INTRODUCTION

The failed cases of primary endodontic treatment can be successfully orthogradely retreated in most cases. Although there are situations when due to post reconstructions, often metallic, the removal might compromise the tooth resistance, cause vertical fracture or great hard tissue sacrifice. These cases recommend endodontic surgery.

Many techniques have been described for the preparation and filling of the retrograde cavity. The classical manner of preparation using rotary instruments has been replaced with special ultrasonic tips with or without diamond coating. In the past, cavity preparation was performed using low-speed small burs, round or inverted cone. The use of ultrasonic in retrograde cavity preparation has been introduced by Bertrand since 1976 (1) followed latter by Flath and Hicks in 1987.(2) The cavity shaping using burs leads frequently to perforations, difficult access and the need for a 45° bevel.(3) Amongst the disadvantages mentioned in the literature, fissures and microfractures of the lateral walls seem to bring most of the concerns. Also this aspect is rather controversial and so is the advice of not using diamond coated tips in order to prevent their occurrence. Another disadvantage is the fracturing of the active part of the ultrasonic tip due to angulation between the active part and the passive one due to tension induced. The authors suggest the reduction in angle and increase of the dimensions of the instrument. This aspect might increase the tooth sacrifice and lower the isthmus cleaning capacity.(4)

Many materials have been used and studied for retrograde obturation to identify the most appropriate one. The materials studied are: amalgam (with or without varnish), zinc oxide-eugenol cement, IRM cement, super-EBA and EBA, polycarboxylate cement, glassionomer cement, gutta-percha, composite resins, cianoacrilates and recently MTA.(5) It is known that the success rate of a retrograde retreatment is directly influenced by optimal filling of endodontic space, an appropriate retrograde cavity and its sealing.
The existence of lateral canals and apical delta is universally accepted. They can be found in the tooth anatomy so often that not giving them the appropriate importance might result in the thin line between success and failure. Most frequently, they appear in the apical third of the root. In endodontically treated cases where the coronal restoration is based on post reconstruction, the post might extend, at least on half of the radicular length. In two studies both on cases with the coronal restoration performed in Romania, we concluded a few aspects related to endodontic sealing of the remaining root canal after post cementation. The cases were evaluated using either periapical radiograph or both periapical and CBCT investigation. The concluded aspects were the following: 40.71% of the cases had filling on more than 3 mm shorter from the apex in the study on periapical radiographs and 29.03% of the cases examined on CBCT. These high percentages explain the need for a technique of retreatment of the untreated and unsealed root portion, the actual reason of the persistence or occurrence of periapical pathology in these teeth.

### PURPOSE

Starting from the necessity of shaping and sealing of the endodontic space on its entire length until the section surface when periapical surgery is performed, for increasing the success rate, we tried testing an in vitro retrograde retreatment procedure, sealing and paraclinical evaluation of a few cases.

### METHODS

In order to create similar work conditions as in vivo cases we’ve chosen nine monaradicular mandibular teeth with one canal (incisors, canines and premolars), and implanted them into a mandibular bone in their anatomical position. The working length was determined before implantation with a 10 ISO Kerr file and each canal was enlarged up to 40 ISO 0.2. The preparation was minimal, insufficient for some of the cases in order to reproduce cases in daily practice; insufficiently mechanically enlarged canals both in length and diameter. Fiber posts and a fragment of the active part of plugger type files were cemented at different levels up to middle and third apical part of the canal. All posts were situated at a minimum of 6 mm distance from apex. We tried this technique in order to obtain the minimum result needed which is an obstruction similar to those in clinical cases with cemented posts. The thickness and lateral adaptation of the posts were not considered as important for the method.

---

**Figure no. 1. The steps of the microsurgery procedure**: 1. bucal aspect of the implanted teeth in the mandibular bone, 2. oral aspect of the implanted teeth in the mandibular bone, 3. the measure of the bone window, 4. the shaping of the first 2-3 mm from the section using Kis-1D ultrasonic retrotip, 5 and 6. canal irrigation using NaviTips Ultradent, 7. shaping of the canal in the deeper than 3 mm portion using the ultrasonic tip customized for this purpose, 8. gutta-percha injection with System B Cordless, 9. the 23Ga needle fitting the section surface, 10. cleaning of the bone crypt with a bone curette, 11. the final aspect of the section surface, 12. the fluid resin final layer.
RESULTS

The posts were cemented at different distances from the apex. After sectioning of less than 2-3 mm of the apical third without any bevel, the length of the unsealed part of the canal was measured on the radiograph using for calibration the length of the teeth measured at the beginning of the study (figure no. 2). The unsealed canal measured distances between 4.02mm and 7.3mm and one case of 11.06mm. In 8 cases out of 9 the sealing of the unfilled and canal was successful. For the 9th tooth due to a disto-lingual curvature the retrograde obturation could be achieved just on 2mm, the rest of the canal up to the post remained unsealed. In the case of tooth no.4 on the periapical radiograph the sealing of a lateral canal could be identified at approximately 2.3mm from the sectioned surface. Small radiotransparent irregularities could be identified on periapical radiographs in two cases.

DISCUSSIONS

In a comparative study of success rate between traditional and modern endodontic surgery, Tsesis et al. (8) find a significantly difference (46,9%) in the modern techniques’ favour. The modern technique implies an unbeveled section, retrograde cavity with ultrasonic preparation and magnification, together with very small instruments.

The ultrasonic tip imagined in this study has a multiple role. The mechanical preparation of the walls on more than 3mm, needed for tridimensional sealing of the unsealed canal through the smallest bone cript possible and also for pushing the irrigation liquid in the inaccessible lateral canals. Also, the use of CHX and chelating agents such as citric acid and EDTA is advisable for gathering the disinfectant and smear layer removal effect. Chlorhexidine (CHX) is a biocompatible irritant suitable for surgical intervention.

We decided to seal the section surface of the apex after gutta-percha injection to improve the sealing ability of the retrograde filling. Finishing the surface of the gutta-percha filling on the section surface offers a healing rate of 52% according to Christiansen et al. (2009),(9) Though according to the comparative study of Walivaara published also in 2009 (10), the injected gutta-percha has a success rate of 89,6%. The composite resin has proved itself as a very good sealing agent, capable of keeping its properties even after nine years. In vivo procedures must pay attention to an appropriate haemostasis.

The microscope due to its powerful light source can lower the working time by polymerizing the resin, an orange filter being necessary.

The objective was to seal retrograde the unsealed canal on more than 3mm. The last 3mm can be sealed after removal of gutta-percha with ultrasonic tips, with different materials, one of the most indicated nowadays being MTA. In 2006 Al-Saeed (12,13) presents an ultrasonic technique and the sealing with gutta-percha using a heat carrier. The warm injection of gutta-percha allows an optimal distribution of material in the canal in the same manner it does when used for orthograde obturation. On contrast to the injection technique used by Walivaara in 2009 (10), sealing with gutta-percha from a gun-type system is a lot efficient and quickly avoiding leaving the working place for charging the syringe used in his technique.

The microfissures that might appear on US instrumentation are diminished when using an uncoated ultrasonic tip.(4) Hopefully, the ultrasonic tip used in this study might not lead to fissures in dentinal walls due to the design characteristics and alloy properties. In vivo cases might contribute to the dissipation of waves because of the periodontal ligament.(15) Berbert et al. support in 2010 (16) that no matter the width of walls fissures could not be identified even at a 0.5mm thickness. (15) Rosales-Leal et al.(12) found the same. The ultrasonic tip used for this study need further research to confirm this aspect.

To avoid the presence of gaps in the injected material and lack of homogeneity, the use of a more radiopaque resin sealer is advisable to fill the gaps that might occur for a better radiological image and easy observing of defects.

CONCLUSIONS

1. The technique described above is considered simple, with a reduced potential of ultrasonic tip fracture due to the properties of the alloy and characteristics of design.
2. The advantage consists in the possibility of deeper access of the unsealed canal in clinical situation where the length of the untreated root-canal is longer than 3 mm.
3. A high capacity of increasing the disinfectant properties of CHX and other irrigants that can also be used for cooling purposes due to the capacity of pushing and agitation of the liquid in mechanically inaccessible parts of the canal.
4. The sealing ability of injected gutta-percha has been proved in many studies on orthograde filling which makes it appropriate for the retrograde technique as well.
5. Gutta-percha injection using a gun type system after needle precurving, offers a rapid and easy technique and an appropriate way of retrofilling.

REFERENCES


