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Prosthodontic Rehabilitation of a Patient with an Anterior Fibrous Edentulous Maxilla opposed by a Partially Dentate Mandible

Abstract: Tooth loss may affect the dietary patterns, phonetics, appearance, and lifestyle of affected individuals. Therefore, patients require the replacement of missing teeth to allow adequate function, appearance, and psychological wellbeing. However, the replacement of missing teeth in patients at the transitional stage from the natural to the artificial dentition can pose a significant challenge to a clinician. This case describes the management of a patient with an ill-fitting upper complete denture, which rested on an anterior fibrous edentulous maxilla, opposing a partially dentate mandible.

CPD/Clinical Relevance: Selection of the optimum treatment option available to manage a patient with an anterior fibrous edentulous maxilla opposed by a partially dentate mandible is important.

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Owing to improved health care and increased oral health awareness, patients increasingly wish to function with their natural teeth as long as possible. Tooth loss may affect a patient's dietary pattern, appearance, and lifestyle. Therefore, patients seek to replace missing teeth to improve function, appearance, and psychological wellbeing.

Replacement of missing teeth in patients at the transitional stage from the failing natural dentition to the fully

prosthetic dentition can be challenging. Tooth-supported overdentures have been proposed when there are a few teeth or roots available, and when these are not possible, implant-supported overdentures have been proposed as the 'standard of care'.^{1,2} However, prior to the extraction of the last remaining teeth, both of these treatment options remain available and the use of natural teeth as overdenture abutments offers a less expensive alternative than an implant-

supported prosthesis.¹

A patient who presents with an ill-fitting upper complete denture resting on an anterior flabby edentulous maxilla, opposing a partially dentate mandible where a few natural teeth remain, can pose a significant clinical challenge to a clinician. This is due to complications, including:

- Negative past denture experience;
- Poor ability to adapt to new dentures owing to relatively poor neuromuscular control, which can occur with advanced age;
- Systemic illnesses, such as xerostomia as a result of polypharmacy.

The remaining abutment teeth are also insufficient to retain a partial denture adequately, and may have overerupted or migrated.

The following case describes the

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Figure 1. Existing upper denture with the tissue paper lining.

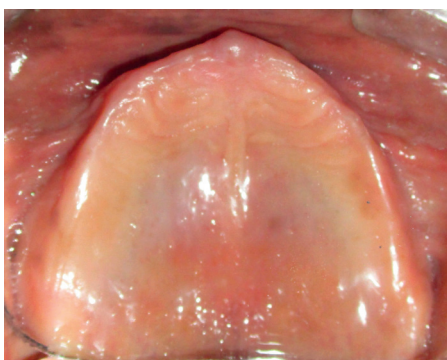


Figure 2. Edentulous maxilla with pinpoint hyperaemia of the palate.

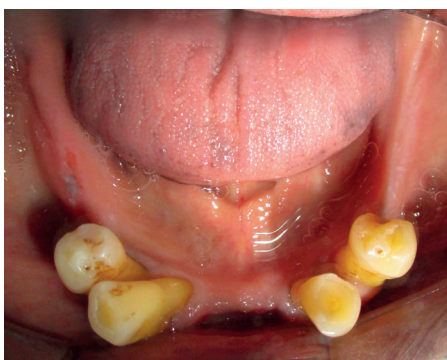


Figure 3. Intra-oral view of the mandible.

prosthodontic management of a patient with an anterior flabby edentulous maxilla opposing a partially dentate mandible.

Case report

A 54-year-old male presented to the Restorative Unit A, National Dental Teaching Hospital (NDTH), Sri Lanka, complaining of looseness of his upper complete denture and a burning sensation of the palate. He was diabetic and had undergone a coronary artery bypass graft (CABG). At the time of presentation, he was taking ecosprin, enalapril, atorvastatin and metformin.



Figure 4. IOPA radiographs of (a) LL3, LL4 and (b) LR3, LR4.

He had started wearing an upper complete denture, together with his third lower removable partial denture (RPD), approximately 6 years previously. However, his upper complete denture had become loose in the previous year. To improve retention, he had been adapting tissue paper to the fitting surface daily (Figure 1). He used to clean the denture every morning, but did not remove the denture at night.

Extra-orally, there was no facial asymmetry, and the lower facial height was not significantly affected. Intra-orally, pinpoint reddish patches were noticed at the back of the palate, suggesting denture stomatitis type I (Figure 2).³ His maxillary alveolar ridge showed moderate ridge resorption with mobile, fibrous tissue (flabby ridge) anteriorly.



Figure 5. Following the relining of the fitting surface of the existing upper denture.

LL3, LL4, LR3, and LR4 teeth showed supra-eruption and grade I mobility. None of these teeth had periodontal pockets >3.5 mm. Nevertheless, all of them had Miller's class IV recession.⁴ LL3 and LR3 showed signs of attrition (Figure 3).

All the teeth gave a positive vitality response to an electric pulp tester. Intra-oral peri-apical (IOPA) radiographs of the teeth were taken to assess the bone support (Figure 4).

Several prosthodontic treatment options were discussed with the patient to manage the maxillary and mandibular arches.

Maxillary arch

- Surgical removal of the fibrous tissue and construction of a new complete denture;
- Construction of a new complete denture using special impression techniques;
- Implant-supported overdenture;
- Implant-supported fixed bridge.

Mandibular arch

- Mucosa-borne removable partial denture;
- Tooth-supported complete overdenture (with or without precision attachments);
- Extraction of the remaining teeth and construction of a conventional complete denture;
- Extraction of the teeth followed by construction of an implant-supported complete overdenture;
- Extraction of the teeth followed by construction of an implant-supported fixed bridge.

After discussing these treatment options with the patient, it was decided to construct a new complete denture using special impression techniques for the upper

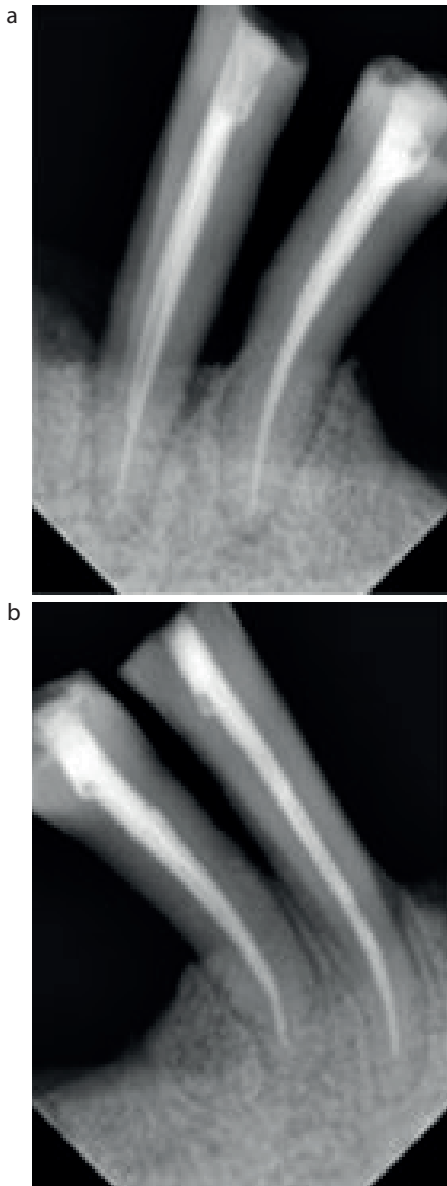


Figure 6. IOPA radiographs of (a) LL3, LL4 and (b) LR3, LR4 following endodontic treatment.

arch and a tooth-supported complete overdenture with bare-root abutments for the lower arch.

Initially, the borders of the existing upper denture were adjusted, and the impression surface was relined with the permanent soft liner (Ufi Gel, VOCO, Germany) to improve its retention (Figure 5). Then, 0.1% chlorhexidine gluconate solution was prescribed for overnight immersion of the upper denture. A 2% miconazole oral gel was prescribed for topical application over the palate and fitting surface of the denture, 6-hourly for 2 weeks to treat the denture stomatitis.

In the meantime, elective endodontic



Figure 7. Prepared bare-root abutments.

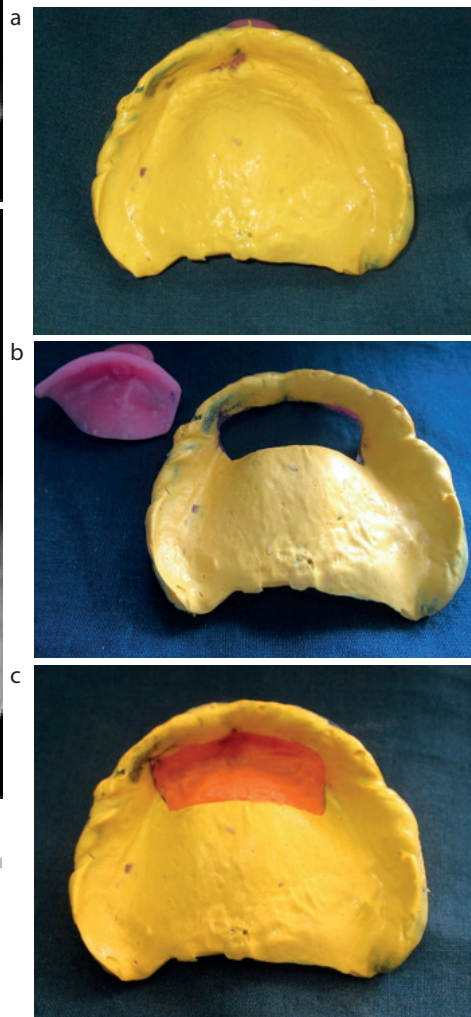


Figure 8. (a) Master impression of the upper arch taken with medium-bodied silicone. (b) Modified master impression and the tray, following removal of the impression material and equivalent area of the impression tray which laid over the fibrous tissue. (c) Completed master impression with light-bodied silicone over the flabby tissue.

treatment was undertaken for LL3, LL4, LR3 and LR4 (Figure 6). Thereafter, all the teeth were prepared to have a 2–3-mm tooth structure supragingivally, with dome-



Figure 9. Master impression of the lower arch.



Figure 10. Metal framework of the lower complete overdenture.

shaped surface contours and flush gingival margins. Root canals were sealed coronally with light-cured composite resin (Figure 7).

Primary impressions were made using alginate, and special acrylic trays were constructed using 1.5-mm spacers, i.e. the space required for elastomers. Border moulding of the special trays was carried out with green stick compound to ensure a good peripheral seal.

A master impression of the maxillary arch was taken with medium-bodied silicone (Perfect-F, Premium Fast, Han Dae Chemical Co Ltd, Korea). The extent of the flabby tissue was marked on the impression, and it was removed together with the equivalent area of the impression tray. The modified tray was replaced in the mouth, and flabby tissue was recorded in a minimally displaced position by injecting light-bodied silicone into the flabby area and supporting it with the supporting tray (Figure 8).⁵

The master impression of the mandibular arch was taken using medium-bodied silicone and light-bodied silicone, using the one-stage impression technique (Figure 9).

The mandibular metal framework was constructed (Figure 10), and the maxillary denture base was constructed using acrylic resin. The lower metal framework and the

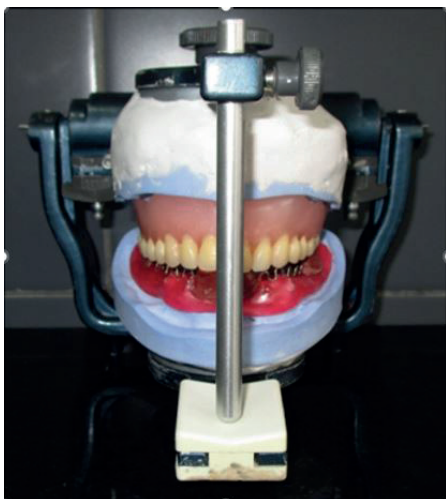


Figure 11. Mounted upper try-in and lower denture base containing the wire loop.

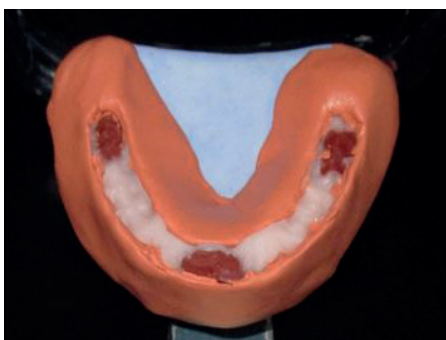


Figure 12. Lower neutral zone impression with the silicone putty index.

upper denture base were evaluated in the mouth for their accurate fit, retention and stability.

The jaw relations were recorded, and the upper trial denture was constructed in the laboratory. Vertical pillars made of impression compound were placed in the incisor region, and first molar region of the lower denture base to maintain the established OVD and a retentive wire bent in a sinusoidal manner was attached to join the vertical pillars (Figure 11).

The upper trial denture was checked intra-orally for retention, stability and aesthetics. The lower denture base with the wire loop was assessed intra-orally to ensure that the established OVD was maintained with the upper trial denture. Subsequently, tissue conditioning material (D-soft; Medicept Dental, UK) was placed along the wire loop while the upper trial denture was *in situ*. The patient was asked to perform closed-mouth exercises to record the neutral zone. Finally, a silicone putty index of the functional impression



Figure 13. Fitting surface of the lower complete overdenture.

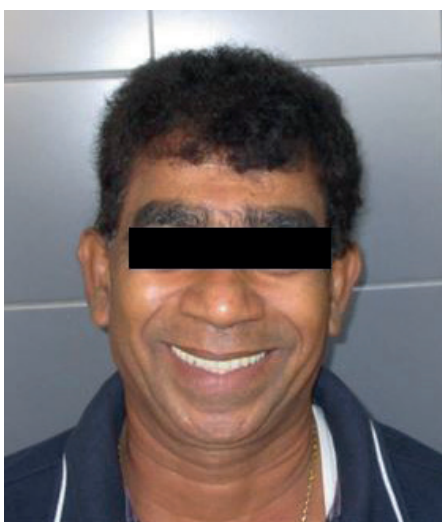


Figure 14. Post-treatment smile.

was made (Figure 12).

Prosthetic teeth of the lower try-in were arranged within the neutral zone using that silicone putty index. Shallow angle cusped posterior teeth were placed according to the principles of a lingualized occlusal scheme.⁶

After assessing the upper and lower trial dentures intra-orally, they were processed and finished with heat-cured acrylic resin (Figure 13). Finally, the finished dentures were delivered to the patient with the necessary instructions (Figure 14).

Discussion

Tooth loss results in atrophy of the residual alveolar ridge, positional changes of the remaining teeth in horizontal and vertical planes, altered maxillo-mandibular ridge relationship, and changes in the facial form.⁷ It also compromises the patient's confidence, dietary patterns, aesthetics and lifestyle.⁸ Therefore, patients may wish to replace their missing teeth to facilitate function, appearance, and

psychological wellbeing.

However, replacing missing teeth at the transitional stage from the natural to the artificial dentition can pose a significant challenge to a clinician. Therefore, alternative treatment strategies, such as tooth- and implant-supported overdentures have been recommended.^{1,2}

The formation of a fibrous (flabby) maxillary anterior ridge is seen in approximately 24% of patients with an edentulous upper ridge opposed by lower anterior teeth.⁹ A fibrous maxillary anterior ridge appears to result from overloading of the anterior maxillary ridge and subsequent alveolar bone resorption and replacement by fibrous tissue.¹⁰ This displaceable tissue offers poor support for the denture, compromising the stability and retention of the prosthesis.

Flabby tissue can be managed by either surgical or non-surgical approaches. Although the surgical excision of fibrous tissue can provide a firm support for the denture, this reduces the denture-bearing area. Furthermore, the excised tissue has to be replaced with denture base material, which inevitably creates a less retentive, bulky prosthesis.

Implant-retained prostheses may offer enhanced stability and retention. Osseointegrated implants can be regarded as the treatment of choice for edentulous maxilla in many situations.⁶ However, when there is a significant alveolar bone resorption, as in the anterior fibrous maxilla, the vertical distance between the alveolar crest and the base of the nasal sinuses can be a limiting factor for the placement of implants.¹² Furthermore, in the case of a flabby maxillary ridge, as a small amount of alveolar bone is left for implant placement, further surgical intervention may be needed in the form of bone grafting, which would complicate the procedure further. The age and health of the patients, as well as affordability and personal preferences, may make a surgical approach inappropriate.

It is reported that a flabby maxillary anterior ridge can be successfully managed non-surgically by selecting the appropriate master impression technique.¹ If the flabby tissue is recorded using a conventional muco-compressive impression technique, the tissue would recoil and displace the constructed denture overlying it.¹ Whereas, the muco-static impression technique does not displace the flabby tissue while recording, and therefore, maximum retention can be achieved.¹

In addition, several other special impression techniques have been proposed to record the flabby tissue, and they include:

- A technique in which the two different materials, plaster of Paris over the flabby tissue and zinc oxide–eugenol over the normal tissue, are used in a special tray;¹³
- A technique in which two separate impression trays and materials are used to record the fibrous tissue and normal tissue separately by relating two trays intra-orally;¹⁴
- Window technique, where plaster of Paris over the flabby tissue and zinc oxide–eugenol over the normal tissue is used;¹⁵
- A technique where an impression compound is used in a special tray to record the normal tissue in its compressed state, followed by zinc oxide–eugenol wash impression of the flabby tissue in its non-displacive state.¹⁶

However, there is little evidence in the literature to support the superiority of one technique over the other. The selection of the impression technique is largely determined by personal preference.¹⁷

A modified window technique using polyvinyl siloxane of different viscosity has been suggested because of its convenience in practice.^{5,18} In this patient, the window technique was used, with regular-bodied silicone to record the normal tissue and light-bodied silicone to record the displaceable tissue.

When an anterior flabby edentulous maxilla is opposed by a partially dentate mandible, clinicians are posed with a dilemma for management options.

Mucosa-borne removable partial dentures can be considered a compromised option for the partially dentate mandible, because they can result in poor retention, stability, unfavorable occlusion and poor aesthetics.

Extraction of the remaining teeth and construction of a conventional complete denture can result in poor support, retention and stability of the prosthesis, owing to the continuous and unpredictable loss of residual bone after extraction. The use of a complete denture can further reduce the denture-bearing area and bone support of the edentulous mandible.¹⁹

Extraction of the remaining teeth and construction of an implant-supported fixed prosthesis for the mandible opposing a complete denture in the maxilla can

cause more bone loss in the maxilla than a mandibular overdenture.²⁰

Tooth- or implant-borne complete overdentures can offer a better alternative option. However, prior to the extraction of the last remaining teeth, both options remain available. Osseo-integration in the anterior mandible is reported to be successful and predictable and it may be argued that it is a more cost-effective option in the long term.⁵ Nevertheless, prosthodontic treatment should be concerned with conservation of what remains, rather than replacement of what has been lost.¹⁶ Furthermore, tooth-supported complete overdentures can offer several advantages, such as preservation of the alveolar ridge, more uniform distribution of functional load, improved stability, improved retention when attachments are used, proprioceptive response, more stable occlusion, psychological benefits, ease of modification on failure of abutment teeth and relatively low cost compared to an implant-supported prosthesis. Although disadvantages, such as increased risk for caries and periodontal diseases, exist, they can be successfully addressed by the patient maintaining excellent oral hygiene, fluoride therapy and regular follow-up care.²¹ In view of this, a tooth-supported complete overdenture option was the preferred option in the mandible of this patient.

The success of a tooth-supported overdenture largely depends on the selection of strategic teeth or roots of teeth for abutments. Single-rooted teeth, such as canines, lower first premolars, and upper central incisors, are preferable for overdenture abutments.¹ The reduction of clinical crown height of the overdenture abutments decreases the crown: height ratio and reduces tooth mobility. Furthermore, it allows sufficient interocclusal clearance for the metal framework and the acrylic to ensure the prosthesis is thick enough for strength in cross-section. The dome-shaped surface contour of the abutment minimizes potentially harmful horizontal forces.

Overdenture abutments can be bare-rooted, with metal copings alone or with a precision attachment. Metal copings minimize caries risk, and attachment systems offer increased retention, stability and support. However, it is a more costly treatment with additional laboratory stages and components. Furthermore, long-term maintenance of precision attachments is

also more challenging because, over time, different components may fail and may be difficult to source from suppliers as designs change. Therefore, bare-root overdenture abutments were considered for this patient.

Irrespective of the mode of prosthetic replacement, basic prosthodontic principles of complete denture construction should be applied.

For the arrangement of maxillary anterior teeth, conventional biometric principles can be considered. Nevertheless, posterior teeth should be arranged after deciding on a suitable occlusal scheme for the patient. This is determined by the height and width of the residual alveolar ridge, the relationship of the skeletal bases, neuromuscular control, para-functional habits, and the patient's aesthetic concerns.²²

In general, an upper denture offers greater freedom for the arrangement of teeth. On the contrary, owing to the lateral spreading of the tongue, the arrangement of teeth in the lower arch can be challenging. To overcome this, the 'neutral zone technique or anthropoidal pouch technique' was introduced.²³ The neutral zone impression technique was used for this patient to record the zone of minimal conflict.

Conclusion

Prosthodontic management of a patient with an anterior fibrous edentulous maxilla opposed by a partially dentate mandible can pose a significant challenge to a clinician. The selection of the most appropriate replacement option, fabrication, and delivery of the planned prosthesis, using the skills of both clinician and laboratory technician, will hopefully result in a successful outcome that will improve the patient's quality of life.

Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

Informed Consent: Informed consent was obtained from all individual participants included in the article.

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