



REVIEW ARTICLE

Endodontic Retreatment - A Nightmare to Dentist : An Overview

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Abstract

Clinicians are regularly confronted with different choices after failure of root canal treatment. In present scenario patient prefer to retain their original teeth that's why non-surgical retreatment should be the treatment of choice. The new generation of endodontic instruments, magnification, materials and technology with the basic principles of endodontic retreatment have helped in retention of the patients natural tooth structure to form and function decreasing the need for extensively expensive prosthetic replacement in the area of implant dentistry. Surgical approach can be adopted in obstructed, calcified or non-negotiable canals.

Keywords: Retreatment, Failures, Post, Gutta - Percha



1 | INTRODUCTION:

Evolutionary introduction and widespread adoption of the operating microscope has enhanced vision and magnification allowing success for untreated root canal systems, poorly obturated root canals, coronal microleakage, undetected cracked tooth, an obstruction, a ledge, a perforation or an instrument fracture indicating non

healing associated with the previous treatment. [1] Persistent intraradicular infection occurs most frequently when the original treatment falls short of acceptable technical standards, missed canals, inadequate shaping, cleaning and obturation of the root canal system [2]. To gain entry into the root canal system coronal access is required. The clinician may be familiar with various techniques to remove coronal restoration and safely remove a variety of

post systems thus making endodontic retreatment a success. [3]

2 | DISCUSSION:

Retreatment ensures that the entire root canal system and any communicating channels are thoroughly cleaned and a good quality root filling is placed under optimal asepsis in every canal. While assessing the outcomes of endodontic retreatment, the damage to the root level walls should be considered. Compromising crown to root ratio and mobility resulting from chronic periodontitis are contraindications. External resorptive root defects, vertical root fractures, not negotiable root canal space should not be considered for retreatment. [4]

Rationale for retreatment

Endodontic failures can be attributable to inadequacies in cleaning, shaping, obturation, iatrogenic events or reinfection of the root canal system when the coronal seal is lost after completion of root canal treatment. Leakage and bacterial contamination are the major reason of failure of endodontic treatment. Non-surgical endodontic retreatment efforts are directed toward eliminating microleakage. The rationale for retreatment is to remove the root canal irritants as a source of irritation of the attachment apparatus [3, 5].

Criteria for success:

The healing capacity of endodontic lesions is dependent on many variables including diagnosis, complete access, identification of canals and use of concepts and techniques directed toward 3-dimensional cleaning, shaping and obturation. [6]

Standard for success [6]

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1. Asymptomatic patient and function equally well on both sides.
2. Healthy periodontium including normal attachment apparatus.
3. Radiographic healing or progressive bone fill over time.
4. Restorative excellence principles should be satisfied.

Case selection and treatment planning [7]

Retreatment is usually performed after previous treatment has produced definitive signs and symptoms of failure.

How to identify a failed case?

- Persistent pain / symptoms in a RCT treated tooth.
- In complete/ deficient existing root treatment.
- Procedural errors (perforations, ledges etc.)
- Non-healing periapical lesions

Periapical conditions that could present as a persistent periapical radiolucency following root canal treatment [8]

- a) Persistent or reintroduced intraradicular microorganism
- b) Extraradicular infection
- c) Foreign body reaction
- d) True cyst
- e) Periapical scar

Diagnosis of posttreatment disease: [8–10]

It has been stated that, there can be but one correct diagnosis for treating every disease. Presence or absence of endodontic disease is determined according to clinical and radiographic findings. The clinical examination should include a visual extraoral and intraoral examination and thorough periodontal evaluation. Visual examination is greatly aided by magnification and illumination which allow the clinician to identify very fine root fractures on root structures. Exposed dentin from the recession and narrow probing defects may be the result of an endodontic

infection draining through the sulcus. The presence of occlusal wear facets indicates the presence of occlusal trauma that predispose the tooth to fracture and has been associated with posttreatment disease.

However, apical periodontitis is frequently asymptomatic and diagnosed primarily by the radiographic appearance. In cases with previous endodontic therapy, radiograph are very useful in evaluation of caries, defective restoration, periodontal health, quality of the obturation, existence of missed canals, periradicular pathosis, perforation, fractures, resorption and canal anatomy. Most useful are the periradicular test that include percussion, bite and palpation. These tests are of greater importance when evaluating teeth that have been previously treated with endodontic therapy because of lack of significant and consistent evidence that can be gained from pulp vitality test. If a tooth exhibit percussion tenderness, it may be due to persistent endodontic disease.

Pulp vitality tests are of little importance when examining teeth with previous endodontic therapy. However, if the patient's chief complaint reveals the need for these tests, they must be performed. When there is vital tissue remaining in the canals of a previously root filled tooth either due to missed canal or improperly cleaned canal patient may complain of sensitivity to heat or cold. Usually the response is negative in previously treated with endodontic therapy. The positive response usually means there is responsive pulp tissue remaining in the tooth.

Treatment Planning: [8]

The patient harbouring true endodontic post treatment disease has four options for treatment:

1. Do nothing
2. Nonsurgical retreatment
3. Surgical retreatment
4. Extract the tooth

Factors influencing treatment outcome: [11]

Preoperative factors:

- Diagnosis
- Case selection
- Apical periodontitis

Operative factors:

Extent of canal preparation(over and under instrumentation)

Quality of seal

Procedural errors(ledges, perforation, missed canals and seperated instruments)

Postoperative factors:

- Coronal leakage
- Post preparation
- Final restoration

Generalized procedures to be followed during most the retreatment cases :

Coronal disassembly [9, 12]

Retreatment access has been called coronal disassembly because of the frequent need to take apart or remove the previous coronal and radicular restorations. Following initial endodontic therapy, most teeth require and receive a full coverage restoration and many times that restoration is supported by a post and core. Coronal - radicular access for retreatment is much more complicated in these cases when compared with endodontically treated teeth that have been minimally restored .

Factors influencing restorative removal

- Preparation type
- Restoration design and strength
- Restorative material
- Cementing agent
- Removal devices

Coronal disassembly devices:

Coronal Disassembly Devices: -

Grasping Instruments: eg. Trident crown placer / K.Y. pliers, Wyman crown grippers.

Percussive Instruments : eg. Ultrasonic energy, The peerless crown – A matic, The Coronaflex.

Active Instruments : eg. Metalift, Kline crown remover, Higa bridge remover

Hand instruments works by applying inward pressure on two opposing handles. eg. Trident crown remover and K4 pliers

Percussive instruments:

This involves using a selected and controlled percussive removal force. This family of instruments delivers an impact either directly to a restorative or indirectly to another securely engaged prosthetic removal device. eg. Ultrasonic energy, Peerless crown-A-matic and Coronaflex

Active Instruments: -

These devices require a small occlusal window to be out through the restorative to facilitate the mechanical action of the instrument. eg. Metalift, Kline crown removes, Mega bridge remover.

Alternative Methods:

- Use diamonds on ceramic and precious metal.
- Use cartridges on non-precious metal.

Post removal:

During retreatment, post removal is essential in endodontically treated teeth which are restored by post and core. [13]

Factors influencing post removal

Post diameter, length and the cementing agent. Other factors that will influence removal are whether the post is parallel versus tapered, stock versus cast, actively engaged versus non-actively retained, metallic versus non-metallic compositions and the post head configuration. Additionally, other considerations include available interocclusal space, existing restorations and if the post head is supra or sub - cretal. [14]

Techniques for post removal

1. Piezoelectric Ultrasonic system : Various tips are available – CPR 1,2,3,4,5,6,7,8 are used to remove the post. It should be emphasized that all non - surgical ultrasonic work should be performed under dry condition to optimize the vision. When ultrasonic work is done in wet field, the gen-erated debris accumulates quickly and becomes slurry of mud. Once the post has been fully exposed, rosonics is an easy and economic method for loosening and removal of post. [9]

2. PRS Kit : It requires straight line access and complete circumferential visualization of the post within the pulp chamber from the occlusal table to the orifice level. [15]

Fiber posts : Neither Gonon kit nor ultrasonic can be used for fiber post removal. A new, Largo bur (Dentsply) and Gyrotip with heat generating tip has been designed specifically for the removal of fiber post. [9]

Ceramic and Zirconia posts : These are usually impossible to retrieve as they are very fragile. Ceramic posts may be removed by grinding with bur but Zirconia has hardness similar to diamond, so cannot be removed by this method. [9]

Gaining access to the apical foramen:

Access to the apex in endodontic retreatment is gained through removal of the filling materials from the root canal primarily by instrumenting the coral.

Three types of filling materials have to be removed : Pastes and cements, Semisolid materials and Solid materials. [9]

1. Pastes and cements : Some pastes may be dissolved with common solvents but not hard cements like N - 2 or Zinc phosphate. The removal of pastes and cements dependent upon the consistency of the material.

Soft Consistency : Should be penetrated with endodontic files or reamers. eg. Iodoform based pastes.

Hard Consistency : Removed through dispersion by ultrasonic endodontic devices. Drilled out to a depth that is considered safe from perforating the root. eg. Beutel rock (or) engine reamers (or) burs. Failure to penetrate the cement and to instrument the entire root canal may necessitate surgery. eg. GIC based sealers, Resin sealers - Resilon. [16]

Resilon is a thermoplastic polyester polymer that is bonded into the canal space using an unfilled resin bonding system. It has been advocated as a root canal obturating material to replace traditional gutta percha and sealer due to its apparent, enhanced sealing ability and potential to strengthen root resistanceto fracture as a result of internal bonding. [9]

Semisolid materials :

Gutta-Percha : The treatment plan for retreating gutta-percha root fillings depends on the following considerations.

1. Quality of Condensation : Poorly filled - Well-condensed - dissolve the gutta percha Coronal portion may be drilled out with Gates Glidden drill. [4]

2. Shape of root canal : In curved canal, gutta percha should be dissolved so as to allow resistance free negotiation of the canal curvature without ledging or perforation. In straight canals, rotary endodontic instrumentation is used for removal of gutta percha. [16]

3. Length of Obturation : Root canals that have been filled short of apex, particularly in curved canals, ledges may have formed at the apical end of the obturation. So, it is necessary to dissolve the gutta percha.

Over extended gutta percha cones should be pulled out after being bypassed carefully and their apical portions should not be dissolved. [16]

Techniques:

1. Rotary Removal : Ni - Ti 0.04 & 0.06 tapered rotary files are most effective for removal of gutta percha. When attempting gutta-percha removal, it is useful to mentally divide the root into thirds and then select 2 or 3 appropriately sized rotary instruments that will fit passively with in these progressively smaller regions. To soften and engage gutta-percha mechanically, rotary instruments must turn at speeds ranging between 1200 & 1500 RPM (frictional softening). [4]

2. Ultrasonic Removal : Energized instruments produce heat that softens gutta-percha. Specially designed ultrasonic instruments are carried into canals that have sufficient shape to receive them and will float gutta-percha coronally in to the pulp chamber where it can be subsequently removed [4].

3. Heat Removal : Heat carrier instruments. eg. Touch N Heat (Sybron Endo), Down Pack, Endotec hand spreader, Pluggers [4, 9].

4. Heat and Instrument Removal : Employs heat and H - files. A hot instrument is plunged into the gutta percha and immediately removed to heat soften the material. 35, 40 or 45 size H - file is then selected, quickly but gently screwed into the thermo softened

mass and when it freezes on the flutes of instrument, whole G.P. can be removed in one motion in poorly obturated canals. This technique is especially good in those cases where gutta percha extends beyond the foramen. [4]

5. File and Chemical Removal : This is the best way used to remove gutta percha from small and curved canals. *For this*, Chloroform is the reagent of choice. When used carefully, it is safe and effective. Other agents such as Eucalyptol, Xylene, Methylchloroform and Halothane can also be used.

Technique : Fill the pulp chamber with chloroform. Take appropriate K-file and then gently “picking” into the chemically softened gutta percha. Initially size 10 or 15 stainless steel file is used to “pick” into the gutta percha occupying the coronal 1/3 rd of the canal. Frequent irrigation with chloroform creates a pilot role and sufficient space for the serial use of larger files to remove gutta percha in this portion of the canal. This process is continued till no G.P. is evident on the cutting flutes of the file. [9, 17]

6. Paper point & Chemical Removal : Gutta percha and most sealers are miscible in chloroform and once in solution, can be absorbed and removed with appropriately sized paper points. Drying solvent filled canals with paper points is known as ‘wicking’ (final step of up & sealer removal). It is essential to remove Gutta Percha and sealer from fins, cul de-sacs and aberrations of the root canal systems. Chloroform is first filled in the canal, then absorbed and removed with appropriately sized paper points. Paper points “wick” by pulling dissolved materials from peripheral to central and their use in this manner liberates the residual gutta percha and sealer from the root canal system. Iso propyl alcohol is used at the end to remove the remaining material from the canal. [9]

3 | SOLID MATERIALS:

The relative ease of removing failing silver points is based on the fact that chronic leakage greatly reduces the seal and hence the lateral retention. [18] Significance of canal preparation in silver point obturation :

1. Apical 2 to 3 mm of the canal was prepared relatively parallel and then flared coronal to this apical zone.
2. Recognize parallel nature of silver point over length, hope for a coronally shaped canal and take advantage of this space discrepancy when approaching retreatment. [19]

Coronal restorative material and the luted cement around the silver point in coronal orifice is best removed without gauging the silver point by a special prepared bur which has half circle round cutting end for making trough around silver point without any gauging or nicking of the protruding metal. The grasped silver point can be removed using Stieglitz or perry pliers and hemostat. More than 50% of silver cones can be removed using ultrasonic vibration. [20]

Files, Solvents and Chelators :

H file displacement technique in a solvent filled chamber files are used laterally to the silver point to break up cements and to undermine and loosen the silver points for removal.

Micro tube Removal Options :

1. Micro tubes tap and thread option : PRS kit.
2. Micro tube and an appropriately sized H-file. (STN picture) [21]

Carrier Based Gutta percha Removal :

They are metal and file like which can easily remove plastic materials. A suitable grasping pliers is selected and a purchase is obtained on the carrier. The relative tightness of the carrier within the canal can then be tested using the pliers. Recognizing that the carrier is frozen in a sea of hardened gutta percha enhances successful removal in these cases. [22]

Techniques :

The carrier is grasped with the pliers and exhalation is attempted using fulcrum mechanics, rather than a straight pullout of the tooth. If enough canal shape exists, a CPR - 3,4 or 5 ultra sonic instrument can be used along side the carrier to produce heat and thermo soften the gutta percha. The carrier is often times displaced and floated out coronally when the activated instrument is moved apically.

Indirect Ultra Sonics : Grasping the exposed carrier with a pliers and then placing an ultra sonic instrument against the pliers.

Rotary Ultra Sonics : Can be used to auger a plastic carrier effectively and efficiently from a canal. This can be attempted if there is sufficient space to passively accommodate the rotary instrument without engaging dentin.

Instrument Retrieval System:

Solvents : Endosolve - E : Eugenol based sealers, **Endosolve - R :** Resin based sealers. These solvents will chemically soften the gutta percha. [23]

Micro debridors : These are specially designed instruments used to precisely remove residual paste materials from a root canal system. These stainless steel instruments enhance vision due to their design offset handles, have D₀ diameters : 0.20 & 0.30 mm and available in 0.02 tapers with 16 mm of efficient H-type cutting blades. [24]

Broken instrument removal :

Various option for management are :

1. Removal
2. Bypassing and obturating in obturation
3. Surgical removal

Instrument breakage is one of the most common mishap during root canal treatment. Because of technological advancements in vision, ultra sonic instrumentation and micro tube delivery methods, separated instruments can be removed. The dental operating microscope affords remarkable vision into most aspects of the root canal system and fulfils the age-old adage, "if you can see it, you can probably do it". In combinations, microscopes and ultra sonics have driven "micro sonic" techniques that have dramatically improved the potential for and predictability of removing broken instruments safely. [21]

Techniques :

Straight line access to orifice with high speed, friction group, surgical length burs. After that, radicular access is made. If access is limited, then use hand files in sequence followed by GG drills in brush strokes. GG modification is used if greater access is required. Lateral to the most coronal aspect of the obstruction, bud shaped tip of GG can be "modified"

and used to create a circumferential “staging platform”. It can be altered by cutting it to long axis at buds max. c/s diameter. Modified GG is rotated at 300 RPM and is carried gently till it lightly touches the obstruction. CPR – 3, 4, 5 is used for trephing around instruments. 6, 7, 8 is used for narrow and limited access cases. [21]

IRS: Instrument Removal System:

It is composed of variously sized micro tubes and inserts wedges that are scaled to fit and work deep within the root canal space. Before the IRS can be used, straight line, coronal and radicular access is required to expose and subsequently visualize the most coronal end of the broken instrument. Expose 2 to 3 mm or $1/3^{rd}$ if instrument length exposed using ultra sonic instrumentation. Micro tube is then selected that can passively slide into the canal end is oriented to the outer wall of the canal to scoop up the head of the broken instrument and guide it into the lumen. The inset wedge is then placed through the open end of the micro tube and passed down its internal lumen until it contacts the broken obstruction. Broken instrument is engaged and secured by turning the insert wedge’s handle screw in a clockwise rotation. [21, 24]

Cancellier Kit : It is a hollow tube that can be inserted over a fractured instrument within the root canal and small drop of cyanoacrylate adhesive is used to bond the two and then the instrument is withdrawn. Four different sized microtubes with diameters of approximately 0.50, 0.60, 0.70 and 0.80mm are available in this kit and is mainly useful in retrieval of fracture nickel titanium instrument in the middle and apical $1/3^{rd}$ of root canal. [25]

Masserann Kit : Firstly an extractor device is applied and locked around the object, then an end-cutting trepan burs is rotated in an anticlockwise direction to provide access to the object.

- Good in straight canals
- Requires radiographic monitoring
- Cannot be used in curved canals and in apical portions
- Requires considerable sacrifice of Radicular dentin, making tooth more susceptible to fracture. [20]

Endo Extractor: It is an extractor with adhesive. [24]

4 | SUMMARY:

Endodontic retreatment differs from root canal treatment in many aspects and in this, various procedures have to be followed which include coronal disassembly, post removal and filling material removal within canal depending on the conditions of tooth. Also, a high percentage of the teeth that are indicated for retreatment have been restored and the restoration has to be considered before retreatment can be initiated. The coronal restoration or the post and core can be removed or retained. Each such option is related to specific conditions and has its advantages and disadvantages. Filling materials from root canal should be removed by using proper technique and resources.

5 | CONCLUSION:

Proper use of techniques and resources make endodontic retreatment a blessing for dentist and patient. Although retreatment is associated with certain disadvantages like it results in thinning of dentin walls, weakening or perforation of the root canal wall, creation of ledges in the canal wall, separation of instruments and the need for replacement of a well fitting fabricated crown but it is much better than fixed prosthesis and also cost effective.

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