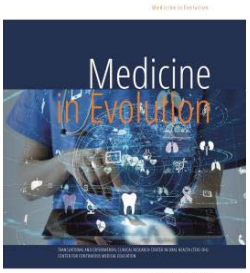
Aesthetic rehabilitation for anterior edentulous spaces: The techniques and rationale for the use of temporary acrylic resins supported by CAD/CAM techniques in aesthetic emergencies



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Abstract

The present case report describes our approach to the management of the anterior edentulism treating the patient with the provisional PMMA made with the CAD/CAM technique at the aesthetic emergency. The patient's problem meant that tooth 1 had to be removed. 3 from the upper anterior arch and, with regard to the aesthetics, a custom provisional restoration option was selected. The restoration was designed with retention arms provided with retention holes sufficiently to provide adequate extent of fixation of the adhesive composite and was maintained in sterile condition for three weeks until the dental implant was done. Stressing that although adhesion problems are inherent to PMMA materials, CAD/CAM technology and the use of innovative adhesive systems ensure that esthetic and functional solutions can be achieved in cases of emergency esthetic rehabilitation, it states that it can be a reliable and esthetic provisional restoration in a short time. Based upon the findings of the present study, a combination of modern techniques can be seen to be beneficial for using PMMA as a provisional material in certain clinical situations.

Keywords: temporary crowns and bridges, anterior teeth, computer-aided design/computer aided manufacturing

INTRODUCTION

In the field of restorative dentistry, the application of CAD/CAM technology for the fabrication of provisional prosthetic restorations has become popular because it is precise and time saving especially when used in anterior partially edentulous patients where esthetics are important. Apart from simple clinical cases, conditions like external root resorption are best addressed promptly and with high efficiency, so that form and function can be regained. An example is the tooth 1. 3 from the upper anterior arch, which are pathologically shaped and, due to the intensive external resorption, had to be extracted [1,2].

Due to the esthetic convenience of the anterior tooth a successor immediately was placed after extraction, with an indirect TEMP-PMMA crown and bridge made by CAD and CAM [3]. Thus, for retention of this restoration, two specially designed retention arms were placed, whose holes allow the penetration of the adhesive composite to resin-tag the adjacent teeth [4,5]. Despite the fact that PMMA is has particular shortcomings in terms of adhesion it was possible to apply this fixation method and this simple yet effective contextual aesthetics was very important in such cases [7]. Also, the provisional restoration was eliminated from the static and dynamic occlusion for precautions and the implant was placed as soon as possible after the extraction to maintain optimal site preservation [7,8].

We also wanted to demonstrate how CAD/CAM technology can be applied to provide special provisional prosthetic restorations and consequently stress on the necessity to develop adhesive techniques to overcome the problems of the material [9,10]. Therefore, the present work can be further enriched with the existing knowledge about the potentials of modern dentistry regarding quick and efficient aesthetic treatment outcomes.

Aim and objectives

It involves an attempt to assess the suitability of CAD/CAM produced PMMA indirectly adhesive provisional restorations for the treatment of anterior dental edentulism. The aims are thus to evaluate the clinical performance and longevity of such provisional restorations in an urgent aesthetic scenario, especially when established preparation parameters are crossed. Further, the article aims at assessing the effect of adapted retention procedures, including retention arms having opening for perforation by adhesive on the sturdiness and functionality of the restorations. It also seeks to find out the extent to which CAD/CAM technology can be put in the achievement of the optimal adaptation and aesthetically fulfilling results. In the last section of the article, the authors describe how PMMA has the possibility of being used as a long-term material for providing provisional restorations in complex clinical cases, as well as the relation of this to future trends in aesthetic and restorative dentistry.

MATERIAL AND METHODS

The patient attended the clinic with external resorption of tooth 1. 3 from the upper anterior arch out of which 3 were severely impacted were that had to be extracted. That is why, taking into consideration the aesthetic sensitivity resulting from the absence of an anterior tooth, it was planned to use an adhesive temporary restoration made by means of CAD/CAM technology and made of PMMA – a material, which is known to be suitable for temporary restorations from the point of view of both aesthetic characteristics and mechanical properties [11,12]. Thus, two retention arms were created at the oral level in order to maintain stability and prevent disintegration of the restoration; they were made small in order to be distinctive. These were incorporated to permit the adhesive composite to interlock effectively

and bond with adjacent teeth; to address the adhesion factors that are characteristic of PMMA [13,14]. The holes were placed in such a manner that it was possible to retain as much as possible while pulling nice looks as the retention arms were all hidden at the oral side of the teeth. While the operation, an implant was also installed in the post-extraction socket to preserve the bone tissue and to prepare for future definitive prosthesis [15]. To avoid overloading and potential complications the function of provisional restoration was eliminated from static and dynamic occlusion [16]. The restorative work was completed with the aid of CAD/CAM technology which allowed to achieve the greatest accuracy when reproducing the relationship of the restoration to the arch morphology of the patient. CAD/CAM technology not only ena-LES for quick fabrication of provisional restorations, but also enable fine individualisation which is important in many difficult aesthetic cases including the one illustrated [17]. Raw PMMA material was appropriately processed and finished to provision an acceptable esthetic characteristically adapted to blend with the patient's natural dentition. It was then bonded to the restoration under a strict bonding procedure which involved the usage of adhesive composite system which has the best penetration and fixation in the holes produced on retention arms [18]. This method was very efficient in the situation of provisional restorations, as it gave the patient not only an anatomic and esthetic rehabilitation but also a temporale stability at the end of which the implant osseointegration was completed and the final restoration was definitive [19].

a) b)

Figure 1. a). The aesthetic aspect of the smile before the extraction of tooth 1.3; b) External resorption of tooth 1.3

a) b)

Figure 2. a) The aesthetic aspect before the placement of an indirect PMMA b) An indirect provisional restoration made from PMMA with two arms and holes at their level

a) b)

Figure 3. a) Immediately after the polymerization of the composite and the placement of the indirect PMMA prosthetic restoration b) The appearance of the composite on the adjacent teeth to tooth 1.3. The representation of the composite on the oral surface of the three teeth involved in the indirect PMMA restoration

RESULTS

The adhesive acrylic provisional PMMA restoration made with CAD/CAM proved to be very stable during the subsequent three weeks up to the final cementation of the PMMA definitive restoration on the dental implant. In the entire period of observation, there were no observed signs of fracture, dislodgement, or change in structure and position of the restoration. The retention arms developed at the planning stage of the oral treatment and provided with retention bores for the adhesive composite greatly helped to enhance the stability of the restoration which was fixed securely. The removal from static and dynamic occlusion helped avoid overloading, which in its turn assisted with preserving the structure for the entire usage period.

DISCUSSIONS

The outcomes achieved in this case bear evidence on the efficacy and predictability of esthetic provisionals made from PMMA with the help of CAD/CAM technology in the treatment of partially edentulous patients, especially when there is an aesthetic crisis. To the contrary of what was thought about the adhesiveness of PMMA on the lower restoration, the restorative remained unabated for the entire three weeks without any cracks or separations meaning that the adapted retention technique was used as the key mode of treatment [21,22]. Another factor that led to a detailed stability of the restoration was translated retention arms with retention holes – they allowed to fix stably the adhesive composite even if basic adhesive properties of PMMA were not very high [21]. This innovative technique made it possible to have sufficient adhesion in order to counteract the minimal occlusal forces because the restoration was pull out of static and dynamic occlusion hence minimizing mechanical stress. The results obtained in this case match other works on the use of PMMA in provisional restorations, which indicate that when the restoration is well designed and fixed, it is possible to achieve successful esthetics and function despite existing problems with adhesion [23]. Also, CAD/CAM technology made it possible to achieve a high degree of matching to the patient's morphology of the restore, which has been rated as the major factor that influenced the aesthetic and functional outcomes [24].

This relatively gentle approach meant that the patient was able to take advantage of an instant and stable cosmetic improvement while waiting for the dental implant treatment to be finalised, without sacrificing the mechanical properties of the provisional prosthesis. The result obtained proves that the use of this method is effective in the management of similar situations where quick and esthetic rehabilitation is desirable [25].

CONCLUSIONS

Therefore, it is possible to emphasize that the overall satisfaction in this case is satisfactory if using advanced and highly individualized adhesive technologies and with the help of PMMA-based provisional restorations despite the unfavorable clinical conditions. Using fresh ideas in bonding the PMMA and integrating CAD CAM technologies, this work has revealed that PMMA can be a plausible and accurate form of an interim restoration in many clinical situations. Hence, employing CAD/CAM technology together with novel adhesive modalities can significate for the immediate, effective, and esthetical management of patients requiring provisional restorations until a final prosthetic is fabricated [26,27].

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