Conservative Dentistry Journal Vol. 14 No. 2 July-December 2024; 79-86

Case Report

Smile makeover for multiple caries of anterior teeth through endodontic, periodontic, and restorative management: a case report

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ABSTRACT

Background: *Dental aesthetic issues may affect individual's aesthetic, function, and psychological well-being. The functions of the stomatognathic system are supporting mastication, speaking, breathing and swallowing functions, so that structural integrity and an ideal and harmonious smile can be achieved as well. Aesthetic issues due to caries of maxillary anterior teeth requires deep analysis, consideration and appropriate treatment planning to aim a good result both functionally and aesthetically. Digital smile design (DSD) plays an important role in aesthetic dentistry where problems can easily be rectified.* ***Purpose:*** *This case report describes a step-by-step aesthetic treatment of a male patient with multiple caries of anterior teeth.* ***Case:*** *This study reports a 21-year-old man with multiple caries on his maxillary anterior teeth. Tooth number 12 with class IV caries lesion. Teeth number 11 and 22 with class IV and VI caries lesion and were endodontically treated, tooth number 21 with class III mesiodistal caries lesion. The patient's chief complaint is that he felt less confidence with his appearance.* ***Case Management****: tooth number 21 was managed with endodontic treatment and followed by insertion of fiber post. Teeth number 11 and 22 that endodontically treated previously, were managed with prefabricated fiber post. Tooth number 12 was managed with crown. Teeth number 11, 21, 22 11, 21, 22 were managed with gingivectomy for aesthetic crown lengthening. Lithium disilicate was chosen for the crown materials* ***Conclusion****: Anterior teeth with multiple caries can be improved through endodontic-periodontal-restoration treatments to improve the function and aesthetic performance.*

Keywords: *complex aesthetic, multiple caries, endodontic-periodontal-restoration, human and health.*

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INTRODUCTION

A beautiful smile, accompanied by healthy, aesthetic teeth and gingiva, will psychologically increase self-confidence. The aim of aesthetic rehabilitation treatment is not only to improve aesthetics, but also to obtain a masticatory system that is stable, and harmonious.[1] Temporomandibular joint (TMJ) analysis aims to obtain the stability of the masticatory system by determining the function of the stomatognathic system which supports the functions of mastication, speaking, breathing and swallowing so that harmonious and efficient function, structural integrity and an ideal and harmonious smile are obtained. Dental restoration should be able to restore not only in aesthetic perspective, but also phonetics, mastication, and breathing functions as well as the health of periodontal tissue.[2] Modern dentistry has shifted from being concerned with gums and teeth into integrating the smile with overall facial framework.[3]

Smile disharmony associated with the asymmetry and disproportionality among periodontal, teeth, and orofacial structures is the main reasons patients looking for clinical procedures in dental aesthetic.[4] The increasing demand for beauty, aesthetics, and dental harmony has provided a vast development in dental technology, aiming to facilitate and add the performance of clinical dental procedures through digital simulation.[3]

The decay in anterior teeth due to caries is considered a key issue that require aesthetic treatment to obtain patient's confidence.[5] A smile is one of the important facial expressions of a person, because it expresses pleasure, pleasant sensations, conveys warmth, friendly communication, and appreciation. In social relationships, smile has a very important role because it has a good and positive effect on those who give and those who receive.[6] A beautiful smile, accompanied by healthy, aesthetic teeth and gingival, will psychologically increase self-confidence and feeling comfortable with oneself.[7]

Comprehensive dental management is required to get natural appearance based on the smile design principles. Some cases may need a multidisciplinary management in

DOI: https://doi.org/10.20473/cdj.v14i2.2024.79-86

order to improve their esthetic and functional outcomes, which are dependent on careful consideration of the face shape and head, also the texture, volume, ratio, shape, size, pattern of placement, and shade of teeth. Other crucial factors may include the health and appearance of the gingival line, the relationship between the lower lip and upper-incisor line, the soft tissue and gums, the smile line and width, dark spots at the corners of the mouth, and the zenith point.[5] Furthermore, the longevity of the restoration of maxillary anterior tooth were also the main concern for the patient.[8] Excellent tooth contour, soft tissue health, and profiles are just as crucial as the actual shade of the new restoration and teeth.[7]

Smile rejuvenation can impact a patient's self-confidence and emotional health through better appearance. This article represents a case report of multiple caries on maxillary anterior teeth, managed by comprehensive endodontic-periodontal-restorative management to recover its aesthetically optimal function.

CASE

A 21-year-old male complained about multiple cavities on several teeth of his upper jaw accompanied with fracture of one of them. The patient had root canal treatment one month ago and has no complaints, otherwise the untreated teeth sometimes felt pain. The patient wanted his teeth to be managed because he is not confident with his appearance. The patient stated that he had no systemic diseases.

Intraoral examination revealed that the patient had normal anterior relation with overbite of 2 mm and overjet of 2 mm, and posterior relation that is cusp to fossa. The saliva test result showed that the quantity and quality were normal. Objective examination showed class IV caries lesion on teeth number 11 and 12, class III caries lesion on tooth number 21. Tooth number 12 were on vital state with class IV caries lesion. (Figure 1). Root canal treatment has been done on teeth number 11, and 22 a month ago. Percussion was tested negative. Bite test was tested negative and normal surrounding gingiva on all of the affected tooth. Vitality test showed teeth number 11, and 22 was non vital and teeth number 12 and 21 was vital. Radiographic examination showed a radiopaque appearance of hermetic root canal filling on treated teeth number 11, and 22. Carious radiolucency appearance of the dentin in the mesial area was seen on tooth number 12. Caries radiolucency in the distal area to the pulp chamber and caries on the mesial side was seen on tooth number 21 (Figure 2).

Based on intraoral, subjective, and radiography examination, the diagnosis of the teeth number 11, and 22 were previously endodontically treated with normal apical tissue. The diagnosis of the tooth number 12 was reversible pulpitis with normal apical tissue, and tooth number 21 was diagnosed with symptomatic pulpitis irreversible with normal apical tissue.

Figure 1. The condition of anterior tooth before treatment. (a) Pre-operative labial view; (b) pre-operative palatal view; (c, d) pre-operative lateral view.

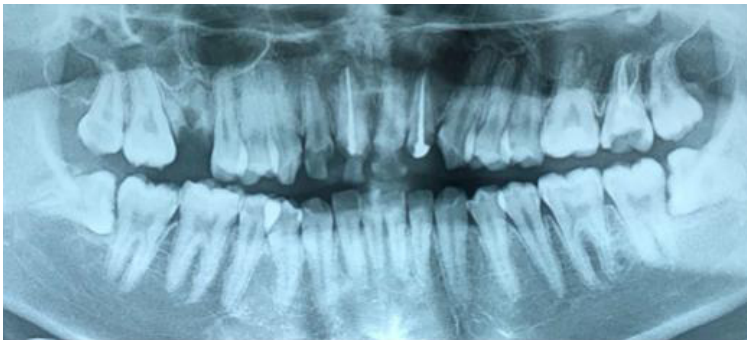

Figure 2. Panoramic radiography.

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CASE MANAGEMENT

The treatment was completed in nine visits which consists of three stages: endodontic treatment, crown lengthening surgery and restorative treatment. Tooth 12 was endodontically treated, followed by fiber post placement. Teeth 11 and 22 were previously endodontically treated managed with fiber post insertion. Then crown lengthening was performed on gingival of teeth 11, 21, and 22. Furthermore, the insertions of all porcelain crowns were performed on teeth number 11,12, 21, 22.

At the first visit, dental health education (DHE), subjective, objective, and radiographic examination were done. Information about the patient's treatment plan, dental health conditions, informed consent and informed to consent were also performed. Initially, an impression was taken for study models with irreversible hydrocolloid, wax up model, profile photos, intraoral photos, and a digital smile design were created. Smile design consists of central incisal ratio, gum line margin heights, gum line symmetry, midline placement, smile line follow the lip, incisal embrasure, flossing contact, gap or diastema (Figure 3a), final target (Figure 3b), and wax up model (Figure 3c).

During the second visit, endodontic treatment was done on tooth number 21 with local infiltration anesthesia. Rubber dam isolation and dental suction was prepared, followed

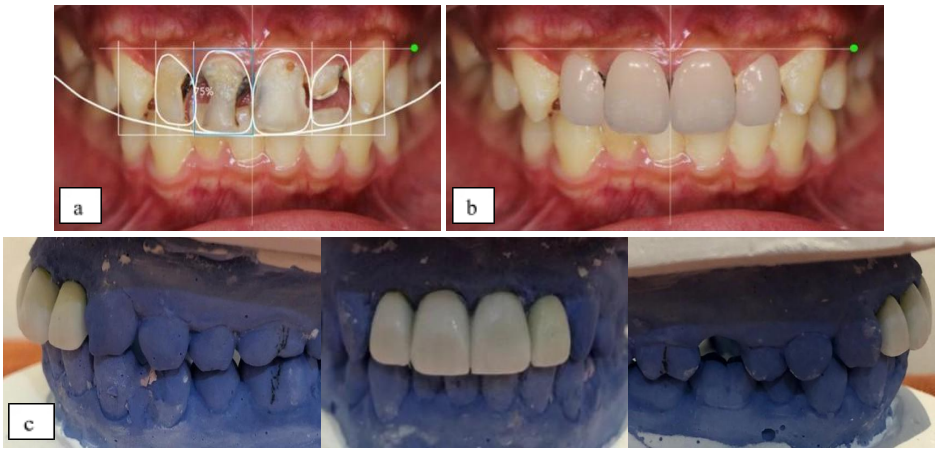

Figure 3. (a) Digital smile design, (b) final target and (c) wax up model.

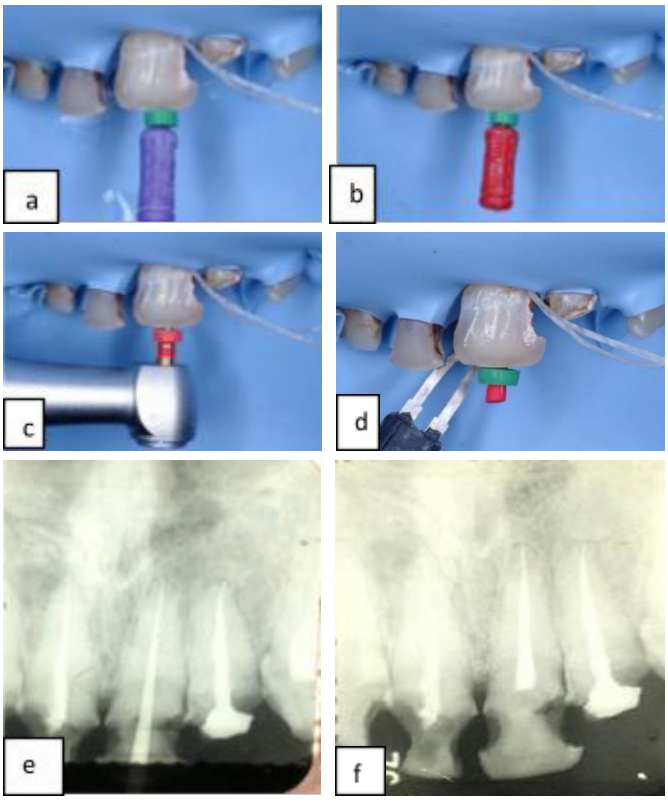

Figure 4. Root canal treatment on tooth 21. (a) Access opening and negotiation, (b) Apical gauging, (c) Canal shaping was done using Protaper gold, (d) Obturation, (e) Gutta-percha point trial, (f) Radiographic view to confirm obturation.

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by tooth access opening of the. The next stage is glide path management using K-File #10 (Dentsply, USA) and rotary file (ProGlider) with root canal lubricant. Measurement the working length was done using Electric Apical Locator, the estimate working length of tooth number 21 is 24 mm. Apical gauging was obtained with K-File number #25 (Dentsply, USA). Root canal preparation is done using Protaper Gold rotary file with crown-down pressure-less technique up to F2 (25/06) (Dentsply, USA). At each change of file, the root canals were irrigated using the irrigation sequence with NaOCL 2.5% - Aquadest - EDTA 17% - Aquadest, the irrigation system was done using 1 side-vent 30 G needle syringe and ultrasonic agitation activation. The root canals were dried, and followed by obturation with single cone technique using resin-based sealer. Gutta-percha point obturation on tooth number 21 was confirmed by radiographic view (Figure 4).

During the second visit, obturated tooth number 21 was evaluated, the patient had no complaint. Percussion tested negative, good apical seal, no sign of fistula, no sign of inflammation, and temporary filling still intact. Non-rigid posts core crowns were chosen due to severely destructed teeth. The next step is fitting the post sizes using templates, then, 18 mm long gutta-percha point removed with piezo reamer and post drill on tooth number 21. Irrigation of root canal with ethylenediaminetetraacetic acid (EDTA) solution 17%, try in fiber post, followed by post cementation. 37% phosphoric acid etch applied on the crown of the tooth, and then, universal bonding on root canals were applied and light cured. Fiber post inserted using dual cure adhesive resin cement, and core build up was done using dual cure composite core material on tooth number 21 (Luxacore Z, DMG America) (Figure 4).

During the third and fourth visit, fiber post was inserted on teeth number 11 and 22. Under rubber dam isolation, temporary filling was removed, followed by fitting the post sizes using templates. Furthermore, coronal - middle third of gutta-percha was removed using piezo reamer and dental post drill, for removing 12 mm long gutta-percha point on tooth number 22 mm, and 17 mm long gutta-percha point on tooth 11. Try in fiber post, application of 37% phosphoric acid etching for 20 seconds on the crown of the tooth, rinse and dry. Universal bonding on root canals was applied and cured, then, universal bonding on crown was applied. Hereafter, fiber post insertion and core build up was done on tooth number 21 (Figure 5), tooth 22 (Figure 6), and tooth 11 (Figure 7), using dual cure composite core material. Radiographic view was taken to confirm fiber post insertion on teeth number 11, 21, 22 (Figure 8).

During the fifth visit, crown lengthening surgery procedure was performed. Started with patient's condition check up by measuring blood pressure (120/80 mm/Hg), Pulse: (80x/minute), temperature (36.4°C), respiration (15 x/minute), SPO2 (98). After giving an adequate anesthesia, transgingival probing and bone sounding was done around the intended tooth (Figure 9). The level of incision was

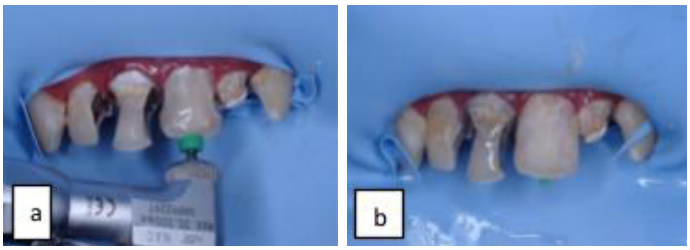

Figure 5. (a) Post Preparation on tooth 21 and (b) Fiber post try-in on tooth 21.

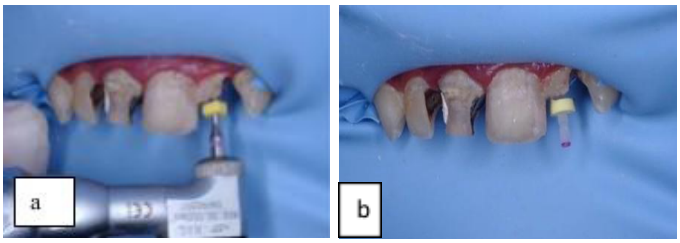

Figure 6. (a) Post preparation on tooth 22 and (b) Fiber post try-in on tooth 22.

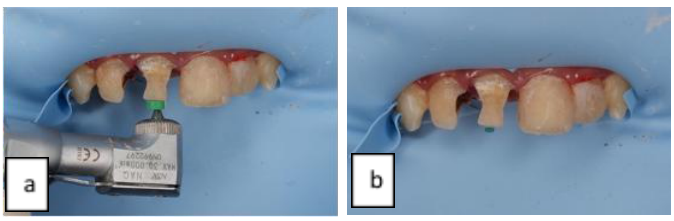

Figure 7. (a) Post preparation on tooth 11 and (b) Fiber post try-in on tooth 11.

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marked by placing bleeding points with the Pocket Marking Forceps (PMF) as a marker for the height of the gingiva (Figure 10). External bevel incision with an angle of 45^0 starting from the distal tooth number 11 continued along the gingival margin to the distal tooth number 22 using a 15C scalpel and control bleeding. The incised gingiva was taken with a curette. Interproximal gingival reconstruction using an Orban periodontal knife, midfacial gingival reconstruction using a Kirkland periodontal knife. New margin gingival height confirmation performed with periodontal probes. After gingival irrigation and drying, the periodontal dressing pack applied, then adapted to the gingival region of the adjacent teeth (Figure 11). Explanation about postoperative instructions to avoid postoperative complications was given. Patient was instructed to control 7 days later.

During the sixth visit, there were no complaints and extraoral abnormalities, clinical examination showed periodontal pack dressing was in good position and condition, there was no swelling or bleeding on surgery area (Figure 12a). The periodontal pack then were removed, followed by irrigation with saline. Composite restoration was performed on tooth number 12 (Figure 12b).

During the seventh visit, a week after the crown lengthening procedure, the patient had no complaints. Next, crown color selection has done using shade guide Vita 3D (2M3) (Figure 13a). Crown preparations were performed on teeth 12,11,21,22 with a slope of 3°-5° convergent towards the incisal. Reduction of the incisal surface and preparation of the labial, palatal and proximal surfaces following the tooth anatomy to a depth of 1-1.5mm using a long taper round end diamond bur. Gingival management was done with retraction cord, and preparation of crown endings with chamfered finish line design (Figure 13b).

Impression of the maxilla was made with two-step technique using elastomeric impression materials followed by antagonist impression with irreversible hydrocolloid. Bite registration was made using polyvinyl siloxane, and temporary crowns were made using bis-acryl (Figure 13c).

Figure 8. Radiographic view to confirm fiber post insertion on teeth 11, 21, 22.

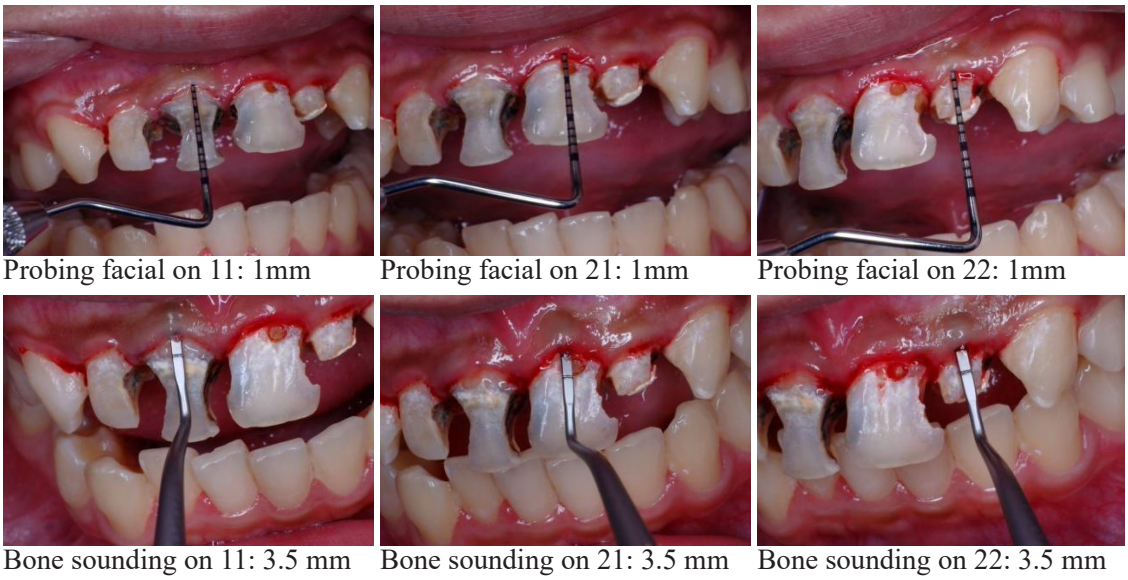

Figure 9. Measurement of probing and bone sounding.

Figure 10. Bleeding point on teeth number 11, 21, 22

During the eighth visit, there were no complaints. Percussion tested negative, Bite test tested negative, gingiva around the teeth was normal, temporary crown was in good condition. During this visit, a rubber dam isolation was placed, temporary crowns were removed. Try in of all porcelain (lithium disilicate) crowns were performed on teeth number 12,11,21, and 22. Check occlusion, articulation, color resemblance, proximal contact, adaptation of the restoration to the surrounding tissue. Next, inner crowns were etched for 90 seconds with 9% buffered hydrofluoric acid before rinsed and dried, then covered with silane. The teeth were etched with 37% phosphoric etch f Universal bonding applied on teeth number 12, 11, 21 and 22 followed by light curing. Insertion of crowns on teeth number 12, 11, 21, and 22 using dual cured resin cement (Figure 14).

During the ninth visit, control was carried out, the patient had no complaints. Clinical examination showed that percussion tested negative, bite test tested negative, and the gingiva around the teeth was normal. The marginal fit condition of the restoration was seen good (Figure 15).

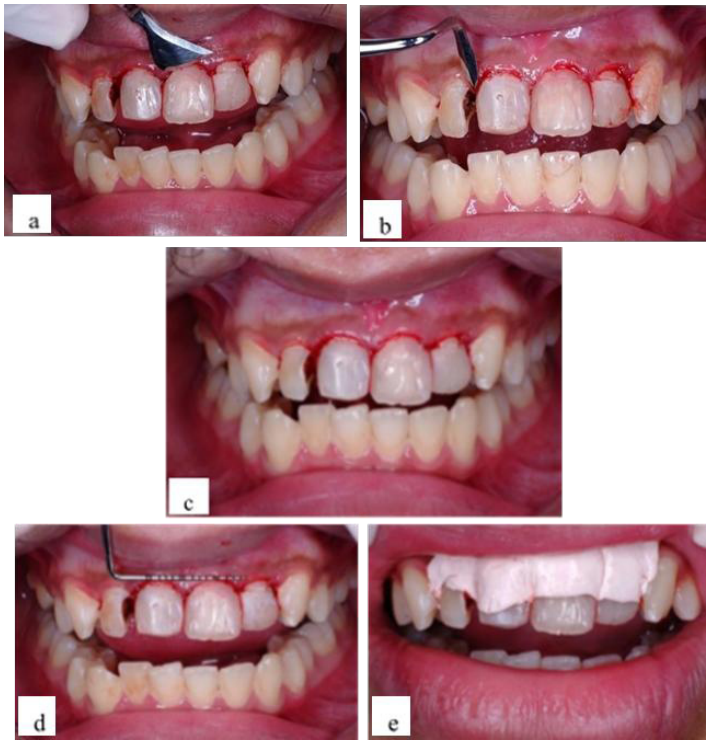

Figure 11. Crown Lengthening surgery procedure. (a) Gingival reconstruction with Kirkland knife, (b) Gingival reconstruction with Orban knife (c) post-op crown lengthening surgery (d) Symmetric check (e) Periodontal dressing application.

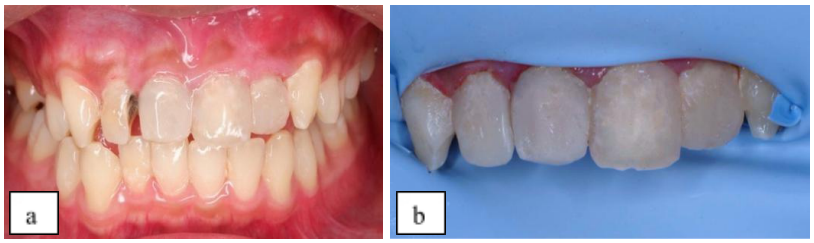

Figure 12. (a) Control after crown lengthening; (b) Resin composite filling.

Figure 13. (a) Shade guide Vita 3D (2M3); (b) Gingival management with retraction cord; (c) Try-in Mock up.

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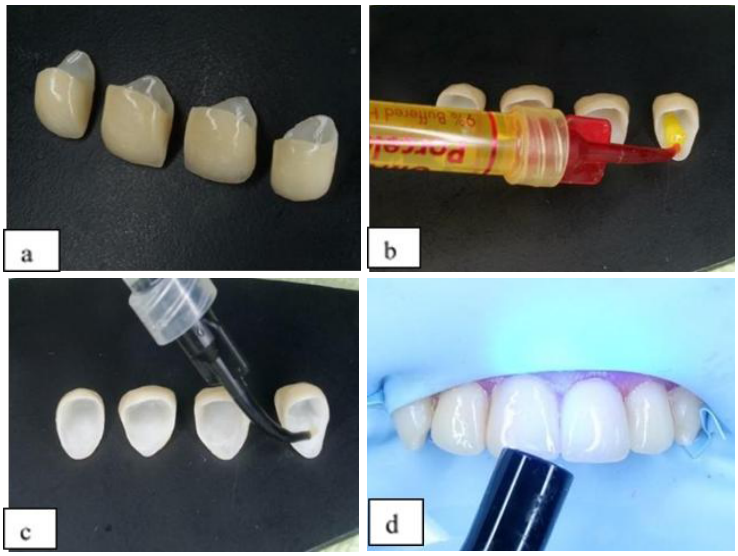

Figure 14. Crown Insertion (a) Inner crown etch with 9% buffered hydrofluoric acid for 90 seconds. (b) Application of silane. (c) Universal bonding application. (d) Insertion of the crowns.

Figure 15. Clinical photo after cementation. (a) Post-operative clinical labial view. (b,c) Post-operative clinical lateral view.

DISCUSSION

Caries is a disease-causing destruction and breakage of teeth. The prevalence of caries in developing countries could reach more than 90%. The caries process results from an imbalance between remineralizations and oral biofilm (plaque).[9] If this caries process continues, it will continue to pulp and periapical diseases. Pulp and periapical diseases can be treated with curative treatment, through endodontic and restorative treatment.[10]

The aim of aesthetic rehabilitation treatment is not only to improve aesthetics, but also to obtain a masticatory system that is stable, harmonious and functioning efficiently.

Temporomandibular joint (TMJ) analysis aims to obtain the stability of the masticatory system by determining the function of the stomatognathic system. The resulting dental restoration must restore tooth function, aesthetics, phonetics, mastication, breathing and maintain the health of the tooth supporting tissue.[2]

In this study, tooth number 21 were managed with root canal based from the diagnosis which is symptomatic irreversible pulpitis with normal apical tissue, root canal treatment has done in one visit. One visit root canal treatment was done on the tooth number 21 to prevent the spread of the disease from the pulp to the periapical. The treatment reduces the risk of infection possibly occurred among the visits, time saving, but also reducing the risk of inter appointment flare-up.[10] Root canal preparation was done on teeth 12, 21, 22, and 23 using crown down pressureless technique with Protaper. This technique is efficient and support irrigation in the root canals.[11]

Anatomic wax-up (mock-up) is one of the most important steps in re-designing a patient's smile as it corrects temporary restorations to verify final restorations, including length of the restoration, intra-oral occlusion, and relationship with the neighboring gingiva and teeth, phonation, position of lips at rest or while smiling, and harmony with the patient's face.[12] As all these parameters can be visualized and experienced by the patient immediately, it is recommended that the clinician takes the patient's opinion into consideration during the mock-up.[13]

The restoration must restore the initial function of the teeth, such as phonetics, aesthetics, and mastication and maintain protective functions of the tooth supporting tissues. A smile design is a dental procedure that artistically creates straighter and beautiful natural-looking smiles.[14] Correction of these dental problems can produce significant changes in appearance, which often result in improved social life, confidence, and personality.[15]

In the maxillary anterior area, position of the gingival labial margin is important to achieve an ideal smile. The relationship between the restoration and the periodontium is critical if both gingival health and esthetics needs to be achieved. In addition, surgical procedure can establish an

accurate bone width and gingival asymmetries. To have a harmonious and successful long-term restoration, the distance between the crestal bone and restoration margins, which allows recreating the biological width, should be at least 3 mm.[16]

The choice of post and core restorations are sometimes complicated and should consider the indications, physical properties, disadvantages and advantages, as well as the amount of missing coronal structure and aesthetics.[17] In this case, the post used to support tooth structure is the fiber post. Fiber posts has similar elasticity to dentin and have aesthetic appearance. The post inside the root canal achieves esthetics, biocompatibility and retain high radiographic visibility.[10] Gutta percha point removal to 2/3 length root canal or equal to the height of the tooth crown, and the least leaving a gutta point in the apical area 4-5 mm from the tip apex to maintain the integrity of the root canal closure, maintains hermetic, stable, preventive apical closure apical leakage occurs because there are many in the apical area lateral canal or accessory canal.[18]

In this case, we use self-etch universal bonding on root canals, and universal resin-based cement for cementing fiber post, because universal bonding contains 10-methacryloyloxydecyl dihydrogen phosphate (10-MDP), MDP + bisphenol di-methacrylate (BPDM) primer and conventional resin cement, and 3) MDP containing self-adhesive resin cement, silane, polyalkenoate, combination of hydrophilic (HEMA) dan hydrophobic (D3MA, intermediate (Bis-GMA). MDP is the mostly used functional monomers, it is the hydrophilic phosphate monomer which increase resin adhesion and diffusion by causing acidic decalcification and binding to tooth structure through calcium ions or amino groups.[6,7]

Furthermore, E-max crowns were used to restore 11 and 22 teeth because e-max gives very good results. E-max crowns have superior clinical and radiographic results due to their mechanical and physical properties such as durability, biocompatibility, flexural strength, radioactivity, and safety for patients, technicians and dentists. E-max crowns that made from lithium silicate, are the preferred type of crown because of its aesthetic appearance with high strength of 470 MPa. The shade is translucent, which has the closest match of the natural tooth. Bacterial plaque accumulation has been reported to be less on porcelain margins if compared to metal margins.[1]

In conclusion, aesthetic dental procedures have received more attention. This case showed complex treatments focusing on aesthetic result especially for anterior teeth. Digital smile design for a smile makeover in multiple caries of anterior teeth through comprehensive aesthetic-endodontic-periodontal-restoration approaches were done successfully. The patient was satisfied with the aesthetic treatment.

REFERENCES

1. Alalkhashab M. Lithium disilicate (Emax press) based crowns for esthetic rehabilitation in esthetic zone: a case report. J Dental Sci. 2018; 3(2): 000178.
2. Heyman H, Edward S, Ritter A. Studervant's Art and Science of Operative Dentistry. 6th ed. St.Louis: Mosby-Elsevier. 2013; Pp. 20-548.
3. Coachman C, Calamita M. Digital smile design: a tool for treatment planning and communication in esthetic dentistry. Quintessence Dent Technol. 2012; 35:103-11.
4. Kina M, Leal FA, Fabre AF. Treatment minimally invasive aesthetic restorative through direct technique with composite: Case report. Arch Health Invest 2015; 4: 50-5.
5. Demir F, Oktay EA, Topcu FT. Smile and dental aestheticss: a literature review. Med Science. 2017; 6(1): 172-7.
6. Shibuya K, Ohara N, Ono S, Matsuzaki K, Yoshiyama M. Influence of 10-MDP concentration on the adhesion and physical properties of self-adhesive resin cements. Restor Dent Endod. 2019; Nov 12;44(4): e45.
7. Garg N, Garg A. Textbook of Operative Dentistry. 3rd ed. India: Jaypee Brothers Medical Publishers. 2015; pp: 454-69.
8. Burykina M, Admakin O, Skatova E, Medvedeva T, Kozlova N. Indirect restoration of primary teeth with individual crowns. International Journal of Pediatric Dentistry. 2013; 23: 53-4.
9. Yadav K, Prakash S. Dental Caries: A Review. Asian Journal of Biomedical and Pharmaceutical. 2016; 6(53): 1-5
10. Berman LH, Hargreaves KM. Cohen's Pathways of The Pulp. 12th Ed. St. Louis: Elsevier. 2021; Pp. 819-901.
11. El-Kishawi M, Khalaf K. An update on root canal preparation techniques and how to avoid procedural errors in endodontics. The Open Dent J. 2021; J 24 Aug, 15 :15-318.
12. Swelem AA, Al-Rafah EMZ. Evaluation of "Golden Proportion" in Saudi individuals with natural smiles. Saudi Dent J. 2019; 31(2): 277-83.
13. Erdemir U, Yildiz E. Esthetic and functional management of diastema - a multidisciplinary approach. Turkey, Springer Nature Link. 2016; Pp. 53-140.
14. Kohli S, Yee A. Smile enhancement with anatomic diagnostic wax-up and comprehensive esthetic smile designing. J Int Oral Health. 2019; 11(4): 221-7.
15. Terry D, Leinfelder K. A simplified aesthetics concept: part one. Int Dent. Africa Ed. 2014; 4(2): 6-9.
16. Fletcher P. Biological rationale of esthetic crown lengthening using innovative proportion gauges. The International Journal of Periodontics and Restorative Dentistry. 2011; 31(5) :523-5.
17. Dimitrios T, Kourtis S, Kountouras K. Restoration of endodontically treated anterior teeth with cast metallic post or prefabricated fiber post placement: 2 case reports and critical literature review. Balk J Dent Med. 2015; 19:86-91.
18. Bonchev A, Radeva E, Tsvetanova N. Fiber reinforced composite posts - a review of literature. International Journal of Science and Research (IJSR). 2017; 6 (10): 1887- 93.