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(CASE REPORT)

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Complex Aesthetic Treatment for Smile Rehabilitation with Supernumerary Tooth, Tooth Fracture, and Dental Shape Anomalies on Upper Anterior Teeth: A Case Report

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Abstract

Background: Facial and dental harmony play a crucial role in psychological well-being and self confidence. Aesthetic discrepancies in the maxillary anterior region, including supernumerary teeth, crown fractures, and unesthetic crown morphology, require rehabilitation while preserving oral functions. Digital Smile Design (DSD) facilitates complex aesthetic treatment by integrating macroesthetic and microesthetic principles in smile design planning.

Purpose: This case report presents step-by-step of complex aesthetic treatment in a male patient with a supernumerary tooth, crown fractures, and unesthetic crown morphology.

Case: A 23-year-old male with untreated dental trauma from an accident one year ago. Intraoral examination revealed a supernumerary tooth labeled 22(2) between teeth 21 and 22. Crown fractures in teeth 11, 21, and 22(2) were diagnosed as pulp necrosis and asymptomatic apical periodontitis. Tooth 12 exhibited an incisal taper, while tooth 22(1) had a more rounded mesio-incisal than disto-incisal edge. The patient reported diminished self confidence and sought treatment.

Case Management: Teeth number 11, 21, and 22(2) were managed with root canal treatment, followed by fiber post insertion and lithium disilicate crown. Tooth 12 underwent direct veneer restoration, while tooth 22(1) received an indirect veneer restoration using lithium disilicate. Aesthetic optimization was achieved through two-dimensional photographic analysis and digital impressions, with specialized software simulating the ideal tooth shape and size following macroesthetic and microesthetic principles.

Conclusion: Complex aesthetic rehabilitation with Digital Smile Design (DSD) and lithium disilicate restorations optimizes aesthetics and function.

Keywords: Complex Aesthetic Treatment; Supernumerary Tooth; Crown Fracture; Unesthetic Crown Morphology; Good Health and Well-Being.

1. Introduction

Demand for aesthetic enhancement and facial-dental harmony has increased, significantly influencing the development of dental materials, instruments, and technology [1]. An aesthetically pleasing smile must also consider dental and gingival health, requiring proper treatment before aesthetic procedures. Digital Smile Design (DSD) protocol enables

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dentists to analyze facial structure, smile, teeth, gingiva, space, and dentofacial relationship using facial and intraoral photographs in occlusion from frontal and sagittal aspects, as well as dental impressions [2]. Treatment can involve collaboration across endodontics, restorative dentistry, periodontics, oral surgery, and prosthodontics.

One aesthetic concern is the presence of supernumerary teeth, a dental anomaly that can occur in permanent dentition. The primary cause is the continued proliferation of the dental lamina, leading to the formation of a third tooth germ [3]. Supernumerary teeth are more commonly found in the maxilla [4] and occur unilaterally or bilaterally, with a 1.37 times higher risk in males than in females [5]. Additional teeth can compromise anterior dental aesthetics and impact a patient's appearance. Additionally, anterior tooth fractures due to trauma and unaesthetic maxillary crown morphology can affect both appearance and psychosocial well-being. Maxillary anterior crown morphology plays a crucial role in smile aesthetic. Central incisors are typically square, tapering, or ovoid, with a greater mesiodistal width than cervicoincisal height, whereas lateral incisors have a smaller mesiodistal width and a more rounded distoincisal angle. Maxillary anterior teeth are considered aesthetic based on mesiodistal and cervicoincisal width measurements. The ideal and proportional ratio for maxillary central incisors is 75-80% [2]. The ideal percentage for maxillary anterior teeth is determined by comparing the mesiodistal width of each tooth to the total width of the anterior segment (from the distal edge of the right canine to the distal edge of the left canine): central incisors 25%, lateral incisors 15%, and canines 10%.

Teeth with pulp necrosis require root canal treatment to eliminate bacteria and infected necrotic tissue. This treatment consists of biomechanical preparation, sterilization, and root canal obturation. The primary goal is to clean the infected pulp cavity, remove toxic debris, and shape the root canal to accommodate a filling material that completely seals the canal. Endodontic therapy must also ensure adequate canal sealing to prevent fluid accumulation and avoid creating a favorable environment for microorganism bacterial infiltration growth or from the bloodstream [6].

Complex aesthetic treatment is required to restore dental function and achieve optimal aesthetic outcomes. Advances in treatment techniques and restorative materials have led to the development of aesthetic post materials, such as zirconia posts, carbon fiber posts, glass fiber posts (translucent quartz fiber), and woven fiber posts (polyethylene fibers). Restorative materials like lithium disilicate and zirconia offer biocompatibility, mechanical and aesthetic reliability, minimal invasiveness, and precise marginal fit with the aid of digital dentistry. Therefore, maxillary dental treatment must consider aesthetic factors to enhance patient confidence and emotional well-being.

Digital Smile Design (DSD) can be used to plan a smile design by considering masticatory system harmony, enhancing aesthetic visualization and diagnosis, and improving communication between patients, dentists, and dental laboratories, ultimately increasing treatment success [7,8]. This article presents a case report on complex aesthetic treatment of maxillary anterior teeth with crown fractures, a supernumerary tooth, and unesthetic crown morphology, utilizing Digital Smile Design to optimize dental function and aesthetic.

2. Case

A 23-year-old male presented with the complaint of broken upper front teeth due to a traffic accident 1 year ago (Figure 1). The teeth were painful for a few days after the accident and have not been treated previously. The patient wants treatment for his teeth because he feels insecure about their condition. He reports no history of systemic diseases.

On intraoral examination, teeth 11 and 21 were fractured, overbite 2mm, overjet 2 mm, and the relationship of posterior teeth was cusp to fossa (Figure 2). Saliva tests, including hydration test: 20 seconds (green), viscosity: watery (green), pH 7.2 (green), quantity: 5.5 ml (green), and buffer capacity: 10 (green), indicated that the saliva test was normal. On objective examination, a supernumerary tooth was found in the lateral incisor area, referred to as tooth 22(2), with the upper jaw midline shifted 4 mm to the right. Teeth 11, 21, and 22(2) showed Ellis Class IV fractures. The crown of tooth 12 appeared pointed in the incisal area, and the crown of tooth 22(1) was more rounded at the mesio-incisal side compared to the disto-incisal side, making it unaesthetic (Figure 3 and 4). Vitality tests showed that teeth 11, 21, and 22(2) were non vital, while teeth 12 and 22(1) were vital. Percussion tests on teeth 11, 21, and 22(2) were negative, bite test was negative, and the gingiva around the teeth appeared normal. Radiographic examination of teeth 11, 21, and 22(2) showed crown fractures extending to the pulp chamber and a diffuse radiolucent image in the apical area (Figure 6). Based on intraoral examination, vitality tests, and radiographs, the diagnosis for teeth 11, 21, and 22(2) is pulp necrosis accompanied by asymptomatic apical periodontitis. The diagnosis for teeth 12 and 22(1) is normal pulp.

Figure 1 Clinical photo of the smile in the frontal view before treatment without cheek retractor

Figure 2 Clinical photo of the occlusion in the frontal view before treatment with cheek retractor

Figure 3 Clinical photo of the right buccal side view with class I occlusion

Figure 4 Clinical photo of the left buccal side view with class I occlusion

Figure 5 Clinical photo of the teeth from the occlusal view of the upper jaw

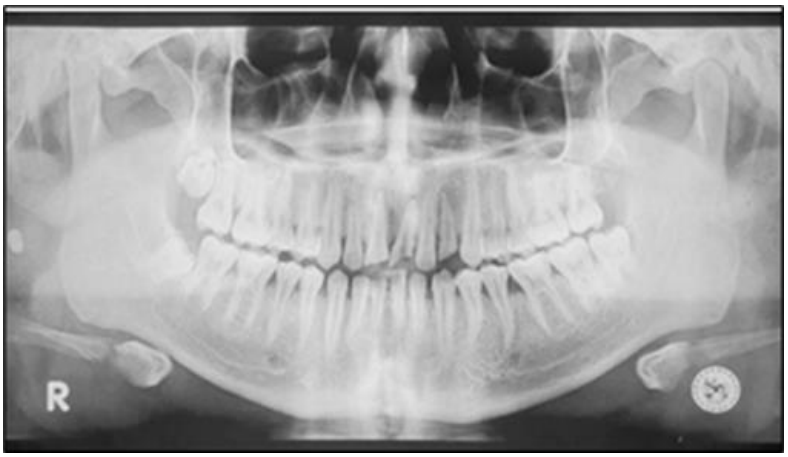

Figure 6 Panoramic radiography

3. Case Management

At the first visit, a thorough Dental Health Education, subjective, objective, and radiographic examinations were carried out. Information regarding the treatment plan was provided to the patient, and consent to proceed with the treatment

was obtained through informed to consent and informed consent. Impressions for study models were taken using irreversible hydrocolloid. Macroesthetic analysis consists of facial analysis and smile analysis. Facial analysis from the frontal plane revealed an oval face shape. The vertical and horizontal facial proportions indicated facial symmetry. The median facial line and midline were deviated by 4mm. Facial analysis in the horizontal direction along the horizontal line consists of the trichion, glabella, subnasale, menton, commissural line, and interpupillary line. The interpupillary horizontal line is parallel to the bizygomatic line and the commissural line. Frontal directional facial analysis with a vertical direction consists of the midline and the line from the eye pupil to the corner of the mouth (right and left) (Figure 7). Sagittal directional facial analysis consists of the Steiner line and the Ricketts line. The Steiner line is formed by combining the line from the glabella to the subnasale and the line from the subnasale to the menton, resulting in an angle of 180 degrees. The Ricketts line extends from the pronasale to the pogonion, with the upper lip positioned 2 mm behind the line and the lower lip aligned at 0 mm, the interpretation result obtained is normal. The obtained facial profile angle is 167 degrees.

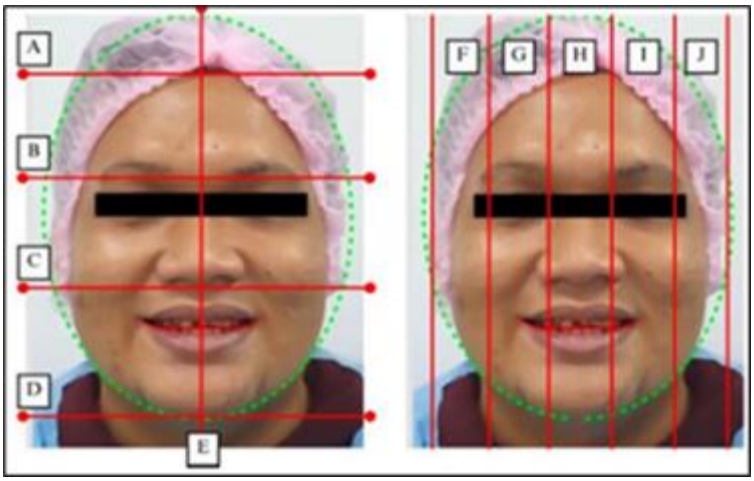

Figure 7 Facial analysis from the frontal aspect horizontal (A) Trichion; (B) Glabella; (C) Subnasale; (D) Menton; (E) Midline; (F, J) Area between the base of the ear and the helix of the ear; (G, I) Representation of eye width; (H) Area between the inner canthi of the eyes. Didapatkan simetri

Figure 8 (A) Steiner S-Line (B) Ricketts E-line

Figure 9 Normal facial profile angle (167°)

Based on the smile analysis, it was found that the patient's smile line falls under the medium smile line category, no lip contraction with the interdental gingival area being almost invisible and the incisal plane of the anterior teeth not discernible due to crown fracture.

Normally, the interdental gingival area is visible by 1-2 mm when smiling, and the incisal plane of the anterior teeth touches the lower lip (Figure 9). Based on the DSD analysis, crown lengthening treatment is not required.

Figure 10 Clinical appearance of the patient's lips during an active smile

Microesthetic analysis consists of dental analysis, gingival analysis, space analysis, dentofacial analysis, and the golden proportion. In the dental analysis, it was found that the central incisors' ratio for tooth 12 is 57%, for teeth 11 and 21 is 75%, for tooth 22(1) is 61%, and for tooth 22(2) is 57% (Figure 5a). It was also noted that the axis of teeth 11, 12, 22(1), and 22(2) is tilted toward distal, while tooth 21 is tilted toward mesial, indicating that the tooth axis is not ideal for teeth 11, 12, 21, 22(1), and 22(2). The Interproximal Contact Area (ICA) between teeth 13 and 12 is 30%. Meanwhile, the ICA between tooth 12 and tooth 11, between tooth 11 and tooth 21, between tooth 21 and tooth 22 (1), and between tooth 22 (1) and tooth 22 (2) cannot be determined due to the presence of a fractured crown. The Interproximal Contact Point (ICP) was found to be not ideal and cannot be determined due to the presence of a fractured tooth crown and abnormalities in the tooth crown shape (Figure 9). A fracture was found in teeth 11, 21, and 22(2). Flossing contact points were present only in tooth 12 and 13. There was an anatomical crown anomaly in teeth 12 and 22(1), and the W/H ratio was not obtained for the fractured teeth.

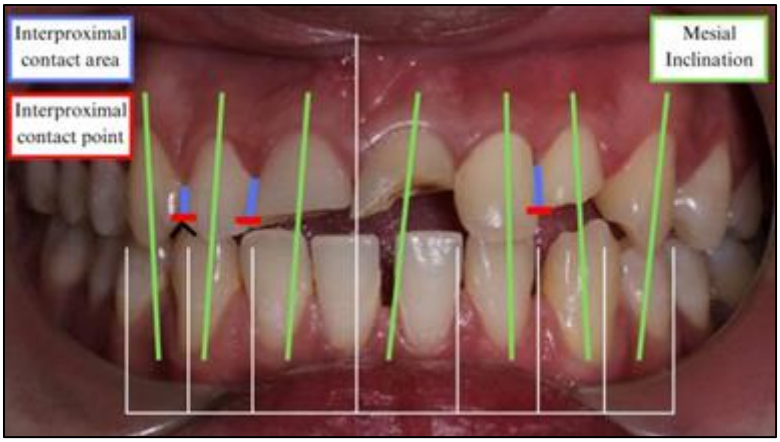

Figure 11 Aesthetic criteria that need to be corrected include central incisor width/height ratio, mesial inclination, incisal embrasure (Interproximal Contact Area (ICA) and Interproximal Contact Point (ICP))

Based on the gingival analysis, the color of the gingiva is coral pink (normal), the gingival texture is stippled (normal), the gingival shape is characterized by rounded interdental papilla in the anterior region (normal), and the gingival consistency is soft in the anterior region (normal). The gingival zenith position of teeth 11 and 12 is not ideal. The gingival zenith position of teeth 12, 22(1), and 22(2) is not ideal. Meanwhile, the gingival zenith position of teeth 13 and 23 is not ideal (Figure 10). The gingival margin of tooth 11 appears more coronal than that of tooth 21, the gingival margin of tooth 12 appears more coronal than that of teeth 22(1) and 22(2), and the gingival margin of tooth 13 appears more apical than that of tooth 23, indicating that the gingival margin position is not aligned between the left and right maxillary anterior teeth (Figure 11). These findings do not indicate the need for crown lengthening treatment (Figure 10).

Figure 12 Position of the gingival zenith, gingival symmetry, and gum line margin height of the upper anterior teeth

Based on the space analysis, the intercanine distance is 44 mm, the distance from the caninus to the midline (right) is 19 mm, and the distance from the caninus to the midline (left) is 25 mm. The upper anterior teeth midline is shifted distally relative to the facial midline.

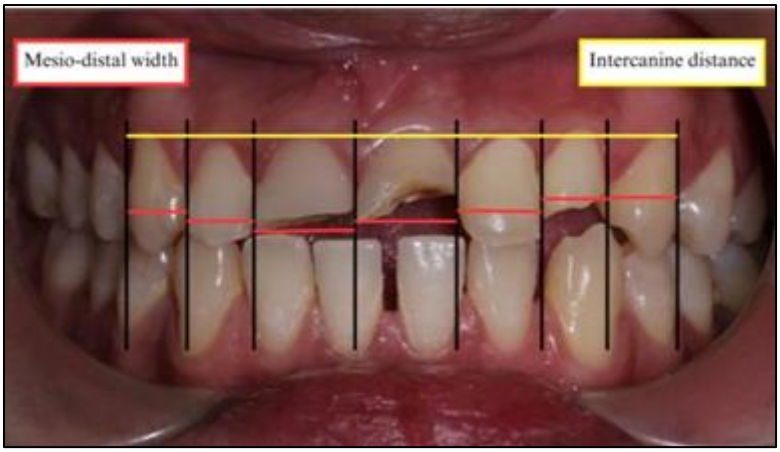

Figure 13 Analysis of the upper anterior dental space. The red line represents the mesio-distal width of the teeth, and the yellow line represents the intercanine distance

From the dentofacial analysis, the bizygomatic width was measured at 128 mm. The ideal width of teeth 11 and 21 is 1/16 of the bizygomatic distance, determined through the imaginary midfacial line. The ideal mesial distal width of teeth 11 and 21 is 8 mm, calculated from 1/16 of the zygomatic prominence to the imaginary midline of the face. The trichion-menton distance is 169 mm, and the ideal height of teeth 11 and 21 is 1/18 of the trichion-menton distance. The ideal height for teeth 11 and 21 is 10,5 mm, calculated from 1/18 of the distance between the trichion and menton (Figure 12). The measurement results for the ideal width and height of the teeth, based on the face, indicate that the tooth size is proportionate. The obtained dentofacial analysis result is 75%.

Figure 14 Dentofacial analysis from frontal view of the face, the white line indicates the trichion-menton distance, and the blue line indicates the inter-zygomatic prominence distance

The treatment plan for teeth 12, 11, 21, 22(1), and 22(2) will follow the golden proportion. Golden proportion yang ideal adalah C:I2:I1=0,617:1:1,618. Based on Digital Smile Design, the golden proportion width of tooth I1 is 8 mm, the golden proportion width of tooth I2 is 5 mm, and the golden proportion width of tooth C is 3 mm. (Figure 13). A wax up model was made and discussed with the patient to obtain their consent to proceed with the treatment. A 3D printed white resin model of the digital wax-up was created (Figure 14).

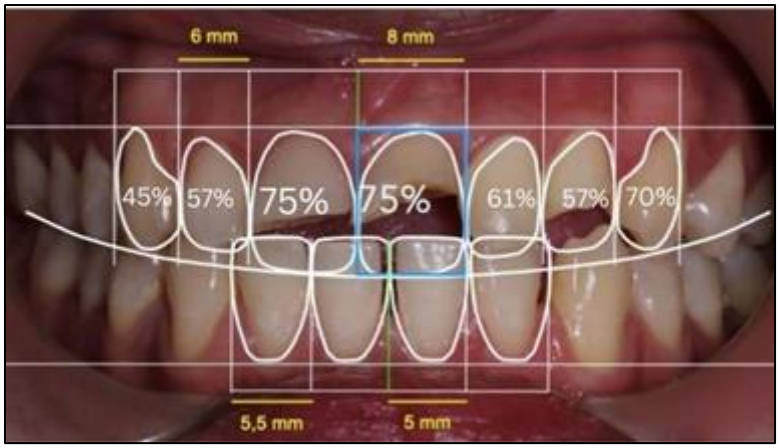

Figure 15 Design of the ideal size of teeth 13, 12, 11, 21, 22 (1), 22(2), 23 according to the tooth proportion

Figure 16 Restoration design according to the ideal size

Figure 17 Wax up model

For teeth 11, 21, and 22(2), root canal therapy was performed, followed by the insertion of a fiber post and a permanent crown made of lithium disilicate. Tooth 12 was restored with a direct veneer, and tooth 22(1) was restored with an indirect veneer using lithium disilicate material.

During the second visit, Saliva tests and shade taking were done, with the cervical color as A3 and incisal color as A2 (using the Ivoclar shade guide). Treatment was divided into two stages: endodontic treatment and restorative treatment. Endodontic treatment was performed on teeth 11, 21, and 22(2) with fiber post insertion and lithium disilicate crown, direct veneer for tooth 12, and indirect veneer for tooth 22(1). The procedure started with isolation using a rubber dam, followed by access opening using an endo access bur for teeth 11, 21, and 22(2) (Figure 6). After access opening, glide path was done using a K-File #10 (Figure 7) and working length measured with an apex locator (11: 21mm; 21: 19mm; 22(2): 19mm) (Figure 8). Apical gauging was done with a tug back on K-File #25 (Figure 9). The root canal preparation was done using a rotary file Protaper Next up to X2 (25/06) (Figure 10) and irrigation with

NaOCl 2.5% (Figure 11), distilled water, and EDTA 17% activated with a sonic endoactivator (Figure 12). The root canal is dried with endosuction and paper points (Figure 13). Once dry, a trial gutta-percha point was placed and confirmed with radiographs (Figures 14). Root canal medication was applied using Ca(OH)2 paste and a temporary filling was placed.

Figure 18 (a) Isolation of the working area, (b) Access opening for teeth 11, 21, and 22(2)

Figure 19 Root canal negotiation of teeth 11, 21, and 22(2)

Figure 20 Measurement of working length of teeth 11, 21, and 22(2)

Figure 21 Apical Gauging of teeth 11, 21, and 22(2)

Figure 22 Root canal preparation for teeth 11, 21, and 22(2)

Figure 23 Sonic activation of teeth 11, 21, and 22(2)

Figure 24 Trial gutta percha points for teeth 11, 21, and 22(2)

During the third visit, Anamnesis was taken, and the patient had no complaints. The temporary filling was intact, percussion test: negative, bite test: negative, and the gingiva around the teeth was normal. Treatment started with isolation using a rubber dam, followed by removal of the temporary filling. Final irrigation was done using EDTA 17% and NaOCl 2.5%, interspersed with distilled water at each irrigation fluid change, with sonic activation using an endoactivator, followed by drying. Root canal filling was performed with a single cone technique using gutta-percha points and resin-based sealer paste (Figure 15a). A temporary filling was applied, and the obturation was confirmed with radiographs (Figure 15b).

During the fourth visit, Anamnesis was taken, and the patient had no complaints. The temporary filling was intact, percussion test: negative, bite test: negative, and the gingiva was normal. Treatment continued with isolation using a rubber dam, removal of the temporary filling, and fiber post size matching for teeth 11, 21, and 22(2) using a template. After sizing, ⅔ of the gutta-percha point was removed using a peeso reamer, followed by root canal adjustment with a calibration drill on teeth 11, 21, and 22(2). A radiograph was taken for confirmation of fiber post placement (Figure 16). The fiber post was inserted with self-etch adhesive applied to the root canal, light-cured for 20 seconds. The fiber post was placed using dual-cure universal resin cement, and confirmation was made with a radiograph (Figure 17). Core build-up was performed using dual-cure composite, light-cured for 20 seconds (Figure 18). A mock-up was mounted and discussed with the patient for approval, also used as a guide for preparation. Tooth preparation was performed over the mock-up with a depth-cutting bur on teeth 11, 21, and 22(1) (Figure 19a). Veneer preparation was performed using the mock-up as a guide with depth-cutting bur on teeth 12 and 22(1) (Figure 19b). The mock-up was removed, and the preparation was checked on teeth 11, 21, 22(1), and 22(2) with a silicone guide based on the mock-up (Figure 20). Finishing of the preparation was done, followed by gingival management using retraction cord and shade taking using ND shade (ND 2) (Figure 21). Impressions of the upper jaw were taken using the double impression two-step technique with vinyl polysiloxane (Figure 22a), and the antagonist was also taken using irreversible hydrocolloid (Figure 22b). Bite registration was done using vinyl polysiloxane (Figure 22c), and temporary crowns and veneers were placed using bis-acryl material. Temporary crowns were placed on teeth 11, 21, 22(1), and veneers on tooth 22(2) (Figure 23).

Figure 25 (a) Root canal obturation of teeth 11, 21, and 22(2), (b) Radiographic view to confirm obturation

During the fifth visit, The temporary restorations were removed, and crown and veneer try-ins were performed using try-in paste in neutral shade (Figure 24). Occlusion, articulation, shape, color, proportion, restoration edges, and proximal contacts were checked before isolation with a rubber dam. The inner surface of the restorations and veneers was etched with 9% buffered hydrofluoric acid for 90 seconds, then rinsed and dried (Figure 25a). The inner surfaces were then coated with silane for 60 seconds (Figure 25b). Gingival management was done using retraction cord. The tooth surfaces were etched using 37% phosphoric acid for 20 seconds, rinsed, and dried (Figure 26a). Bonding was applied to the surfaces, followed by air spraying (Figure 26b), and light curing for 20 seconds (Figure 27). The insertion process began with the placement of the all-porcelain crown on teeth 11 and 21 using dual-cure resin cement in neutral shade, followed by tack curing for 1-2 seconds, cleaning off excess cement, and final light curing for 20 seconds (Figure 28). The all porcelain indirect veneer was placed on tooth 22(1) using light-cure resin cement in neutral shade, followed by tack curing for 1-2 seconds, cleaning off excess cement, and final light curing for 20 seconds from all angles (Figure 28a). The all-porcelain crown on tooth 22(2) was placed using dual-cure resin cement with similar procedures as for tooth 22(1). After the restorations were placed, polishing was done using Eve Diapro. For tooth 12, shade taking was done using the composite try button technique (Figure 28b). The enamel surface was prepared using diamond bur and finishing (Figures 29). The tooth surface was then etched with 37% phosphoric acid and bonded (Figures 30), air sprayed, and light cured for 20 seconds (Figure 31). The palatal shell was made using enamel shade A1 composite with

silicone key technique based on the wax-up model (Figure 32), followed by the creation of the proximal wall and incisal edge with enamel shade A1 composite (Figure 33). Composite layering continued with dentin shade A2 to form mamelon (Figure 33), finished with enamel shade A1 composite on the labial surface and light cured. Glycerin was applied and light cured for 10 seconds. Finally, occlusion, articulation, shape, color, proportion, restoration edges, and proximal contacts were checked, followed by finishing and polishing using Soflex coarse discs and Eve Diacomp twist (Figures 34).

Figure 26 Reduction of gutta-percha points in teeth 11, 21, and 22(2) was confirmed by radiographic examination (RO)

Figure 27 Insertion of fiber posts in teeth 11, 21, and 22(2) was confirmed by radiographic examination (RO)

Figure 28 Core build-up of teeth 11, 21, and 22(2)

Figure 29 (a) Depth cut and shading of tooth 22(1). (b) Crown and veneer preparation results

Figure 30 Check the preparation results using a silicone guide

Figure 31 Gingival management and ND shade

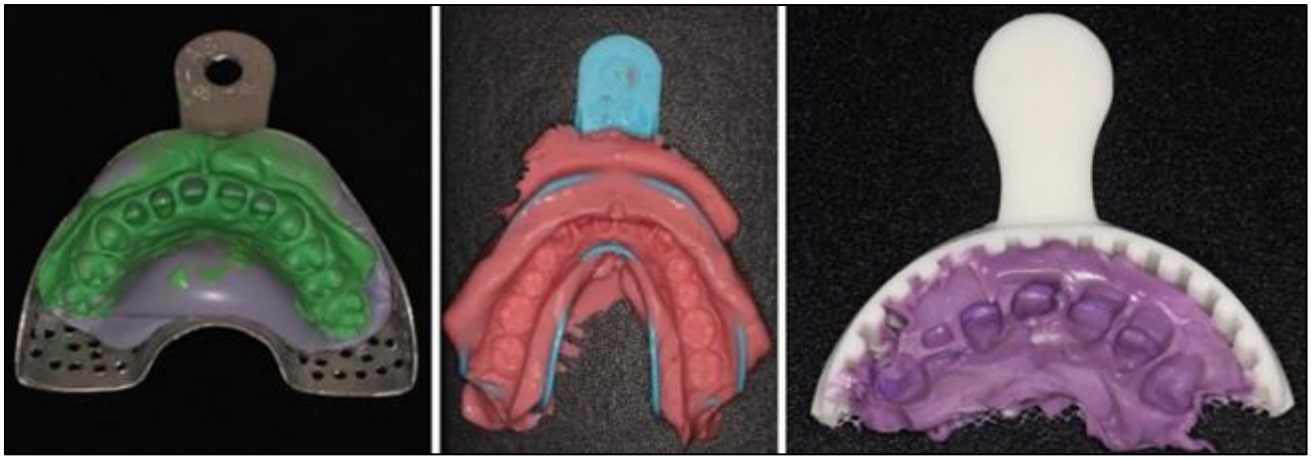

Figure 32 Impression of the (a) upper jaw, (b) antagonist (lower jaw), and (c) bite registration

Figure 33 Temporary crowns and veneers for teeth 11, 21, 22(1), and 22(2)

Figure 34 Try in crown and veneer

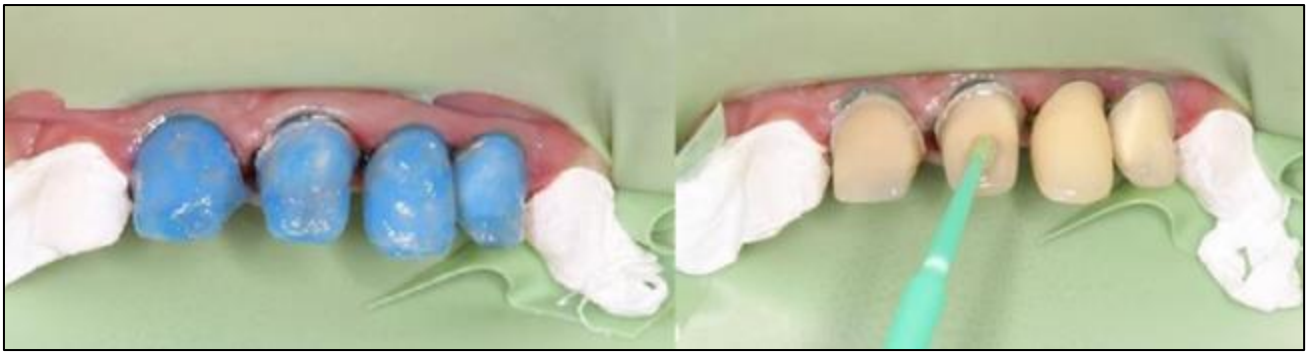

Figure 35 (a) Etching and (b) bonding application on teeth 11, 21, 22(1), and 22(2)

Figure 36 (a) Insertion of crowns and veneers on teeth 11, 21, 22(1), and 22(2). (b) Composite try-in button on tooth 12

Figure 37 (a) Direct veneer preparation on tooth 12. (b) Finishing of preparation on tooth 12

Figure 38 Silicone guide

Figure 39 Palatal shell and mamelon on tooth 12

Figure 40 Final result of the direct veneer on tooth 12 after finishing and polishing

In the final visit, from anamnesis, the patient had no complaints, and there were no abnormalities on the extraoral examination. On intraoral examination, percussion and bite tests were negative, crowns and veneers were in good condition, and the gingiva around the restorations appeared normal (Figure 36).

Figure 41 Radiographic photo after treatment

Figure 42 (a) Clinical before treatment, (b) Clinical after treatment

Figure 43 Facial profile analysis before and after treatment (Ricketts lip analysis esthetic line)

4. Discussion

Demand for facial and dental aesthetics is increasing, as visual appearance plays a crucial role in psychological self-confidence. Aesthetic imperfections in the maxillary anterior teeth, such as supernumerary teeth, crown fractures, and disproportionate crown shapes, require correction to achieve a more harmonious appearance while restoring optimal function in chewing, breathing, speaking, and swallowing [9,1].

The microesthetic analysis revealed several discrepancies in dental, gingival, space, and dentofacial parameters. Dental analysis showed non-ideal tooth axis inclinations and fractured crowns in teeth 11, 21, and 22(2), with abnormal crown shapes and ICA/ICP values being undeterminable in several regions. Gingival analysis indicated generally normal color, texture, and consistency, but with misaligned gingival zeniths and margins in the anterior maxillary teeth, though crown lengthening was deemed unnecessary. Space analysis showed asymmetry in the intercanine distances (44 mm total; 19 mm right and 25 mm left), with a midline deviation. Dentofacial analysis, using the bizygomatic width (128 mm) and trichion-menton distance (169 mm), suggested that the dimensions of teeth 11 and 21 (8 mm width, 10.5 mm height) were proportionate to facial measurements, yielding a 75% harmony with facial esthetics.

In this case, the Digital Smile Design (DSD) concept was used to enhance understanding and communication between the patient, dentist, and dental laboratory regarding the aesthetic visualization of the treatment plan [8]. Digital Smile Design is a digital approach that projects a new smile design through simulation and previsualization of the proposed treatment outcome. This digital design involves patient participation in their own smile design process, allowing customization based on individual needs and preferences while aligning with the patient's morpho-psychological [10].

Teeth number 11, 21, and 22(2), classified as non-vital with Ellis Class IV classification, require endodontic treatment to prevent infection. Root canal treatment is an endodontic procedure that removes infected and inflamed pulp tissue. This procedure aims to create an environment that support pulp healing and prevents periapical complications [11].

Root canal treatment consists of three main principles: root canal preparation, sterilization, and obturation.

Root canal preparation for these three teeth was performed using the crown-down pressureless technique. This technique was chosen due to its variable taper width, which enhances root canal cleaning and sterilization. Additionally, it ensures consistent shaping of the root canal [12,13]. Root canal obturation was performed using the single cone technique, selected for its convenience for both the patient and the dentist while also saving time [14]. This technique applies low pressure to the root canal while maintaining obturation quality, minimizing apical microleakage, and preventing bacterial penetration [15]. Gutta-percha was trimmed to two-thirds of the root canal length or at the coronal level, leaving 4-5 mm of gutta-percha at the apex tip to maintain root canal integrity, ensure stability, and prevent microleakage [12]. Root canal-treated teeth require a post and core material to achieve optimal retention for crown restoration. Endodontic posts help retain the remaining tooth structure with the core restoration. They are recommended when less than half of the coronal tooth structure remains [16]. In teeth number 11, 21, and 22(2), fiber posts were chosen for their dentin-like elastic modulus, reducing root fracture risk and stress on canal walls [17]. The ferrule in the fiber post enhances restoration strength by withstanding occlusal forces, maintaining the cement seal, and minimizing stress. Fiber posts also provide good aesthetics, biocompatibility, and radiographic visibility [18].

Creating a mock-up before the final restoration helps simulate tooth anatomy and serves as a guide using a silicone index. For tooth 22(1), a depth cut was made on the mock up using a depth cutting bur to create orientation grooves and prevent excessive preparation.

An esthetic smile requires a harmonious relationship between the lips, teeth, and gingiva. In this case, microesthetic corrections included adjustments to the gingival zenith, Interproximal Contact Area (ICA) and Interproximal Contact Point (ICP), embrasures, tooth inclination and the crown height-to-width ratio. Modifying the gingival zenith was essential to optimize tooth proportions and ensure a predictable esthetic outcome [19]. In this case, ICA and ICP were corrected due to fractured teeth and abnormal crown anatomy. ICA adjustment enhanced tooth proportions and eliminated black triangles, while ICP was repositioned from its apical and off-midline location. Incisal embrasures were also refined to follow the ideal gradual widening from central incisors to canines. Tooth inclination was corrected to achieve the ideal progressive mesial angulation from central incisors to canines [20]. Furthermore, the crown height-to-width ratio was corrected to the ideal proportion of 75–80% to enhance esthetic harmony [2].

Color selection is a crucial aspect in achieving optimal aesthetic quality. Proper color harmonization contributes to the creation of a visually pleasing appearance for patients [21]. In this case, tooth 12 was restored using shade A2 for the internal layering and A1 on the labial surface, matching the original dentin and enamel shades. The crown shade for teeth 11 and 21 was determined using shade A3 in the cervical area and A2 in the incisal area. Tooth regions exhibit slight variations in color and opacity. The cervical area appears darker and less translucent due to thicker dentin and thinner enamel, while the incisal area looks brighter and more translucent due to the opposite structure [22].

Crown is an extracoronal restoration that is cemented and covers the outer surface of the clinical crown to protect the tooth structure while maintaining shape and aesthetic [23]. In contrast, a veneer is a tooth-colored material applied to restore dental abnormalities such as diastema and discoloration [24]. In this case, veneers were chosen for teeth 12 and 22(1) due to their minimally invasive nature and ability to enhance the patient's smile aesthetics while preserving the natural tooth structure [25]. The direct veneer technique was applied directly to the prepared tooth 12 in a single visit. Meanwhile, an indirect veneer was placed on tooth 22(1). The indirect technique allows for better control of veneer color and contour, and reduces chair time for the patient, as the veneer is fabricated in a laboratory.

In this case, lithium disilicate was used for crown restorations on teeth 11, 21, and 22(2), as well as for the indirect veneer on tooth 22(1). Lithium disilicate was chosen due to its translucency, which enhances the esthetic outcome, especially for anterior teeth. This ceramic offers high mechanical performance, including good wear resistance and a flexural strength averaging 400 MPa [26]. Lithium disilicate can be used for partial or full crowns, inlays, onlays, and three-unit fixed partial dentures32. Meanwhile, composite material was used for the direct veneer on tooth 12, providing an enamel-like appearance and long-lasting results when properly polished [28].

For the insertion of the all-porcelain indirect veneer on tooth 22(1), a light-cure resin cement in a neutral shade was used, this cement was chosen for its high strength, durable bonding, and ability to reinforce ceramic veneers [21]. Studies suggest that light-cure resin cement is suitable for thin laminate veneer cementation due to its superior color stability compared to self-cure and dual-cure cements28. Initial curing is performed for 1-2 seconds to make it easier to clean excess cement with an excavator [23]. Excess cement removal is a crucial step, as failure to do so may increase the risk of gingivitis and periodontitis [24]. For the insertion of the all-porcelain on teeth 11, 21, and 22(1), a dual-cure resin cement in a neutral shade was used. Dual-cure resin cement offers advantages such as adequate polymerization

and extended working time, as its light-cure mechanism allows for controlled setting. As a result, a fast initial setting helps stabilize the restoration [23].

5. Conclusion

Complex aesthetic treatment on the upper anterior teeth using digital smile design (DSD) and restorations with lithium disilicate crowns and veneers resulted in optimal aesthetic outcomes. The treatment also restored proper functions such as chewing, breathing, speaking, and swallowing. After one month, a clinical evaluation was conducted on the crowns and veneers, and the results showed that the restorations were in good condition without any issues.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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