

SURGICAL RETREATMENT OF UNSUCCESSFULLY ENDODONTICALLY TREATED TEETH WITH POST RECONSTRUCTION

ANCA TORCĂTORU¹

¹University of Medicine and Pharmacy Tîrgu-Mureş

Keywords: surgical retreatment, microsurgery, ultrasonic, warm gutta-percha injection

Abstract: In many clinical cases, failed endodontic treatment is associated with post reconstructions. The apical part of the canal is unsealed and apical surgery is needed. The aim of the study was to test a surgical technique that allows retrograde retreatment on more than 3 mm. **Material and methods:** After cementing posts on nine single rooted mandibular teeth, apical microsurgery was performed. A special ultrasonic tip was used to access more than 3 mm. The teeth were sealed using warm gutta-percha and an apical resin cover. Radiographical and CBCT exams were performed. **Results:** 8 teeth out of 9 were optimally sealed on their entire length between the apical portion of the post and sectioned surface of the apex. **Conclusions:** Using an ultrasonic tip, such as the one used in this study, might allow the access on more than 3mm. Warm injected gutta-percha is a very easy and helpful technique for retrograde sealing.

Cuvinte cheie: chirurgical, microchirurgie, ultrasonic, injectare de gutapercă plastefiată

Rezumat: În multe cazuri clinice, tratamentul endodontic primar eşuat este asociat cu reconstituire coronară prin dispozitiv cimentat endodontic. Partea apicală a canalului este neobturată și de aceea chirurgia endodontică este necesară. Scopul acestui studiu este testarea unei tehnici chirurgicale care permite tratamentul retrograd pe mai mult de 3 mm. **Material și metodă:** După cimentarea dispozitivelor pe nouă dinți mandibulari monoradiculari, s-a efectuat abordul microchirurgical retrograd. O ansă ultrasonică specială a fost folosită pentru a accesa retrograd pe o lungime mai mare de 3 mm. Dinții au fost obturați folosind gutapercă plastefiată și o sigilare a suprafeței cu compozit fluid. S-a evaluat calitatea obturației pe radiografiile retro-alveolare și secțiuni CBCT. **Rezultate:** 8 dinți din 9 au fost obturați optim pe toată lungimea între porțiunea apicală dispozitivului și suprafața secționată a apexului. **Concluzii:** Folosirea unui vâr ultrasonic ca cel folosit în acest studiu, permite accesul pe mai mult de 3 mm în profunzime. Injectarea de gutapercă plastefiată este o tehnică facilă și eficientă pentru obturarea retrogradă.

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 eccentrically preparations, with high risk of oral wall perforations, difficult access and the need for a 45° bevel.(3) Amongst the most important features of ultrasonic tips, we can mention the access in narrow space, with low bone sacrifice, more conservative cavities in surface and also deeper cavities. In addition, the more conservative access allows an increased visibility without the need for bevelling of the sectioned surface that reduces the opening of additional tubules with lowering the risk of microleakage. Ultrasonic tips allow the removal of tissue

at the isthmus level between the canals of the same root. The cleaning capacity and dentin removal efficiency on the walls of the canal is satisfactory, according to many authors. The smear layer resulting is lower compared to the one resulting after bur preparations. 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.

¹Corresponding author: Anca Torcătoru, Str. Ghe. Marinescu, Nr. 38, Tîrgu-Mureş, România, E-mail: anca_tor26@yahoo.com, Tel: +40265 211551
Article received on 20.04.2013 and accepted for publication on 29.07.2013
ACTA MEDICA TRANSILVANICA December 2013;2(4):285-288

CLINICAL ASPECTS

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.(6) 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 treatment performed in Romania, we concluded a few aspects related to endodontic sealing of the remaining root canal after post cementation.(7) 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 3mm 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 monoradicular 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 3mm portion using the ultrasonic tip customized for this purpose, 8. guttapercha 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



The surgical technique was performed using a Zumax Medical operative microscope. We marked on the vestibular cortical bone the location of the apex according to the working length previously measured. A perforation of 3mm diameter of the cortical bone was done using a spherical tungsten bur that could be sufficiently large to assure the manoeuvres but small enough to avoid useless bone sacrifice. Approximately 3mm from apex were removed with a fissure bur. Using a Kis-1D (Obtura-Spartan, Fenton, MO, USA) at medium power a 2 mm retrograde cavity was obtained.

For the retrograde unsealed space, an ultrasonic tip customized from an endodontic file was used in order to access the entire canal left unsealed until the apical part of the post. We used this customized ultrasonic tip due to its flexibility and bending capacity of the alloy. Chlorhexidine, citric acid,

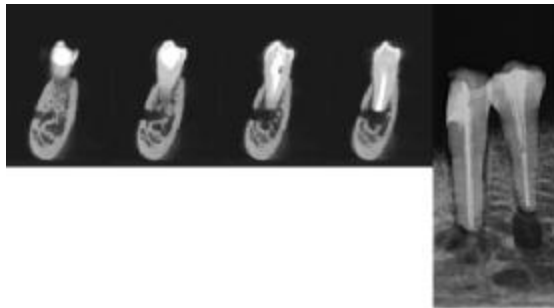
distillate water were used under surgical aspiration for irrigation purposes. The needle used to access the retrograde cavity was a yellow NaviTips Ultradent (29Ga, 21mm), bend in its 3mm apical part to fit the retrograde cavity. The 23Ga needle of the System B Cordless, Obturation System, Sybron Endo was used to inject thermoplasticized gutta-percha into the canal. The needle was precurved on its 3-4 mm so that it might fit the retrograde cavity entrance for optimal gutta-percha injection. After minimal sealer (Adseal Meta Biomed Co. LTD.) insertion with a retrograde instrument, gutta-percha was injected in the endodontic system. Using a small curette the excess was removed and the section surfaced was carefully sealed with fluid resin. The result was evaluated on periapical radiographs and CBCT scans.

CLINICAL ASPECTS

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 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.

Figure no. 2. Radiographical and CBCT scan of one of the 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. Chlorexidine (CHX) is a biocompatible irigant 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.(11) 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.(12,13)

In 2006 Al-Saeed (14) 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 radioopaque 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. Guttapercha injection using a gun type system after needle precurving, offers a rapid and easy technique and an appropriate way of retrofilling.

REFERENCES

1. Bertrand G, Festal F, Barailly R. Use of ultrasound in apicoectomy. Quintessence Int. 1976;7:9-12.
2. Flath RK, Hicks ML. Retrograde instrumentation and obturation with new devices. J Endod. 1987;13:546-549.
3. Hoskinson AE. Hard tissue management: osseous access, curettage, biopsy and root isolation. Endodontic Topics. 2005;11:98-113.
4. De Paolis G, Vincenti V, Principe M, Milana M, Plotini G. Gutta-percha as retrograde filling in endodontic surgery without apicectomy (A clinical and radiographical study with new technique). Annali di Stomatologia. 2010;I(2):6-10.
5. Ingle JJ. Ingle's Endodontics 6. BC Decker Inc; 2008. p. 1207.
6. Castellucci A. Endodontics. vol.III. pag.758.
7. Torcătoru A, Iliescu A, Benedek A. Comparative Analysis of Periapical Radiography and Cbct of Endodontically Treated Teeth. RJOR. 2013;5(1):36-40.

8. Tsesis I, Rosen E, Schwartz-Arad D, Fuss Z. Retrospective evaluation of surgical endodontic treatment: traditional versus modern technique. *J Endod.* 2006;32: 412-6.
9. Christiansen R, Kirkevang LL, Hørsted-Bindslev P, Wenzel A. Randomized clinical trial of root-end resection followed by root-end filling with mineral trioxide aggregate or smoothing of the orthograde gutta-percha root filling – 1-year follow-up *International Endodontic Journal.* 2009;42:105-114.
10. Wälivaara DA, Abrahamsson P, Sämfors KA, Isaksson S. Periapical surgery using ultrasonic preparation and thermoplasticized gutta-percha with AH Plus sealer or IRM as retrograde root-end fillings in 160 consecutive teeth: a prospective randomized clinical study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2009 Nov;108(5):784-9.
11. Rud J, Rud V, Munksgaard EC. Long-term evaluation of retrograde root filling with dentin-bonded resin composite. *J Endod.* 1996;22:90-3.
12. Rosales-Leal JL, Olmedo-Gaya V, Vallecillo-Capilla M, Luna-del Castillo JD. Influence of cavity preparation technique (rotary vs. ultrasonic) on microleakage and marginal fit of six end-root filling materials. *Med Oral Patol Oral Cir Bucal.* 2011;16 (2):e185-9.
13. Wälivaara DÅ, Abrahamsson P, Isaksson S, Salata LA, Sennerby L, Dahlin C. Periapical Tissue Response After Use of Intermediate Restorative Material, Gutta-Percha, Reinforced Zinc Oxide Cement, and Mineral Trioxide Aggregate as Retrograde Root-End Filling Materials: A Histologic Study in Dogs. *J Oral Maxillofac Surg.* 2012;70(9):2041-7.
14. Al-Saeed AA. Gutta-percha as retrograde filling in endodontic surgery without apicectomy (A clinical and radiographical study with new technique). *J Bagh Coll Dentistry.* 2006;18(2):52-6.
15. Khabbaz MG, Kerezoudis NP, Aroni E, Tsatsas V. Evaluation of different methods for the root-end cavity preparation. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2004;98:237-42.
16. Camargo Villela Berbert FL, de Faria-Júnior NB, Tanomaru-Filho M, Guerreiro-Tanomaru JM, Bonetti-Filho I, Leonardo Rde T, Marcantonio RA. An in vitro evaluation of apicoectomies and retropreparations using different methods. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2010;110(4):e57-63.