



CASE REPORT

From Scan to Smile: Additive Manufacturing of Zirconia Crowns for Anterior Maxillary Teeth - A Paradigm Shift in Digital Dentistry

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ABSTRACT

Anterior tooth decay presents significant aesthetic and functional challenges, particularly in young adults where smile confidence plays a crucial role in psychological well-being. The integration of modern dental technologies with traditional prosthodontic principles has revolutionized the approach to anterior rehabilitation, making it possible to achieve predictable and aesthetically pleasing outcomes. A 20-year-old female patient presented to the Department of Prosthodontics and Crown & Bridge with the chief complaint of unaesthetic appearance due to extensive carious involvement of maxillary anterior teeth. Following comprehensive treatment planning and patient consent, a multidisciplinary approach was implemented involving intentional root canal treatment of the affected teeth and inclusion of vital maxillary canines for optimal prosthetic stability. The treatment sequence included intentional endodontic therapy of carious teeth, followed by tooth preparation of maxillary central incisors, lateral incisors, and canines bilaterally. The digital workflow incorporated intraoral scanning for CAD/CAM fabrication, complemented by conventional polyvinyl siloxane impressions. After milling and polishing, bisque trial was conducted with evaluation of phonetics and incisal guidance before final prosthesis delivery. The patient received six zirconia crowns providing comprehensive anterior rehabilitation. The final prosthesis demonstrated excellent marginal adaptation, optimal emergence profiles, and superior aesthetic integration. This case demonstrates the effectiveness of combining intentional endodontic therapy with modern prosthodontic techniques for extensive anterior rehabilitation. The use of zirconia crowns provided superior strength, biocompatibility, and aesthetic properties essential for anterior restorations in young patients. The comprehensive treatment approach, incorporating both digital workflow and traditional prosthodontic principles, resulted in optimal biological and psychological outcomes. This case emphasizes the importance of comprehensive treatment planning that addresses both functional requirements and psychological impact, ultimately restoring patient confidence and oral health. The predictable outcomes achieved through this multidisciplinary approach support its application in similar clinical scenarios requiring extensive anterior rehabilitation.

Keywords: Zirconia crowns; Anterior rehabilitation; Intentional root canal treatment; CAD/CAM technology; Aesthetic dentistry; Digital dentistry

1 INTRODUCTION

Confidence is an important aspect of one's personality and a confident smile makes the picture complete. With the increase in the concern of aesthetics in terms of smile correction we have come a long way to enhance as well as give a radiant fixture to patients concerns. New technologies in the field of dentistry such as 3D printing, CAD CAM tech,

advancements in the fabrication of maxillofacial prosthesis have become less challenging and more efficient to provide the patient with their dream smile corrections.

Looking at the preventive aspect of tooth decay and oral habits, one can only do so much to prevent it, however certain debilitating habits of food consumption as well as habits can lead to tooth decay to some extent. It should be taken into account that development of tooth decay

isn't isolated to children only, it re-occurs or occurs in adults as well. Tooth decay becomes a major concern for restoration especially if present in the anterior teeth of maxilla or mandible. Restoration plays an important role in the rehabilitation, however if the tooth decay has the pulp exposed it requires extensive treatment planning of root canal treatment, followed by tooth preparation and crown rehabilitation. In this particular case report we will look at the steps involved in the rehabilitation of decayed maxillary anterior teeth with zirconia crowns.

2 CASE REPORT

A 20-year-old female reported to the department of prosthodontics and crown & bridge with the chief complaint of unaesthetic appearance due to carious maxillary anterior teeth. On examination of the concerned teeth, it was noticed that both maxillary centrals as well as maxillary laterals were carious, moreover the central incisors were carious on mesial as well as on the distal aspects. The treatment planning was explained to the patient thoroughly and patient agreed to have zirconia crowns for the best aesthetic result.

Taking into account the damage caused by the caries on the mesial and distal aspect of central incisors and mesial aspect of lateral incisors, patient was advised for intentional root canal treatment in the concerned teeth, patient was also explained the procedure of vital tooth preparation involving canines so as for better stabilization of the final prosthesis. Agreeing to this, intentional root canal treatment was done followed by tooth preparation in maxillary centrals, laterals and canines of both the quadrants. A facebow transfer was carried out to rule out the plane correction. Wax mock-up was done, and the prepared teeth were temporized. Before taking the final impression of the tooth preparation done, intra oral scanning was done for the CAD and milling of the prosthesis, later to which final impression was taken using polyvinyl siloxane. After the prosthesis was milled and polished bisque trial was carried out and the required corrections were done, phonetics and incisal guidance were evaluated. The final prosthesis was delivered later. The patient presented with a strong comeback in her smile and confidence. A week later follow up was done to check for any discomfort due to the prosthesis, which the patient was absent with.

3 DISCUSSION

This case report demonstrates the successful rehabilitation of severely carious maxillary anterior teeth using zirconia crowns, highlighting the integration of modern dental technologies with traditional prosthodontic principles. The decision to perform intentional root canal treatment on the affected central and lateral incisors was appropriate given the extensive carious involvement, particularly the mesial and distal destruction of the central incisors. This

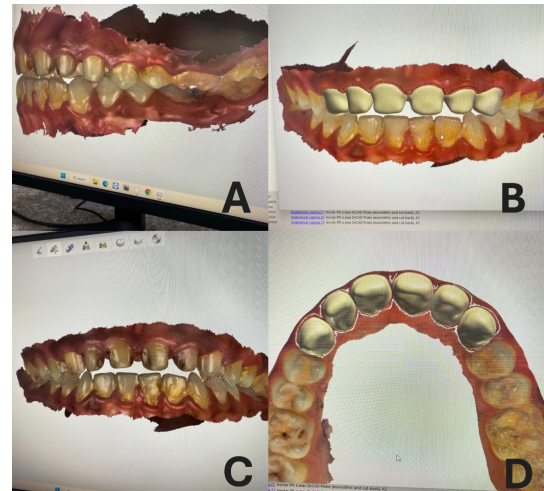


Fig. 1:



Fig. 2:

approach allowed for adequate tooth structure removal while maintaining sufficient retention and resistance form for the final restorations.

The inclusion of the maxillary canines in the treatment plan, despite their vital status, represents sound clinical judgment for achieving optimal prosthetic stability and load distribution across the anterior segment. The use of CAD/CAM technology with intraoral scanning streamlined the fabrication process while ensuring precise marginal adaptation and optimal emergence profiles crucial for anterior aesthetics.

Zirconia was an excellent material choice for this case, offering superior strength, biocompatibility, and aesthetic properties essential for anterior restorations in a young patient. The comprehensive approach involving facebow transfer, wax mock-up, and bisque trial ensured proper

occlusal relationships and patient satisfaction before final cementation. The immediate improvement in the patient's confidence underscores the psychological benefits of anterior aesthetic rehabilitation.

4 CONCLUSION

The successful rehabilitation of multiple carious maxillary anterior teeth with zirconia crowns demonstrates the effectiveness of combining intentional endodontic therapy

with modern prosthodontic techniques. The integration of digital workflow with traditional impression techniques provided predictable aesthetic and functional outcomes. This case emphasizes the importance of comprehensive treatment planning in anterior rehabilitation, where both biological and psychological factors must be considered. The patient's restored confidence and absence of post-treatment discomfort validate the treatment approach. Regular follow-up care will be essential to monitor the long-term success of these restorations and maintain optimal oral health.