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Multidisciplinary Management Of A Mutilated Maxillary Bicuspid With Veneerlay : Biomimetic Approach – A Case Report

[1]Dr. Remya Varghese, [2]Dr. Midhun N G, [3]Dr. Swathy Krishnan

***Corresponding Author:**
Dr. Remya Varghese

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Abstract

Dentistry has transitioned from the classic era to a more conservative one, emphasizing minimally invasive partial restorations. Less invasive procedures significantly enhance aesthetic outcomes in addition to guaranteeing biological and biomechanical requirements. With the advancement of ceramic technologies, particularly CAD/CAM systems and bonding materials, conservative tooth preparation and restorative operations are achievable. This case report highlights the multidisciplinary approach employed to restore a fractured maxillary upper left premolar, including root canal treatment (RCT), crown lengthening via gingivectomy, and the use of a fiber post for reinforcement. The restoration was finalized with a biomimetic veneerlay, ensuring optimal aesthetics and functionality while preserving tooth structure.

Keywords: Veneerlay, Biomimetic approach , CAD-CAM, Crown lengthening

Introduction

Dentistry has transitioned from the classic era to a more conservative one, emphasizing minimally invasive partial restorations. Less invasive procedures significantly enhance aesthetic outcomes in addition to guaranteeing biological and biomechanical requirements. With the advancement of ceramic technologies, particularly CAD/CAM systems and bonding materials, conservative tooth preparation and restorative operations are achievable.

Management of fractured maxillary premolars poses a clinical challenge due to their critical role in aesthetics, function, and structural integrity of the dental arch. A fractured upper left maxillary premolar can significantly compromise oral health and patient comfort if not addressed comprehensively.

This case report highlights the multidisciplinary approach employed to restore a fractured maxillary upper left premolar, including root canal treatment (RCT), crown lengthening via gingivectomy, and the use of a fiber post for reinforcement. The restoration was finalized with a biomimetic veneerlay, ensuring optimal aesthetics and functionality while preserving tooth structure.

The described treatment plan underscores the importance of integrating endodontic, periodontal, and restorative strategies for predictable outcomes in complex dental cases. This approach not only rehabilitates the tooth but also enhances long-term prognosis by mimicking the natural biomechanical and aesthetic properties of the tooth structure.

Patient History and Examination:

A 49 year old male patient reported to the Department of Conservative Dentistry and Endodontics and presented with a chief complaint of fractured restoration in the upper left back tooth region before 3 months and had history of intermittent pain for past one week. The patient had no relevant medical history. Past dental history revealed history of restoration irt 25. Clinical examination revealed fractured amalgam restoration irt 25. The percussion response was negative and there was no fractured cusp and presence of pain during biting or mastication.

Figure 1 : First visit

Radiographic Examination:

Radiographic examination revealed fractured restoration with secondary caries and there was no periapical changes and no bone loss is seen irt 25. A diagnostic radiograph confirmed the restoration's proximity to the pulp chamber along with secondary caries, consistent with the clinical signs of chronic irreversible pulpitis.

Treatment Protocol and Complication:

Root Canal Treatment was advised as treatment plan and explained to patient. After obtaining informed consent, Access opening and biomechanical preparation was done on the same visit and appointment for obturation was given. Unfortunately the patient reported with fractured buccal cusp irt 25 on the next visit. A multidisciplinary treatment approach was planned based on the remaining tooth structure as the functional palatal cusp was intact. And the treatment plan was explained to patient.

Multidisciplinary Management of the Maxillary bicuspid:

Following obturation, Crown lengthening was done to expose about 2mm of enamel on the buccal surface for better adhesion of the prosthesis.

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Figure 2 and 3 : Crown lengthening irt 25

On the next visit, post and core was done. The post space was created using Guttaflow to loosen the Gutta Percha and prepared using #1 Peso. Size 1 Glass fibre post was luted with Para Core (Coltene Whaledent, USA). The core buildup was also done using Para Core (Coltene Whaledent, USA) to establish Monoblock concept.

Figure 4 : Post endodontic radiograph

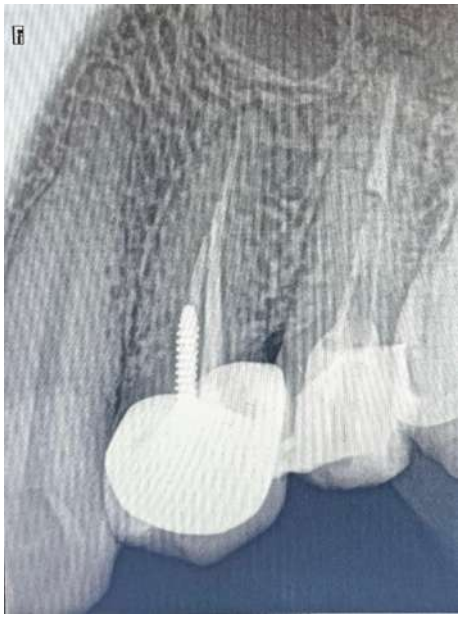

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Figure 5 : Post and Core buildup

Morphology Driven Preparation Technique (MDPT):

In order to minimize the tooth preparation and to conserve enamel a veneerlay with lithium disilicate (IPS E max , Ivovclar Vivadent, Schaan, Liechtenstein) was planned following Compression Dome Principle, the Morphology Driven Preparation Technique (MDPT) was planned for the following visit.

Buccally, a thin finish line margin of about (0.2-0.4 mm) was prepared using TR13 bur and Palatally, shoulder finish line was prepared using TF12 bur and the margins were placed just below the height of contour. The finish line continues interproximally to establish a ramped up design.

Figure 6 : After veneerlay preparation

CAD/CAM :

A digital impression of the prepared tooth was made using iTero intraoral scanner (Align Technology Inc, San Jose, CA, USA).

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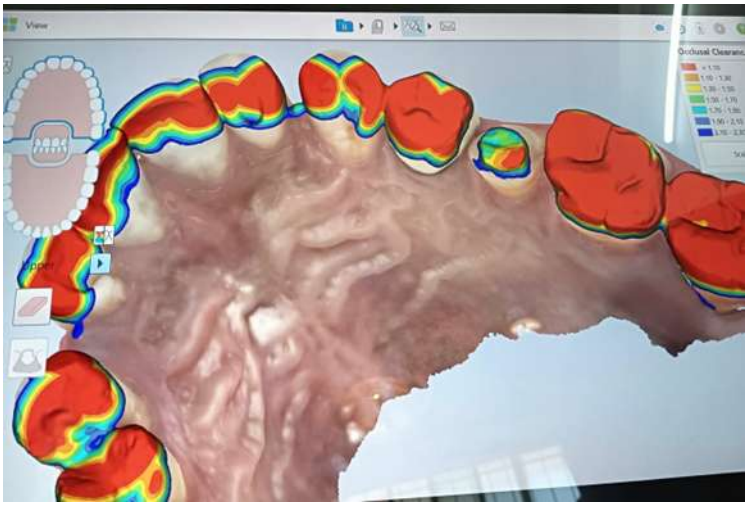
Figure 7 and 8 : Digital impression




The CAD designing was done and the prosthesis was milled using CAM machine.

Figure 9 and 10 : Veneerlay preparation

Figure 11 and 12 : Veneerlay (Buccal and Palatal view resp.)

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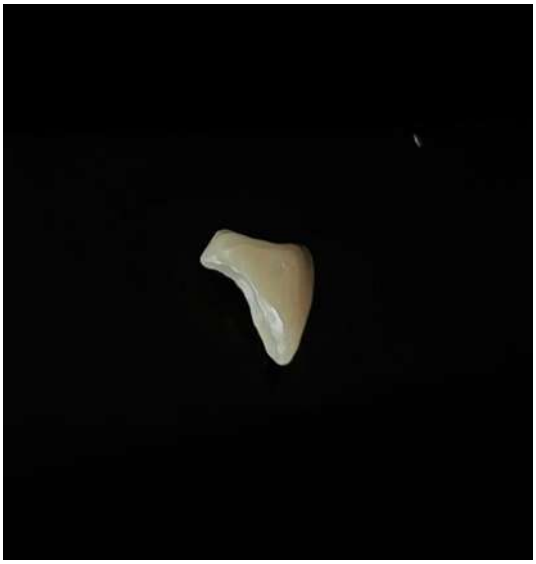
Fig 13 : Prosthesis (Veneerlay)



Tryin was done and the milled prosthesis had a good marginal adaptation and had no occlusal discrepancy.

Veneerlay cementation:

Following tryin the veneerlay was bonded to the prepared tooth surface following the bonding protocols for lithium disilicate restoration.

Fig 14 and 15 : After cementation (Buccal aspect)

Fig 16: After cementation (Palatal aspect)

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Discussion:

Teeth with moderate coronal defects in the posterior region of the dentition can now be restored using a variety of modern restorative solutions. (1)

With the advent of adhesively bonded restorative materials which have superior esthetics, higher strength, and increased mechanical reliability, the proportion of restorative treatments in posterior teeth using cosmetic materials is rapidly growing. (2)

To satisfy both functional and esthetic demands of patient, a partial coverage restoration like the veneerlay can be indicated. Veneerlays are excellent restoration option rather than using a full coverage crown.

Considerations for

1.Periodontal Health (Crown Lengthening):

Crown lengthening was necessary to attain the appropriate biological width, which is essential for maintaining periodontal health and providing adequate tooth tissue for restorative operations. This step is crucial for long-term success since it can prevent future problems like inflammation or bone loss. To improve the emerging profile in this instance, we performed gingivectomy and 2 mm of alveolar bone contouring at the buccal aspect preserving the biological width.

2. Endodontic integrity:

Infection was successfully eradicated and appropriate canal sealing was guaranteed by the root canal procedure. The addition of a glass fiber post reinforced the remaining tooth structure, providing both strength and aesthetic translucency that is ideal for anterior teeth. The gutta percha from the canal was removed with a heated instrument leaving behind 3mm at the apex (3) and finally #1 Peeso reamer was used to shape the canal in order to receive the #1 glass fibre post which reduces the unwanted removal of root dentin.

3. Restorative Strategy (Veneerlay):

The veneerlay restoration combined the advantages of partial coverage with the aesthetic and functional requirements of the case. It aimed to preserve as much tooth structure as possible while restoring both form and function. While the veneerlay biomimetic restoration with lithium disilicate improved the external shape with minimally invasive preparation, the glass fiber post provided internal support. During the preparation process, the morphology-driven tooth preparation principles were adhered to; In accordance with the cuspal outlines, 1 mm of the occlusal surface was reduced using a tapering round diamond bur. The buccal finish line was positioned 0.5 mm supragingivally, and the preparation ended palatally at the height of contour to follow the compression dome technique.(4) A ramped finish line was followed at the buccal and palatal transition line angle in order to preserve the enamel rods. Finishing and polishing were done with TR 12 EF and polishing discs (Supersnap kit, Shofu Dental, India) for better bonding.

The iTero intraoral scanner(Align Technology Inc, San Jose, CA, USA) was used to create a digital imprint, and it was milled using CORiTEC 350i PRO (imes-icore , Eiterfeld, Hessen, Germany). Compared to traditional impressions, digital impressions offer greater accuracy and precision, reduced gag reflex and patient discomfort due to the elimination of messy impression materials, faster turnaround times for restorations because digital impressions can be sent to dental labs instantly, and improved communication between dental technicians and dentists (5). Digital technology integration has made it possible for dentists to deliver accurate and smooth dental care.

Biomimetics is the field of study that attempts to design system and synthesize materials through biomimicry(6). The main goal of biomimetics in restorative dentistry is to return the hard tissues (enamel and dentin) to attain full function by a hard tissue bond. This allows functional stresses to pass through the tooth making the entire crown into a unit that provides near normal function and biologic and esthetic result. Lithium disilicate was chosen here for the preparation of veneerlay which has the same elastic modulus as of enamel.

Conclusion:

The veneerlay provided a seamless integration with the natural dentition, maintaining aesthetics without sacrificing strength. The use of advanced materials like glass fiber posts contributed to both durability and biocompatibility. This case underscores the importance of customizing treatment by leveraging expertise from various specialties to achieve optimal results in complex dental situations.

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