Aesthetic Correction of Bony Defect with Multidisciplinary Approach: A Case Study

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Abstract: The correction of severe malocclusion with fixed prostheses in vital tooth is crucial and may end up with complication such as loss of vitality, multiple root canal treatment and extraction that lead to major procedures. In this case report the loss of hard and soft tissue of alveolar ridge resulted from traumatic tooth extraction in conjunction of periodontal tissue destruction due to longstanding inflammation. Alveolar bone defect on the anterior region commonly affects the aesthetic. The morphology of class III bony defect on aesthetic area can be unfavorable for construction of dental prosthesis. Surgical attempt has been made to improve hard and soft tissue prior to prosthesis placement. The expertise’s from multidisciplinary required in the procedures to achieve the primary aesthetic demand. Prepared provisional bridge with ovoid pontic shape on the surgical area will initiate soft tissue filling into interdental embrasure and enhance the aesthetic. The complication arises when insufficient soft tissue toward healing takes place. The replacement of exposed and infected membrane and photodynamic disinfection (Foto San) was imposed to minimize the chance of reinfection. Therefore, aim of this paper is to present the application of the invented Piezosurgery system of three dimensional ultrasonic vibrations and bone expansion gadget in the ridge augmentation procedure. The application of bone regenerative material (Puros-allograft) and bioresorbable collagen membrane (Resolut Adapt LT) ensure ridge modification. All these procedures were carried out as the consequences if inappropriate correction of severe malocclusion with extensive fixed prosthesis on vital anterior teeth.

Key words: Aesthetic dentistry · Ridge augmentation · Bone regeneration · Fixed prosthodontics

INTRODUCTION

Patient awareness and expectations have increased recently especially the demand on aesthetics [1]. The management of severe crowding to improve aesthetic by orthodontics means will reduce the risk of deterioration of pulp. Unfortunately, if the crowding was treated with fixed prostheses, it may end up with endodontic treatment. Study shown that 10% of vital teeth that been crowned will need to undergo root canal treatment [2] due to pulpal deterioration.

‘Pink aesthetic’ was defined as surrounding soft tissue that enhance the aesthetic [3]. The aesthetic concern when there is loss of gingival and interdental soft and hard tissue, may resulting in unpleasant smile due to long clinical crown and black triangle between the crowned teeth. Removable partial denture can provide the pink aesthetic and reduce the black triangle or the other option was the long clinical crown incorporate with pink porcelain to improve loss of soft tissue.

Deficient of soft tissue and alveolar bone after tooth extraction is part of normal healing process which cause by bone resorption and remodel [4]. The level of reduced alveolar bone depending on the damage that already taken place and during dental extraction. In severe alveolar bone loss, the contour changes in vertical and horizontal dimensions created a problem and influence the success of fixed or removable prosthesis.
Surgical intervention is also one of the treatment options to improve aesthetic. Whether to introduce the soft tissue or bone graft or other regenerative procedures are depending on the rationale. The aim of this paper was to highlight the procedure of surgical intervention to improve pink aesthetic due to loss of hard and soft tissue with the use of high technology instrumentation.

**Case Report:** A 35 year old lady was referred to Periodontic Specialist Clinic complaining of unsatisfactory removable partial acrylic denture and requested for fixed prosthesis. The general practitioner was hesitant to provide fixed bridge for this patient and request of expert opinion and management because the amount of hard tissue and soft tissue loss was quite extensive. Past dental history revealed patient had undergone extensive crown work on her anterior teeth from right canine to left canine to correct her malocclusion. Few months later, right maxillary lateral incisor and canine need an extraction due to long standing dental abscess. Instead of simple extraction patient was suffered from minor oral surgery due to fractured root during extraction. Large amount of alveolar bone lost and patient ended up with immediate acrylic partial denture to replace missing 12 and 13 while waiting for bone remodeling for fixed prosthesis. The occlusion assessment was acceptable for bridge from 14 to 11.

On the first visit, the retention of her partial denture was acceptable and aesthetic was satisfactory. However, the psychological discomfort of having something that removable in a young lady make her insisted for a bridge. Radiographic findings revealed the incomplete root canal treatment and significant periapical radiolucencies on several anterior teeth such as 11, 21 and 22 (Figure 1). Study model and diagnostic wax up was prepared to estimate the amount of bone to be augmented. The initial treatment planning offer her 4 units fixed bridge to replace the missing teeth. Root canal treatment on 11, 21 and 22 were carried out prior the replacement of all the crowned teeth. Crown lengthening was planned to improve the final pink aesthetic on the contralateral side from 21, 22 and 23 and surgery that involve hard and soft tissue replacement. Patient will be using provisional bridge from 14 until 1 after the surgery and at the end stage, all the six crowned need to be replaced.

**Surgical Procedure:** The teeth [12, 13] have been extracted due to the failure of endodontic treatment. Dental extractions were traumatic to the underlying alveolar bone. As a consequence, the bone defective over the area was quite extensive which definitely will affect the aesthetic outcome of permanent prosthesis.

She has no significant medical illnesses and habit. Upon intra-oral examination, the plaque control was moderate and calculus detected on interproximal surfaces of posterior teeth. Long splinted crown was evidence from 11 to 23. A narrow edentulous ridge was prominent on the right corner of maxilla (12 and 13) and classified as class III bone defect (Figure 2). Gingival margin on 11, 21 and 23 were not harmonized. The surgical augmentation was planned to gain the horizontal and vertical height of edentulous ridge before placement of permanent prosthesis. Concurrent crown lengthening on 11, 21 and 23 is to improve the aesthetic of final prosthesis (Figure 3). She was educated towards maintaining adequate plaque control.

The alveolar bone splitting technique and incorporation of guided bone regeneration were chosen in this patient. Using Piezosurgery system an adequate gutter was made in the centre of alveolar ridge along the length. A bone expander from the same system was activated inside this gutter to laterally widen the alveolar ridge until greenstick fracture on the buccal leaving the remaining periosteum attached to the bone. Bone regenerative material (Puros-allograft) filled into the gutter and covered with bioresorbable collagen membrane (Resolut Adapt LT) (Figure 4). After managed to get sufficient soft tissue to cover the membrane, the site was sutured with 5/0 vicryl.

![Fig. 1: The radiographic finding revealed the incomplete endodontic treatment on 11 and periapical radiolucency on 21 and 22.](image-url)
Fig. 2: Reduce vertical (a) and horizontal (b) edentulous ridge

Fig. 3-1: The gingival line on the surgical site compared to the contralateral side showed short clinical crown after the crown lengthening on 21, 22 and 23.

Fig. 3-2: The gingival line with new provisional crowns on contralateral side showed even gingival line and improved aesthetic.

Fig. 4: Widening of alveolar ridge and guided bone regeneration (GBR)
However, three [3] weeks later the complication suddenly appears. Membrane was exposed and show evidence of sign of infection (Figure 5). The second surgery was required to remove the previous membrane and replaced with the new membrane. Light activated disinfectant (FotoSan) was applied to the site for reducing the chance of reinfection. Two [2] weeks after that, evident of soft tissue healing started to cover the site of defect. The aim is achieved when there is increment of alveolar bone volume in vertical and horizontal dimension. This created favourable contour that will facilitate the placement of prosthesis and improve the aesthetic.

**DISCUSSION**

Misjudgment and management of general practitioner to correct the malocclusion with extensive work of fixed prosthesis led to extensive treatment plan that involve restorative and surgical intervention. The over prepared tooth for placement of fixed prosthesis such as crown will jeopardize the vitality. It is a challenge to do root canal treatment on crowned teeth that had been modified the position and proclination of the tooth. The chance of perforation was very high during access cavity and post canal preparation. The worse consequence would be dental extraction.

The changes of alveolar ridge contour occurred following tooth extraction. The resorption and remodeling process are significant on buccal plate as it is thinner. It caused reduction of bone in vertical and horizontal dimension and the alveolar ridge will appear narrow. Deterioration of soft and hard tissue would be more significant if the extraction was due to longstanding infection or traumatic procedure [5]. When this happen on anterior region that would give rise to unsatisfactory to the sufferer.

There are various techniques applicable to improve this condition prior to permanent prosthesis. Combinations of two techniques of widen the alveolar ridge and guided bone regeneration was applied in this case. Lateral expansion of alveolar ridge towards using expansion gadget (Piezosurgery system) helped to increase the horizontal or buccolinguial width. Simultaneous GBR enhanced bone growth under the membrane which prevents soft tissue to interfere into the defect [6]. Bone graft (Puros Allograft) was used to support the bioresorbable membrane (Resolut Adapt LT). The use of bioresorbable membrane does not require secondary surgical removal of the membrane.

However, regenerative procedures are technique sensitive and there is possibility for membrane exposure because of insufficient soft tissue. That happened in this case, but immediate replacement of infected membrane help to increase the success of augmentation. Provisional prosthesis such as bridge in this case created the scallop contour of gingival and achieved the standard pink aesthetic. The new provisional crowns on contralateral site [21-23] were constructed in order to harmonize the crown margin and improve the aesthetic and smile line.

**CONCLUSION**

In management of narrow alveolar ridge, a multidisciplinary approach is essential to enhance and fulfill the aesthetic demand. The fixed prosthesis facilitates the achieving of pink aesthetic.

**REFERENCES**
