Multidisciplinary approach for aesthetic rehabilitation in gummy smile and fluorosis: a case report

[1,2]Nurul Jannah Zulkefle, [3]Nur Hafizah Kamar Affendi
[1]Faculty of Dentistry, Universiti Teknologi MARA, Sungai Buloh Campus, 47000, Sungai Buloh Selangor, Malaysia
[2]Ministry of Health Malaysia
[3]Centre of Restorative Dentistry, Universiti Teknologi MARA, Sungai Buloh Campus, 47000, Sungai Buloh Selangor, Malaysia
Corresponding author: **Nur Hafizah Kamar Affendi,** e-mail: **hafizah_kamar@uitm.edu.my**

ABSTRACT
Background: Teeth, gingiva and lips are the three interrelated primary components in aesthetic dentistry. These combinations warrant a multidisciplinary approach for planning and predictable treatment outcome. **Objective**: The aim of this article is to describe the multidisciplinary approach for aesthetic rehabilitation involving gingivectomy and minimally invasive tooth preparation with porcelain laminate veneer (PLV) restorations and resin bonded bridge. **Case**: A 25-year-old female patient attended with existing space between maxillary anterior teeth post orthodontic treatment and missing mandibular anterior teeth. Intraorally, patient had uneven interdental spacing in between 13 to 23, missing 31 and 32, with merging and irregular opacities suggestive of enamel fluorosis appearance. The zenith lines were asymmetrical with short clinical crowns and disharmonious teeth axes. To optimize the aesthetic outcome and overall smile appearance, gingivectomy was performed after confirmation of biologic width. Eight weeks after healing, PLV restorations were delivered from 13 to 23, and zirconia resin bonded bridge were used to restore missing mandibular lateral incisors. **Conclusion**: The present case illustrates the sequential and predictable approach for management of gummy smile and fluorosis. An alternative treatment modality such as electrocautery may enhanced the smile and obtain positive outcome.
Keywords: gummy smile, fluorosis, gingivectomy, veneer
This title has been presented in The 12th Biennial Congress of Asian Academy of Prosthodontics, 21 August 2021

INTRODUCTION

Gummy smile and fluorosis whether congenital or developmental origin may cause an esthetic concern for patient especially in the anterior teeth. The condition of gummy smile or excessive gingival display (EGD) are usually corrected with gingivectomy, or apically positioning flap with or without osteotomy depending on the biologic width.[1] Various approach has been documented to remove the EGD, and electrocautery is one of the simple and effective method.[2] Less pain and discomfort were also recorded when compared to scalpel.[3] By correcting the gummy smile, the perfect balance of three interrelated primary components teeth (white), gingiva (pink) and lips can be achieved for smile correction and to restore the patient's confidence.[4] To achieve these goals, multidisciplinary treatment and the biomimetic approach are usually a dual approach to reproduce the biomechanics, structure, function and esthetic of natural tooth.[4,5]

Fluorosis are generally treated with direct composite restoration, indirect composite or all-ceramic laminate veneers and metal-free full coverage crowns.[6] Compared to the previous years where adhesive dentistry was not common, the full coverage crowns were approved as a treatment of choice to restore discoloured tooth. It is known that this treatment option can be damaging to the tooth and possibly affect the condition of the pulp and surrounding periodontal tissues. As biomimetic concept is introduced, direct composite resin restoration has gained popularity, particularly because of its esthetic properties and being minimally invasive.[4] Although this treatment can be in a single visit, this option has limited longevity because of discolouration, susceptible to wear and prone to fracture.[7] Therefore, the application may be limited and may need frequent maintenance.

As an alternative for longer clinical performance, the indirect approach with minimal preparation is preferred for tooth size and shape modification.[6] All-ceramic laminate veneer has superior esthetic result and less invasive than full coverage crown preparation.[8] This modality is recommended in the tooth condition that require minimum preparation, provides lower rate failure and excellent esthetic.[9] To ensure tooth preparation is minimum, the conservative approach is applied by using the guidance from the presume final shape, contour and texture of the restoration, known as aesthetic pre-evaluative temporary (APT) technique.[10] In addition, bonding between ceramic material and tooth structure can be improved by bonding to enamel rather than dentinal layer. The complications like microleakage or debonding of all ceramic veneer is reduced when the restoration

DOI: 10.46934/ijp.v3i1.131

is bordered on all margins by the enamel.[10] Hence, the purpose of this case report is to illustrate a predictable soft tissue management by removing the excess gingiva, and demonstrate a sequential approach for the restoration of polydiastema, fluorosis appearance and missing teeth.

CASE

A 25-year-old lady was referred to Prosthodontic Clinic from Outpatient Department Faculty of Dentistry, Universiti Teknologi MARA (UiTM), Sungai Buloh, Selangor, Malaysia for management of spacing in between maxillary anterior teeth and missing mandibular anterior teeth, 31 and 32 (Fig. 1A). She completed fixed orthodontic treatment 12 years ago at a private orthodontic clinic, and was provided with a maxillary Essix retainer and mandibular removable partial acrylic denture to replace missing 31 and 32. However, the patient was not compliance with the retainer and defaulted orthodontic treatment follow up since then. Subsequently, relapse occurred resulting in the spacing. She was medically fit and healthy. On intraoral examination, the patient had uneven interdental space between 13 to 23, asymmetrical tooth size proportion and disharmonious teeth axes, generalised merging and irregular white opacities on enamel surfaces of the maxillary and mandibular teeth suggestive of enamel fluorosis appearance that affect more than 50% of the enamel surfaces (TFI score 3) and asymmetrical zenith lines. (Fig.1B) On the radiographic evaluation, there was no abnormality noted and the pulp vitality test was positive for all the maxillary and mandibular anterior dentition.

MANAGEMENT

After completed clinical, radiographic evaluation and investigations, a comprehensive treatment approach that consisted of aesthetic crown lengthening followed by the porcelain laminate veneers (PLVs) with lithium disilicate and resin bonded fixed dental prosthesis (RBFDPs) with zirconia to restore the interdental spacing, and missing teeth. After obtaining informed consent from the patient, she was advised to practice good oral hygiene care to prevent any oral diseases prior to the treatment. During diagnosis and treatment planning, maxillary and mandibular primary impressions were made using irreversible hydrocolloid impression material (Kromopan, Lascod, Illinois, USA) and poured with Type 3 dental stone (Model stone, Zhermack, Italy) to produce study models. Following that, study models were mounted on an arcon, semi-adjustable articulator (Denar® Mark II Articulator) using facebow (Denar® Slidematic Facebow) transfer and interocclusal record taken in maximum intercuspation position (MIP). The conformative occlusal approach was applied in this case since it only involved rehabilitation of anterior dentition. Diagnostic wax-up was fabricated to help the patient to visualize the proposed outcome in terms of both aesthetics and function (Fig.2a).

Veneer preparations were performed based on the *aesthetic pre-evaluative temporaries* (APTs) technique. The APTs technique was divided into two steps, which are the evaluation of the APTs followed by tooth preparations through the APTs. Evaluation of the APTs was carried out with Bis-acryl composite resin temporisation material (Protempt™ 4, 3M/ESPE, Shade A2) prior to the treatment in order to assess the patient in terms of aesthetic, function and phonetics (Fig.2b). Transgingival probing was performed to determine the alveolar bone level on labial and interproximal area. Due to adequate supracrestal attachment provided, crown lengthening procedure was done without osteotomy. Based on diagnostic mock-up, gingivectomy was performed with electrocautery to produce the favourable gingival zenith and gingival aesthetic line. A monopolar electrocautery tissue contouring system (PerFect® TCS II, Coltene, Germany) was used for gingivectomy procedure with an external bevel incision at an angle of 45° to the root surface. (Fig.3a).

During provisional phase, minimal tooth preparation for PLVs from 13-23 were performed through the APTs restoration using a horizontal depth cutter diamond bur. The preparation grooves were marked to ensure the equal and necessary minimum tooth/enamel reduction from the facial aspect and to mimic the exact final contours of the PLVs. (Fig.3b) The incisal edge was reduced evenly with a butt-joint preparation. The preparation margins were shaped with a smooth shoulder margin and clearly established within the enamel surface for better bonding. For PLVs, provisionalisation was performed using the spot etch technique. For cantilever RBFDPs, the retainer wing of zirconia cantilever RBFDPs preparation was performed on tooth 33 with lingual veneer preparation, a fine cervical shoulder margin, a groove on the cingulum and a small proximal box preparation; approximately 2x2 mm^2. The proximal preparation was positioned lingually to the proximal contact. (Fig.3c) Prior to the impression taking, electrocautery was done to create an ovate pontic on the missing space (Fig.3d). The missing space was then restored with patient's mandibular removable partial acrylic den-

DOI: 10.46934/ijp.v3i1.131

ture supported with 31 acrylic teeth.

For impression taking, a single cord impression technique was used with the cord size #00 (Ultrapak, Ultradent Products Inc., South Jordan, Utah, USA) on RBFPDs preparation (tooth 33). Double cord impression technique was used on all veneer preparation (teeth 13-23) since the cervical preparation margin was placed equigingivally. The final/working maxillary and mandibular impressions were made using heavy and light-bodied consistency polyvinyl siloxane (PVS) (Aquasil, Dentsply Sirona, USA) impression materials. During the definitive restorations, surface treatments for lithium disilicate PLVs and zirconia RBFPDs were carried out prior cementation. The clear shade of light-cure universal adhesive resin dental cement (NX3 Nexus™ Third Generation, Kerr Corporation, USA) was selected to cement PLVs and the translucent (TR) shade of dual cure, adhesive resin dental cement (RelyX Ultimate, 3M™ ESPE™ AG, Germany) was applied for zirconia RBFPDs. She was very happy and satisfied with the treatment outcome, felt confident with her new appearance (Fig.4a,b,c,d). Maxillary hard occlusal splint (Michigan) was provided as a protective guard to protect the new anterior bonded restorations and also act as retainer to prevent relapse. The patient was reviewed after one week for delivery of her occlusal splint and was reviewed another three months.

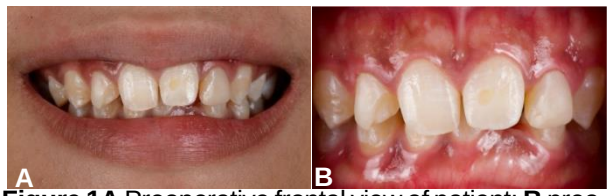

Figure 1A Preoperative frontal view of patient; **B** preoperative frontal view intraoral condition

Figure 2A Diagnostic wax up; **B** mock up try in was done to evaluate the esthetic and function

DISCUSSION

The clinical presentation of gummy smiles may lead patients to seek treatment to address the aesthetic and functional concerns. The condition of excessive gingival display may result from altered passive eruption of the maxillary dentition, a high lip line, a hypermobile upper lip or vertical maxillary excess.[11] In relation to the smile aesthetics, the critical consideration is the relationship of the gingival margins to the edge of the upper lip.[12] After stabilizing the periodontal health, the comprehensive treatment with gingivectomy was planned to expose the ideal clinical crowns and improve the patient's gummy smile.[13] The new ideal clinical crown heights were planned to make sure they were not violating the supracrestal attachment tissue width, which was measured as 2.04 mm.[14] As recorded in this patient, the keratinized tissue width of 5 mm was observed in through transgingival probing, indicates adequate procedure for gingivectomy for esthetic purpose.

Developmental anomalies of the enamel can have an important effect on dental aesthetic appearances especially on the anterior teeth. Fluorosis frequently manifest as white colour defects with high opacity, presenting a significant challenge for the clinician to mask these alterations. It may due to developmental whitish enamel defects that result from pathological changes of ameloblasts that im-

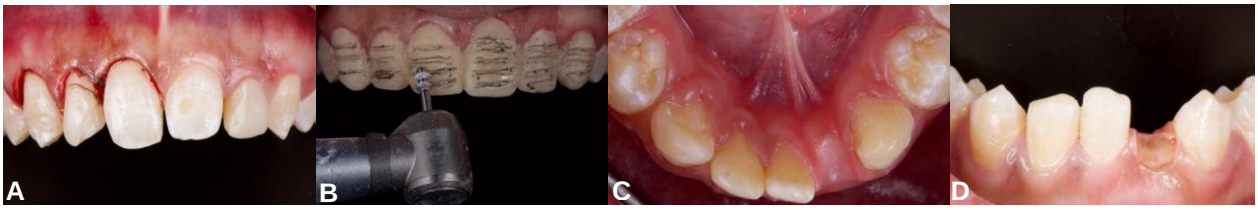

Figure 2A Gingivectomy with electrocautery; **B** preparation with APT technique; **C** preparation of grooves on lingual retainer; **D** creation of oviate pontic on #32

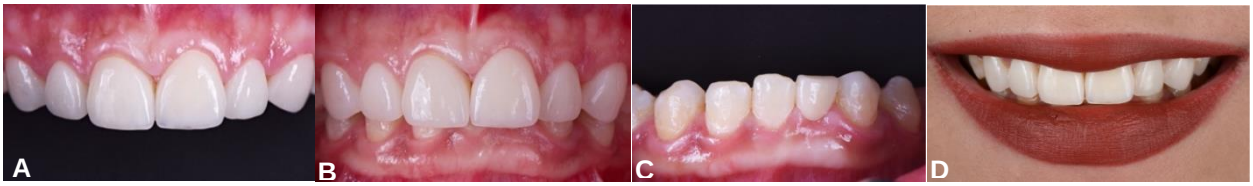

Figure 3A Intraoral frontal view of maxillary anterior teeth; **B** intraoral frontal view of mandibular resin bonded bridge; **C** intraoral frontal view after three months follow up; **D** extraoral view of patient smile.

DOI: 10.46934/ijp.v3i1.131

pede the formation of normal hydroxyapatite crystals. Several treatment options have been proposed to improve the appearance of the fluorosis, including the placement of veneers or full crowns, composite restoration, microabrasion, bleaching, and or resin infiltration. Bleaching and microabrasion have been recommended for treating mild cases of fluorosis; however, in moderate to severe cases, bleaching and microabrasion are either ineffective or may lead to only transient improvement,[15] while composite restorations are prone to discoloration, chipping, and debonding. The PLVs were planned since they require minimal tooth preparation, provide satisfactory aesthetic results to mask the fluorosis presentation and close the interdental spacing, as well as demonstrate high survival rate.[16,17] According to Gurel et al, the 12-year survival rate of PLVs was 98.7%.[18] Another retrospective clinical study by Arif et al reported that PLVs exhibited a high survival rate of 98% over 7 years and 88.2% over 14 years follow-up.[19] There are a lot of advantages of PLVs compared to other treatment modalities. For instance, PLVs are able to provide strong bonded restorations especially if cemented on enamel surfaces,[18] resist staining[20] and are excellent in tissue tolerance. In addition, the highly glazed smooth porcelain surface provides less plaque adherence.[21]

Systematic treatment planning helps us to obtain desirable and excellent outcomes and fulfill a patient's high aesthetic demands. The diagnostic wax-up information is transferred to the patient's mouth in order to provide a physical evaluation of the proposed design of the final restoration.[22-25] For this case, diagnostic mock-up with Bis-acryl composite resin temporisation material was carried out prior to the treatment in order to assess the patient in terms of aesthetic, function and phonetics. During this stage, the patient can physically evaluate the desired outcome and the clinician is able to modify specific areas as needed.[10] PLVs preparation in this case was confined to enamel the surface. Based on a retrospective study up to 12 years by Gurel et al, porcelain veneers cemented on enamel showed significantly higher clinical longevity than those cemented on dentin, with survival rates of 99.0% where margin and preparation depth were in the enamel and 94.0% for veneers with enamel only at the margins.[18]

Resin-bonded fixed dental prostheses are considered a minimally invasive treatment approach for the replacement of single missing anterior teeth and provide excellent clinical outcomes, high survival rates and great patient satisfaction.[26-27] The RBFDPs have many advantages including simple and conservative preparation, low cost and reversible treatment option, with no risk of pulpal irritation, no need for anaesthesia, and minimal risk of caries development and less demanding postoperative care.[26-27] Moreover, these restorations demonstrated a high survival rate of up to 81.8% after 18 years of clinical service.[28] Anterior all-ceramic cantilever single-retainer RBFDPs made from zirconia ceramic showed a highly successful clinical outcome after 10 years of clinical service with a 10-year survival rate of 98.2% and a success rate of 92.0%.[28-29] Although overloading can result in debonding in zirconia RBFDPs, the higher flexural strength and fracture load would make reattachment of zirconia RBFDPs is possible as compared to glass infiltrated alumina that is prone to fracture.[29-30] In addition, the design of cantilever the RBFDPs has recorded the success and survival rates of 100% after 18 years as compared with only 10% and 50% with 2-retainer metal-ceramic counterparts.[31] This 2-retainer RBFDP design was documented to have differential movement of the 2 abutment teeth, resulting in a shear force on the wing of the retainer, debonding of RBFDPs and consequently a lower survival rate.[32]

It was concluded that a well-planned diagnosis and multidisciplinary approaches are necessary to deliver the patient's aesthetic needs for predictable and longterm success of the treatment chosen.

REFERENCES

1. Hamasni FM, Majzoub ZAK. Effect of patient- and surgery-related factors on supracrestal tissue reestablishment after crown lengthening procedure. Quintessence Int 2019; 50 (10): 792-801.
2. Robbins W. Differential diagnosis and treatment of excess gingival display. Pract Periodontics Aesthet Dent 1999; 11: 265–72.
3. Garber DA, Salama MA. The aesthetic smile: diagnosis and treatment. Periodontol 2000 1996;11(1): 18-28.
4. Assaf M. Esthetic crown lengthening for upper anterior teeth: indications and surgical techniques. Int J Dent Med Res 2014;1(3):86-91.
5. Gargiulo A, Wentz F, Orban B. Dimensions and relations of the dentogingival junction in humans. J Periodontol 1961;32(3):261-7.
6. Denbesten P, Li W. Chronic fluoride toxicity: dental fluorosis. Monographs in Oral Science 2011; 22: 81–96.

DOI: 10.46934/ijp.v3i1.131

7. da Cunha LFPL, Gonzaga CC, Furuse AYJ. Aesthetic, occlusal and periodontal rehabilitation of anterior teeth with minimum thickness porcelain laminate veneers.J Prosthet Dent 2014:1315-8.
8. Veneziani M. Ceramic laminate veneers: clinical procedures with a multidisciplinary approach. Int J Esthet Dent 2017;12(4):426-48.
9. Gurel GSN, Calamita MA, Coachman C, Morimoto S. Influence of enamel preservation on failure rates of porcelain laminate veneers. Int J Periodontics Restorative Dent 2013:31-9.
10. Arif RDJB, Garcia D, Yaman P. Retrospective evaluation of the clinical performance and longevity of porcelain laminate veneers 7 to 14 years after cementation. J Prosthet Dent 2018:31-7.
11. Magne P, Douglas WH. Rationalization of esthetic restorative dentistry based on biomimetics. J Esthet Dent 1999;11(1):5-15.
12. Quirynen MBC. The influence of surface roughness and surface-free energy on supra and subgingival plaque formation in man. A review of literature. J Clin Periodont 1995:1-14.
13. Magne P, Belser UC. Novel porcelain laminate preparation approach driven by a diagnostic mock-up. J Esthet Restor Dent. 2004;16(1):7-16.
14. Coachman C, Gurel G, Calamita M, Morimoto S, Paolucci B, Sesma N. The influence of tooth color on preparation design for laminate veneers from a minimally invasive perspective: case report. Int J Periodontics Restor Dent 2014;34(4):453-9.
15. Beier USKI, Dumfahrt H. Clinical long-term evaluation and failure characteristics of 1,335 all-ceramic restorations. Int J Prsothodont 2012:70-8.
16. Soares PVSP, Carvalho VF, Souza PG, Gonzaga RC, Tolentino AB, Machado AC. Aesthetic rehabilitation with laminated ceramic veneers reinforced by lithium dislicate. Quintessence Int 2014: 129-33.
17. Kern M. Resin-bonded fixed dental protheses as alternative to implants in the anterior region-Age as a criterion, Implantol 2016; 24:389-98.
18. Sasse M, Kern M. All-ceramic resin-bonded fixed dental prostheses: treatment planning, clinical procedures, and outcome. Quintessence Int 2014; 45:291-7.
19. Kern M. Fifteen-year survival of anterior all-ceramic cantilever resin-bonded fixed dental prostheses. J Dent 2017; 56:133-5.
20. Kern M, Passia N, Sasse M, Yazigi C. Ten-year outcome of zirconia ceramic cantilever resin-bonded fixed dental prostheses and the influence of the reasons for missing incisors. J Dent 2017;65:51-5.
21. Denry I, Kelly JR. State of the art of zirconia for dental applications. Dent Mater 2008; 24:299-307.
22. Botelho MG, Chan AW, Leung NC, Lam WY. Long-term evaluation of cantilevered versus fixed- fixed resin-bonded fixed partial dentures for missing maxillary incisors. J Dent 2016; 45: 59-66.
23. Sasse M, Kern M. Survival of anterior cantilevered all-ceramic resin-bonded fixed dental prostheses made from zirconia ceramic. J Dent 2014;42:660-6

DOI: 10.46934/ijp.v3i1.131