

Replacement of Failed Anterior Crowns with Zirconia Based Restorations

Amina Khiari¹, Dalenda Hadyaoui², Jilani Saâfi³, Hassen Harzallah⁴,
Mounir Cherif⁵

¹ (DDM, post graduated student, department of fixed prosthodontics, faculty of dental medicine, Monastir, Tunisia)

^{2, 3, 4, 5} (Professor, department of fixed prosthodontics, faculty of dental medicine, Monastir, Tunisia)

Abstract: Aim: Our objective is to present how to accomplish an optimal desired esthetic outcome in a specific clinical situation including a previously disappointing result. Only a multi-disciplinary approach allows overcoming the difficulties related to gingival smile and discolored abutments complicated by very natural bright teeth.

Case presentation: A 23-year-old student presented to the fixed prosthetic dentistry department at the dentistry faculty, Monastir University. The patient reported an esthetic dental problem related to two splinted full coverage retainers cemented on the maxillary central incisors. The patient was dissatisfied with the length and the shape of the crowns. Furthermore, the bluish shade in the gingival collar was so uncomfortable specially that the patient presented a gingival smile. After a comprehensive dental and periodontal examination, part of treatment plan included removal of crowns, endodontic treatment of the right maxillary central incisor, whitening of left maxillary central incisor, and its reconstruction by a fiber reinforced resin post and core. Manufacturing of all ceramic separated crowns with zirconia copings was our decision.

Conclusion: In particular clinical situations related to failed splinted crowns with discolored and decayed abutments, obtaining a natural color through prosthetic crowns becomes a difficult task. In fact, the multi-disciplinary approach is the only way to enhance the esthetic result by whitening the abutment teeth, reconstructions should use a translucent material which is the fiber reinforced resin post and core with final zirconia restorations meeting the right natural teeth color.

Keywords: bleaching, endodontic treatment, failed crowns, fiber-reinforced post and core, zirconia based restorations

I. Introduction

Fixed prosthodontic failures are often complex in terms of both diagnosis and treatment. They can be varied and grouped into several categories as it had been reported by Manappallil.[1] In fact, a mild failure of a crown may be considered one that is generally correctable without having to remake the restoration, and the ultimate goal of its replacement is to treat at first crown complications and second to improve esthetics. Therefore, if a treatment plan does not begin with a clear view of its esthetic impact on the patient, the outcome could be disastrous.[1, 2]

Burk et al reported in a retrospective study that there were 17% being replaced crowns, and 12% root treatment.[3] Walton et al [4] concluded that secondary caries were the most frequent cause of failure accounting 24.3% of the units requiring replacement. The decay process may be responsible for the structural weakening of teeth, [5] as confirmed by Burke et al [3] reporting a percentage of 12% of root treatment as a reason of reintervention on crowns placed in the oral cavity for 18years or more. In case of large destruction of coronal tooth structure and after endodontic therapy, the reconstruction of structurally compromised non vital teeth seems to be necessary.[5] Recently, fiber reinforced composite post and core systems have become to be widely used in the restoration of endodontically treated teeth as they have better stress distribution pattern and esthetic result.[6]

On the other hand, Walton et al [4] reported that periodontal diseases or mobility were the next most frequent oral diseases causing failure of single crowns or FPD. Whereas, the second most frequent reason for replacement was poor esthetics as reported by patients themselves accounting for 6% units requiring replacement. Worn or loss of resin veneers led to failure in 10.8% of the units observed and the need of replacement in 7.2%. Moreover, the metallic component in some restorations can cause a discoloration of the abutment teeth and gingival collar related to phenomena of corrosion and polymetallism and incorporation of chromatogenic material into dentin and enamel. This leads to associate treatments such as intracoronal bleaching to improve esthetics, and to use colored material like ceramic or/and glass fiber with a reinforced composite to build up post cores.[7]

Based on the esthetic demands that increase the interest for nonmetallic and biocompatible restorative materials and with the development of zirconia based prostheses, Yttrium-oxide partially stabilized zirconia (Y-TZP) became commonly used for anterior teeth when the abutments were discolored, or for opaque teeth.[8-10] This article illustrates the clinical techniques and esthetic-driven sequence for an outcome-based protocol that enhances therapeutic cohesiveness in failed crowns, and ensures the sequential transfer of design objectives for the improvement of esthetics in multidisciplinary therapy.

II. Case Presentation

A 24-year-old student with unremarkable medical history presented at the department of fixed prostheses in the dental clinic of Monastir requesting for phonetic and esthetic problems related to resin veneered splinted crowns cemented since few months. Furthermore, the patient reported that the resin metallic restorations caused periodontal pathologies with bleeding gingiva. (Fig 1) Extra-oral examination revealed a gingival smile with labial incompetence. Intra-oral examination showed too long crowns not included in the anterior occlusal plan with buccally located incisal edges. The failure analysis reported a defective shape of restorations with pronounced biological contours, and closed embrasures. Moreover, the lighter shade with smooth surface and diastema persistence confirmed the esthetic failure. The defective shape was aggravated by the bluish margins due to the metallic collars. Periodontal examination showed a biological failure remarked by gingival inflammation and papilla hypertrophy. (Fig 1) In addition, the inflammation was surely aggravated by the lack of hygiene. As far as function is concerned, the patient had occlusal and phonetic problems, related to the increased overjet and overbite forbidding a functional anterior guidance as the dynamic amplitude was exaggerated. Radiographic examination revealed favorable root-to-crown ratio of abutments, and sufficient endodontic treatment in the left central incisor. As a matter of fact, our case was graded in class IV situations, as reported by Manappallil [1] where the restoration requires replacement, and the supporting tooth structure of foundation is deficient. So before making a new restoration, the tooth structure must be reinforced, and reconstructed.

III. Procedure And Discussion

One of the most common, yet difficult clinical determination is the prognosis of teeth that may serve again as a prosthetic abutments. In this case, the conservation of the central incisors was indicated based on radiographic evaluation that proved a favorable crown-to-root ratio. An atraumatic crown removal was recommended using a steel bur which allowed to protect residual tissues and to inspect the prepared abutments: the right upper central incisor was vital and the collateral was devitalized, decayed, and discolored. The abutments were buccally tipped. Usually, in same situations, orthodontic treatment is often an integral component of multidisciplinary therapy, frequently enhancing the esthetics of the final restorations.[11] However, the patient refused any long-lasting treatment. So, the axis of the crowns needed to be significantly shifted in order to realign the teeth in the anterior occlusal curve. This rectification required an endodontic treatment of the right upper lateral incisor which was vital. As it was reported by Goodcare et al [12] that two of three needing endodontic treatment occurred in conjunction with tooth preparation and one subsequent to restoration.

On the other hand, the left upper central incisor was discolored and decayed. So, a careful bleaching was necessary. A combination of sodium perborate and distilled water has been used as proved to be the less invasive bleaching procedure.[13] After 3 times of intracoronal bleaching, the attempt of the whitening in this case left a slightly persisting discoloration. This declined the indication of vitroc ceramic in favor of opaque ceramic hiding the coloration of the central incisor.

As the left upper central incisor was also decayed it was recommended to reconstruct it. For esthetic consideration, fiber reinforced resin posts were used.[7]

However, Roberto et al [14] found a decrease in the fracture resistance of teeth submitted to dental bleaching, and restored only with composite resin or with fiberglass post, with no statistically significant difference observed when these teeth were compared to healthy teeth.

Both preparations were rectified to receive ceramo-ceramic crowns. (Fig2) Following traditional preparation guidelines is important not only for retention of all-ceramic crowns, scanning and milling prerequisites, but also for stress distribution during dynamic loading of the restoration.[8]

During the following steps, the patient worn temporary prostheses fabricated on the basis of a wax up reflecting the final restorations which was utilized as a design pre-establishing the esthetic outcome and guiding adjunctive treatment procedure.[11] Then, the one step elastomeric master impression was made reproducing the finish line, the prepared teeth, and the non-prepared portion beyond the finish line.

Zirconia based crowns were the most suitable prostheses to cover discolored abutments. An opaque zirconia core overlaid by translucent enamel has a more natural appearance, and provides greater esthetic

results.[15] Tartaglia et al [10] reported that the patient satisfaction with the zirconia crown was also generally high.

Y-TZP was manufactured through computer-aided design/computer-aided manufacturing (CAD/CAM) technology.[8] For that, before veneering, a serious communication between the practitioners and laboratory technicians must be achieved to transfer clinical informations concerning the shade, the texture, and the translucency. In this step, photographs were transferred to the technician of the laboratory. For this patient, 3mm of incisal display at rest is appropriate. As the patient was demanding for a diastema closure, a deviation of the midline of central incisor was allowed to equal the crowns dimensions. (Fig 3) This doesn't affect the esthetic appearance, as proved by recent studies which have shown that lay people do not notice midline deviation to the right or left of up to 3 or 4 mm if the long axis of the teeth are parallel with the long axis of the face.[2] The labial surface of the restored maxillary central incisors was carefully perpendicular to the occlusal plane. (Fig 4) On the one hand, this relationship permits maximum direct light reflection from the labial surface of the maxillary central incisors, which enhances their esthetic appearance.[2] On the other hand, this allowed to correct the position of the lips and the labial incompetence at rest. After veneering, an intraoral checking showed an embrasure allowing biological outcome, and a natural mimitisme thanks to irregular surface texture reproduced on the ceramic crowns.

IV. Figures



Figure 1. Intraoral view showing defective resin veneered restorations.



Figure 2. Prepared and restored abutments after multidisciplinary treatment.

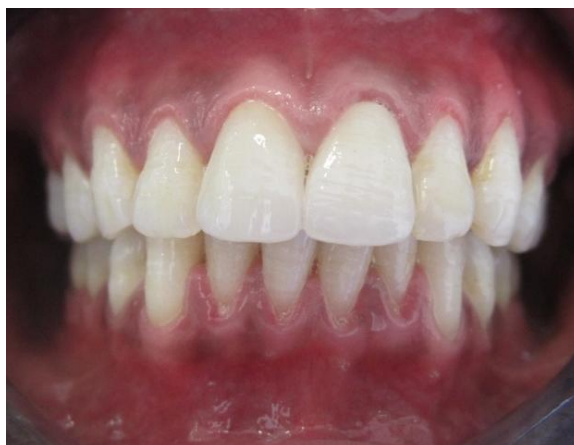


Figure 3. Final restorations showing suitable width-to length crown ratio, diastema closure, color and texture in harmony with the adjacent teeth.



Figure 4. Lateral view showing labial crown surfaces perpendicular to the occlusal plan.

V. Conclusion

The treatment comprising an interaction between different specialties allowed a favorable functional and esthetic outcomes in failed anterior restorations case which needed to be replaced with the conservation of the abutments, highlighting the importance of all ceramic restorations based on zirconia cores in terms of biocompatibility and esthetic outcome.

Acknowledgements

The authors would like to thank colleagues from the department of prosthodontics for their support. We would also like to thank Fethi Troudi for his valuable advice.

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