

Case Report

## Restoring Occlusal Vertical Dimension of Kennedy Class I Partially Edentulous Mandibular Arch Using an Overlay Cobalt-Chromium Partial Denture and Thin Acrylic Veneers

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**Abstract**— Reduced occlusal vertical dimension due to severe tooth surface loss poses significant functional and aesthetic impacts to the patient. Extensive dental procedures to restore the occlusion and aesthetics is usually a challenge to the treating dentist. Overlay removable partial denture can be used as the simpler treatment modalities to treat moderate to severe tooth surface loss. This case study reported the fabrication of a lower partial cobalt-chromium overlay denture to restore the occlusal vertical dimension on a 78 year-old lady with Kennedy Class I partially edentulous with severe lower anterior tooth surface loss. Thin layer of acrylic tooth veneers was added to the labial surface of the overlay denture to improve the aesthetics. This solution was functionally acceptable and met the need and demand of the patient.

**Keywords**— Kennedy Class I; overlay denture; overdenture; tooth surface loss; occlusal vertical dimension

### I. INTRODUCTION

Tooth surface loss (TSL) or tooth wear is the loss of dental hard tissues from the tooth surfaces caused by factors other than caries, trauma, and developmental disorder [1]. The improvement in economic status, healthcare facilities, and dental awareness among the public have led to the increase of individuals' lifespan and more teeth are retained in the mouth for life, thus resulting in increasing incidence of tooth wear. Epidemiological studies showed that the prevalence of severe

TSL increases with increasing age [2] and the severity of the TSL is also related to age [3].

TSL can be classified into four main groups, namely abrasion, attrition, erosion, and abfraction. The rate of tooth wear differs individually, depending on the aetiological factors and the dynamic musculoskeletal response. Slower rate results in dento-alveolar compensation, thus maintaining the occlusal vertical dimension [4]. Accelerated TSL, on the other hand, usually leads to loss of occlusal vertical dimension (OVD) and increase in free-way space [4][5]. Loss of OVD significantly affect patients' function, aesthetics, and quality

of life. Proper treatment planning and management need to be carried out to ensure that the treatment is feasible, meets the treatment objectives, and satisfies the need and demand of the patient [6]. This case report will discuss on the simple management of reduced OVD in a Kennedy class I partially edentulous mandibular arch with generalised TSL and reduced OVD.

## II. CASE REPORT

A 78 year-old Malay lady was referred to the Prosthodontics Specialist Clinic, Faculty of Dentistry, Universiti Sains Islam Malaysia for construction of lower partial denture. Medical history revealed that the patient suffers from arthritis which affects her knee joints, has history of breast cancer in 2013, and undiagnosed back pain. She had received extensive crowns and bridgeworks from private clinics ten years ago and multiple units of lower partial dentures were made, but none of the dentures were worn by the patient due to pain, poor retention, and poor aesthetics.

Extraoral examination revealed skeletal pattern class II with prominent naso-labial angle. At rest, there were 3mm of incisal edge visible with incompetent lips. Intraorally, the upper arch was fully restored with all ceramic crowns and fixed bridges. Mandibular arch was Kennedy class I partially edentulous with only 33, 32, 31, 41, 42 and 43 present. Severe ridge resorption was noted on the bilateral free-end saddle area and severe TSL was present on most of the remaining lower teeth with reduced OVD. The periodontal tissues were healthy and without any significant inflammation and/or infection (Fig. 1).



Fig.1: Fixed prostheses opposing lower anterior teeth with reduced occlusal vertical dimension

Assessment of the previous lower acrylic dentures showed poor retention and stability. Attempts were made by the previous dentists to restore the attrition on the remaining lower anterior teeth to increase the crown height and provide retention for the denture, however to no avail. Dislodgement of composite restorations on the abutment teeth lead to loss of retention from the gingivally-approaching clasps on both abutment teeth.

Teeth 33, 32, 41 and 42 presented with severe attrition with only one-third of the tooth structures left. Tooth 31 had severe TSL resulting in exposed gutta-percha, but without any symptoms. Tooth 43 was sound with minimal TSL (Fig. 2). Dental panoramic radiograph and lower anterior periapical

radiographs showed no pathological lesions associated with the dentition.



Fig. 2: Severe tooth surface loss on the lower anterior teeth with exposed gutta-percha on tooth 31

Treatment options were: lower anterior crowns to increase the crown height followed by construction of partial denture to replace the missing teeth; or, construction of an overlay denture with increased OVD. The root canal treatment (RCT) on tooth 31 was also suggested to be redone due to exposed gutta-percha and compromised coronal seal. The patient decided to have a lower partial cobalt-chromium overlay denture to replace the missing teeth, as she was reluctant to undergo invasive and lengthy treatment procedures due to her physical condition.

Selective pressure impression techniques were used for primary impression of the edentulous jaw using impression compound with alginate wash. The remaining tooth structure was smoothed and undercuts were eliminated prior to secondary impression taking. Special tray was constructed and secondary impression was taken using medium body polyvinyl siloxane impression material. Cobalt-chromium framework was placed directly over the teeth without any major reduction of the coronal structures to utilize all remaining teeth for additional retention and support. Gingivally-approaching clasps and distal proximal plates were placed on teeth 33 and 43 by adapting the RPI concept. Meshwork was also placed covering the incisal and labial teeth surfaces (Fig. 3). The exposed gutta-percha on tooth 31 was covered with glass ionomer cement and upon patient's request, RCT would be initiated later, should there be any sign and symptom.



Fig. 3: Overlay denture with gingivally approaching clasps and proximal plates on teeth 33 and 43

Maxillomandibular record was taken at retruded contact position (RCP) with increased OVD for 2mm. Willis gauge was used to obtain the correct OVD. The anterior acrylic teeth were trimmed until they became like a veneer for the anterior teeth to provide better aesthetics of the lower dentition (Fig. 4). Appropriate occlusion with the upper dentition was ensured during installation of the denture. Denture retention, stability, occlusion, and aesthetics were assessed and found to be good (Fig. 5). The patient returned for review visits after one week and one month, and both visits were uneventful.



Fig. 4: Thin layers of acrylic veneers were placed on the labial surface of the meshwork for better aesthetics of the lower anterior teeth



Fig. 5: Frontal view of the final denture

### III. DISCUSSION

Attrition is mechanical wear of occlusal or incisal tooth surfaces due to functional or parafunctional tooth-to-tooth contact. The process is usually slow and does not result in pulpal diseases as secondary dentine is laid down to protect the pulp; therefore, attrition is asymptomatic, and most patients are unaware of the problem until it becomes severe. In this case, attrition on all remaining lower teeth has led to excessive wear and reduced OVD, which might be associated with lack of posterior support and the use of extensive ceramic anterior fixed prostheses on the maxillary arch for more than ten years [7]. The hardness of dental ceramics was found to be associated with greater abrasive effects to natural teeth [8].

Management of TSL is complex and usually requires extensive dental treatment resulting in lengthy treatment time and high financial expenditure for the patients [6][9]. Overlay denture is a better alternative as it is more conservative and simpler, suitable for moderate to severe tooth wear with partial edentulism [10]. Overlay denture can be either used as

a transitional prosthesis or as a definitive prosthesis in severe tooth wear cases especially in patients with time and financial constraints [5][11].

In this case, overlay denture was used to address the loss of OVD and Kennedy class I partial edentulism. Restoration of Kennedy class I poses biomechanical challenge because they derive from two different tissue supports [12]. Therefore, our denture design involved full extension and occlusal coverage of the remaining teeth and oral tissue to help in providing additional retention and stability, and also to protect the remaining teeth from further damage. The occlusion of the denture is set at RCP due to its reproducibility and the condyle is at its most relaxed position.

Thin acrylic veneers were placed on the labial surface of the overlay meshwork to improve the aesthetics of the anterior teeth. Similar veneering technique in an overdenture was also described by Zanardi et al. (2016) which involves placement of acrylic veneers in the anterior and posterior teeth, in bounded saddle area and using a different cobalt-chromium denture design [13]. Option was also given to the patient for placement of porcelain veneers on the metal framework as suggested by a few literatures [14][15], however the patient declined and requested for a simple and cheaper treatment option.

Post-operative instructions and maintenance visits are crucial to ensure the success of the overlay denture [5]. Periodic maintenance visits are needed to ensure the periodontal and the remaining teeth are maintained, without any diseases. Recall visits were done one week and one month after completion of treatment and the patient is required to come for review every six-monthly.

### IV. CONCLUSION

The management of TSL is complex and challenging to the attending clinicians. Considerations must be given to patients' general health, need and demand, and their time and financial capabilities during treatment planning. This case highlights a conservative treatment approach using an overlay cobalt-chromium partial denture in treating severe TSL with reduced OVD in Kennedy class I partially edentulous mandible, which is not only simple and economical, but able to restore the occlusion and aesthetics of the patient.

#### CONSENT TO PARTICIPATE

Informed written consent had been obtained prior to publication of this case report.

#### CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

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