

Labial Wing-retained Modified Maryland Bridge with Monolithic Zirconia Veneers for Deep Bite Rehabilitation: A Case Report

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ABSTRACT

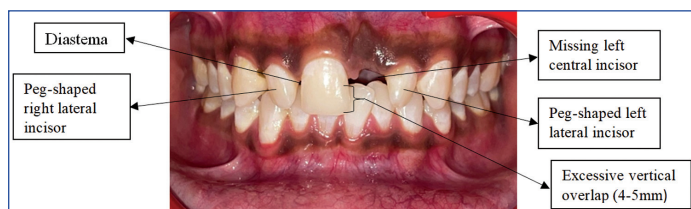
Rehabilitation of missing anterior teeth in young patients presents a clinical challenge due to high aesthetic demands, ongoing craniofacial growth and the need to preserve sound tooth structure. The present case report describes a 17-year-old male with peg-shaped lateral incisors, spacing, severe vertical overlap and a missing maxillary left central incisor. A conservative treatment approach was planned using a modified Maryland bridge in conjunction with ceramic veneers, considering the patient's age, occlusal characteristics and minimally invasive requirements. Unlike the conventional design, the prosthesis incorporated labial retentive wings combined with veneer preparations on the abutment teeth. Monolithic zirconia was selected to enhance fracture resistance in the presence of a deep bite. Additional ceramic veneers were cemented on adjacent teeth to close diastemas (between the maxillary right central incisor and lateral incisor and between the right lateral incisor and canine) and improve tooth morphology. At two-year follow-up, no biological or mechanical complications were observed and satisfactory functional, phonetic and aesthetic outcomes were maintained. The present case highlights the value of individualised prosthetic design and adhesive principles in achieving predictable, minimally invasive anterior rehabilitation in young patients with excessive vertical overlap.

Keywords: Adhesive dental prosthesis, Resin-bonded fixed partial denture, Tooth preparation, Zirconium oxide

CASE REPORT

A 17-year-old male patient reported to the Department of Prosthodontics with the chief complaint of an unpleasant smile due to a missing maxillary anterior tooth and spacing between the remaining anterior teeth. The patient gave a history of dental trauma at the age of 12 years, which resulted in avulsion of the maxillary left central incisor (tooth 21). The edentulous space had been present for approximately five years. Past dental history was non contributory.

On clinical examination, the maxillary left central incisor was missing, peg-shaped lateral incisors were noted and an excessive vertical overlap of 4-5 mm was observed [Table/Fig-1]. Diastemas were present between the maxillary right central incisor and right lateral incisor and between the right lateral incisor and canine.



[Table/Fig-1]: Preoperative clinical photograph showing the affected teeth.

Radiographic evaluation using an intraoral periapical radiograph and orthopantomogram revealed adequate alveolar bone height in the edentulous region and no periapical pathology in the adjacent abutment teeth.

Considering the patient's age, ongoing craniofacial growth, pronounced vertical overlap and aesthetic expectations, a conservative treatment plan was formulated with informed consent. As the patient was a minor, informed consent for treatment and publication of clinical images was obtained from the patient's parents.

Implant-supported rehabilitation was deferred due to the risk of infraocclusion associated with continued skeletal growth. A conventional full-coverage fixed dental prosthesis was avoided to

preserve sound enamel and prevent possible pulpal compromise in a young patient. Therefore, a minimally invasive adhesive prosthetic approach was selected.

A modified Maryland prosthesis was custom designed to replace the maxillary left central incisor using the maxillary right central incisor and left lateral incisor as abutments. Unlike the conventional design with palatal wings, the present modification incorporated retentive wings on the labial surfaces of the abutment teeth, extending to the incisal third of the palatal surfaces, to accommodate the excessive vertical overlap. Individual ceramic veneers were additionally planned for the maxillary right lateral incisor and canine to optimise aesthetics and function [Table/Fig-2].

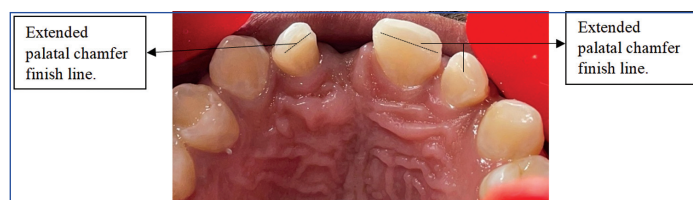


[Table/Fig-2]: Post tooth preparation image illustrating the prepared abutments.

A diagnostic wax-up was completed to assess proposed aesthetics and occlusion. The prosthesis was digitally designed using Computer-aided Design (CAD) software, with connector dimensions maintained at a minimum height of 3 mm and width of 2 mm to enhance fracture resistance under deep bite conditions.

Shade selection was performed using the VITA Tooth-guide 3D-MASTER system (VITA, Germany). Tooth preparation followed the incisal overlap technique with an extended palatal chamfer on the abutment teeth, as well as on the maxillary lateral incisor and canine. Depth cutting diamond burs were used to achieve uniform facial reduction of approximately 0.7-1.0 mm and incisal

reduction of 1.0-1.5 mm, with a defined equigingival chamfer finish line [Table/Fig-3].



[Table/Fig-3]: Occlusal view demonstrating the extended palatal chamfer finish line.

Gingival retraction was performed using braided gingival displacement cord (Gingi-Pak 000) and the final impression was made using elastomeric impression material (Honigum Fast Set Putty and Honigum Light Body, DMG, Hamburg, Germany). Provisionalisation was carried out using a bisphenol A-glycidyl Methacrylate (bis-GMA) composite material (Protemp 4, 3M ESPE, St. Paul, MN, USA) with a direct technique.

The modified design involved facial preparation of the abutment teeth following veneer preparation principles, thereby maximising bonding surface area and mechanical resistance. In this configuration, the bonded ceramic veneers functioned as the retentive elements of the prosthesis [Table/Fig-4].



[Table/Fig-4]: Digital/design phase of the prosthesis showing its contour and fit.

The modified Maryland bridge and veneers were fabricated using monolithic zirconia (Katana™ Zirconia, Kuraray Noritake Dental Inc., Tokyo, Japan). A bisque trial was performed to evaluate aesthetics, contour and occlusion, with special attention to the vertical overlap. Following characterisation and staining for optimal integration, the definitive prosthesis was cemented using a dual-polymerising resin luting agent (3M RelyX™ U200, 3M) under isolation according to the manufacturer's instructions [Table/Fig-5].



[Table/Fig-5]: Post-cementation clinical photograph of the modified Maryland bridge along with veneers.

At the six-month follow-up, the patient reported satisfaction regarding aesthetics, phonetics and comfort [Table/Fig-6]. Over a two-year follow-up period, no biological or mechanical complications such as debonding or fracture were observed [Table/Fig-7,8]. The patient continued to express satisfaction with the functional and aesthetic outcome of the prosthetic rehabilitation.

DISCUSSION

Rehabilitation of anterior teeth is integral to restoring facial harmony, phonetics and psychosocial well-being, particularly in young individuals where aesthetic expectations are high. The anterior dentition significantly influences smile dynamics and self-perception, necessitating conservative yet predictable restorative



[Table/Fig-6]: Six-months follow-up image.



[Table/Fig-7]: Two-years follow-up image.



[Table/Fig-8]: Occlusal view of prosthesis two years after cementation.

strategies [1]. In the present case, the patient exhibited a missing maxillary left central incisor, peg-shaped lateral incisors, diastemas and excessive vertical overlap, presenting both aesthetic and biomechanical challenges.

Conventional management options for anterior tooth replacement include implant-supported prostheses and full-coverage fixed dental prostheses. While implant therapy demonstrates high long-term survival rates in adults, its use in adolescents remains controversial due to continued craniofacial growth and the risk of infraocclusion. Similarly, conventional fixed partial dentures require extensive tooth preparation and may compromise pulpal vitality in young patients. In contrast, minimally invasive adhesive approaches preserve sound enamel and align with contemporary restorative principles [2,3].

Porcelain laminate veneers have demonstrated predictable aesthetic outcomes with high survival rates when bonded predominantly to enamel. Resin-bonded fixed dental prostheses, particularly Maryland bridges, have demonstrated favourable long-term survival when appropriate case selection and occlusal control are ensured. In a long-term clinical evaluation, Botelho MG et al., reported satisfactory survival rates of resin-bonded fixed partial dentures for missing maxillary incisors, emphasising the importance of minimal preparation and controlled occlusal loading [4]. Similarly, Pjetursson BE et al., in a systematic review observed that ceramic-based tooth-

supported fixed dental prostheses show predictable outcomes when biomechanical principles and connector dimensions are respected [5]. However, most published studies describe conventional palatal-wing designs. Literature describing labial-wing modifications in patients with excessive vertical overlap remains limited. The present case demonstrates that, with careful design modification and appropriate material selection, predictable functional and aesthetic outcomes can be achieved even in deep bite conditions.

In the present case, the modification involved incorporating facial ceramic veneers as retentive elements, effectively functioning as labial wings. This approach differs from conventional Maryland bridges by increasing surface coverage and distributing functional stresses across a broader bonded interface. Similar design modifications have been reported in selected case reports to enhance retention and aesthetics; however, literature describing their application specifically in deep bite scenarios remains limited. The current report therefore contributes to the evolving clinical evidence by demonstrating favourable two-year outcomes in a patient with pronounced vertical overlap [5].

The excessive vertical overlap posed a significant risk of mechanical failure, particularly at the connector. To mitigate this, connector dimensions were optimised and monolithic zirconia was selected due to its superior flexural strength and fracture resistance. Compared to metal-ceramic or layered zirconia systems, monolithic zirconia reduces the risk of veneering ceramic chipping while maintaining adequate aesthetics. This material selection was critical in ensuring durability under increased anterior functional stress [6,7].

Despite its advantages, the modified labial-wing design may present limitations. Shade matching and margin maintenance require meticulous clinical execution and veneer debonding or ceramic fracture remain potential complications, particularly in patients with parafunctional habits. Connector fracture, although not observed in this case, remains a theoretical risk in deep bite conditions. Long-term maintenance should include periodic occlusal assessment, reinforcement of oral hygiene practices and regular recall visits to monitor prosthesis integrity and periprosthetic health [8].

From a cost-effectiveness standpoint, this technique offers a non surgical alternative to implant-supported rehabilitation, reducing surgical expenses and treatment time while preserving biological structures. However, long-term comparative studies evaluating survival rates and patient-reported outcomes between modified Maryland designs and implant therapy in adolescents are warranted [9].

The staged diagnostic protocol and incisal overlap preparation with palatally extended chamfer facilitated enamel preservation, which is

critical for optimal bond strength in young patients. Over the two-year follow-up period, no biological or mechanical complications were observed and the patient remained satisfied with the functional and aesthetic outcome [Table/Fig-7,8] [10].

Future research should include prospective clinical trials with larger sample sizes and extended follow-up periods exceeding five years to evaluate long-term biomechanical stability. Finite element analysis studies may further elucidate stress distribution patterns in labial-wing designs under deep bite conditions. Additionally, schematic illustrations or design diagrams may aid in standardising this modification for broader clinical application.

CONCLUSION(S)

The present case highlights the importance of comprehensive treatment planning and conservative restorative strategies in managing anterior aesthetic concerns in young patients. The modified Maryland prosthesis provided a minimally invasive and aesthetically favourable solution for anterior tooth replacement in the presence of excessive vertical overlap, achieving predictable functional and aesthetic outcomes while preserving healthy tooth structure.

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