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Case Report Article

Two-year clinical performance of cast post and core self-adhesive cementation

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Abstract

Introduction and Objective: Endodontically treated teeth commonly present extensive tissue loss, requiring the use intraradicular posts, which provide retention for a coronal rehabilitation. Cast post and cores (CPCs) have been traditionally used in cases of marked tooth tissue loss. **Case report:** This case report describes two cast post and cores and subsequent rehabilitation by metal ceramic crowns. The patient was followed-up at intervals of 12 and 24 months after the rehabilitation. The posts were cemented within the root canal with self-adhesive resin cement, in a way that guarantees a perfect sealing of the root and remains stable in the oral environment. **Conclusion:** Self-adhesive cements are a one-step material capable of providing additional chemical adhesion to the metal, creating a monoblock, quality not found in conventional resin cements, where the adhesion occurs only in the dentin-cement interface.

Introduction

The rehabilitation of teeth with minimal coronal structure is complex and involves several factors that may determine its success and longevity. The prosthetic restoration of a weakened tooth often requires endodontic treatment and additional intraradicular post cementation, which provides retention for the subsequent crown restoration [14]. Clinicians must consider several factors when restoring these teeth, such as tooth location [8, 16], type of post [16] and its surface shape and configuration [11, 16], the amount of dental structure remaining, and the materials or techniques used for construction [11, 16]. However, the increase in retention provided by intraradicular posts must be carefully evaluated, since the preparation of the root canals may become a risk for further weakening to the tooth tissue [11].

Cast post and core (CPC) and prefabricated fiber-reinforced posts (FRP) have been the current options to restore weakened teeth. CPC has high structural rigidity, intimate contact with the dentin walls of the root canal, resulting in low thickness of cement film and passive fit, as well as clinical longevity of more than 10 years [15]. These posts are considered the most appropriated restorative method for anterior teeth with moderate and severe destruction since the incidence of horizontal forces is higher compared with more axial and compressive forces for posterior teeth [8]. Despite of CPCs exhibit high modulus of elasticity, which could increase the risk of root fractures [15], they have higher fracture resistance compared to fiber posts [10, 16]. This could be attributed to its intimate contact with the walls of the root canal, which may explain the higher clinical survival rate found in CPCs [11]. Romeed and Dunne [13] compared the stress distribution between metallic posts or glass fiber posts and the dentin walls of root canals and found a significant increase in root tensions in the group restored with fiber posts, which lead to the conclusion that the modulus of elasticity of the intraradicular post is inversely proportional to the stress transmitted to the root, in agreement with other studies [6, 9]. It is important to note that the stress distribution in the root dentin is the main factor leading to restoration failure, once it can generate root fractures, cement-post debonding of the dentin walls, and post mobility, which must be taken into consideration by the clinician during the proper case planning [16].

A satisfactory post restoration is expected to create a monoblock, which theoretically guarantees a perfect sealing of the root, remaining stable in the oral environment [17]. Self-adhesive resin cements are an alternative for cementation to provide additional chemical bonding of the post and the dental tissue without previous treatment, offering a shorter working time, as well as adhesion to metallic substrates, which is not found in conventional cements [4]. Thus, the purpose of this case report is to present a cast post and core cementation using self-adhesive resin cement with 2 years of follow-up, as well as to review the physical and chemical properties of these cementing agents.

Case report

A 50-year-old female patient reported to the Department of Dentistry at State University of Ponta Grossa – Brazil seeking for prosthetic rehabilitation. At the intraoral examination, severe coronal destruction of the maxillary left second molar (figure 1) and a well-adapted provisional restoration in the mandibular right second premolar were present. The radiographic examination revealed a satisfactory endodontic root canal treatment of the maxillary left second molar and necessity of endodontic treatment in the mandibular right second premolar. It was observed absence of coronal walls in both teeth. Cast models were obtained and mounted on a semi-adjustable articulator using a facial arch and intermaxillary relationships and occlusion were then analyzed. After taking consent from the patient to document the case, the treatment planning was proposed consisting of endodontic treatment of the mandibular right second premolar and cementation of cast post and cores and metal ceramic crowns in the mandibular right second premolar and the maxillary left second molar.

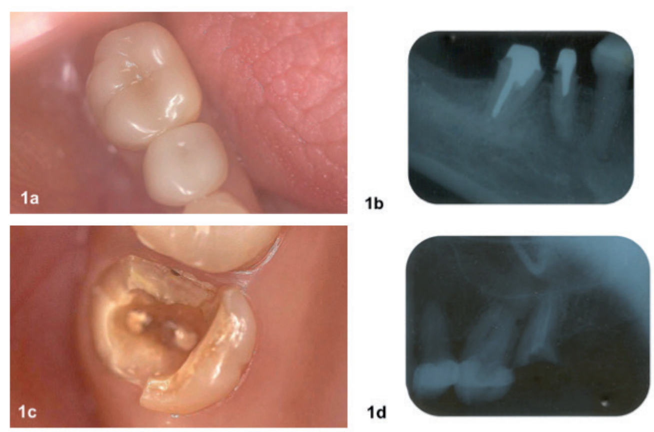

Figure 1 – Clinical examination showed a well-adapted provisional restoration in the mandibular right second premolar (a), however with absence of endodontic treatment (b), and severe coronal destruction of the maxillary left second molar (c), with satisfactory endodontic treatment (d)

Initially, endodontic treatment of the mandibular right second premolar was performed, through step-back shaping preparation and vertical condensation of gutta-percha techniques. After, 135-degree shoulder finish lines were made in both teeth using a diamond bur #4123 (KG Sorensen, Cotia, SP, Brazil) and a high-speed hand piece under constant coolant. The gutta-percha was removed using Gates Glidden Drills and Peeso Reamers #3, #4 and #5 (Dentisply Maillefer, Ballaigues, Switzerland) following the pattern: 2/3 of the root canal of the mandibular right second premolar and palatal canal of the maxillary left second molar, and 1/3 of the distobuccal canal of the same tooth. The double mixing impression technique was used, and the CPCs were obtained through the lost-wax technique. Provisional crowns were made with chemically-cured acrylic resin and then cemented on both teeth.

The CPCs adaptation was checked through x-rays and cemented using the self-adhesive resin cement RelyX U200 (3M ESPE, St. Paul, MN, USA), according to manufacturers' instructions, as follows. The root canals were rinsed with 18% Ethylenediaminetetraacetic acid (EDTA) solution (Ultradent, South Jordan, UT, USA), neutralized with saline (ADV, Nova Odessa, SP, Brazil) and dried using absorbent paper points (Dentsply, Petrópolis, RJ, Brazil). The cement was inserted into the canals with a zero-dead space insulin syringe (BD, São Paulo, SP, Brazil) in a relative isolation of the operatory field with cotton rolls. The CPCs were maintained under digital pressure and the cement excesses were removed with an explorer, followed by light-curing for 60 seconds (Radii Plus, SDI Limited, Victória, Australia) (figure 2). The provisional crowns were then readapted.

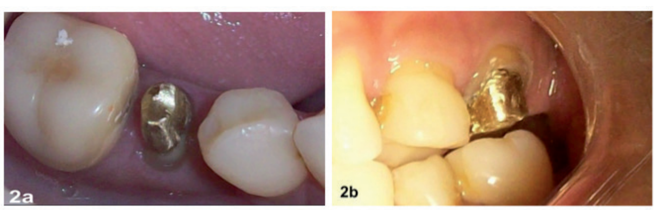

Figure 2 – Self-adhesive cementation of the cast post and core in the mandibular right second premolar (a) and maxillary left second molar (b)

At the following appointment, axial, occlusal and gingival reductions were checked and adjusted for metal ceramic crowns for both teeth. Color selection was performed with the aid of VitaPan 3D Master Shade-guide (Vita ZahnFabrik, Bad Sackingen, Germany). A one-step putty-wash impression technique with polyvinyl siloxane (Adsil, Coltene, Rio de Janeiro, Brazil) was made. The metal ceramic crowns were checked and adjusted and sent for glaze. After approval, the metal ceramic crowns were cemented using the self-adhesive resin cement RelyX U200 (3M ESPE, St. Paul, MN, USA) (figure 3). Oral hygiene instructions were reinforced. The patient was followed-up at intervals of 12 (figure 4) and 24 months (figure 5) after the rehabilitation. Metal ceramic crowns were checked stable, with no modifications and the patient related to be pleased and comfortable with the rehabilitation.

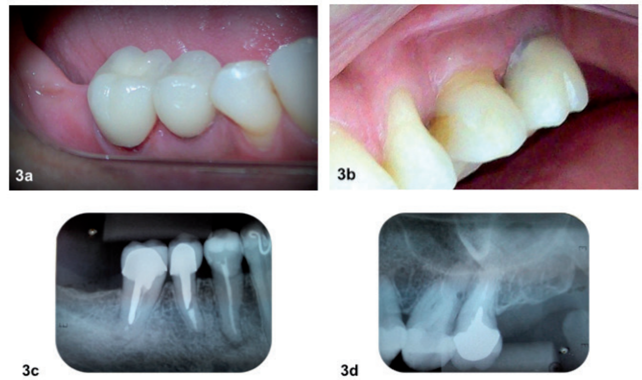

Figure 3 – Final clinical and radiographic aspect of the self-adhesive cementation of cast posts and cores and metal ceramic crowns in the mandibular right second premolar (a and c) and in the maxillary left second molar (b and d)

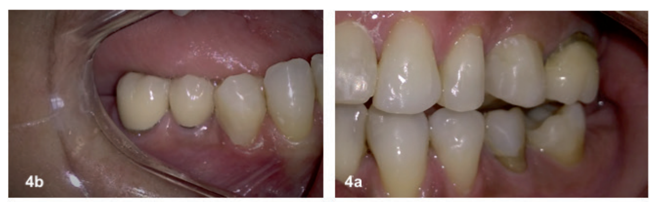

Figure 4 – Clinical aspect after 1 year

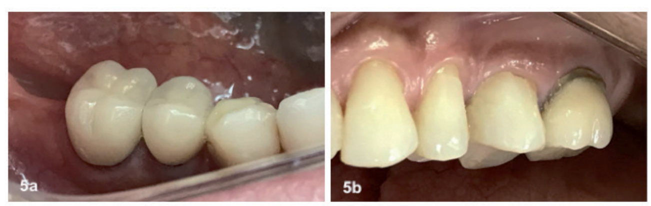

Figure 5 – Clinical aspect after 2 years

Discussion

The absence of coronal walls was described as the worst scenario for tooth rehabilitation [15]. Cast posts and cores have been considered the method of choice in these cases [16]. The clinical survival of posts has shown to be improved when they are chemically bonded to the dentin, as it promotes greater retention and attenuates the weakening of the dental structure [2]. Self-adhesive resin cements provide chemical adhesion to the metal through the presence of hydrophilic functional monomers with phosphoric or carboxylic groups in their composition. These monomers can promote bonding to metallic ions through an acid-base reaction [4]. This additional chemical adhesion of self-adhesive resin cements and their easy application, which does not require dentin treatment before, gained widespread use of self-adhesive resin cements in cases with minimal presence of coronal tissue [3].

The literature has pointed that the biomechanical behavior of self-adhesive resin cements is affected by their interaction with the dentin [19]. Hattar *et al.* [4] compared the bonding strength of three different self-adhesive cement trademarks. Low bonding strength values were found, notably because the self-adhesive resin cements did not dissolve the smear layer, only superficially infiltrated the collagen fiber network [4]. Youm *et al.* [19] suggested that scrubbing the dentin with 18% EDTA or 10% polyacrylic acid before cementation could significantly increase the micro tensile strength of these cements. In the present case, 18% EDTA solution was used, followed by neutralization with sterile saline solution, previously to the post cementation.

The modulus of elasticity and the microhardness at the adhesive interface seems to favor the use of self-adhesive resin cements. These factors indirectly indicate the degree of conversion of the material and its extent of polymerization [12, 18]. Previous study had shown that the microhardness and the modulus of elasticity are higher in these cementing agents when compared to conventional total-etch or etch-and-rinse cements, which causes an intense dentinal demineralization and formation of an area susceptible to degradation [18]. Self-adhesives resin cements present an initial acidity followed by a rapid neutralization of the pH. This fast interaction allows only superficial dentin to be demineralized, limiting the exposure of dentinal tubules and formation of resinous tags, increasing microhardness and modulus of elasticity [18].

Additionally, as important as bond strength is the bond stability. Thus, the resin cements should achieve their maximum degree of conversion to be able to withstand intraoral challenges [12] and not be susceptible to water sorption, which could expand, dissolve, and leach some unreacted components, leading to degradation of the resin cement [7, 12]. Studies suggested a reduction of sensitivity of the self-adhesive cement to humidity, and consequent reduction of solubility in the oral medium [1, 12].

It is important to notice that scientific evidence is still lacking regarding bond stability and clinical longevity of self-adhesive resin cements in metal alloys. This study presented a case report with a time of observation of 2 years, and although it can be considered a short follow-up period, there are few case reports available in the literature that describe the self-adhesive cementation of cast post and cores. Some studies evaluated the self-adhesive cementation of metal ceramic crowns and found survival rates higher than 90% after six years of follow-up [3, 5], which may indicate the clinical success of adhesion of self-adhesive resin cements on metal substrates. The use of cast post and core associated with self-adhesive cement may offer a reliable rehabilitation choice, with user-friendly technique, low film thickness and adhesion to dentin walls and to the metal. However, prospective studies and clinical trials are needed to prove long-term adhesion stability and survival rate of this restorative procedure.

Conclusion

Within the limitations of this case report, it can be inferred that self-adhesive cementation of cast posts and cores associated to metal ceramics crown can be a feasible alternative for rehabilitation of teeth with severe coronal destruction.

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