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Non-Invasive Approach of Retreating a Tooth - A Review

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Abstract: ***Non- invasive approach of retreatment is a way to preserve the natural dentition. Patients show great desire in retaining their natural dentition and advancement in endodontic therapy have lead the endodontist to become more aggressive in retreating the teeth. Often the operator encounter problem while retreating the failed root canal cases. In such situation, the choice of different retreatment methods enables them to carry out the retreatment procedure more successfully.***

Keywords: Retreatment, Etiology of failure, Gutta-percha, Post and Core

1. Introduction

In the era of modern dentistry, the non-invasive retreatment therapy has become a routine treatment modality. With advances in techniques, endodontics have emerged progressively in retaining millions of lost teeth. Even though advancement in prosthesis and surgeries have resulted in replacement of teeth becoming less burdensome.It is generally accepted that a tooth with a better prognosis is always considered as an alternative option to replacement and loss.[1]

Various factors such as host immune system, location of microbial infections,and operators knowledge and skills helps to decide in treating a patient either surgically, non-surgically, or undergo implant placement and extraction.When the outcomes of treatment protocols are compared, the success rates of endodontic treatment and or extraction and implant placement are similar.[2] The non-invasive technique is safe, cost effective, consumessignificantly less time and enable to preserves the natural dentition.[3] To retreat such cases, clinicians require specific armamentarium and should be capable of performing these specialized procedures.

When the non-invasive retreatment is chosen, main purpose is to regain approach to the pulp chamber and root area to retrieve obturating materials from the root canal, which ifallowed to persist, appear as repair defects or deficiencies,that are iatrogenic or pathologic in nature.[4]After the access cavity, missed canals should be located, procedure,disinfected, cleansed, re-shaped and obturated along with other canals.[5]Non-invasive retreatment can be broadly classified into location of missed canals, disassembly of coronal part,fractured tooth, retrieval of obturating materials, negotiation of blocked canals, by-passingthe ledges, transportations management, repairing perforations, treatment planning and retrieving the posts and separated instruments.[4]

Failure in endodontics is difficult to diagnose and confirm. Due to tentative issues with peri-apical surgery, conservative approach should be given importance in planning the treatment. Specialized techniques should be preferred for retreating the failed root canal treated teeth. Therefore, this review wascarried outto maximize the probabilityof success in the treating the existing endodontic disease.

Etiology

Persisting intra-canal infections:
The main cause of post-treatment disease is the persisting intra-canal infections.[6]Complications such as broken instrument or ledge formation lead to persistence of microbes in the root canal system. The primary intra-canal infections contain the most common poly-microbial, mainly anaerobic flora.[7]whereas secondary intracanal infections display predominant gram positive microbes. Enterococcus faecalis and Candida albicans, are most often found persistent intra-canal infections that are responsible for the refractory lesions.[8]

Extra-radicular infection:
Sometimes there is invasion of bacterial elements into the peri-apical region from the canal through infected periodontal tissues that react with peri-apex directly,[9] extruding infected dentinal chips beyond apex,[10] or by contact of prei-apical tissue with extruded and contaminated endodontic instruments.[11] Generally, the destruction of micro-organisms occurs by host defense mechanismbut few organisms are capable of resisting these immune responses and persist in the periapical regions, by releasingmatrix outside the cell or forming the protective layer of plaque.

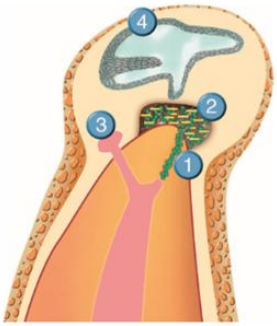
Propionibacterium propionicum and Actinomyces israelii are the common organisms that can exist in the peri-radicular area and may act as barrier and stop healing after the endodontic treatment.[11]

Reaction via foreign objects:

Sometimes, the presence of foreign particles in the peri-apical area lead to persisting endodontic disease even though there may be no discernible microorganisms present within the canal. Cellulose fibers and lentil beans are some of the materials associated with inflammatory reactions.[1][12]Overextension and overfilling causes materials to extrude outside the apical foramen resulting in decreasedincidence of healing of apical region. There are alsochances of leakage of persistent microorganismsin cases of improper canal preparation and condensed obturation. Sealersand Gutta-percha are well tolerated by the peri-apical tissues and healing of apical region due to filling materials extrusion can occur, if the tissues are free of microorganisms as a result of over instrumentation.[13]

True cysts:

Cyst is formed in the peri-apical tissues when there is proliferation of epithelial malassez of cell rests because of the presence of inflammatory mediators. The formation of cyst is an attempt to differentiate the surrounding bone from inflammatory stimuli. It ranges from 15 to 42% of all the peri-apical lesions.[14]In true cyst, the lumen is contained within the epithelial lining and needs surgical enucleation to heal, whereas in pocket cyst the open lumen is attached to the root canal of tooth affected. (Figure 1)



(1) Intra-radicular microorganisms (2) Extra-radicular infection (3) Foreign body reaction (4) True cysts

Indications

- Infected or inflamed teeth with sign and symptoms, independent of initial root canal treatment.
- Adequately or inadequately prepared canal and obturated teeth verified by the radiograph along with the persisting lesion peri-apically in the presence or absence of infection.
- Inadequately prepared and filled teeth with evidence of coronal leakage and defective restorations.
- Inadequately prepared and filled teeth without clinically evident coronal leakage and defective restorations.
- Teeth with access to the chamber in absence of obturating materials.

Contraindications

- Teeth with vertically fractured root.
- Excessive weakened tooth structure unsuitable for restoration.
- Presence of excessive mobility and compromised proportion of root to crown.
- Calcified canals or teeth with post and core.
- Broken instruments which cannot be removed or bypassed.

2. Retreatment Procedures

2.1 Regaining coronal access:

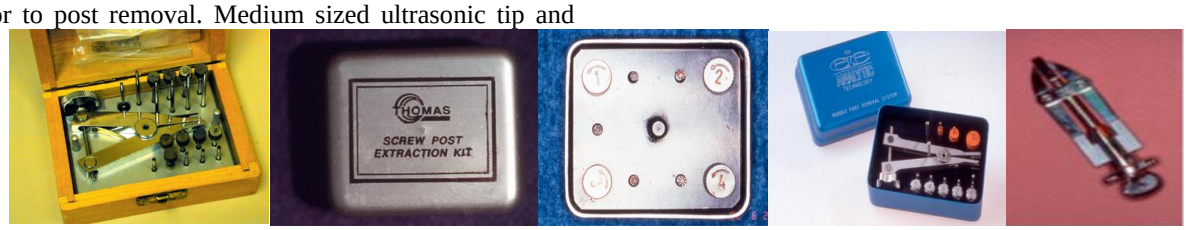
Coronal disassembly- Three types of disassembly devices can be used either alone or in combination to provide synergistic retrieval of permanent prosthesis or restorations. [15]

1) **Active devices:** It engages the restorations actively, with a specific dislodging force that lifts off the permanent prosthesis. Ex: Higa Bridge Remover (Higa Manufacturing, West Vancouver, B.C.), WAMkey Removal Keys (Dentsply Maillefer, Ballaigues, Switzerland) and Metalift (Classic Practice Resources, Baton Rouge, LA).
2) **Percussive Instruments:** It involves controlled and percussive force for retrieving both the both permanently and temporary cemented prostheses. This type delivers an effect to a restoration either directly or engage another prosthetic retrieval device indirectly. Ex: Coronaflex (Kavo America, Lake Zurich) and Crown-A-Matic (Peerless International Inc., North Easton).
3) **Grasping devices:** This hand instruments functions by application of inward pressure on two contralateral handles. Increasing pressure of handle increases the instrument's capability to grip the prosthesis or restoration. It should protect the restoration from slippage and are best in removing temporary restorations. Ex: Wynman Crown Gripper (Miltex Instrument Company Lake Success, NY), K.Y. Pliers (G.C. America, Alsip, IL) and the Trident Crown Placer-Remover (Trident Dental Inc., Hendersonville, NC).

K.Y. PliersMetalift Roydent CoronaFlex Kit Crown-A-Matic Kline Crown

2.2 Remover

1) **Post Removal:** The post retention should be minimized prior to post removal. Medium sized ultrasonic tip and Roto- Pro bur (Element Int, Hicksville, NY) used to loosen the post.



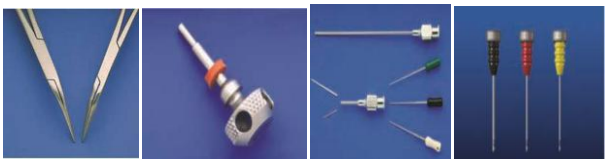
Gonon Kit Thomas Post Removal Kit Ruddle post removal kit Eggler Post Removal kit

GyroTip instrument

2.3 Regaining apical access

1) ***Gutta-percha removal*** -In spite of all the available techniques, the best removal of GP occurs in a progressive manner, so as to avoid inadvertent accidental dislodgement of irritants peri-radicularly. Various methods such as rotary,thermal(heat carrier device), chemical(xylol, turpentine), piezoelectric ultrasonics, mechanical with chemical(H-File with xylene, chloroform), paper points with chemicals and lasers have been used as GP removal system.[1] The ProTaper Retreatment system (Dentsply Int.) is used with a speed ranging between 900 and 200 rpm to mechanically soften and efficiently retrieve GP from filled canals.
2) ***Removal of resilon*** -It is hypothesised that canals filled with Resilon and Epiphany sealer can be retreated, utilising hand and rotary devices, in similar way as canals, obturated with GP and sealer. The most effective removal techniques includes rotary instrumentation combined with chloroform dissolution.[16] These materials can also be removed effectively using Gates Glidden burs and H-files compared to rotary.
3) ***Silver Points removal***- Stieglitz Forceps used in rotational motion and levered, utilizing fulcrum mechanics, against the tooth structure to facilitate retrieval of silver points. Ultrasonic tips (e.g., ProUltra ENDO-3, 4, and 5, Dentsply Int) transfers energy along the point, disintegrate the interface deep within the root canal, and enhance its retrieval.[1]Solvents, Chelators and Hedstrom files also used for removing silver points.

Various microtube removal systems such as Lasso and anchor, Tube and glue (eg- Cancellier Extractor Kit, SybronEndo), Tap and thread (eg- Post Removal System, SybronEndo), The Masserann kit (Micromega, Besano;on, France),Spinal tap needle (STN, Ranfac, Avon, MA), Endo extractor/Meisinger Meitrac: (Roydent Dental Products, lohnson City, TN), Instrument Removal System (iRS, Dentsply Maillefer) used for removing separated instruments or other intra-canal obstacles.



Stieglitz pliers *Microtubular taps* *STN* *iRS*

(d) Paste removal-Ultrasonic device, in combination with the microscope, produce an excellent control in retrieving paste from straight canal.[17] Ultrasonic instruments that are specially designed and coated, may be used under the orifice to retrieve brick-hard resin-type pastes. To remove filling materials from apical part, hand files of smaller size should be introduced first to negotiate this portion of the canal and after a glide path has been achieved, an appropriate sized pre-curve file may be attached to an adapter (File Adapter 11, SybronEndo) that mounts upon and activated via the ultrasonic handpiece.

Certain heat carriers are used to soften resin paste and facilitates its removal. NiTi rotary with non cutting tip are effective in removing the filled material coronally. Some times the end-cutting NiTi rotary are useful in penetrating paste. These devices are more active in apical region and therefore more vulnerable to preparation error, if used aggressively.

Chemicals such as Endosolv "E" and "R" (Endoco; Memphis, TN) may be helpful in softening hard paste.[15] These solvents may be placed with the help of cotton pellet or paper point between the appointments opposite to a paste-type material to enhance subsequent retrieval.

Micro-Debriders (Dentsply International) are designed to retrieve remaining paste materials from the canal. These are stainless steel devices that facilitate vision because of their

offset handles, and have a tip diameters of 0.2 and 0.3 mm with 0.02 tapers and 16 mm of efficient cutting blades.

Chemicals with paper point used in a wicking motion to remove material from the ramifications of canal system.

3. Discussion

Owing to the wide acceptance of routine endodontic therapy by the public and profession, today non- invasive re-treatment can be routinely advocated when indicated.Sometimes, the projected retreatment creates an unanticipated problem or is beyond the ability of a particular operator. Such cases require practical expertise to manage wide range of endodontic re-retreatment conditions using several retreatment procedures.

Various devices and procedures have been reviewed and recorded by the authors, which have shown great efficacy during non-invasive treatment. Host factor, play a vital role in success or failure of endodontic treatment. Nair et.al. reported six factors that lead to unmanageable asymptomatic radiolucencies:(1)persistent intra-radicular infection within the canal system; (2) extra-radicular infection, such as peri-apical actinomycosis; (3) foreign body reaction because of over-extended endodontic materials; (4) deposition of endogenous cholesterol crystals that cause peri-radicular inflammation of tissues; (5) true cysts without any connectivity to the canal space, and (6)presence of scar tissue after the healing of a periapical lesion.[10]
Generally the previously filled teeth that have been vigorously instrumented and exposed to procedural errors, may lead to changes in original canal anatomy as well as possible infection, resulting in lower rate of success. Gorni FG et.al found healing of peri-apical lesion after retreatment to range between 56% to 84%, while initial endodontic treatment of apical periodontitis was 83 to 100% .[18]

Kvist and Reit, on comparing the sequelae of peri-radicular surgery reported that there was remarkably less pain and discomfort after retreatment.[19]

Wilcox et. al,compared the four procedures that utilised combinations of ultrasonic or hand instrumentation with heat and chloroform, and found that no techniques were able to remove all debris from canal wall and found AH26 to be more difficult to remove than Roth's paste filling material. Both Roth's and AH26 sealers were removed equally well when with ultrasonic instrumentation in combination with either sodium hypochlorite or chloroform.[20]

Wilcox and Zuolo et. al,described difficulty in retrieving the metal carrier from the canal during retreatment procedure. Similarly, many authors have demonstrated difficulty in retrieving the entire filling material after re-instrumentation in combination with mechanical and hand instruments.[20][21]

According to Stamos & Gutmann, post retrieval devices are not used commonly because of the chances of inducing root fractures by the responders. Besides, most of the responders utilised haemostats (67%) or they drilled the posts out with burs (62%).[22]

After treatment and retreatment of root canal by Cavalli D et.al, a remarkable decrease in endotoxin was noted following treatment with reciprocating and rotary instruments, whereas, Martinho FC et.al. demonstratedsimilarity between both the instrumentation groups in endotoxin reduction.[23][24]

After biomechanical procedure, ErCr YSGG Laser can be used as a final step to perform disinfection procedure and decontaminate the canal walls by penetrating deep into the dentinal tubules. It acts as an adjunct to successful treatment but is not a necessary options involved during carrying out the treatment.[25]

Retreating the endodontically failed cases is a better alternative to extraction. Retreatment procedures are less complicated, less expensive, more biocompatible, more safe and provide a reasonable prognosis.

4. Conclusion

Cases of retreatment can be managed in a much more acceptable manner because of the advancement in technologies that have emerged over the past 10 to 15 years. The endodontic disease which occur post-treatment does not prohibit saving the tooth. The majority of these diseased lesion, associated with endodontically treated teeth can be returned to the original healthy state by the various retreatment options available. In most cases retreatment options is advantageous to the patient because there is no need of replacement as well as retention of natural teeth.

References

[1] Cohen S, Burns RC. Pathways of the pulp, 3rd ed. St. louis: CV Mosbys.1984:291-2.
[2] Friedman S, Abitbol S, Lawrence HP. Treatment outcome in endodontics. The toronto study.Phase1:Initial treatment.J Endod 2003; 29:787.
[3] Brown LJ,Nash KD,Johns BA,Warren M.The economics of endodontics, Chicago.American Association of Endodontists.2003
[4] FriedmanS, Mor C.The success of endodontic therapy:healingand functionality,Calif. Dent Assoc J 2004;32:493.
[5] Wolcott J, Ishley D, KennedyW,et al:A 5 yr clinical investigation of second mesiobuccal canals in endodontically treated and retreated maxillary molars. J Endod 2005; 31:262.
[6] Ozyurek T,Ozsezer E.Efficacy of different nickel – titanium instruments in removing gutta-percha during root canal retreatment. J Endod 2016;1-4.
[7] Fedele RG,Ahmed MH.Assessment of root canal filling removal effectiveness using micro-computed tomography:A systematic review. J Endod 2016;1-7.
[8] Neelakantan P, Ahmed AM, Chang WJ, Nabhan SM, Cheung SG, Brenda G. Effect of instrumentation systems on endotoxin reduction from root canal systems: A systematic review of clinical studies and

meta-analysis . Australian Society of Endodontology 2018;1-6.
[9] Grabliauskiene Z, Smirnovaite K,Zamaliauskiene R.In vitro evaluation of the effectiveness of different organic solvents in gutta-percha removal.J Cont Med A Dent 2018;6(1):60-3.
[10] Nair PN, Sjogren U, Krey G,et al. Intraradicular bacteria and Fungi in root filled,asymptomatic human teeth with therapy-resistant periapical lesions:a long-term light and electron microscopic follow-up study .J Endod 1990 ; 16:580.
[11] Sundqvist G: Ecology of the root canal flora.J Endod 1992;18:427.
[12] Nair PNR, Schroeder HE. Periapical actinomycosis. J Endod 1984; 10:567.
[13] Sundqvist G, Reuterving CO:Isolationof Actinomyces israelii from periapical lesion. J Endod 1980 6:602.
[14] Nair PN. New perspectives on radicular cysts: do they heal? Int Endod J 1998; 31:155.
[15] Ingle JI, Bakaland LK. Outcome of endodontic treatment and retreatment: Endodontics. 5th ed. Hamilton: BC Decker Inc. 2002; 747-68.
[16] Goon WW. Managing the obstructed root canal space.rationale and techniques.Ensuring the sowldness of the remaining tooth structure. J Calif Dent Assoc 1991;19(5):51-60.
[17] Ruddle CJ. Nonsurgical endodontic retreatment. In: Cohen 5,Burns RC, editors. Pathways of the pulp. St.Louis: Mosby;2002:875-929.
[18] Gorni FGM. The removal of broken instruments. Endod Prac 2001;4(3):21-6.
[19] Kvist T,Reit C.Post operative discomfort associated with surgical and nonurgical endodontic retreatment. Endod Dent Traumatol.2000; 16(2):71-4.
[20] Wilcox LR, Krell KV, Madison S, Rittman B. Endodontic retreatment: Evaluation of gutta percha and sealer removal and canal re-instrumentation. J Endod.1987; 13:453–7.
[21] Zuolo ML, Imura N, Ferreira MO. Endodontic retreatment of thermafil or lateral condensation obturations in post space prepared teeth. J Endod 1994: 20: 9–12.
[22] Stamos DE, Gutmann JL. Survey of endodontic retreatment methods used to remove intraradicular posts. J Endod 1993; 19:366.
[23] Cavalli D, Toia CC, Orozco FIE, Khoury DR, Cardoso RGF, Alves Carvalho TAC, Valera CM. Effectiveness in the Removal of Endotoxins and Microbiological Profile in Primary Endodontic Infections Using 3 Different Instrumentation Systems: A Randomized Clinical Study. J Endod.2017;43(8):1237-45.
[24] Marinho AC, Martinho FC, Zaia AA, Ferraz CC, Gomes BP. Influence of the apical enlargement size on the endotoxin level reduction of dental root canals. Journal of Applied Oral Science : Revista FOB. 2012 Nov-Dec;20(6):661-666.
[25] Dr.David Browdy, Hybridization of endodontic techniques.Advanster Dental media: Continuing education:www.ultradent.com/pro.