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Premium protocol for planning a periodontal–restorative approach: Conservative, predictable, and reproducible

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Planning oral rehabilitation that involves an interdisciplinary approach is challenging, especially when it includes changes in the morphologic aspects of teeth and the architecture of gingival tissues. Patients commonly complain about the esthetics of maxillary anterior teeth, especially when diastemata are present. A guideline known as the golden proportion can be used to establish adequate width distribution of anterior teeth. Tooth proportion is also affected by incisogingival tooth length, hence gingival contouring should be evaluated as well. In these situations, the width-to-height ratio of 0.75:0.78 in the maxillary anterior teeth could be used to obtain wax-ups and a surgical guide, resulting in a more predictable esthetic outcome. Therefore, this clinical report describes a protocol for the planning of a periodontal-restorative approach with two wax-ups and a surgical guide using the golden proportion width-to-height ratio of 0.75:0.78 for the treatment of maxillary anterior teeth with diastemata using minimum thickness lithium disilicate veneers. *(Quintessence Int 2017;48:549–554; doi: 10.3290/j.qi.a38265)*

Key words: dental ceramics, dental esthetics, periodontal surgery, veneer

Planning oral rehabilitation that involves an interdisciplinary approach is challenging, especially when it includes changes in the morphologic aspects of teeth and the architecture of gingival tissues. Different protocols have been presented in the literature;[1,2] thus, a conservative, predictable, and reproducible method is required.

Establishment or restoration of maxillary anterior teeth width in patients with diastemata is complex. The golden proportion (defined as a specific mathematical proportion where the ratio of the shorter segment to the longer one is equal to the ratio of the longer to the whole segment) has been suggested as one potential method to achieve the correct tooth width to obtain an attractive smile.[3,4]

Different tooth proportions have been used in the literature,[2-4] but there is still little information regarding how tooth height should be established during restorative rehabilitation. A width-to-height ratio of 0.75:0.78 in the maxillary anterior teeth can be considered an acceptable esthetic proportion.[5] Thus, once the correct tooth width is determined based on the golden pro-

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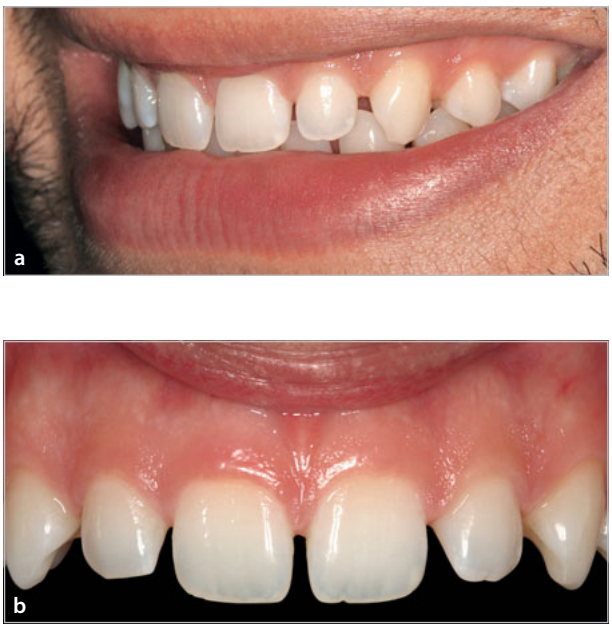


Figs 1a and 1b *(a)* Preoperative view of patient's smile. *(b)* Close-up view of maxillary anterior teeth. Note the negative effect of diastemata, compromising esthetic harmony due to anatomic discrepancies of size and shape of maxillary anterior teeth.

portion, the correct tooth height can be established using this ratio.

The esthetic rehabilitation process must not be undertaken without restorative planning. Gingival contouring and a periodontal approach should be evaluated to reproduce the natural gingival architecture and appropriate teeth height. The diagnostic wax-up can be considered a functional/esthetic tool[6] to analyze the width-to-height ratio of maxillary anterior teeth and also to obtain a surgical guide.

Therefore, this paper describes a protocol for the planning of a periodontal-restorative approach with two wax-ups and a surgical guide using the golden proportion and the width-to-height ratio of 0.75:0.78 for the treatment of maxillary anterior teeth with diastemata.

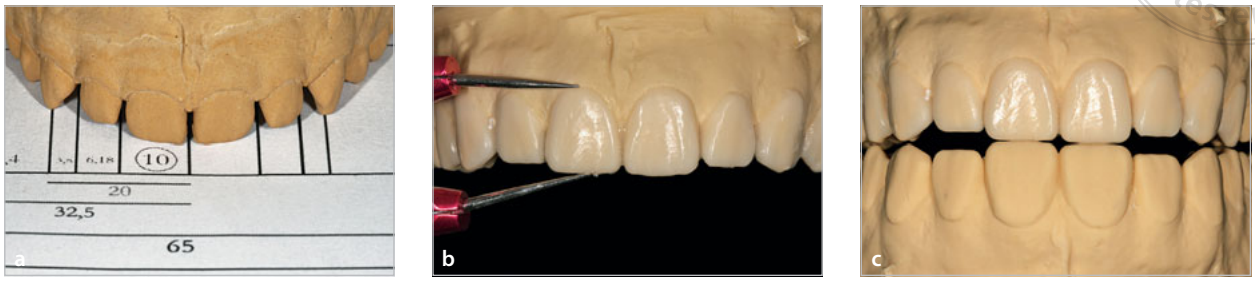
CASE PRESENTATION

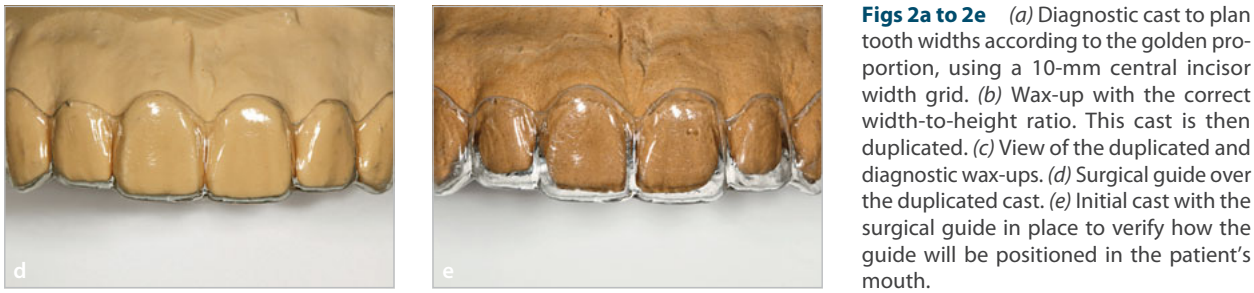
A 21-year-old man was referred for dental esthetic treatment because he was dissatisfied with his smile. Diastemata and short clinical crowns were observed during clinical examination. Also, the gingival margins of the central and lateral incisors were coronally positioned in relation to the canines (Fig 1). Radiographs and study casts were also obtained.

This initial cast was duplicated and mesiodistal widths of the maxillary anterior teeth were determined by means of wax-ups following golden proportion parameters, determining a regressive proportion of the maxillary teeth arrangement in the anterior view (Fig 2a). Based on this principle, central incisor-to-lateral incisor width and lateral incisor-to-canine width were repeated in the golden proportion (1.618:1) when the patient is viewed from the front.[4] A golden proportion grid with a central incisor width of 10 mm was selected based on the anterior segment of the smile (midline to the cusp tip of the canine) and buccal corridor width. Based on the widths of all anterior teeth, determined by the golden proportion, adequate crown heights were calculated at the width-to-height ratio of 0.75:0.78. The casts were mounted in a semi-adjustable articulator for diagnostic wax-up, for correct determination of crown height by means of veneer placement or periodontal surgery. Progressive wax-up was done initially in the canines until functional occlusion was achieved, then the remaining maxillary anterior teeth were waxed up in the incisal edge. To obtain the correct width-to-height ratio, a simulated gingival procedure was performed in the cast, and the wax-up was finished (Fig 2b).

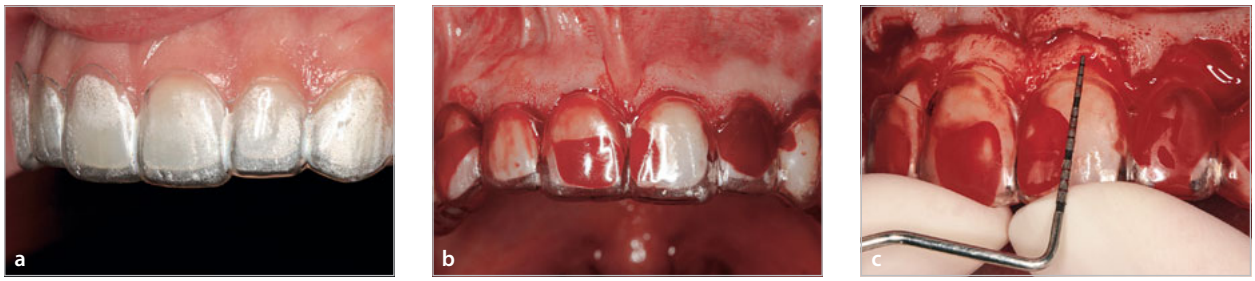
This wax-up was then duplicated to create a gingival surgical guide (Figs 2c and 2d). The first (initial) and third (duplicated cast after wax-up) casts were sent to the periodontist – the first cast was used to determine the fit of the surgical guide in the mouth, and the third cast served to verify the final result.

Gingivectomy was performed using the surgical guide to achieve the desired gingival margin position. Up to 3 mm of bone on each tooth were removed, improving the width-to-height ratio of dental crowns (Fig 3). After 1 week, sutures were removed. Dental prophylaxis was performed 30, 60, and 90 days after surgery.





Figs 2a to 2e *(a)* Diagnostic cast to plan tooth widths according to the golden proportion, using a 10-mm central incisor width grid. *(b)* Wax-up with the correct width-to-height ratio. This cast is then duplicated. *(c)* View of the duplicated and diagnostic wax-ups. *(d)* Surgical guide over the duplicated cast. *(e)* Initial cast with the surgical guide in place to verify how the guide will be positioned in the patient's mouth.



Figs 3a to 3c *(a)* Surgical guide properly positioned in the patient's mouth for try-in and verification of new length and axial contouring of the soft tissue profile. *(b)* During periodontal surgery, the incision was made according to the surgical guide. *(c)* Determination of the bone level as a reference for osseous recontouring. Bone was removed up to 3 mm from the position of the guide on each tooth according to the planned cast.

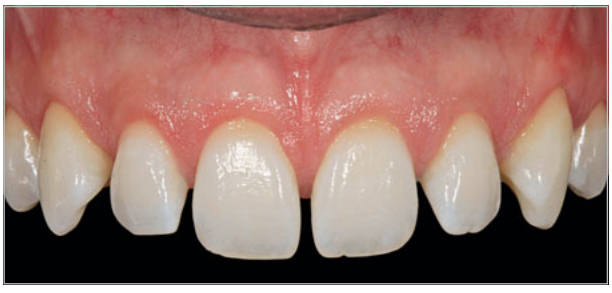
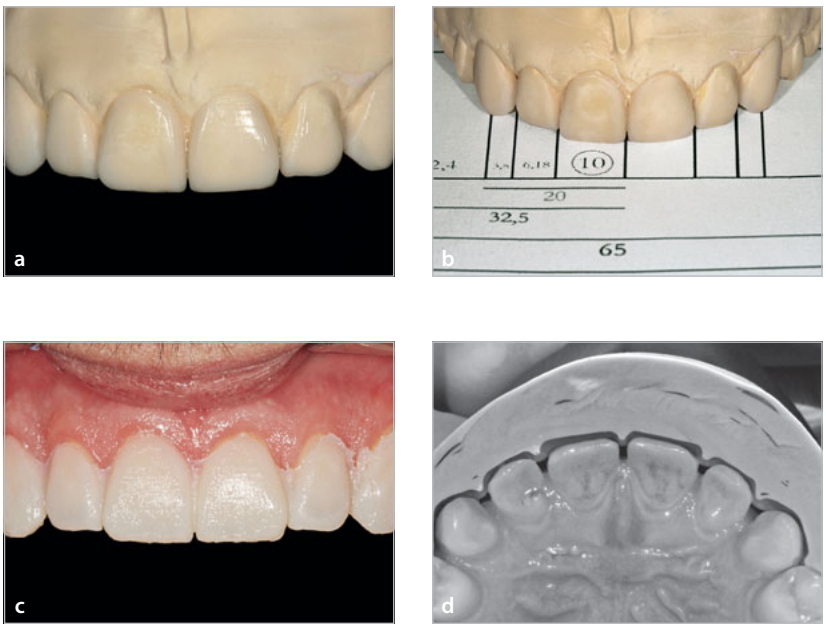


Fig 4 Postoperative image 3 months after periodontal recontouring. Note the final gingival margin and axial contouring.

During this period, home bleaching was performed with 10% carbamide peroxide for 2 weeks (Whiteness Perfect; FGM) (Fig 4). Ninety days after surgery, new casts and wax-ups maintaining the width-to-height ratio of maxillary anterior teeth were made because periodontal wound healing produced differences from the initial cast. This would facilitate the fit and luting of the ceramic veneers.



Figs 5a to 5d *(a and b)* After 3 months, a new wax-up was created for diagnosis according to the golden proportion and width-to-height ratio of 0.75:0.78. *(c)* Mock-up made with bis-acryl resin. *(d)* Wear guide made with polyvinyl siloxane over the wax-up in position during preparation for the assessment of the restoration material thickness.

Fig 6 Close-up view of anterior teeth after minimally invasive preparation. Finish line margins are supragingivally positioned.

A bis-acryl resin (Structur 3, Voco) was inserted into a silicon guide obtained from this new wax-up, and a mock-up was made to assess the size and form of the maxillary anterior teeth. A reduction guide was made with polyvinyl siloxane (Variotime; Heraeus-Kulzer) over the wax-up and was used during preparation for the assessment of the restoration material thickness (Fig 5). The final preparations can be observed in Fig 6. An impression was made with displacement cords (Pro-retract 000, FGM) and polyvinyl siloxane material. Provisional restorations were made with bis-acryl resin (Structur 3, Voco). Minimum thickness lithium disilicate glass-ceramic (IPS e.max Press, Ivoclar Vivadent) veneers were fabricated for the six maxillary anterior teeth.

The veneers were etched with 5% hydrofluoric acid (Porcelain Etchant, FGM) for 20 seconds, washed, dried, and silane coupling agent was applied for 1 minute (Prosil, FGM). One thin coat of the adhesive (Ambar, FGM) was applied and not polymerized. The teeth were etched with 37% phosphoric acid for 30 seconds, washed, and dried. The same adhesive system was applied onto the tooth surface. The veneers were bonded with a light-cured resin cement (AllCem Veneer E-bleach, FGM). The light polymerization was performed with a LED device (Radii-cal, SDI) for 40 seconds. Restorations were then checked for occlusal interference and subgingival excess (Fig 7). The final photographs show the esthetic outcome obtained following the presented protocol with two wax-ups,

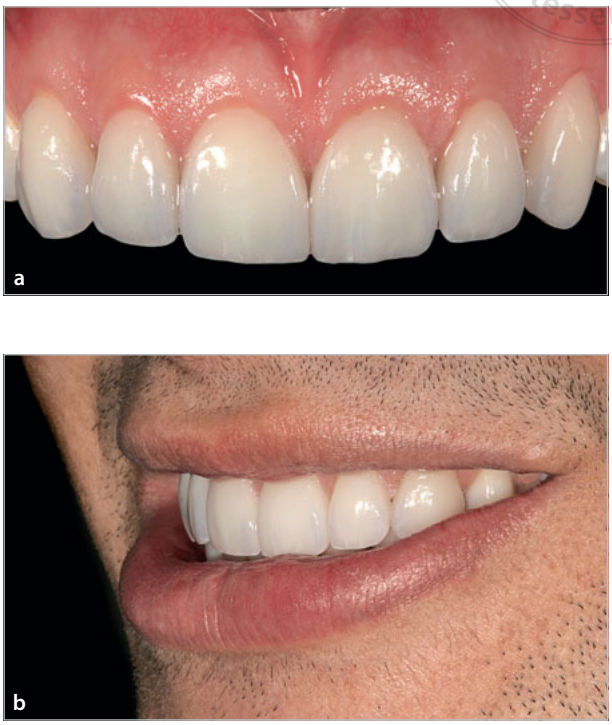
based on the golden proportion and width-to-height ratio of 0.75:0.78.

DISCUSSION

Since the introduction of the golden proportion in dentistry by the articles of Beder,[7] Lombardi,[4] and Levin,[3] this theory has been commonly used for the evaluation of symmetry, dominance, and proportion of anterior teeth during esthetic dental evaluation. In the present case, the golden proportion was used to guide dental remodeling to harmoniously reestablish the width of the anterior teeth in the frontal view. Rosenstiel et al[5] demonstrated that a 0.75:0.78 width-to-height ratio for central incisors is an acceptable proportion for anterior esthetics.

Cosmetic remodeling for the establishment of new mesiodistal widths and cervical-incisal heights for maxillary anterior teeth can be achieved by the use of ceramic veneers, as described, or by composite resin as reported by da Cunha et al.[8] Periodontal health after the application of thin porcelain laminate veneers can be maintained or improved, with ceramic properties providing adequate resistance to support anterior and lateral guidance in the present situation, based on their optical properties and good adhesion to tooth structure.[9]

An interdisciplinary approach has been well-described as an important factor for conservative and predictable results when restoring esthetically compromised anterior teeth.[10,11] In the present case, an interdisciplinary approach involving periodontics was required to adequately reestablish the smile. Periodontal health is essential before, during, and after any restorative treatment. Before treatment, oral instruction and prophylaxis were performed to facilitate impression taking and surgical procedures. Monthly dental prophylaxis can aid the process of wound healing and maintains the patient's periodontal health during treatment. The new wax-up obtained 90 days after the surgical procedure is fundamental to improve marginal fit in the provisional phase and to facilitate the cementation protocol. Additionally, a personalized emergence profile has to be established, resulting in improved periodontal health over time.[12]



Figs 7a and 7b *(a)* Anterior teeth after placement of minimum thickness lithium disilicate ceramic veneers. Note soft tissue health and teeth proportion. *(b)* Final aspect of the smile.

The resolution of clinical cases considering dental and gingival esthetics can be more predictable and provide better outcomes. In this case, the use of reverse restorative planning, ie first determining the adequate crown width and height (based on the golden proportion and width-to-height ratio of 0.75:0.78) and then performing the periodontal surgery, facilitated the smile esthetic rehabilitation, and can be considered a simple and secure technique.

CONCLUSION

It can be concluded that the protocol described in this report using reverse planning, the golden proportion, and a width-to-height ratio of 0.75:0.78 to obtain two wax-ups and a surgical guide helped to achieve the best gingival and dental esthetic results.

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