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Replacement of Maxillary Posterior Teeth Using Resin-Bonded Fixed Partial Denture – A Minimalistic Invasive Approach: A Case Report

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Abstract

This case highlights the use of lithium disilicate as posterior prosthesis instead of traditional anterior prosthesis through proper case selection and optimized bonding protocol. A 35-year-old female presented with the chief complaint of a missing upper right first molar, extracted one year earlier due to caries. Based on Clinical and radiographic evaluation, the condition was diagnosed as a single posterior edentulous space suitable for conservative adhesive rehabilitation. All possible treatment options were discussed but the patient opted for a minimally invasive approach. So, lithium disilicate resin-bonded bridge was fabricated with minimal preparation and bonding protocol included hydrofluoric acid etching, silane application, and cemented with dual-cure resin cement. At the 6-month follow-up visits, the restoration exhibited satisfactory occlusion, function, and esthetics, with no evidence of debonding or complications. This case underscores that resin-bonded all-ceramic prostheses can be extended to posterior tooth replacement when supported by careful planning and adhesive protocol.

Keywords: Lithium disilicate, resin-bonded bridge, Maryland bridge, minimally invasive, Posterior tooth replacement, Case report.

Introduction

Occlusion is a dynamic functional balance that influences speech, mastication, deglutition support, esthetics, coordinated forceful respiration and the health of the temporomandibular joint, not just the contact between maxillary and mandibular teeth.[1] Minimally invasive approaches in restorative dentistry is to achieve both functional and esthetic rehabilitation while preserving as much of healthy tooth structure as possible.[2] De Van's Dictum is "Preserve what remains rather than meticulously replacing what is lost" which highlights the prerequisites of conserving sound tooth structure as it advocates long-term health and function of existing teeth and tissues before designing prosthetic restorations.[3] Among the available conservative options, resin bonded fixed dental prostheses (Maryland bridge) is preferred because it requires minimal tooth preparation and retained via micromechanical and adhesive enamel bonding.[4] With proper case selection and bonding protocol, e.max Maryland bridges can offer a dependable, esthetic, and functional solution for posterior tooth replacement.[5] This case report is unique because it shows how a lithium disilicate all-ceramic resin-bonded bridge can be successfully used to replace a posterior tooth in an area that is typically thought to be unsuitable for such restorations. It also highlights a minimally invasive and aesthetically pleasing alternative.

Case history

A 35-year-old female patient reported with the chief complaint of missing upper right first molar (tooth 16), extracted one year ago due to extensive caries. On detailed clinical examination, the edentulous area was assessed as Seibert Class I ridge defect[6] (loss of bucco-lingual width with maintained height) and Atwood Class III ridge form[7] (well-rounded ridge width adequate height and width). Abutment teeth were found to be periodontally healthy with no gingival recession and mobility [Fig 1]. Parafunctional habits were assessed through patient history, with no such habits observed during clinical examination. On periapical radiographic examination it reveals well-defined lamina dura around abutments, indicating healthy periodontal support. Root lengths were approximately 14 mm and 16 mm, with corresponding crown lengths of 6mm and 8mm, suggesting a favourable crown-to- root ratio. The measured pontic space 8mm was adequate for prosthetic replacement. No periapical pathology was observed. Conventional treatment modalities such as Removable Partial Denture (RPD), Fixed Partial Denture (FPD), implants along with advanced minimally invasive treatment modalities were suggested. For all ceramic restorations, the recommended ideal crown height space is 7mm to 10mm, while <7mm reduces fracture resistance, >10mm compromise the longevity. Informed consent was obtained from the patient after describing the nature of the procedure and possible discomforts and risks. A Diagnostic impression was made for study model for precise planning of the Maryland bridge design. Diagnostic wax up done for evaluating occlusion, tooth preparation. Group function occlusal scheme was assessed and preserved during planning.

Design outline was prepared to plan wing dimensions, pontic position and extent of occlusal coverage [Fig 2]. Tooth preparation was carried out on palatal surface of abutment teeth with depth 1mm to establish a required restorative space and ensuring adequate material space of lithium disilicate framework while accommodating luting resin cement. Palato-occlusal reduction of 1 mm was achieved in functional areas to ascertain adequate material thickness under occlusal load. The finish line of 0.5 mm chamfer or rounded shoulder that distributes the stress uniformly and marginal fit, all margins were kept

at equigingival to maintain enamel bonding [Fig 3]. Single-cord gingival retraction technique was used to prior to final impression to expose preparation margins. Impression made using polyvinyl siloxane (Aquasil Ultra+, Dentsply Sirona) [Fig 4] to accurately record abutment enamel surfaces and edentulous span for fabrication of bridge. A Maryland bridge was fabricated using Computer-Aided Design and Computer-Aided Manufacturing (CAD-CAM) technique [Fig 5]. Pontic design selected was modified ridge-lap, ensuring optimal esthetics and hygiene maintenance. Shade selection was carried out under natural daylight conditions using VITA classical shade and contra-shade tabs to ensure precise shade matching. During try-in and bonding, proper isolation protocol was maintained using cotton rolls, suction and retraction to ensure a contaminant-free enamel surface. The following bonding protocol was implemented for the lithium disilicate prosthesis with 15,17. Etching was done on intaglio surface of ceramic retainer with (Porcelain etch, Ultradent, USA) 9% hydrofluoric acid for 20-30 seconds [Fig 6] to create micro porosities and surface roughness there by enhancing micromechanical retention for resin cement, rinsed thoroughly and air-dried. Followed by application of silane coupling agent (Silano, Angelus, Brazil) was applied to promote chemical bonding between ceramic and resin cement. The prepared enamel surface etched using 37% of phosphoric acid etching gel (Coltene, Switzerland) for 20seconds to remove the smear layer, increase surface energy & wettability there by improving micromechanical retention for bonding. A self-curing adhesive system (Para bond primer A &B with adhesive, Coltene, Switzerland) was applied to conditioned the tooth surface followed by placement of resin cement on the prosthesis surface prior to seating. [Fig 7] Final cementation of prosthesis with dual-cure resin cement resin (ParaCore, Coltene, Switzerland). [Fig 8] After final cementation, occlusion was verified and adjusted to maintain group function. The Patient was instructed meticulous oral hygiene with emphasis on proper tooth brushing, flossing around pontic and abutment teeth. Regular recall visits were scheduled to prevent complications which extend the lifespan of restoration and to ensure periodontal and peri-prosthetic tissue health and maintain long-term function and success of the prosthesis. The patient was reviewed at 1 month, 3months, 6month follow up during which the restoration demonstrated stable occlusion, optimal periodontal health and no evidence of debonding, fracture, or discomfort.

Discussion

Clinically replacing a single posterior tooth with minimal intervention remains challenging. The introduction of bonded restoration not only represents a novel approach in restorative dentistry but also provides a minimally invasive alternative to conventional prosthesis. Although zirconia possesses high flexural strength,[8] Lithium disilicate Maryland bridges was preferred for their superior esthetics, translucency, flexural strength (400Mpa), favourable bonding capability[9,10] and potential for conservative preparation. This treatment approach is considered a good choice in contemporary prosthodontics since it enhances durability by protecting pulp vitality and improved esthetics while requiring less clinical time.[5] Compared to dentin, enamel bonding provides marginal stability with reduced secondary caries and microleakage.[11] Equigingival margins are less plaque-retentive and provides better finishing and polishing, improved moisture control during cementation, and healthy periodontal response. The adhesive protocol used in this case, promote micromechanical interlocking between etched enamel and resin. while silane coupling ensures chemical linkage to ceramic.[10] Despite these,

Maryland bridges still pose high risk for debonding and technique sensitive. These interactions combine the tooth substrate, resin cement, and ceramic to create a cohesive structure that functions as a monoblock system. One of the limitations using lithium disilicate is it shows higher incidence of connector/wing fracture rather than debonding. [12]

Conclusion

This case showed that with proper case selection and adhesive protocol, lithium disilicate Maryland bridge can be a reliable, esthetic and minimally invasive option for posterior tooth replacement. The favourable functional and periodontal outcome in using lithium disilicate is attributed to its strong enamel bonding, optimized occlusal design and conservative preparation.

These advantages of it over the conventional fixed restoration makes it a viable alternative.

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Legend Figures

Figure 1: Preoperative Intraoral

Figure 2: Design Outline

Figure 3: Tooth Preparation

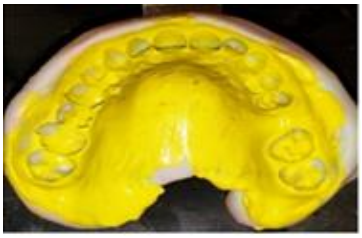

Figure 4: Impression

Figure 5: Fabricated Bridge

Figure 6: Etching with 9% hydrofluoric acid

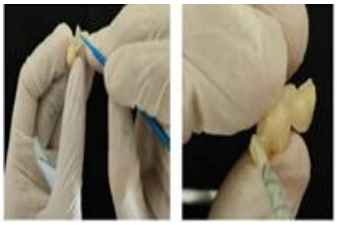

Figure 7: Application of saline coupling agent and resin cement

Figure 8: Post Operative intraoral