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COMPROMISED ROOTS: EXTRACTION OR REHABILITATION?

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ABSTRACT. When it comes to oral care, it is always advisable to evaluate and reevaluate situations in order to decide what treatment attitude needs to be adopted when facing difficult cases. When it comes to endodonticaly treated teeth where the prognostic is not very good, the question always arises: Extraction or Rehabilitation? For more than 100 years root-anchored posts have been used as support, in order to retain artificial crowns. Despite this, recent studies suggest that posts can be the cause of a weakening of the tooth resistance, therefore restorative procedures that help preserve pulp vitality and eliminate the need for posts are desirable. If endodontic therapy is unavoidable, the conservation of the remaining tooth structure is of great importance. When a post and core restoration is necessary for an artificial crown, the most indicated type is a custom cast post, since it is the most effective means of conserving tooth structure. When using this type of post the length and retention of them must not be compromised. The purpose of this study is to advocate the use of new techniques for the restoration of extensively damaged, endodonticaly treated teeth, as alternatives to the classical techniques. We have also suggested new ways of improving the post's retention by using techniques for subminated root consolidation, adhesive cements and sandblasting the cast and prefabricated posts.

Key words: endodontic treatment, fragility, consolidation, corono-radicular device

INTRODUCTION

Restoration of dental structures affected by development of tooth decay was an older concern of people. Methods, primitive at first, started to be successful, only after the development of endodontic techniques and after the design of the Richmond crown (1880). In this field of dentistry, there have been major developments. Thus, new endodontic techniques were developed and improved, so they could start reconstructing non-vital teeth trough a technique consisting of two steps, in the beginning with cast metal posts and then with prefabricated ones. Clinical experience has shown that no technique or material is perfect, so in this field also there are questions to be answered and opportunities for improvement.

MATERIAL AND METHOD

Retention is the quality of a dental preparation that prevents the removal of restoration along the insertion axis. Retention is influenced by several factors: The presence of at least two opposing parallel surfaces or with a low convergence (6 °) according to Jorgensen's diagonal. The relation between the prepared walls of the tooth and the restoration, which must be as large in extension and as intimate posible. Increased length of the opposing walls, which reduces the number of possible axes of insertion and dezinsertion, and the type of cement used. According to these attributes, that part of the pin/post that goes into the root canal should have a standard shape to suit all roots: to be long, bulky and with parallel walls. Clinical practice has shown that parallelism is technically not an easy thing to achieve. Also, because the dental roots become conical towards the apical region, a parallel preparation of this area will lead to a thin-walled area susceptible to fracture especially if the preparation generates sharp angles. Also, cementation of the post in to the rootcanal is difficult to obtain. A more favorable alternative to retention for this shape is a device with slightly convergent walls and with rounded apical end zone and with ditches for excess cement. Numerous studies have concluded that practitioners often make conical preparations of dental structures: they are easy to prepare, convenient for short-rooted teeth, thin, teeth that have suffered apicoectomy surgery or even teeth that have curved roots. Retention is reduced for these teeth; it generates tension in the cervical region during functions and can act as a wedge inducing tooth fractures. As a alternative for this would be prefabricated posts/pins who are actively engaged in dentin, which increases retention, but also the risk of fracture. Regarding the correlation between the post-device and the walls of dental preparation, this can be achieved more easily with devices cast and prefabricated, especially if the canal has an oval shaped section, or if the decay process has evolved intraradicularly thus leading to excessively instrumented canals. Retention occurs only in medium and apical half. In the last situations presented, for a long time it was thought that the cast device is improving the strength of dental root. Today, we know that that elastic modulus of the device is significantly different from that of dentin and could undermine it. In terms of surface area for contact between the device and root canal, this is greater if the preparation is done with big Pesso mills (up to no. 6) as indicated by Shillinburg and Kessler.

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But even this traditional view has changed. Today it is recommended that preparation does not exceed the mill Pesso no. 2. Even in extreme cases, the mill size will not exceed half the diameter of the root in order not to undermine the strength of teeth with poor anatomical and pathological conditions. Dental cements are perfecting the retention of the device in the root canal, but they were also considered until recently, a weak point of fixed prosthesis. The phosphate cement used is an inorganic bonding agent, non-adhesive, which relies mainly on mechanical aggregation in to the micro-retentions of both components-the post device and dentin. They have a high rigidity under pressure and low elasticity which leads to failure of cement cohesion and mechanical connection. Zinc polycarboxylate cement is a cement adhesive that adheres well to metal, but less to dentin. From what we presented so far, it appears that in current practice we frequently encounter situations where, according to traditional treatment principles, non-vital teeth cannot be successfully restored using cast or prefabricated posts. In addition one finds roots with thinned out walls or fractured cast metal posts. To avoid their extraction, especially when the alternative is traumatic and expensive for the patient, we sought new ways to rehabilitate them.

CLINICAL CASES

Clinical case no. 1

Patient RC, presented himself in 2007 at the Prosthodontics Clinic for maxillary prosthetic rehabilitation. On examination multiple dental lesions were identified, restant dental roots, and adult periodontitis and Kennedy class I edentulous jaw. After extraction of remaining roots and irretrievable teeth, gangrene was treated at incisor 21 and a root canal obturation was performed. A Kurer prefabricated post rehabilitation was decided. The root root canal was prepared with the kit milling device and at its emergence an additional slot was created cavity with the tools from the kit (Fig. 2).Later we proceeded to manually threading of the root canal with a tool also found in the working kit(Fig. 3). Finally, cement was introduced in the chamber and then the Kurer device was screwed in.(Fig. 4, 5) During this procedure, and later, the patient complain of spontaneous pain. The radiographic investigation revealed the existence of oxiphosphate zinc cement beyond the apex of the tooth, and also the aggregation of the post was performed too deep for the root length (Fig. 6). A week later the symptoms disappeared. The final restoration (Fig. 7) was a mixed metal-acrylic bridge.

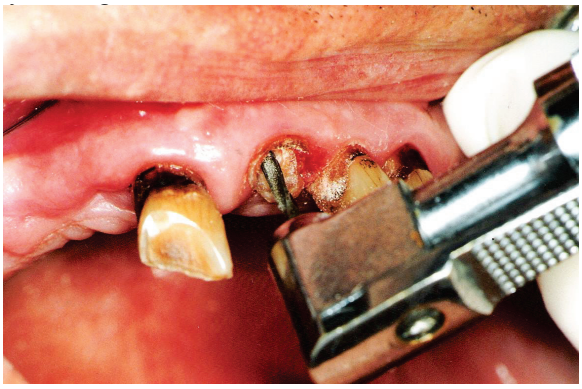

Fig 1. 21 endodontically treated. Preparation of dental root for a Kurer device

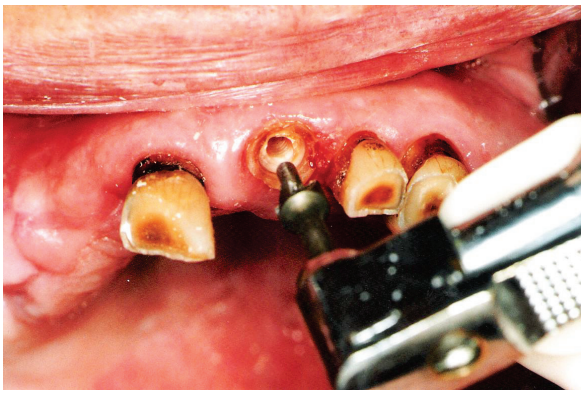

Fig. 2. Preparation of root canal for cervical support

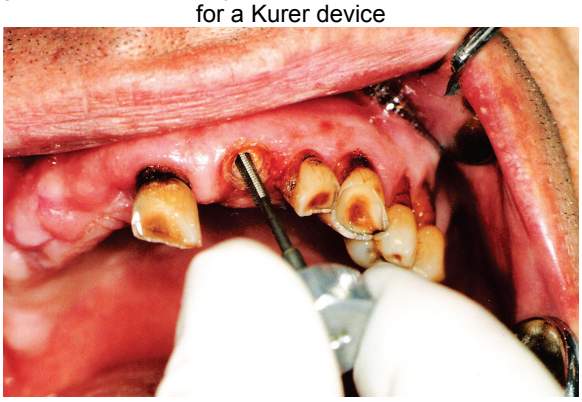

Fig. 3. Threading the root canal

Fig. 4. Kurer device try-in

Fig. 5. Coronary segment of the device after cementation

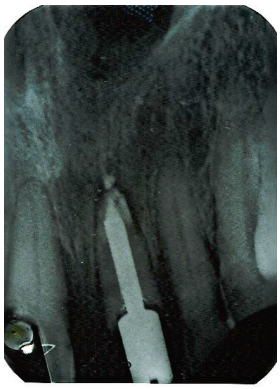

Fig. 6. Radiographic appearance of the restored tooth

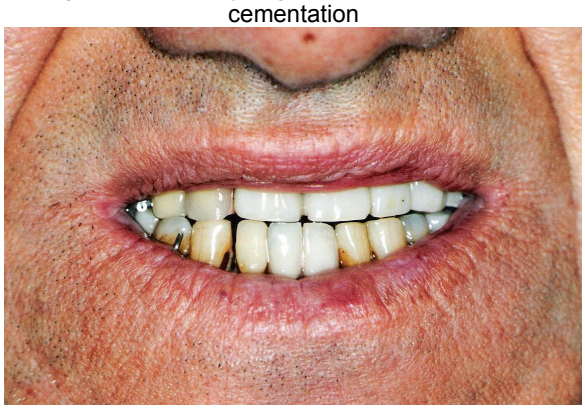

Fig. 7. Final composite crowns

Clinical case no. 2.

Patient R.J. 24 years, student, came to the dentist with tooth 25 fractured and also presenting a Dentatus prefabricated device in the root canal. To prevent the extraction of the tooth, we placed three prefabricated posts in the root dentin and the abutment was rebuilt with Miracle-Mix. For a better resistance of the final fixed restoration, and because the tooth 24 had a large coronary reconstruction, we used a fixed one piece restoration for both teeth (24, 25).

Fig. 8. Case report 2. Tooth 25 with fractured Dentatus device

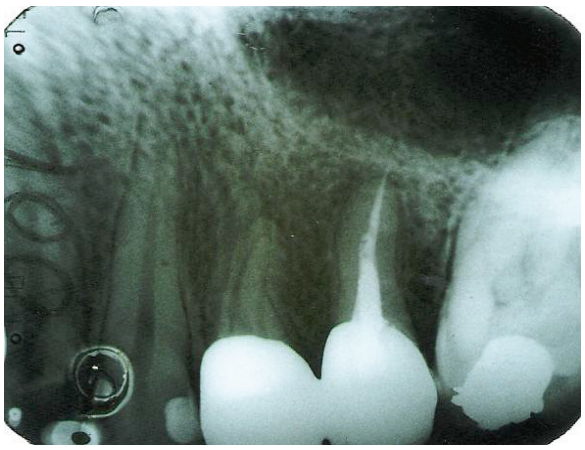

Fig. 9. The same case 2 with tooth restored with prefabricated posts and Miracle Mix. The final restoration will aggregate on 25 and in addition on 24.

Clinical case no. 3.

Patient SE, 70 years old, came to the dental office in 2009 for a maxillary prosthetic rehabilitation. After the removal of the inadequate fixed partial prosthesis, we discovered tooth 21 having been restored coronally with a piece of stainless steel wire and a restoration material that was mobilized. After a X-ray examination we decide to keep the root. Since we were unable to remove

the piece of steel wire from the root we decided to supplement the retention by inserting three TMS pins in the cervical dentin (Fig. 10). The abutment was restored with a composite resin (fig. 11) and the arch was restored using a fixed partial metal-acrylic bridge.

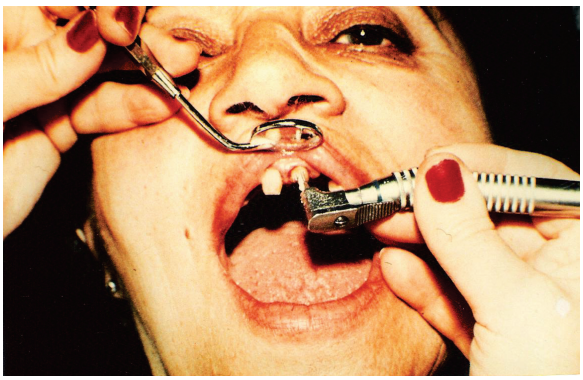

Fig. 10 case 3. 21 reinforced with steel wire. Placing additional T.M.S. posts.

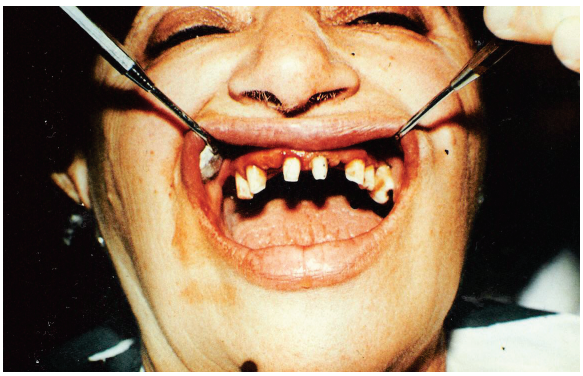

Fig. 11 Abutment restored with composite

Clinical case no. 4

Patient PM, 60 years old, with a previously restored upper jaw with a total fixed metal/acrylic prosthesis (in 2000). The patient came back in 2005 with the prosthesis being mobilized and the Dentatus device aggregated on 13, fractured (Fig. 13). Note that the same type of restoration was in place on tooth 21. The cause of failure was teeth grinding. The patient performed excentric movements which put exaggerated strain on the overly expressed occlusal morphology of the fixed prosthesis. Removing the fractured Dentatus device from the canal was risky and extraction was not an option since this tooth was important for the prosthetic plan; the coronary stump was restored with Stabilok studs (Fig. 12) and then a resin filling was applied. A total fixed metal-acrylic prosthesis was fabricated again, but with slightly attenuated occlusal morphology and correct cervical placement (Figures 14, 15).

Fig. 12. Toolbox for aggregation of Stabilok devices

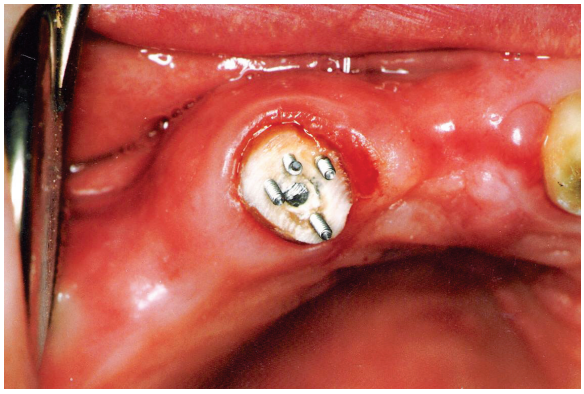

Fig. 13. Canine (13) with Dentatus device fractured. Placement in to the dentin of the Stabilok studs (case 4).

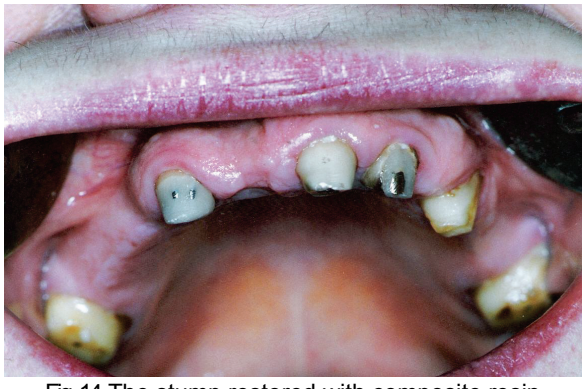

Fig. 14. The stump restored with composite resin

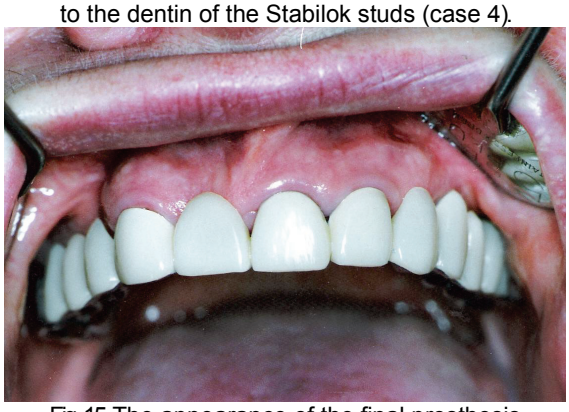

Fig. 15. The appearance of the final prosthesis

Clinical case no. 5

Patient JL, 20 years old, solicited our help for treatment of odontal lesions and a maxillary prosthetic rehabilitation. The examination revealed an inadequate acrylic crown on central incisor 11 (Figure 16) After removing the crown,we discovered a Dentatus device that is short on coronary and root aspects. (Fig. 17). To provide a better aggregation of composite resin used to restore the stump, we placed three Stabilok spikes in the root dentin (Fig. 17). The final restoration is metal composite Artglas (Fig. 18).

Fig. 16. Initial layout of the case

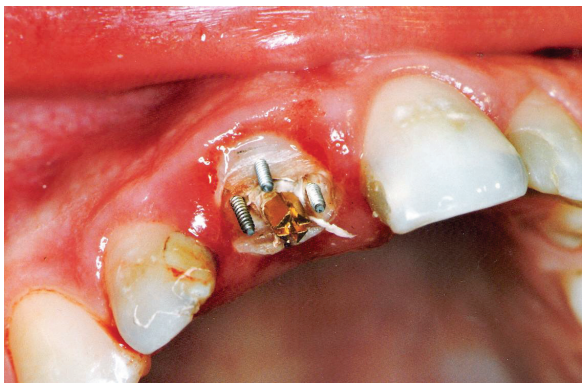

Fig. 17. Central incisor has a short Dentatus, whose retention was supplemented with three spikes Stabilok (case 5)

Fig. 18. Final clinical aspect of the case 5. 11 and no 21 capped with PFM crowns

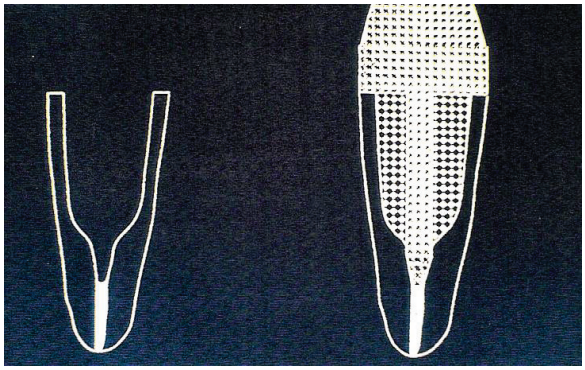

Fig 19. Schematic for Strengthening and conformation for aggregating a prefabricated post device into undermined roots

Due to the possibilities opened by the latest adhesive composite systems, today we can achieve a good reconstruction for extensive dental lesions, but also strengthening and internal conformation, to ensure optimal conditions for application of prefabricated post systems.The technique used for internal conformation which uses „3M Vitremer" which is a triple-setting ionomer cement (1 photo, 2 chemical) has the following steps:

1. isolating the tooth
2. preparing the canal
3. wash and dry well
4. primer is applied for 30 sec, dried, Photo-polymerisation for 20 sec.
5. then fill the canal with ionomer cement
6. a isolated prefabricated plastic post or manufactured extemporaneously is inserted into the canal
7. Photo-polymerisation is 40-60 sec.
8. remove the device
9. then the root is prepared by classical principles for a post
10. apply primer on the post-device, cementation is still done with ionomer cement.

Another possibility is to use a composite resin. The technique is as follows:

1. canals are isolated, washed and dried
2. Canals will be etched with 32% phosphoric acid, 15 sec.
3. 30 sec wash with water.
4. Dry the surface
5. Adhesive primer is applied according to the manufacturer's instructions
6. THT composite is injected (CAULK DENTSPLAY). The post-device is cemented and resin polymerized for 1 min 20 sec.

The best posts are prefabricated devices that transmit light (used with Luminex system) with large diameters that allow a deeper light-curing. Composite resin adheres to dentin and has a elastic modulus close to the one of the dentin. According to literature the polymerization retraction of the resin is directed towards the adhering surface, so the transluminal device and the matrix cand be removed easily. The next step is preparing the slot for the prefabricated device we want to apply. Cementation will be done with composite cement (Enforce - CAULK DENTSPLAY).

CONCLUSIONS

Endodontically treated teeth have unique properties - that's why conservative restorative techniques are indicated. If endodontic therapy is unavoidable, conservation of tooth structure is very important.If the root will be restored with a post device, the device's length will not be compromised, and the diameter will be minimal. Devices which are slightly conical are more conservative and easier to prepare. Devices which are very conical can act as a wedge, inducing the fracture of the root. When retention and length of post devices decreases because of anatomical or pathological limitations, it is recommended to either use an active (threaded) prefabricated post or adhesive cement. When the cervical area of the canal or it's shape are unfavorable for retention or the restored root tissues are reduced, one can employ the use of adhesive techniques of the restoration of the tooth. Areas of adhesion can be increased by sandblasting, acid etching and by the application of primer. When the root has a poor prognosis, however, it is preferable to use another form of treatment either by fixed prosthesis or implant supported restorations.

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