

## CASE REPORT

## Smile Design using Recurring Esthetic Dental Proportion

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## ABSTRACT

Beautiful confident smile has a positive impact on the psychosocial well-being of patients. Spacing present in the anterior region makes a patient feel dissatisfied with their smile. Over the years, a number of innovative techniques have been described in the treatment of diastema. However, a less invasive and short-time treatment procedure with satisfactory result is preferred by the patient. This case report describes the technique of anterior diastema closure by applying Recurring Esthetic Dental (RED) proportion for smile designing using direct composite resin. The RED proportion has been stated to be an essential tool for achieving esthetics and harmony in smile.

**Keywords:** Composite restoration, Diastema, Esthetics, Facial image view analysis values, Recurring esthetic dental proportion.

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## INTRODUCTION

Dentofacial esthetics plays a major role in social interaction and the psychological well-being of individuals.<sup>1</sup> An attractive smile is a vital component of esthetics. The presence of multiple diastema in the anterior region can negatively impact the smile of the individual, and patients tend to be discontented with their smile.

Anterior midline diastema is midline spacing greater than 0.5 mm between the proximal surfaces of adjacent teeth.<sup>2,3</sup> There are multiple causes of diastema including transient malocclusion, tooth size–arch length discrepancy,

genetic factors, trauma etc. Treatment is usually carried out for esthetic and psychological reasons.

Currently, various treatment options are available for diastema closure in adults like orthodontic treatment, direct composite restoration, indirect porcelain laminate veneers, surgical correction depending on the case, and the associated etiology. Direct composite restoration is a conservative, minimally invasive, and inexpensive way to enhance one's smile that can be performed often in a single office visit.<sup>4</sup> This type of treatment has several advantages, such as being cost effective, minimal tooth preparation, if required, no demand for temporization, instantaneous results, and reversibility of the procedure.<sup>5</sup> By following the appropriate clinical technique, which influences the survival and quality of direct restoration, clinical studies have shown that direct composite build-ups can be used as an esthetic, functional, and biologically sound treatment option for closing diastema with clinically promising survival rates.<sup>6,7</sup>

When diastema closure is performed, several factors like dental midline, occlusal relationship, and esthetic proportion of an individual tooth must be considered. The proportions of the teeth are important to achieve an attractive smile.

A proportional smile design theory, which may have a more universal application, has been developed.<sup>8</sup> The ability to change the proportions of teeth to suit the individual patient's face, bone structure, or general physical type is important. Ward suggested the RED proportion as the proportion of the successive width of the teeth remaining constant when progressing distally from the midline.<sup>9</sup> The use of the RED proportion gives greater flexibility. Instead of having to accept the proportion already defined by the widths of the central and lateral incisors, one can define his or her desired RED proportion. Dentists prefer smiles in which the width/length ratio of the maxillary central incisors are 75 to 78%.<sup>10</sup> Daniel Ward also suggests that a width-to-height ratio of 78% is the most pleasing.

Dental photography has become an essential element in smile designing. The author has described the technique of facial image view analysis (FIVE), wherein photographs are used to evaluate and measure the relative tooth dimensions of smile.<sup>9</sup>

This clinical case report presents a treatment option for closure of multiple diastema in maxillary anterior teeth using conservative direct composite resin

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restoration and application of RED proportion for smile designing.

## CASE REPORT

A 24-year-old female patient with normal build reported to the Department with the chief complaint of spacing between anterior teeth (Figs 1 to 4). Intraoral examination revealed good oral hygiene, absence of dental caries, and generalized spacing between the six maxillary anterior teeth (~3 mm). Patient was explained about various treatment options namely routine orthodontic treatment, crowns, veneers etc. Due to patient's preference for conservative treatment procedure and lack of time, direct composite restoration was considered as the treatment option. The RED proportion as suggested by Daniel Ward was used for smile designing.

Using FIVE dimensions, RED proportion and width-to-height ratios can be evaluated. To obtain FIVE dimensions, height of central incisor was measured on the photograph and then on the preoperative cast. The

cast dimension is divided by image dimension to give conversion factor, which correlates the size of image to actual size of teeth. The photographic measurements are multiplied by conversion factor to get FIVE dimensions. The obtained FIVE dimensions are used to evaluate RED proportion and width-to-height ratio.

To begin with, shade selection of the anterior teeth was done using Vita shade guide. A digital single reflex camera (DSLR) was used to capture the facial view of the patient's anterior teeth. As suggested by Daniel Ward, to minimize distortion, the image was taken with the camera lens parallel to two anterior teeth and at a distance of 8 inches away from teeth with 1:2 magnification of lens (Figs 1 and 2). A preoperative alginate impression was made and cast was fabricated (Figs 5 and 6).

Height of central incisor was measured on the cast and in the photograph using a divider and a scale. Conversion factor (as shown below) was calculated by relating the size of tooth on the cast to size of tooth on the photograph.



Fig. 1: Preoperative retracted frontal view



Fig. 2: Preoperative smile



Fig. 3: Preoperative right lateral view



Fig. 4: Preoperative left lateral view



Fig. 5: Preoperative cast: frontal view



Fig. 6: Preoperative cast: occlusal view

Table 1: Photographic widths (mm)

Tooth no	14	13	12	11	21	22	23	24
Width	4.5	6.5	9.5	11.6	12.1	10.4	6	4
Height	10.5	11	12	14.5	14.8	11.5	11.5	9

Table 3: Width/height ratio

11	21
81%	82%

Table 2: Facial image view analysis calculated cast widths (mm)

Tooth no	14	13	12	11	21	22	23	24
Width	2.8	4.0	5.9	7.2	7.5	6.4	3.7	2.5
Length	6.5	6.8	7.4	8.9	9.1	7.1	7.1	5.6

Table 4: Recurring esthetic dental proportion

14/13	13/12	12/11	22/21	23/22	24/23
70%	68%	82%	85%	58%	68%

## CALCULATION AND WORK SHEET

- Cast central incisor length = 9 mm
- Photo central incisor length = 14.5 mm
- Conversion factor (cast length/photo length) = 0.62 mm.

The height and width of anterior eight teeth were measured on photograph and recorded (Table 1).

The measured photographic dimensions were multiplied by conversion factor to calculate FIVE dimensions (Table 2).

The FIVE width of central incisor was divided by height to obtain width/height ratio of each central incisor (Table 3).

The FIVE width of each tooth was divided by FIVE width of adjacent mesial tooth to determine RED proportion (Table 4).

The calculated width-to-height ratio for central incisor was 81 and 82%, which was little higher than the ideal ratio of 78%. The calculated RED proportion was inconsistent.

The desired RED proportion of 70% and width-to-height ratio of 78% was considered to calculate the optimal FIVE values (Table 5) using the formula given by the author.

$$\frac{[(\text{FIVE}) \text{ width of the anterior 6 teeth}]}{[2(1 + \text{RED} + \text{RED}^2)]} = \text{Width of central incisor}$$

Table 5: Facial image view analysis optimal cast widths (mm)

Tooth no	14	13	12	11	21	22	23	24
Width	2.7	3.9	5.5	7.9	7.9	5.5	3.9	2.7
Height			7.1	10.1	10.1	7.1		

Ward<sup>9</sup> preferred RED value of 70% (0.7).

Substituting the values in the above equation

$$34.7/2(1 + 0.7 + 0.7^2) = \text{width of central incisor} = 7.9$$

Height of central incisor (Table 5) is calculated using the below formula:

$$\frac{(\text{Width of central incisor})}{(\text{Width to height ratio})} = \text{Height of central incisor}$$

Having obtained the ideal width-and-height ratio of the anterior 6 teeth using RED proportion, direct composite restoration was done as per the dimensions obtained.

## COMPOSITE BUILDUP PROCEDURE

After oral prophylaxis and shade selection, composite buildup procedure was done to close the interdental spaces. The dental midline was made to coincide with facial midline.

The midline diastema was closed by building up the mesial surfaces of central incisors. The teeth were isolated



and 37% phosphoric acid (N-etch, Ivoclar Vivadent) was applied on the mesial and incisal surfaces of central incisor for 15 seconds, and then rinsed for 20 seconds. Then, two coats of a single bottle, self-priming bonding agent (Prime n Bond NT, Dentsply) were applied using applicator tips and polymerized for 20 seconds with a light emitting diode curing unit.

Care was taken to apply uniform coats of the bonding agent, especially near the gingival area. Since pooling of the bonding agent compromises solvent evaporation, after careful application of the bonding agent near the sulcus, it was air-thinned using oil-free syringe.

A small increment of the selected shade composite resin is placed over the mesiofacial and incisal aspects of the tooth according to calculated height and width. These increments are contoured to ensure optimal shape and identical width and height for both central incisors. A small brush was used to smooth the composite resin surface, and light-cure of the increments was done for 40 seconds using light emitting diode curing unit (Ledition, Ivoclar Vivadent).

A matrix is held against one of the central incisor and lingual half of diastema is layered. Any excess composite resin is removed prior to light-curing. Light-cure of resin was done. The same procedure was carried out for lateral incisor and canine.

Occlusion was evaluated for prematurities, and final finishing was done with fine composite finishing disc. The composite restoration resulted in diastema space closure resulting in an esthetically pleasing smile, meeting the patient's expectation (Figs 7 and 8).

## DISCUSSION

Patients with unesthetic dental alignment often suffer from unpleasant smile and tend to have low self-esteem, which

can affect their social life. Diastema can also affect phonetics, particularly with "s" and "th" sounds. While planning space closure, the underlying etiology has to be addressed first. In this case report, the patient had arch length tooth size discrepancy with no deep bite, occlusal interference, and parafunctional habits. Hence, a more conservative approach of direct composite restoration was opted as treatment of choice. With the recent advances in adhesive techniques and better-quality resin materials, dentists can have more chance to create conservative, functional, esthetic, economic, and long-lasting restorations with short chair-side time.<sup>11</sup>

In this case, RED proportion was used for designing a proportional smile. The range of suggested RED proportions is between 62 and 80%. The golden proportion (62% RED proportion) is one of many proportions that fit within the definition of the RED proportion. Different RED proportions can be used for the same individual according to the desired length of the teeth and the desire to have the size of the teeth match the size of the face and body. It is recommended that the taller the individual and greater the incisocervical height of the teeth, the smaller will be the RED proportion. Taller individuals should have a 62% RED proportion, individuals with average height, a 70% RED proportion, and shorter individuals an 80% RED proportion.<sup>8</sup> Another important proportion to be evaluated is width-to-height ratio. A width-to-height ratio of 78% is found to be more pleasing.<sup>9</sup> In this case, since patient was of normal built, RED proportion of 70% and width-to-height ratio of 78% was considered ideal.

With the aid of dental photography and FIVE dimensions, RED proportion and width-to-height ratio of tooth was evaluated (Tables 6 and 7). Based on the calculations, a proportional smile was designed. With the obtained ideal width and height of anterior teeth, direct composite buildup was used for diastema closure. Height of tooth was altered taking care that incisal edge approximated the contours of lower lip



Fig. 7: Postoperative retracted frontal view



Fig. 8: Postoperative smile

**Table 6:** Width/height ratio

11	21
78%	78%

**Table 7:** Recurring esthetic dental proportion

14/13	13/12	12/11	22/21	23/22	24/23
70%	70%	70%	70%	70%	70%



**Fig. 9:** Preoperative view showing diastema



**Fig. 10:** Postoperative view after esthetic correction

during smile. Phonetics was also checked using f and v sound while altering the height of tooth. The pre-operative and postoperative images (Figs 9 and 10) show that the patient's esthetic requirement has been met successfully through a conservative approach and applying RED smile design protocol.

## CONCLUSION

The RED proportion for smile designing allows the clinician to obtain an acceptable range of width and height values of anterior tooth, providing a result that is likely to be esthetically accepted by the patients. In this case report, the patient's esthetic expectation was met by applying RED proportion for smile designing combined with direct composite restoration.

## CLINICAL SIGNIFICANCE

The use of FIVE to evaluate RED proportion and width-to-height ratio for smile designing, combined with noninvasive composite restoration can be used as a successful treatment option for anterior space closure in less chair-side time, thereby, improving patient's esthetics.

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