

CASE REPORT

Complex aestheticss treatment of six maxillary anterior teeth with smile design and deep bite correction

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ABSTRACT

Dental trauma mostly damages the maxillary anterior teeth, affecting the individual's esthetics, functionality, and psychological well-being. Restorative dentistry treatment is required to obtain a natural appearance based on the smile design approach. The aim of this report is to characterize the procedure of complicated cosmetic restoration of the six maxillary anterior teeth, which results in straighter and more beautiful natural-looking smiles. A 32-year-old male patient presented with multiple crown fractures in the anterior maxillary teeth, resulting in an unaesthetics smile. The patient also had a deep bite. A comprehensive aesthetics dental treatment was carried out. The dental treatment plan had to be carefully executed by considering several factors such as dental convexities and contours, re-establishment of function, and esthetics. Smile design should always be approached as a multi-factor decision-making, which enables the doctor to treat patients using a personalized and interdisciplinary approach.

Keywords: aestheticss; deep bite; restoration; smile-design

INTRODUCTION

Dental trauma to the maxillary incisors is fairly common, and the treatment plan is often influenced by the level of the fracture line, occlusion, and prognosis. When the fracture involves dentine as well, larger pulps and wider dentinal tubules, exposed dentine can therefore result in damage to the pulp. Bacteria can easily grow on the exposed dentine surface and can cause pulpal inflammation, which may lead to pulp necrosis.¹ The teeth with fracture necrosis need root canal treatment and restoration. Restorative dentistry treatment is needed to achieve natural appearance based on the principle of smile design. Some cases may require a multidisciplinary approach in order to improve their functional and esthetic outcomes,² which are dependent on careful consideration of the shape of the face and head and the volume, size, ratio, shape, texture, pattern of placement, and color of the teeth. Other important factors may include the health and appearance of the soft tissue and gums, the gingival line, the smile line

and width, the relationship between the lower lip and upper-incisor line, dark spots at the corners of the mouth, and the zenith point.³

METHODS

A 32-year-old male patient came to the conservative dentistry clinic at Universitas Gadjah Mada with a complaint of dental trauma caused by a traffic accident about 6 months previously. The patient underwent a dental check-up and root canal treatment 4 months after the accident. However, the patient presented with pain in the same tooth a week ago. The patient had no history of systemic diseases and allergies to drugs or food. Patient consent was obtained prior to the treatment. The patient signed the informed consent form and the patient records (including impression, radiographs, and photos) were collected. Clinical and radiographic examination revealed a non-complicated crown fracture in teeth 11 and 13, teeth 12 and 21 previously treated, with asymptomatic apical periodontitis, and tooth 22

with asymptomatic irreversible pulpitis (Figures 1-2). According to the results of the saliva test, the patient may have had a moderate risk of developing caries.

Scaling and oral hygiene instructions were given in phase 1 of the treatment to improve the patient's oral hygiene habits and gingival health and also to prevent further dental issues. Diagnostic casts and pre-operative photos were used to analyze the patient's smile. The analysis showed that (Figure 3) the facial and dental median lines coincided, and the horizontal facial line was parallel to the incisal edge of the anterior maxillary teeth. The patient also had a convex facial profile, and the lower third of the face looked short. Dento-facial analysis showed that (1) the upper lip smile line (yellow line) was under the

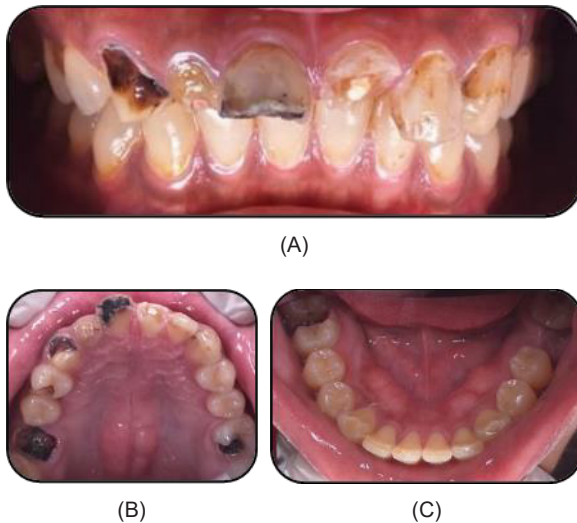


Figure 1. Pre-treatment photograph (A) frontal view of patient's occlusion; (B) occlusal view of maxillary teeth; (C) occlusal view of mandibullary teeth



Figure 2. Pre-operative OPG radiograph

gingival margin, (2) the lower lip smile line (red line) was unbalanced in relation to the incisal plane of the anterior maxillary teeth, and (3) the lip lines were not symmetrical during active smiling. The distance between pupils and the corner of the lips was 69 mm. Based on Willis' method used for the measurement of vertical dimension, the distance between pupils and the corner of the lips was the same as the distance between nose base and the chin tip. As the free way space is 2-4 mm, the distance between the base of the nose and the tip of the chin should be 65-67 mm. In the patient, the distance between the nose base and the chin tip was 65 mm, so the correction of the palatal bite could be accomplished by increasing the vertical dimension equal to the minimum free way space by adding 2 mm on the occlusal posterior teeth.

The distance of inter-canine was 35 mm, distance between right canine and median line was 17.5 mm, distance between left canine and median line was 17.5 mm, mesiodistal widths of teeth as seen from the front: lateral left incisor (22) was 6.5 mm, left canine (23) was 7 mm and the dental median line was coincided with the facial median line. As per the golden proportion theory, the available space for teeth from right canine to right incisor was 17.5 mm, and the proportions of each tooth between canine, incisor lateral and incisor central was 0.618: 1: 1.618. The width of central incisor was 8.75 mm, lateral incisor was 5.4 mm and canine was 6.4 mm (Figure 4C).

The widths of 11 and 21 (contact mesiodistal) under dento facial analysis was 1/16 of the distance from the zygomatic prominence through the imaginary central line of the face. The zygomatic prominence distance was 125 mm so the width of 11 and 21 were 7.8 mm (125/16). The ideal height for teeth 11 and 21 is 1/16 of the distance between the menton and glabella. Glabella menton distance was 145 mm so the ideal height of teeth 11 and 21 was 9.06 mm (145/16). Based on the 1/16 theory, the ideal width for teeth 11 and 21 was 7.8 mm, while the available space under the golden proportion theory was 8.75 mm. Tooth placement was based on the available space after selective contouring



Figure 3. (A). Frontal view of patient's face, the facial and dental median lines coincided, the horizontal facial line was parallel to the incisal edge of the anterior maxillary teeth; (B) sagittal view of patient's face, he patient had a convex facial profile; (C) the lower third of of the face looks short

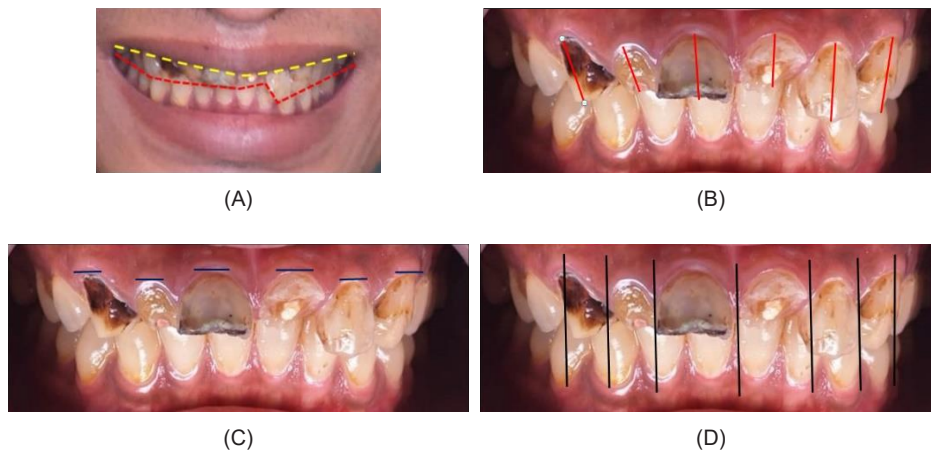


Figure 4. (A) the upper lip smileline (shown in yellow) was under the gingival margin (2) the lower lip smile line (shown in red) was unbalanced in relation to the incisalplane of the anterior maxillary teeth; (B). Dental axes of anterior maxillary teeth; (C) Space analysis (red line- mesio-distal width ofthe tooth; blue line - inter-canine distance for the anterior maxillary teeth); (D) Gingival zenith position for the anterior maxillary teeth

so that the teeth did not look too wide and appeared masculine.

In phase 2 of the treatment, root canal treatment was performed by crown down technique using ProTaper Next Rotary to a #X3 on teeth 11, 13, 22. In between and in the end of the preparation, root canal was irrigated using 2.5% NaOCl, followed by 17% EDTA (Largal Ultra, Septodont, Cedex, France), and ended with 2% chlorhexidine gluconate (Bisco,USA). The root canal was obturated with epoxy resin-based sealer (AH plus, Dentsply) and gutta-

percha (Dentsply-Maileffer). A radiograph was taken to verify the hermetic of root canal obturation (Figure 5).

At the two-week follow-up examination, an occlusal splint was made with an initial thickness of 1.5 mm, inserted into the posterior mandible and used daily for 1 month to correct deep bite (Figure 6A). A month later, the occlusal splint was replaced with another with a thickness of 2 mm and was used daily for 2 months. Eight months later, a bite record was made. The patient bit the putty until the distance between the nose base and the chin



Figure 5. the teeth have been obturated

tip reached 67 mm, followed by casting maxilla and mandibular to make the mock-up (Figure 6B). This mock-up was sent to the laboratory to make a silicone guide for restoring the posterior teeth. The silicone guide was given a hole on 2 opposite cusp (Figure 6C). The occlusal surface of the teeth 34, 35, 37, 44, 45, 47 were reduced by 0.5 mm thickness and beveled using flame-shaped diamond bur (Figure 7A). The prepared teeth were cleaned, the enamel surfaces were etched with phosphoric acid, and then the teeth

were washed and dried. The application of bonding material (single bond, 3M, USA) adhesive used a regular-sized micro brush, and then light-cured as per the manufacturer's instructions. A silicone guide was attached to the teeth, with the help of the guide, and the occlusal of teeth 34, 35, 37, 44, 45, 47 were built using single fill composite system (Sonic fill 2, Kerr) (Figures 7B-C).

Three days afterward, a customized glass fiber (Everstick, GC) was inserted and cemented by fiber reinforced dual-cure resin cement (Built IT-FR, Pentron) into tooth 11 (21 mm in length), tooth 12 (18.5 mm in length), tooth 13 (23 mm in length), tooth 21 (19.5 mm in length), and tooth 22 (22 mm in length) (Figure 8A). Core buildups for teeth 11, 12, 13, 21, 22 were made using fiber reinforced dual-cure resin (Built IT-FR, Pentron) (Figure 8B). The incisal surface of tooth 23 was reduced, and the labial, proximal and palatal were prepared with two grid torpedo high speed to form chamfer finish line. The finishing procedure used an extra-fine finishing bur, then the maxilla and mandibula were cast with double-arch impression, and finally a bite record was taken using putty to make lithium disilicate crowns in the laboratory.

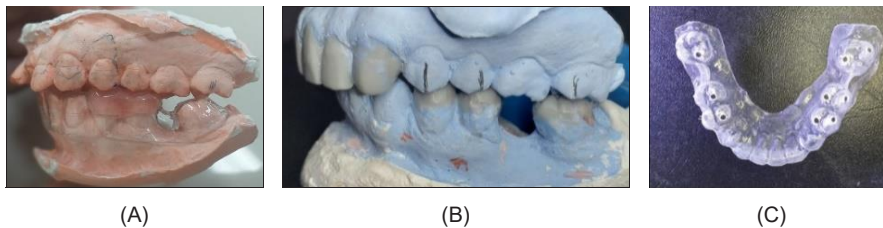


Figure 6. (A) Occlusal spint; (B) mock-up; (C) silicone guide

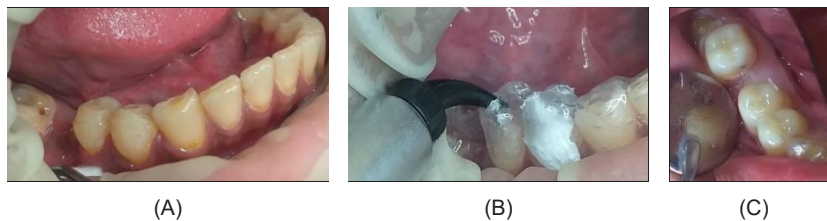


Figure 7. (A) The teeth 34, 35, 37, 44, 45, 47 were prepared; (B) silicone guide was attached to the teeth, with the help of the guide, the occlusal of teeth 34, 35, 37, 44, 45, 47 were built using single fill composite system (Sonic fill 2, Kerr); (C) the teeth have been restored



Figure 8. (A) insertion glass fiber post; (B) core built up

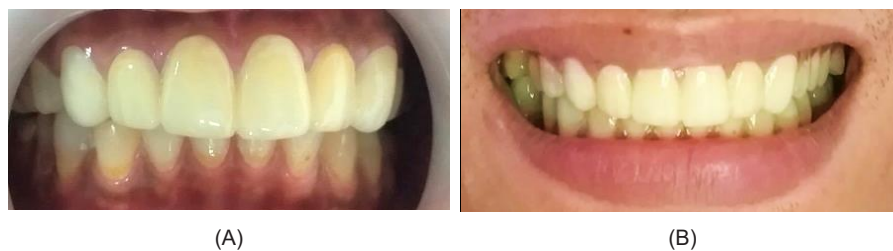


Figure 9. (A) the crowns were cemented on the teeth 13, 12, 11, 21, 22, 23; (B) The follow-up visit after 12 months showed that the the restoration were still good

A week afterward, the lithium disilicate crowns were cemented on teeth 13, 12, 11, 21, 22, 23 using self-adhesive resin cement (RelyX U200, 3M ESPE). The restorations were checked for contour, embrasure, proximal contact area and any traumatic occlusal adjustment (Figure 9A). The follow-up visit after 12 months showed that the restorations were still good (Figure 9B).

DISCUSSION

Dental esthetics is a primary concern for many patients,⁴ and dental trauma involving both enamel and dentin most frequently occurs in the maxillary central incisors. This case report presents a conservative, time-saving, and an inexpensive treatment option for this common esthetic problem.^{5,6} Dental proportion is closely related to facial morphology, and is an essential part of creating an esthetically pleasing smile. The width to length ratio of the center of the tooth should be approximately 4:5 (0.8–1.0), with the width being approximately 75–80% of the length. The shape and location of the facial median line also influence the appearance and placement of the laterals and canines. The golden proportion

(GP) concept was first introduced by Lombardi in an attempt to achieve balance between the dentition and the facial profile.⁷ An important point to note here is that it is not the actual size, but instead the perceived size when viewed from the facial aspect that these proportions are based on. As per this principle, the width of each anterior tooth should not be greater than 60% of the width of the adjacent tooth (the mathematical ratio being 1.6:1:0.6)⁸ when viewed from the facial aspect. In the current case, the proposed GP ($1/1.618 = 0.618$) resulted in the visible (perceived) width of the canine being 62% (0.618) of the lateral incisor, and the visible width of the lateral incisor being 62% (0.618) of the central incisor.

As post and core restoration of the anterior teeth were also indicated for better results, and a fiberglass post was selected due to its increasing popularity.⁹ There are several factors that must be taken into consideration when designing a smile. The first is tooth components, such as dental midline, incisal length, tooth dimensions, zenith points, axial inclinations, interdental contact area and point (ICP), incisal embrasure, sex, personality, and age. Other factors are symmetry components and soft tissue components, i.e.

gingival health, gingival level and harmony, interdental embrasure, and smile line.⁷

Anatomic wax-up (mock-up) represents one of the most vital steps in the process of redesigning a patient's smile⁷ as it provides an opportunity to correct temporary restorations and verify final restorations, including intra-oral occlusion, length of the restoration, and relationship with the neighboring teeth and gingiva, position of lips at rest or while smiling, phonation, and harmony with the patient's face. As all these parameters can be visualized and experienced by the patient immediately, it is highly recommended that the clinician takes the patient's opinion of the mockup into consideration.¹¹ The fundamental criteria for esthetic analysis should include facial, dentogingival, and dental esthetics.¹² The restoration must restore the initial function of the teeth, such as aestheticss, phonetics, and mastication and maintain healthy protection functions of the tooth-supporting tissues.¹³ A smile design is a dental procedure that artistically creates straighter and beautiful natural-looking smiles.¹⁴ Correction of these dental problems can produce dramatic changes in appearance, which often result in improved confidence, personality, and social life.¹⁵

CONCLUSION

The success of restorative treatment requires thorough execution of the dental treatment plan, paying attention to elements such as dental convexities and shapes, re-establishing function, and aesthetics. This is necessary to obtain the desired outcome. Smile design should always be approached as a multi-factor decision-making, which enables the doctor to treat patients using a personalized and interdisciplinary approach. In order for the clinician to achieve these objectives, they need to pay close attention to the patient's expectations in terms of phonetics, biomimetics, and aesthetics.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

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