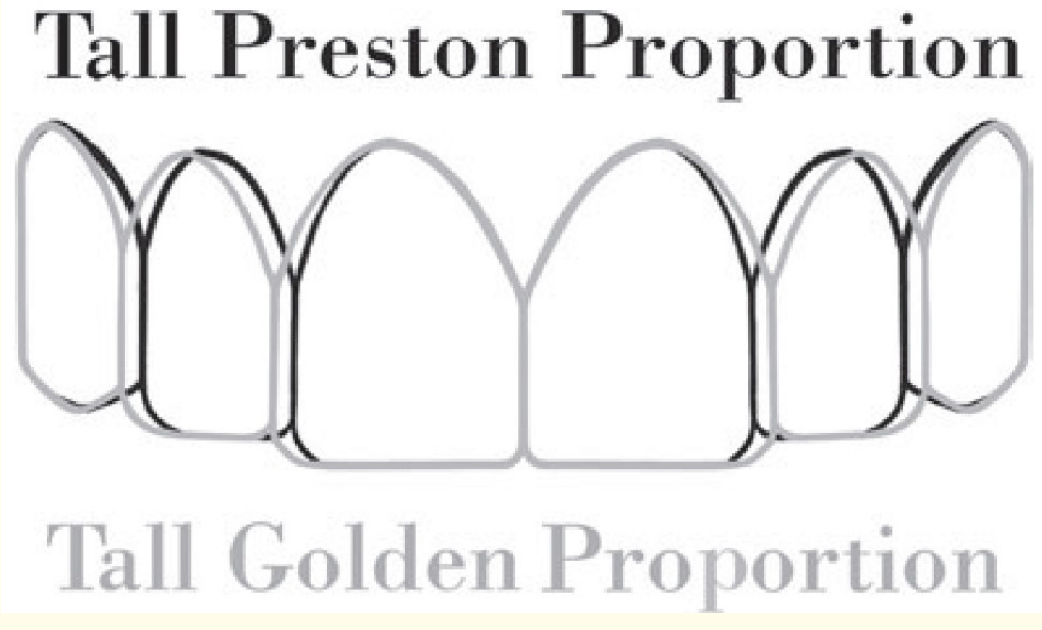


Figure 11: *Tall Preston Proportion vs. Tall Golden Proportion.*

Tall Golden Proportion 58% and Tall Preston Proportion 42%.

Most influencing factor in his study was overall balance and then central incisor proportion.

But when the length of teeth is different we use a study done by Rosenstiel: They found that dentists preferred the 80 percent proportion when viewing short and very short teeth and for very tall teeth they preferred the golden proportion. They found the golden proportion to be worst for normal height or shorter teeth and the 80% proportion for tall or very tall teeth.

There was no clear-cut best for normal height or tall teeth, and their answered could not be predicted based on gender, specialist training, experience, or patient load.

The majority chose central incisors that were as close to 0.75 - 0.78 width/height ratio as possible.

Group	Most Preferred as Best ↔ Least Preferred as Best			
Very tall	Golden (22.2)	Normal (4.7)	70 (2.1)	80 (1)
Tall	70[1] (1.2)	Normal[1] (1.2)	Golden[1] (1.1)	80 (1)
Normal	80[2] (2.1)	Normal[2] (1.2)	70[2] (1.2)	Golden (1)
Short	80 (19.1)	Normal (6.5)	70 (3.2)	Golden (1)
Very Short	80 (277.5)	Normal[3] (8.5)	70[3] (6.1)	Golden (1)

Table 3: *Rosenstiel survey result.*

But on other hand public showed little concern to proportion rather than diastema and midline shift [10].

Conclusion

1. The smile with normal-length teeth using the Preston naturally occurring maxillary anterior width proportions was significantly preferred (70%) over that constructed using the golden proportion.

2. The smile of the 70% RED proportion with normal-length teeth was significantly preferred over both the golden proportion and the Preston proportion (75 and 57%, respectively) smiles by the dentists surveyed.

3. The smile with tall teeth showing the golden proportion (62% RED proportion) was preferred (58%), to a significant degree, over the smile with tall teeth representing the Preston naturally occurring proportion by the surveyed dentists.

4. The majority of dentists (62%) made their selection primarily by the overall balance of the smile. Twenty-three percent made their selection based on the size of the maxillary central incisors, whereas 15% used other teeth or factors.

5. Dentists like the 80 percent proportion when viewing short and very short teeth and for very long teeth they preferred golden proportion. Golden proportion was worst for normal height or shorter teeth and the 80% proportion for tall or very tall teeth.

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