

# Full mouth rehabilitation for severely worn dentition using fixed prostheses and tooth-supported partial overdenture: a case report

Chu Seng Boon

Prosthodontic Department, Kulliyah of Dentistry, International Islamic University Malaysia, Kuantan Campus, 25250 Kuantan, Pahang, Malaysia

## Abstract

Rehabilitation of severely worn dentition represents a significant clinical challenge, especially when the restorative space is not sufficient. Creating restorations that fulfil the aesthetic, occlusal and functional parameters are essential to long-term success. This case report describes a 48-year-old male, who had severely worn dentition, which resulted in collapsed vertical dimension. The initial treatment involved careful planning, stabilization of existing dental diseases and construction of provisional prostheses at increased vertical dimension. Once the compatibility of the new vertical dimension had been confirmed, permanent reconstruction was performed. As with all full mouth prosthetic rehabilitation cases, equal-intensity centric occlusal contacts on all teeth and an anterior guidance in harmony with functional jaw movements were critically taken into account in each treatment phases.

**Keywords:** full mouth rehabilitation, tooth wear, tooth-supported overdenture

## Received:

18 March 2021

## Revised:

22 April 2021

## Accepted:

26 July 2021

## Published Online:

31 July 2021

## How to cite this article:

Chu, S. B. (2021). Full mouth rehabilitation for severely worn dentition using fixed prostheses and tooth-supported partial overdenture: a case report. *IIUM Journal of Orofacial and Health Sciences*, 2(2), 120-128. Retrieved from <https://doi.org/10.31436/ijohs.v2i2.75>

## Article DOI:

<https://doi.org/10.31436/ijohs.v2i2.75>

## \*Corresponding author

### Address:

Prosthodontic Department, Kulliyah of Dentistry, International Islamic University Malaysia, Kuantan Campus, 25250 Kuantan, Pahang, Malaysia

**Telephone:** +60199810975

### Email address:

[chusengboon@gmail.com](mailto:chusengboon@gmail.com)

## Introduction

The progressive wear of teeth surfaces is a normal process during the lifetime of a normal adult. However, excessive wear can result in pulpal pathology, occlusal disharmony, impaired function and aesthetic disfigurement (Song *et al.*, 2010). The terms erosion, attrition, abrasion and abfraction have been used to describe different wear

mechanisms but contrary to the beliefs, it is now accepted that the aetiology of pathological tooth wear is multifactorial, usually involving a variety of behavioural, medical and local factors (Djemaal *et al.*, 1998, Darbar & Hemmings, 1997). Although one type of wear may predominate in a patient (Smith & Knight, 1984), in many clinical situations, combination of these conditions exist (Smith, 1989).

In many cases, the vertical dimension of occlusion (VDO) is maintained by tooth eruption and alveolar bone growth (*Song et al., 2010*). As the progression of tooth wear is slow, the alveolar bone undergoes adaptation and compensates for the loss of tooth structure to maintain the VDO. It is recommended that VDO should not be changed in a patient without careful evaluation and approach (*Jahangiri & Jang, 2002*). Otherwise, there will be a severe overload on the restorations and increased risk of destruction of these restorations.

Management of severely worn dentition utilizing fixed or removable prostheses can be a daunting procedure in clinical endeavour. Loss of harmony of occlusal plane orientation and progressive reduction in anterior tooth length leads to an aesthetically compromised appearance. This condition is normally exacerbated by bruxism and sub-optimal general dental care. Eventually, a reduced VDO may develop, which complicates the future restorations.

Although full mouth reconstruction is the preferred treatment for most cases with generalised tooth wear it is not always needed. Where the coronal tissues are mildly worn or where only a few teeth need restorative intervention, a conformational occlusal approach can be used. This not only simplifies the procedures, but it also cuts down on the cost and duration of the treatment. When multiple restorations are needed, it is critical to consider whether a reorganised occlusal scheme can be used to manage the condition. In a severely worn down dentition, when there is no stable occlusal relationship, the need for reorganised approach becomes more apparent.

This case report describes the full mouth rehabilitation of a patient with severely worn down dentition by means of combination of fixed and removable prostheses.

## Case report

A 48-year-old man was referred to Guy's Hospital, UK for management of his severely worn down dentition. He complained of not being able to chew his food completely and socially compromised due to his appearance. Multiple visits to different dentists could not solve his problem as the composite build-ups that were done eventually failed over the years. An initial evaluation indicated that the patient has no known medical problem and was not aware of any parafunctional habits. He was a chronic smoker for more than 15 years and had been actively smoking about 10 cigarettes per day. A weekly dietary evaluation revealed that the patient consumed acidic fruits, mainly apples and grapefruits, fruit juices and fizzy drinks, which he sipped throughout the day and took them between meal times. He also reported to consume about 10 units of wine weekly.

Extraorally the patient presented with reduced lower facial height associated with overclosure of his lips and prognathism of his mandible. On smiling, no obvious gingival tissue showing, however there was disharmony of occlusal plane orientation (Figure 1A-B).

His oral hygiene was fair and there was no periodontal problem. Clinical and radiographic examinations as well as diagnostic casts revealed generalized moderate to severe tooth wear (combination of attrition, erosion and abrasion). Most affected teeth had worn down to the gingival level with severely short clinical crown height, dentin exposure and visible pulpal outline (Figure 2A-C). Few teeth were sensitive to air blow and his tooth 13 was tender to palpation and percussion. Basic Erosive Wear Examination (BEWE) indicated score 3 for all the sextants.

Occlusal analysis showed Class III incisal relationship with cross bite of the tooth 13 was seen in intercuspation position (ICP). On lateral mandibular movement, the teeth 24 and 25 (contralateral group function) guided his right excursion, while tooth 17 guided his left excursion. Protrusive movement was guided by teeth 24 and 25.

Full mouth periapical radiographs were taken which revealed periapical radiolucencies on teeth 13, 36, 37 and 47. There were also presence of radiolucencies on tooth 37 (disto-occlusal) confirming the intraoral finding of carious lesion. The

radiographs also showed generally short root morphology on most of his teeth (Figure 3). All teeth responded to electric pup test and cold test except teeth 13, 37 and 47, which indicates pulp necrosis.

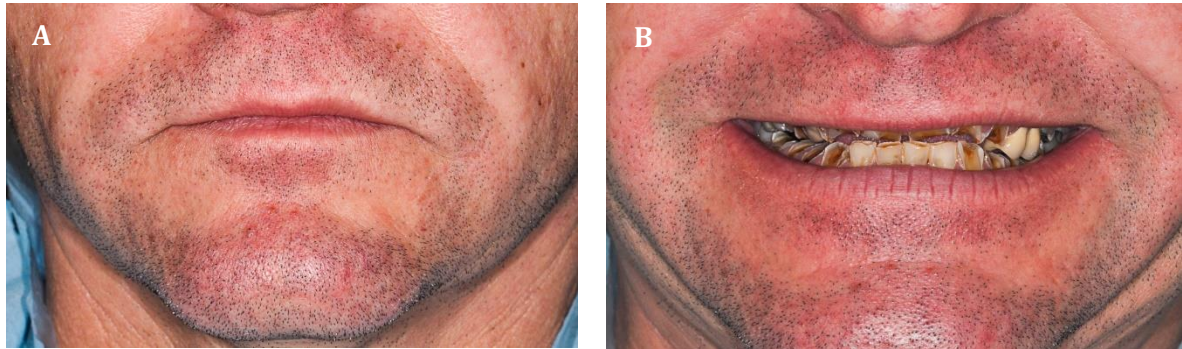


Figure 1. Frontal view. Overclosure of lips at rest (A) and on smiling (B), the occlusal disharmony was evident.



Figure 2A-C. Intraoral view. Severe tooth wear (combination of erosion, attrition and abrasion) could be seen. Dentoalveolar compensation has taken place leading to reduced interocclusal space for restorative works.

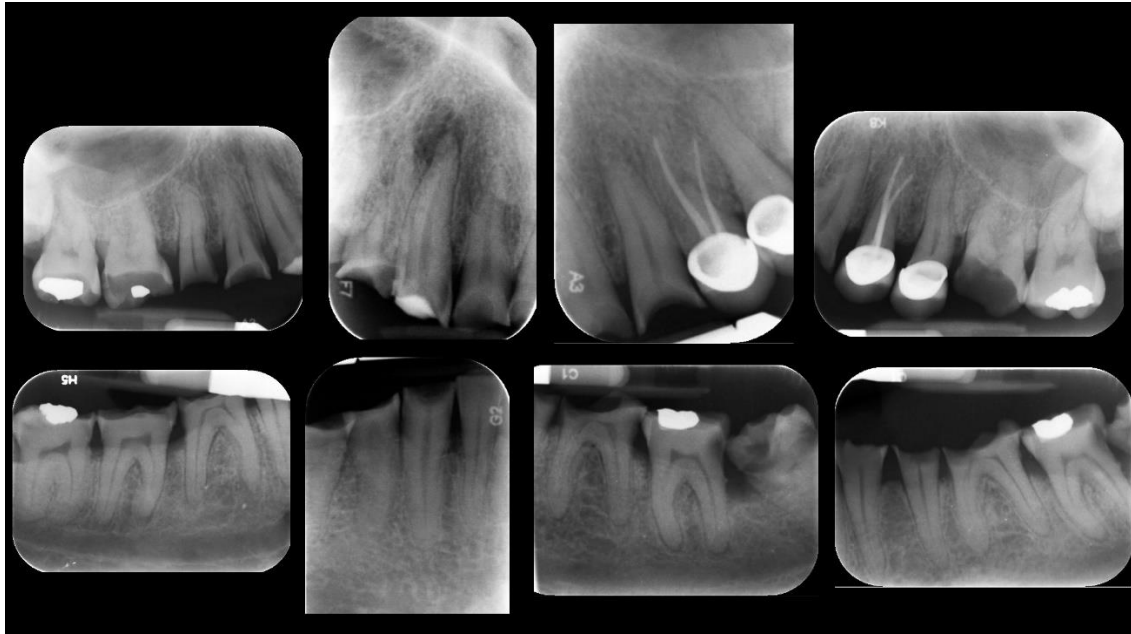


Figure 3. Full mouth periapical radiographs (pre-operative)

The prognosis for his upper anterior severely worn dentition was guarded due to their poor restorability. Most of the anterior teeth did not have adequate ferrule and their roots were short. The provision of crown lengthening and aesthetic anterior crown length for these teeth would result in unfavorable crown-to-root ratio.

The initial preventive treatment phase was first initiated and this includes oral hygiene maintenance and dietary changes as well as caries management. Endodontic treatments were carried out on teeth 13, 37 and 47. Elective endodontic treatment was also performed on 36 (Figure 4A-C).

Diagnostic wax-ups were made at an increased vertical dimension on articulated

study casts using semi-adjustable articulator (Denar® Mark II, Whipmix) (Figure 5). Chairside intraoral mock-up was done with temporary bis-acrylic material (Protemp™ 4, 3M™) to assess the aesthetic and smile line of the planned final restoration (Figure 6).

Provisional upper partial tooth-supported overdenture was constructed to the desired VDO, covering teeth 15 to 25 where the abutment teeth were shaped into dome and restored with composite resin. Posteriorly, provisional resin crowns were placed on all his remaining upper molars (Figure 7A-B). The patient was reviewed every 2 weeks for the total duration of 3 months until the temporary prosthesis and composite restorations were deemed stable.



Figure 4. Post endodontic treatments on teeth 13 (A), 36, 37 (B), 47 (C)



Figure 5. Articulated diagnostic wax up



Figure 6. Intraoral mock-up with bis-acrylic temporary crown material



Figure 7. Provisional upper acrylic partial tooth-supported overdenture (A) and provisional crowns on upper molars (B)

After his oral condition stabilizes, master impression of the prepared molars was done for construction of milled porcelain-fused-metal (PFM) crowns. For bite registration, pattern resins crowns were used and chairside occlusal resin beading was performed to maintain the same vertical dimension, as the temporary crowns were

removed one at a time (Figure 8A). Anteriorly, upper wax rim was used to stabilize the vertical dimension and reconfirm the labial support (Figure 8B).

Definitive metal ceramic crowns with milled palatal ledges were cemented with resin cement and maxillary cobalt chrome

overdenture was issued (Figure 9A-B). On the mandibular arch, composite resin build-ups were done on the four incisors, while the canines and premolars were fitted with composite crowns. Full gold crowns were

issued to the molars (Figure 9C, 10A-C, 11A-C). The patient was reviewed after 1 week, followed by 3 months and 6 monthly intervals to ensure that oral hygiene is up to optimal condition.



Figure 8. Utilizing resin copings to stabilise the existing vertical dimension during jaw registration stage (A). Upper wax rim to stabilize the vertical dimension and labial support (B).



Figure 9. Maxillary molars fitted with PFM crowns with milled rest seats and palatal guideplanes (A), supporting a cobalt-chrome partial denture (B). Posterior fixed prostheses on the lower arch with composite resin build up on the anterior teeth (C).



Figure 10. Frontal view (A), right buccal view (B) and left buccal view (C) of the final treatment



Figure 11. Post treatment frontal view at rest (A) and smiling (B), as well as the side profile view (C)

## Discussion

The management of severely worn down dentition has been classified by Turner and Missirlian according to the amount of VDO loss and the available restorative space (Turner & Missirlian, 1984). His classification with the combination of the conventional treatment of raising VDO with crown lengthening procedure followed by prosthodontic intervention have been widely advocated up until today. However due to the lack of evidence in the long term clinical outcomes of this technique and the vast choice of materials have cause difficulty in clinical decision making (Johansson *et al.*, 2008). Because of these unclear guidelines, adhesive restoration which is more conservative and reversible in nature, is increasingly utilized (Darbar & Hemmings, 1997; Hemmings *et al.*, 2000; Jahangiri and Jang, 2002; Song *et al.*, 2010). Nonetheless, composite restoration was not indicated for this particular patient due to the lack of remaining tooth structures for its retention.

Increasing the occlusal vertical dimension was essential to achieve good outcome. Establishing the anterior guidance first would allow a good occlusal stability and will also affect the morphology of the posterior restoration. There has been various reports on the recommended provisionalization stage for crowns but generally 2 – 6 months are required before final restoration (Turner & Missirlian, 1984; Hemmings *et al.*, 2000; Sato, Hotta & Pedrazzi, 2000; Jahangiri & Jang, 2002) In this case, the patient was regularly monitored for 3 months to evaluate the adaptation to the provisional crowns and provisional acrylic partial overdenture. The increase of VDO was determined not by the standardized aesthetic golden proportion of anterior teeth but rather by the patient's physiologic factor such as interocclusal space, facial bony contour and speech. If the increased VDO was arbitrarily decided without close evaluation, multiple complications might arise and further management will be needed leading to a longer treatment duration. Depending on the patient's adaptability and compliance, the provisional

stage can be modified accordingly and with careful evaluation and monitoring, shorter overall treatment duration may be warranted.

The use of natural teeth as overdenture abutments has become an accepted, realistic alternative to the extraction of remaining teeth since 1960s. The treatment is also affordable for many patients who requires extensive treatment for tooth wear albeit multiple dental maintenance visits are required to ensure a successful and long survival rate. Whilst several cross-sectional and longitudinal studies have shown that patients with overdenture abutments are at a higher risk of developing caries and periodontal disease, the success of overdenture therapy can be predicted with improved communication between the patient and the dentist with regard to the daily use of fluoride gel and regular recall appointments (Ettinger & Qian, 2004). In another study, the same researchers who performed follow up of up to 22 years on patients with tooth-supported overdenture had reported the rate of abutment tooth loss of 20%. They further clarified that many of these failures could have been prevented if patients had practiced a better oral hygiene. Therefore, it is suggested that if a dentist recommends overdenture therapy, the patient needs to be examined regularly to reduce the risk of experiencing caries and periodontal disease.

Traditionally, a full mouth rehabilitation based on complete crown coverage has been the recommended treatment for patients with severe tooth wear. However, with the improvement of adhesive technology, a more conservative approach such as direct or indirect composite resins may be proposed. A study conducted in a university setting has reported a 3-year survival rate of 91.6% for indirect composite resin crowns (Jongsma *et al.*, 2012). In addition, another prospective study also reported a 5-year survival rate of 86.6% for direct and indirect composite cuspal restorations (Fennis *et al.*, 2014). Several factors may affect the prognosis of a crown and may differ between composite resin crowns and metal ceramic crowns. Apart from technical and operator-



related factors, patient-related factors such as oral hygiene, dietary habits, parafunctional habits and the extent of tooth surface loss may all contribute to the survival of the crowns. In this case, due to the severe tooth surface loss of the mandibular premolars and the fact that the patient did not wish to undergo crown lengthening procedure, a less invasive treatment option of composite resin crowns was decided. In addition, the mandibular canines were also fitted with composite resin crowns to provide a canine-guided lateral excursive jaw movement. As for the remaining mandibular incisors, direct composite resins were built up to the intended mutually protected occlusal scheme. As the tooth surface loss was not severe on his mandibular incisors and the enamel layers were adequate, composite resins should provide a medium- to long-term success in this case.

## Conclusions

This case report demonstrates the raising of vertical dimension of occlusion using the combination of fixed and removable prostheses which was performed after careful analysis and provisionalisation. This has shown to be successful outcome of full mouth rehabilitation in a severely worn dentition.

## Acknowledgements

The author wishes to acknowledge the postgraduate lecturers from King's College London, specifically Professor Dr David Bartlett and Dr Satinder Chander for their mentorship in treating the case, as well as the technical team from King's College London for their guidance

## References

- Darbar, U. R. & Hemmings, K. W. (1997). Treatment of localized anterior toothwear with composite restorations at an increased occlusal vertical dimension. *Dental Update*, 24(2), 72-75.
- Djermal, S., Darbar, U. & Hemmings, K. (1998). Case report: tooth wear associated with an unusual habit. *The European Journal of Prosthodontics and Restorative Dentistry*, 6, 29-32.
- Ettinger, R. L. & Qian, F. (2004). Postprocedural problems in an overdenture population: a longitudinal study. *Journal of Endodontics*, 30(5), 310-314.
- Fennis W.M., Kuijs R.H., Roeters F.J., Creugers N.H., Kreulen C.M. (2014). Randomized control trial of composite cuspal restorations: five-year results. *Journal of Dental Research*, 93(1), 36-41.
- Hemmings, K. W., Darbar, U. R. & Vaughan, S. (2000). Tooth wear treated with direct composite restorations at an increased vertical dimension: results at 30 months. *The Journal of Prosthetic Dentistry*, 83(3), 287-293.
- Jahangiri, L. & Jang, S. (2002). Onlay partial denture technique for assessment of adequate occlusal vertical dimension: a clinical report. *The Journal of Prosthetic Dentistry*, 87(1), 1-4.
- Johansson, A., Johansson, A.K., Omar, R., Carlsson, G.E. (2008). Rehabilitation of the worn dentition. *Journal of Oral Rehabilitation*, 35(7), 548-566.
- Jongsma L.A., Kleverlaan C.J., Feilzer A.J. (2012). Clinical success and survival of indirect resin composite crowns: results of a 3-year prospective study. *Dental Materials*, 28, 952-960.
- Sato, S., Hotta, T. H. & Pedrazzi, V. (2000). Removable occlusal overlay splint in the management of tooth wear: a clinical report. *The Journal of Prosthetic Dentistry*, 83(4), 392-395.
- Smith, B. G. (1989). Toothwear: aetiology and diagnosis. *Dental Update*, 16(5), 204-212.
- Smith, B. G. & Knight, J. K. (1984). An index for measuring the wear of teeth. *British Dental Journal*, 156(12), 435-438.
- Song, M.Y., Park, J.M. & Park, E.J. (2010). Full mouth rehabilitation of the patient with severely worn dentition: A case report. *The Journal of Advanced Prosthodontics*, 2, 106-110.
- Turner, K. A. & Missirlian, D. M. (1984). Restoration of the extremely worn dentition. *The Journal of Prosthetic Dentistry*, 52(4), 467-474.