Republic of Iraq Ministry of Higher Education and Scientific research
University of Baghdad/College of Dentistry

Retreatment Of Failure Endodontic

A Graduation Project

Submitted to the Restorative & Esthetic Dentistry Department, College of Dentistry, University of Baghdad

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April 2022

Certification of the Supervisor

I certify that this project entitled "Retreatment Of Failure Endodontic" was prepared by the fifth-year student Ula Abdul Razzaq Yas under my supervision at the College of Dentistry/University of Baghdad in partial fulfillment of the graduation requirements for the Bachelor's Degree in Dentistry.

Supervisor‘s name

Date:

Dedication

This research is a dedication to every person who resists this life who resists to reach his goal and has gone through all these difficulties in this country, commitment to everyone who stood with me and did not leave my hand in the most difficult and happiest of situations, a dedication to the nights we stayed up in the past five years.

"Acknowledgment"

I would like to thank my supervisor especially, Dr. Samer, for his endless support, kind efforts, time, advice, and scientific opinions in supporting and helping me a lot, and I'm very proud and lucky to be under his supervision.

Finally, I would thank my supporting person who made me learn more and helped me in my last year Lamees.

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1-INTRODUCTION

Many studies have been conducted to determine the success and failures of endodontic treatments for a long time. The adequately executed root canal treatment has shown a success rate in 95% of the cases. Yet failures occur, and the root canal failures are commonly caused by ramifications of the infected tooth, periapical or the surrounding periodontium(Nisha Garg MDS,Amit Garg MDS,2014 Endodontic failures and retreatment from Textbook of Endodontics), failure following insufficient instrumentation and removal of microbial infections, or inadequate obturation is often ultimately due either to the carelessness of the operator, a misunderstanding of the treatment concepts, or the use of toxic materials. It could also be traced back to inadequate familiarity with root canal anatomy or failure to follow complex root canal systems(Scianamblo 1993). Reasons for retreatment include failure because of a root canal filling that is too short, a significantly overfilled or underfilled root canal, or a perforation. Endodontic retreatment is a procedure done on a tooth previously endodontically treated but whose current condition requires further endodontic treatment to achieve a successful result. Even though the success rate of endodontic treatment is high, each clinician must be prepared to retreat the endocanalicular system if initial therapy fails endodontically. Several specialists showed that endodontic retreatments represent 30-50% of their clinical work.

The usual factors which can be attributed to endodontic failure are the persistence of bacteria (intra-canal and extra canal), Inadequate filling of the canal (canals that are poorly cleaned and obturated), Overextensions of root filling materials, Improper coronal seal(leakage) Untreated canals (both primary and accessory), Iatrogenic procedural errors such as poor access cavity design, Complications of instrumentation (ledges, perforations, or separated instruments) (Kevin Prayogo, Dian Agustin Wahjuningrum and Ari Subiyanto,2019, Department of Conservative Universitas Airlangga, Surabaya, Indonesia Conservative Dentistry Journal)

2-Aims of the study.

The goal of endodontic retreatment is the same as for primary treatment, namely to obtain a bacteria-free tooth with a bacteria-tight root filling and an adequate coronal restoration so that healing may occur and reinfection is prevented. About two-thirds of retreatment cases will heal after renewed conventional treatment. Of the latter, one-third of which comprises treatment-resistant ant or refractory cases, again about two-thirds will recover following the surgical–endodontic treatment. In addition, the success rate in this group may be improved by adequate systemic antibiotic treatment, preferably following the identification of the infecting bacteria.

3-Retreatment

Endodontic retreatment comprises non-surgical and surgical procedures performed on teeth previously subject to endodontic treatment. The American Association of Endodontists Glossary of Terms states that these procedures revise the shape of canals, remove root canal filling materials, and obturate canals. Retreatment is usually initiated if the initial treatment appears inadequate, if the initial treatment has failed, or if microorganisms from the oral environment have contaminated the root canal. The goals of retreatment and subsequent restorative procedures are to return or maintain a tooth's comfortable function in an environment free of inflammation and pathosis.

(William T. Johnson, 2002, Retreatment, Color Atlas of Endodontics)

Considerations of endodontic retreatment have grown logarithmically in the past 15 years. Reasons supporting the increasing need for retreatment procedures include the following:

1. The increasing number of initial endodontic procedures and the biological certainty that some of these will fail.

2. Recognition of the potential effect of coronal to apical microbial leakage.

3. Growing realization that "the best implant" is a healthy natural tooth.

Endodontic care practitioners should further orient themselves toward nonsurgical and surgical retreatment approaches.

(William T. Johnson,2002, Retreatment, Color Atlas of Endodontics)

4- Indications for Retreatment

4-1. Root Filled Teeth with Apical Periodontitis

Epidemiological studies have shown that there is a correlation between the technical standard of the root filling and the periapical condition of root-filled teeth, whereas 80 – 90 % of teeth with adequate root fillings have normal apical periodontium, only about 50 % of teeth with inadequate root fillings have a normal periapex, There is no reason to expect that healing of apical periodontitis occurs if the root filling does not provide an adequate seal of the root canal, teeth with a technically inadequate root filling and persisting apical periodontitis should therefore be retreated (Fig.1), if the root filling, is technically adequate, apical periodontitis will usually resolve within a period of 2 – 3months to3 – 4 years. As seen radiographically, it is unlikely that a lesion that has not healed after four years will recover in the future. A persisting infection will have to be suspected, and if pathways of infection like a vertical fracture or a deep periodontal pocket are not diagnosed, the chances are that there is coronal leakage or an extraradicular infection, and the tooth should be retreatment endodontically.

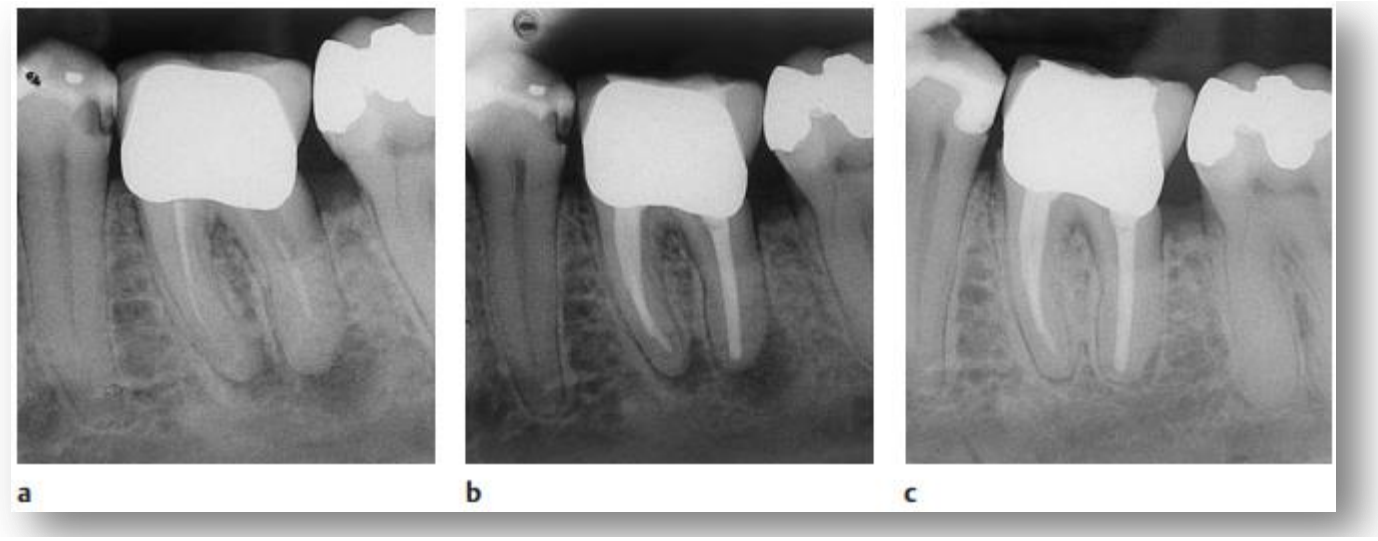


Fig (1): a.Radiograph of a mandibular molar with inadequate root filling and asymptomatic apical periodontitis, b.The tooth has been retreated conservatively tthrough the crown, c.Complete periapical repair is evident at the 6-month control.

NOTE: Teeth without apical periodontitis that appear to have been treated technically adequately may also fail, and apical periodontitis may develop.

4.2. Root Filled Teeth with Normal Apical Periodontium

-Teeth with inadequate root fillings but without clinical or radiographic signs of periapical inflammation represent a set of problems

-In reality, all teeth in this group are candidates for retreatment (Fig.2)

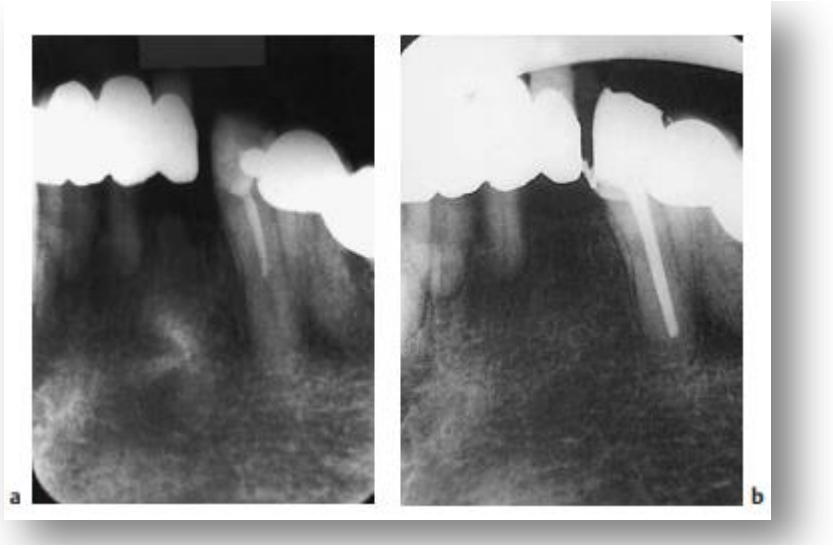


Fig (2): a- Radiograph of a mandibular canine with root filling material in the coronal half of the canal. No periapical inflammation is evident. b-The tooth is retreated endodontically in conjunction with renewing the coronal restoration.

There is no immediate urgency in treating these teeth with no signs of disease, and the treatment can be done over time and, if possible, when convenient for the patient. (Leif Tronstad,2008, Endodontic retreatment, clinical Endodontic -textbook.)

5- Contraindications

5.1-Vertical fracture.

5.2- Unfavorable root anatomy (shape, taper, remaining dentin thickness)

5.3-Non restorable teeth.

5.4- Insufficient crown/root ratio

5.5-Presence of untreatable root resorptions or perforations

5.6- Non strategic position. (Nisha Garg MDS, Amit Garg MDS,2014 Endodontic failures and retreatment from Textbook of Endodontics).

the treatment continues following the guidelines for the treatment of nonvital teeth in two ways:-

1-Non-surgical Endodontic Treatment

Nonsurgical root canal therapy has become a routine procedure in modern dentistry. Recent technical and scientific advances in endodontics have resulted in the retention of millions of teeth that would otherwise be lost. Even as recent advances in surgical and prosthetic restorative care have made tooth replacement less onerous than in the past, it is universally accepted that a natural tooth with a good prognosis is a superior choice for loss and replacement. Unfortunately, not all treatments result in optimum long-term healing. Given the large number of treatments performed, the minimal rate of unsuccessful outcomes translates into relatively large numbers of patients requiring further treatment. Dental clinicians should be able to diagnose persistent or reintroduced endodontic disease and be aware of the options for treatment. If they wish to approach treating these teeth, they should have the appropriate armamentarium and be capable of performing these very specialized techniques at the highest level. Also, clinicians must always have a scientifically sound, evidence-based rationale for every treatment decision made so that they may best serve the patients who entrust them with their care. This chapter aims to provide information to allow the reader to maximize the likelihood of success in the treatment of persistent endodontic disease. (Kenneth m. Hargreaves, Louis h. berman, 2015, nonsurgical retreatment, Cohen's Pathways of the Pulp).

The primary difference between nonsurgical management of primary endodontic disease and post-treatment disease is the need to regain access to the apical area of the root canal space in the previously treated tooth. After that, all the principles of endodontic therapy apply to the completion of the retreatment case. Coronal access needs to be completed, all previous root filling materials need to be removed, canal obstructions must be managed, and impediments to achieving full working length must be overcome. Only then can cleaning and shaping procedures be instituted to allow for effective obturation and case completion. (Kenneth m. Hargreaves, Louis h. Berman, 2010, nonsurgical retreatment, Cohen's Pathways of the Pulp)

1.1-Etiology of post-treatment disease (Sundqvist G. 1998)

The clinician may place the etiological factors into four groups **fig. (3)**

1-Persistent or reintroduced intraradicular microorganisms.

2-Extraradicular infection.

3-Foreign body reaction. 4- True cyst

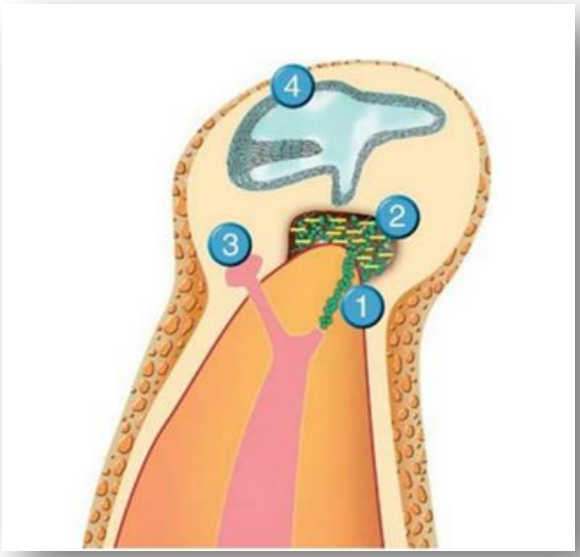


Fig (3): the causes of posttreatment diseases 1. intraradicular microorganisms 2. Extraradicular infection 3-Foreign body reaction 4-true cyst

1-Persistent or reintroduced intraradicular microorganisms.

Inadequate cleaning, shaping, obturation, and final restoration of an endodontically diseased tooth can lead to post-treatment disease. Or if new microorganisms can reenter the cleaned and sealed canal space, then post-treatment disease can occur.(Nair PN, Sjogren U, Krey G, 1990) It has been asserted that persistent or reintroduced microorganisms are the primary cause of post-treatment disease. Many iatrogenic treatment complications, such as creating a ledge or separation of an instrument, result in the persistence of bacteria in the canal system. It is not the complication itself that results in persistent disease. It is the inability to remove the microorganisms present that creates the pathologic state. The infecting flora is predominantly gram-positive, not anaerobic, and a very commonly isolated species is Enterococcus faecalis (Rocas IN, Siqueira JFJ, Santos KR, 2004), which is Very resistant to canal disinfection

Regimens (Basrani B, Tjaderhane L, Santos JM, 2003). Suppose the previous root canal treatment is done so poorly that the canal space contains no obturating material in the apical half of the root canal space. In its flora is more typical of the untreated necrotic infected pulp than that of classic "failed" root canal therapy (Sundqvist G, Figdor D,1998). Though the post-treatment disease has been primarily blamed on bacteria in the root canal system, fungi, notably Candida albicans, are frequently found in persistent endodontic infections and may be responsible for the recalcitrant lesion (Siqueira JF, Sen BH, 2004).

2- Extraradicular infection.

Occasionally, bacterial cells can invade the periradicular tissues either by direct spread of infection from the root canal space, via contaminated periodontal pockets that communicate with the apical area (Simon JH, Glick DH, Frank AL, 1972), extrusion of infected dentin chips(Holland R, De Souza V, Nerythat case, MJ, et al.,1080), or by contamination with overextended, infected endodontic instruments. Usually, the host response will destroy these organisms. Still, some microorganisms can resist the immune defenses and persist in the periradicular tissues, sometimes by producing an extracellular matrix or protective plaque (Tronstad L, Barnett F, Cervone F,1990). It has also been shown (Sjogren U, Happonen RP, Kahnberg KE, Sundqvist G,1988) that two species of microorganisms, Actinomyces israelii and Propionibacterium propionicum, can exist in the periapical tissues and may prevent healing after root canal therapy.

3-Foreign body reaction.

The persistent endodontic disease occurs in the absence of discernable microorganisms and has been attributed to foreign material in the periradicular area. Several materials have been associated with inflammatory responses, including cellulose fibers from paper points (Koppang HS, Koppang R, Solheim T, et al.,1989). Root filling flush to the radiographic apex or gross overextension leads to a lower incidence of healing (Sjogren U, Hagglund B, Sundqvist G, Wing K,1990). Many of these cases involved overextension and inadequate canal preparation and compaction of the root filling, whereby persistent bacteria remaining in the canal space could leak out. Gutta-percha and sealers are usually well tolerated by the apical tissues. If the tissues have not been inoculated with microorganisms by vigorous over instrumentation, then healing in overextended filling materials can still occur (Fristad I, Molven O, Halse A, 2004).

4-True cysts.

Cysts form in the periradicular tissues when retained embryonic epithelium begins to proliferate due to chronic inflammation. The epithelial cell rests of Malassez is the source of the epithelium, and cyst formation may be an attempt to help separate the inflammatory stimulus from the surrounding bone (Regezi JA, Sciubba JJ, 1999). The incidence of periapical cysts has been reported to be 15% to 42% of all periapical lesions (Spatafore CM, Griffin JA Jr, Keyes GG, et al., 1990), and determining whether periapical radiolucency is a cyst or the more common periapical granuloma cannot be done radiographically.

There are two types of periapical cysts: **the true periapical cyst and the periapical pocket cyst.** True cysts have a contained cavity or lumen within a continuous epithelial lining, whereas, with pocket cysts, the lumen is open to the root canal of the affected tooth; true cysts, due to their self-sustaining nature, probably do not heal following nonsurgical endodontic therapy (Ingle JI, Simon JH, Machtou P, Bogaerts P, 2002)and usually require surgical enucleation. (Kenneth m. Hargreaves, Louis h. Berman, 2010, nonsurgical retreatment, Cohen's Pathways of the Pulp)

1.2-Treatment plan.

The patient with actual endodontic post-treatment disease has four basic options for treatment, which are as follows :

1-Do nothing.
2-Extract the tooth.
3-NonSurgical retreatment.
4-Surgical retreatment. (Roda R, Gettleman B, Hargreaves K, Berman L, eds,2015)

-The first option is to do nothing, that is the short-term option if the etiology of the condition remains unknown and the clinician feels that another diagnostic sampling would help with diagnosis even though most clinicians would find this.

- Extraction of the tooth is usually considered a viable option. Recent advances in prosthetic reconstruction techniques and dental implantology have made extraction and replacement more desirable in some instances. This option belongs to the patient decision (Iqbal MK, Kim S,2007).

-Avoiding treatment may result in the progression of the disease and continued destruction of supporting tissues and a possible acute exacerbation of systemic side effects such as cellulitis and/or lymphadenopathy.

-In most cases, the clinician needs to decide if retaining the tooth is in the patient’s best interest. This decision is based on the restorability of the tooth and its strategic

position in the dentition, periodontal health, the health history, motivation and desires of the patient, and the skill level and experience of the dentist. (Robert s. Roda, 2017, Nonsurgical Retreatment: clinical decision making, endodontics colleagues for excellence)

THE STAGES OF ROOT CANAL RETREATMENT ARE:

-Coronal access.

-Radicular access.

-Removal of root filling materials.

Negotiation of blocked or ledged canals, Regaining canal patency -

-Preparation of the canal.

-Antimicrobial management.

-Obturation and restoration. (Philip J Lumley, Nick Adams, and Philip Tomson, 2006, Root canal retreatment, Dental update, university of Birmingham).

1.2.1-Coronal access.

Careful consideration should be given to the quality of the coronal restoration before access. Where the coronal restoration is satisfactory, it should be retained and access made through it, with due care and attention given to the angulation of the bur, as the original coronal landmarks of the tooth may have been lost. The presence of an integral post and core or evidence of leakage around the restoration margins usually indicates that it should be removed before performing root canal retreatment.

Sectioning and removal of crowns or bridges, with careful consideration being given as to the method of temporization, is preferred to tapping them off with a crown remover. The latter approach is uncontrolled and may result in unnecessary fracture of tooth tissue, with subsequent restorative complications. It is advisable to initiate sectioning with a diamond bur if porcelain is involved (Sutherland JK, Teplitsky PE, Moulding MB, 1989), otherwise, the transmetal bur provides an excellent means of cutting through metal crowns. A recent device, the Metalift **(**Clifford J. Ruddle,2004**) Fig (4),** allows crowns to be removed intact. The procedure involves drilling a small hole in the occlusal surface of the restoration before the introduction of a self-threading screw, which pushes against the dentine / core and elevates the crown , thus breaking the cement seal. On occasions , it may be possible to seal leaking restorations internally as a temporary measure to exclude bacteria and prevent leakage of irrigation solutions.

Fig (4): Photograph of the Metalift system. A small hole is drilled in the occlusal surface the restoration prior to the introduction of a self-threading screw which pushes against the dentine/core and elevates the crown, thus breaking the cement seal

Removal of the restoration has the following advantages:

1-Ensuring removal of all caries.

2-Allowing a thorough check to be made for cracks

3-Providing excellent access for identifying previously untreated canals.

In cases of extensive breakdown, it may be necessary to place a copper ring **Figure (5)** or orthodontic band and build a restoration prior to embarking on treatment in order to ensure a seal around the margins of the rubber dam to avoid compromising asepsis and providing a four-walled access cavity for containing irrigant solutions. (Kenneth m. Hargreaves, Louis h. Berman, 2010, nonsurgical retreatment, Cohen's Pathways of the Pulp)

Fig (5): Photograph of tooth restored with copper ring and amalgam prior to re-root treatment; composite or resin re-enforced glass ionomer or orthodontic bands may also be used

1.2.2- Radicular access.

Once coronal access has been gained, attention should be addressed to radicular access. Core materials will either be tooth or non - tooth-colored materials or cast metal. The most common non-tooth-colored material is an amalgam, which can be removed superficially using surgical length, round tungsten carbide burs in the high-speed handpiece, followed by long neck burs used at slow speed deeper in the access cavity. When the pulp chamber floor is approached, ultrasonic tips Figure (6) offer a safer alternative than burs, for dispersing any material remaining over furcal areas and in the orifices of root canals. Tooth-colored cores may be more difficult to distinguish from dentine and careful observation of the dried access cavity floor to differentiate between dentine and restorative material is essential, as is a tactile exploration with an endodontic explorer. The access cavity should be re-evaluated at this stage in regard to its extent to look for previously untreated canals and ensure that files may pass into

the canal without touching the wall. Such interferences may create small amalgam fillings, which can pass apically and block the canal. **(Lumley PJ, Adams N, Tomson P.2006, Root canal retreatment. Dent Update,university of Birmingham**).

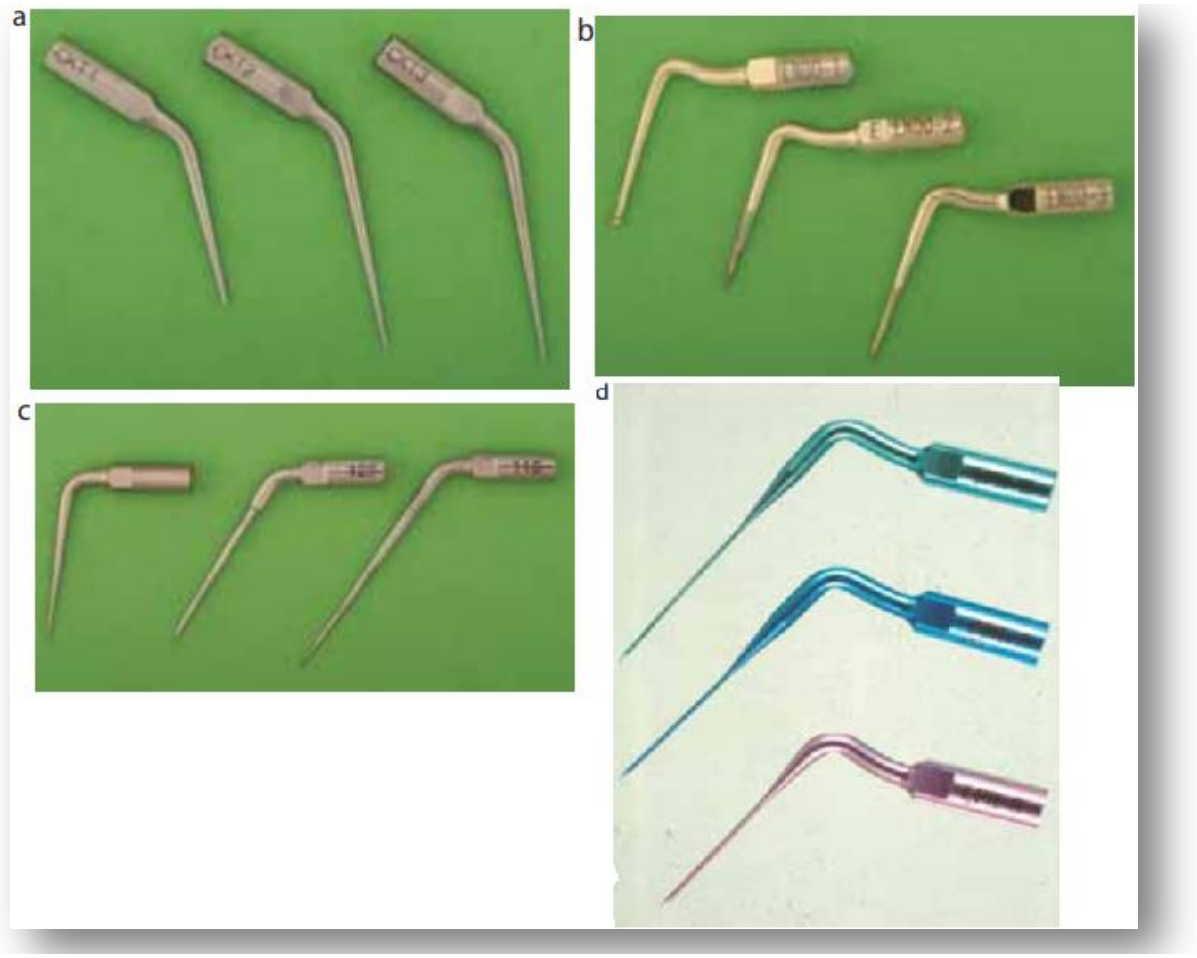


Fig (6): A selection of ultrasonic tips suitable for use in retreatment: (a, b) large robust tips for disturbing deeply placed restorative materials; (c, d) smaller tips used deeper in the canal system

1.2.3- Radicular access, removal of post and cores.

Post and core build-ups may be all in one casting or a combination of preformed posts and plastic core materials. The core should be dissected away in order to expose the individual posts. The removal of a post should not be attempted if the force to remove It might result in root fracture. Ultrasonic vibration may be used initially in an attempt to break the cement seal. The vibrations should be directed in a coronal direction, which necessitates the cutting of a notch on the side of the core. A standard ultrasonic scaler may be used if a specialized tip is not available. Care must be taken with ultrasonic vibration, as heat is produced, which can cause local bone necrosis. It is essential to use coolant water spray(Schwartz RS, Robbins JW, 2004), intermittent application, and moderate power, as high settings may initiate microcracks in the root. In some situations, ultrasonic vibrations may result in the post becoming free within the canal; if it does not, then it is necessary to use a device to extract the post and core. This can usually be accomplished in anterior teeth using the Ruddle Post Removal System (Figures 7 a, b), which consists of a series of trepans to mill the post(Ruddle CJ, Burns RC, 2002), tubular taps to engage the post and extraction pliers to provide the elevation force. Composite or fiber posts normally pose can frequently be removed using ultrasonic vibration or drilling. It is essential to make a close note of the type of post and cement used in the record, as such information is then available to inform future decision-making.

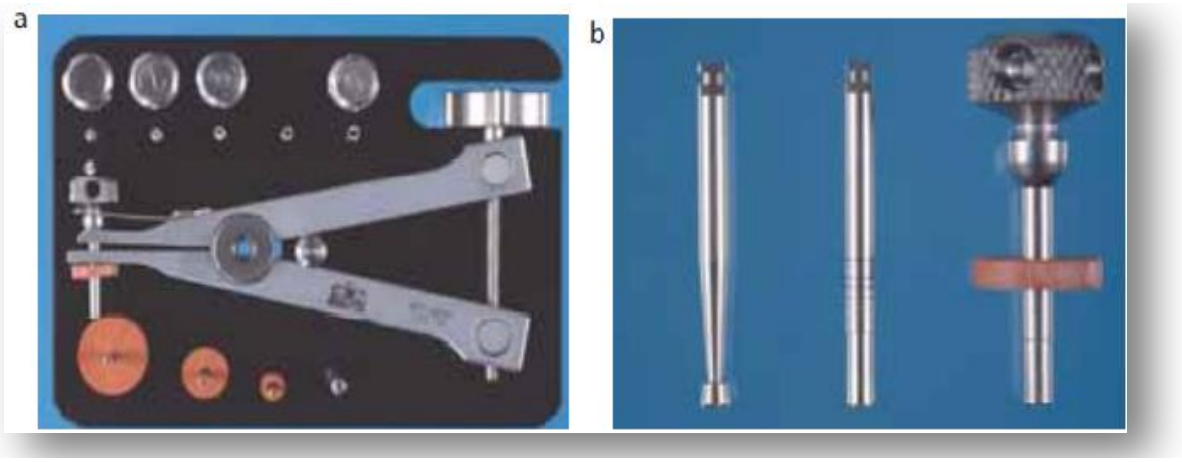


Fig (7): (a) The Ruddle Post Removal System Including the extractor. (b) A domer bur, trepan and tap which are used to modify and engage the post

The fracture of a post within a root canal may pose a significant problem and care should be taken to try not to weaken, fracture, or perforate the root further. Such situations should first be tackled by troughing around the post to remove the luting cement, using a small long neck bur or thin ultrasonic Tip. The use of ultrasonic tips will remove many fractured posts without resorting to additional means, such as the Masserann kit **(Figures 8a, b)**. The Masserann system is preferred to the Ruddle for

removal of fractured posts, as the metal trepans are thinner and, therefore more conservative of tooth tissue. A suitably sized trepan is directed along the side of the post in the space created by the ultrasonic tips. A smaller trepan may then be used to grip and remove the fractured portion. If the post is of the screw-in type, it may be unscrewed after using ultrasound to weaken the cement seal, either by placing a groove in its end or grasping it with a tight-fitting trepan. If this is unsuccessful, then a trepan should be selected, which will cut along the threads of the post, as this will minimize the amount of dentine removed while easing the cutting of the metal. In exceptional cases, fractured posts may be drilled out using an end cutting bur. This procedure is rarely necessary in the view of the recent developments in ultrasonic tip design and improved magnification and lighting.

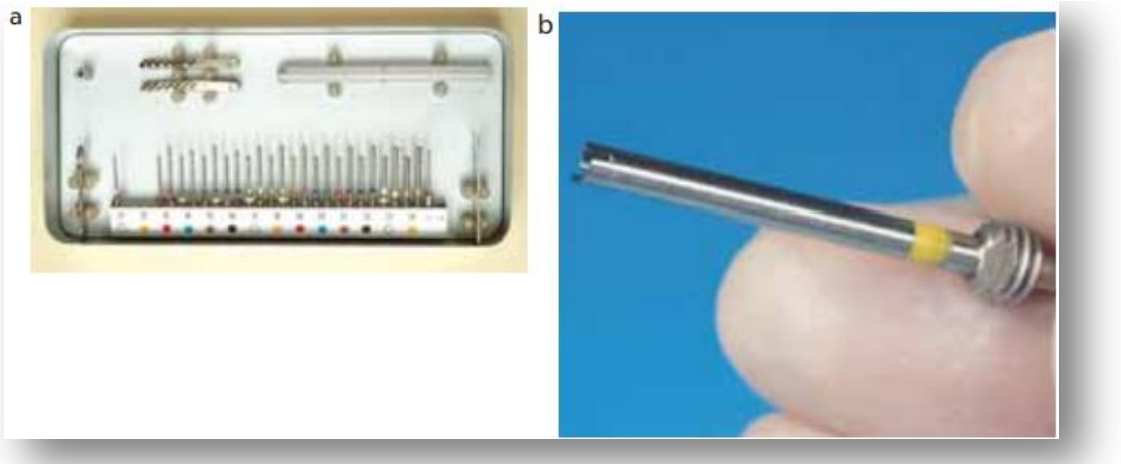


Fig (8): (a) Photograph of the Masserann kit. (b) Close up of a Masserann trepan.

1.2.4- Access to the apical third.

Access to the apical third of the root is usually restricted by the presence of materials used to obturate the canal, the most frequently used is Gutta-percha, a thorough evaluation of the access cavity should be performed, modifying it as necessary to give straight line access to the root canals before attempting removal of the obturation materials**.**

Removal of gutta-percha:-

Gutta-percha root fillings, inadequately laterally condensed, may be removed by rotating one or two small Hedstrom files around or between the root canal filling points(Metzger Z, Ben-Amar A,1995), pulling and elevating the points intact. An attempt should always be made to remove overextended points intact as, once solvents are used, it becomes more challenging to grasp the point and remove overextended material. If this is unsuccessful, the root canal filling should be considered in stages, first removing the coronal, followed by the middle and apical thirds. Gates-Glidden burs may be used coronally in the straight part of appropriately sized canals. These are available in various sizes and have a safe cutting tip that reduces the risk of perforation, provided that too large a size is not used. Care should be taken during their use. If too fast a speed is used, they may inadvertently screw into the canal and cause considerable damage, a suitable speed of 1000–1500 rpm. Using rotary systems to remove gutta-percha in the canals has been advocated due to enhanced efficiency and effectiveness in removing gutta-percha from treated root.

Canals (Ruddle CJ, Burns RC, 2002)This has generally been borne out in the literature. Several mechanical rotary systems are available for gutta-percha removal, including rotary file systems such as the ProFile (Dentsply). These instruments help remove coronal gutta-percha from large canals and around curves, providing a glide path has been confirmed. They are used at a higher speed (up to 500 rpm in the straight part of the canal to soften and elevate gutta-percha) than for canal preparation. Care is needed when advancing around curves or into the apical region when the speed should be reduced to 300 rpm. **Heat** may be used to soften and remove gutta-percha in narrow canals conveniently followed by files and solvent. Once a curvature is approached, if the canal has been poorly obturated, thus eliminating the need for solvents. If that is not possible, then a gutta-percha solvent must be used to remove the remaining material in the apical portion of the canal. Several solvents have been recommended to dissolve and remove gutta-percha for retreatment, including chloroform, methylchloroform, eucalyptol, halothane, rectified turpentine, and xylene.

All of the solvents have some level of toxicity, so their use should be avoided if possible The most popular solvent is **chloroform** (McDonald MN, Vire DE,1992) because it dissolves the gutta-percha rapidly and has a long history of clinical use 4 A small drop placed in the canal is all that is required, as it only softens the coronal end of the gutta-percha, which is then removed with hand files. The chloroform is replaced frequently as softened gutta-percha is removed, and progress is made to the canal's terminus. Gutta-percha, softened with chloroform, tends to smear the canal walls, which may be removed by paper point wicking. (Kenneth m. Hargreaves, Louis h. Berman, 2010, nonsurgical retreatment, Cohen's Pathways of the Pulp)

1.2.5- Regaining canal patency Frequently.

Materials or broken instruments, blockage, or a ledge will be noted, preventing further progress down the canal and completion of cleaning and shaping. The first stage is to refine the coronal and radicular access, as this creates space for thorough irrigation with NaOCI/LDIA and placement of a lubricant.

And the introduction of a small file with a curve, placed in its apical few millimeters, using a file bender (Figure.9). This instrument is directed towards the curvature and used to pick and probe the canal's depths until a catch or bite is sensed. If this is not initially successful, then the file is removed and recurved, or a new file is substituted. Blockage and ledge negotiation may result in many small files being discarded. Once a bite is felt, the file is moved in and out in small increments to smooth the path and advance apically. A very light watch winding movement may also be employed with care. Files are advanced to the end of the canal, up to size 20, and the preparation may be smoothed using pre-curved 06 (white) and 08 (yellow) Hand GT files in reverse balanced force. (Lumley PJ, Adams N, Tomson P.2006, Root canal retreatment. Dent Update, University of Birmingham)

Fig (9): Buchanan file bender which may be used to place a small bend on the end of a file to help negotiate ledged canals.

1.2.6- Antimicrobial management.

Retreatment of teeth with apical periodontitis has a poorer prognosis than initial therapy, with infection at the time of treatment and the size of the lesion both influencing the outcome. The clinical ability to control infection in retreatment cases may be due to several factors. Bacteria lying in canal recesses may be protected by residues of filling material and thereby not exposed to antibacterial agents. Existing ledges, transportation, and obstructions may also prevent an optimal debridement and root filling level. Retreatment aims to regain access to and treat infection within the root canal, the flora of which can be variable. In cases where much of the root canal system has not been instrumented, then the flora is likely to be polymicrobial in nature, similar to that of necrotic pulp and antimicrobial management follows conventional lines that are thorough cleaning, disinfection, and placement of Ca(OH), If the previous root treatment has, however, managed most of the canal system, then the flora may be different with only a few species being present. One organism that has been associated with such failures is Enterococcus faecalis which is resistant to elimination. Therefore, in such cases, a ten-minute soak with 50% IKI following preparation and smear layer removal has been advocated, together with adding IKI to the usual Ca(OH) intervisit dressing to help eradicate this organism. An alternative is not to use IKI but add Camforated Mono Chloro Phenol to a slurry of Ca(OH) and glycerine as an intervisit root canal dressing. Many operators prefer not to use IKI in view of its allergenic potential.

Heat generation during retreatment procedures

The area with the most significant risk of heat-related tissue damage occurs during nonsurgical retreatment is when:

1-Use heat to soften canal filling materials to aid in their removal (Lipski M, Wozniak K,2003).

2-Use ultrasonics to dislodge posts (Satterthwaite JD, Stokes AN, Frankel NT, 2003) and separated instruments (Madarati AA, Qualtrough AJ, Watts DC,2008).

They can potentially generate enough heat to raise the temperature of the external root surface by 10°C or more. Temperature elevations of the periodontal ligament over 10°C can cause damage to the attachment apparatus (Saunders EM, 1990)

The greatest danger of heat-related damage occurs with the use of ultrasonic energy to dislodge foreign objects in the canal space to gain access to the apical portion, these devices must be used with caution as in vitro research and clinical case reports imply that they have the potential to damage the tooth attachment apparatus due to the heat generated during use(Budd JC, Gekelman D, White JM, 2005).

One in vitro study has shown that ultrasonic vibration for post removal without coolant can cause root surface temperature increases approaching 10°C in as little as 15 seconds(Dominici JT, Clark S, Scheetz J, Eleazer PD,2005). Thermal damage to the periradicular tissues may be so serious as to result in tooth loss and permanent bone loss. The factors that may contribute to a heat-induced injury are the length of the post diameter, post material, and type of luting cement. also, a more recent study has shown that the dentin thickness is statistically insignificant as a factor in root surface temperature rise(Satterthwaite JD, Stokes AN, Frankel NT, 2003). One possible mitigating factor would be the effect of the periradicular blood supply, which could act as a heat sink dissipating the generated thermal energy and thus helping to prevent injury. This may be why the effect of seemingly similar conditions of ultrasonic application can have such different results on different patients. The authors do feel strongly with regards to several recommendations for the use of ultrasound energy during the removal of canal obstructions and they are as follows:

.■Use ultrasonic tips with water ports whenever possible

■If your ultrasound device does not have tips with water ports, have your assistant use a continuous coolant air/water spray(Ettrich CA, Labossiere PE, Pitts DL, Johnson JD, 2007).

■Take frequent breaks to let the tooth cool down

■Avoid using the ultrasound in a high-power setting.

Prudent clinicians must take extreme care when applying ultrasound energy to a canal obstruction. It has been shown that even with water coolant, root surfaces can increase in temperature rapidly (Dominici JT, Clark S, Scheetz J, Eleazer PD, 2005).

1.2.7-Prognosis of retreatment.

-When the proper diagnosis has been made and all the technical aspects of retreatment are carefully performed, orthograde retreatment can be highly successful. The prognosis depends to a large extent on whether apical periodontitis exists before retreatment (Ng YL, Mann V, Gulabivala K, 2008). In a systematic review of outcomes studies, Friedman and Mor report that in the absence of prior apical periodontitis, healed cases after both initial treatment and orthograde retreatment range from 92% to 98% up to 10 years after treatment.

-When prior apical periodontitis is present, the incidence of healing drops to 74% to 86%, regardless of whether initial treatment or orthograde retreatment was performed. The authors state that this similar potential to heal after initial treatment and orthograde retreatment challenges the historical perception of the latter having a poorer prognosis than the former(Friedman S, Mor C, 2004). Endodontic surgery is a very predictable procedure performed on most teeth. Extraction, replantation also

Referred to as intentional replantation, is another treatment option. This involves extraction of the tooth and performing the apicoectomy and root-end filling while the tooth is out of the patient's mouth followed by replantation and splinting if indicated. to be selected only when the tooth is non-repairable. If the decision is made to extract the tooth, usually replacement will be necessary to prevent shifting of the dentition with its attendant problems. Replacement can be with an implant, a fixed partial denture or a removable partial denture.

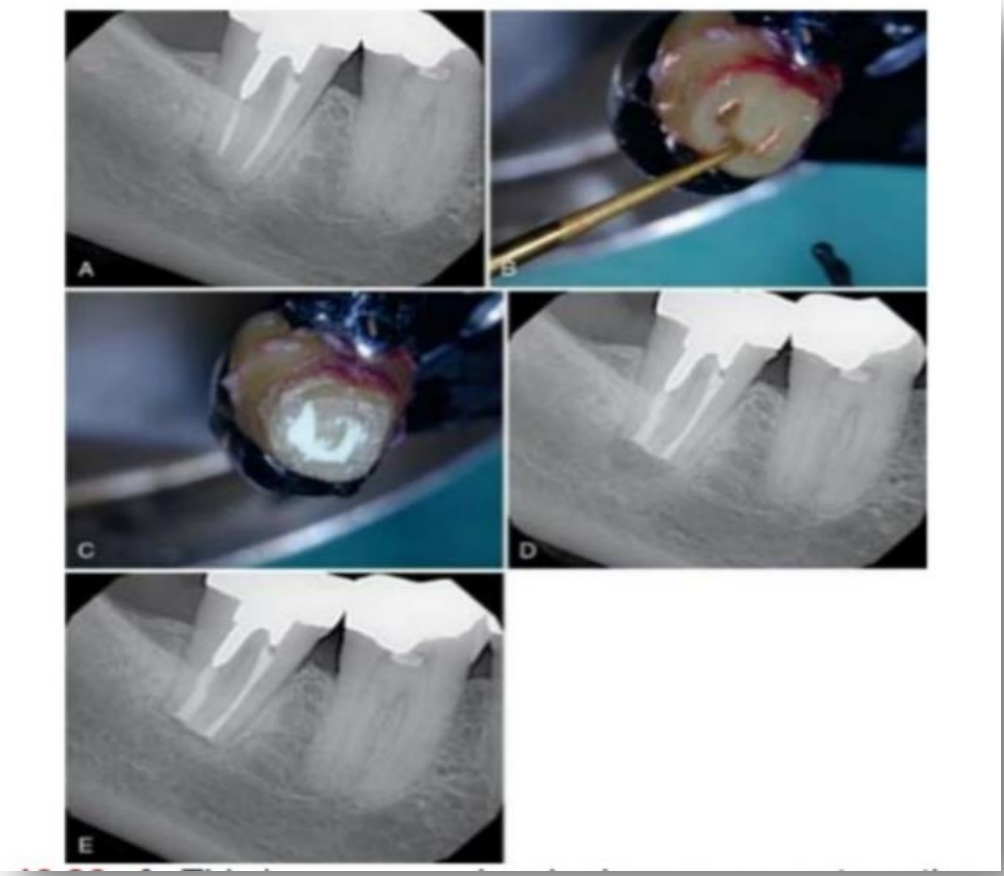


Fig (10): A-This lower second molar became symptomatic many years after nonsurgical treatment. Nonsurgical retreatment had a guarded prognosis due to the large multiroot cast custom post and core. Surgery was precluded by the poor access and proximity of the inferior alveolar canal. BUltrasonic root end preparation is made in the extracted tooth. C, A-white MTA retrograde filling was placed. Note the C-shape. D- Immediate post-implantation radiograph. E- Seven-month reevaluation showing apical healing. The patient was asymptomatic.

2-SURGICAL ENDODONTIC RETREATMENT

When indicated, surgical endodontics should be considered with non-surgical retreatment because of the underlying etiology of the disease process and the objective of treatment. Treatment procedures do not invariably produce the desired healing, Periapical lesions, sometimes in conjunction with clinical symptoms, may persist or develop. The frequent association of periapical lesions with defective obturation of root canals has been demonstrated in several studies.

In such cases, it has been recommended that the root canal should be retreated non-surgically in order to clean the canal and improve the seal; sometimes, non-surgical retreatment may not be feasible, for example, when the root canal contains a post that is very difficult or impossible to remove in this situation surgical retreatment is an appropriate alternative. A method designed to improve the technical quality of the seal during periapical surgery has been described by Nygaard-Ostby (1971). (C. REIT & J. HIRSCH, 1986, Surgical endodontic retreatment, International Endodontic Journal, University of Goteborg)

Objectives: To ensure the proper seal between periodontium and apical foramina

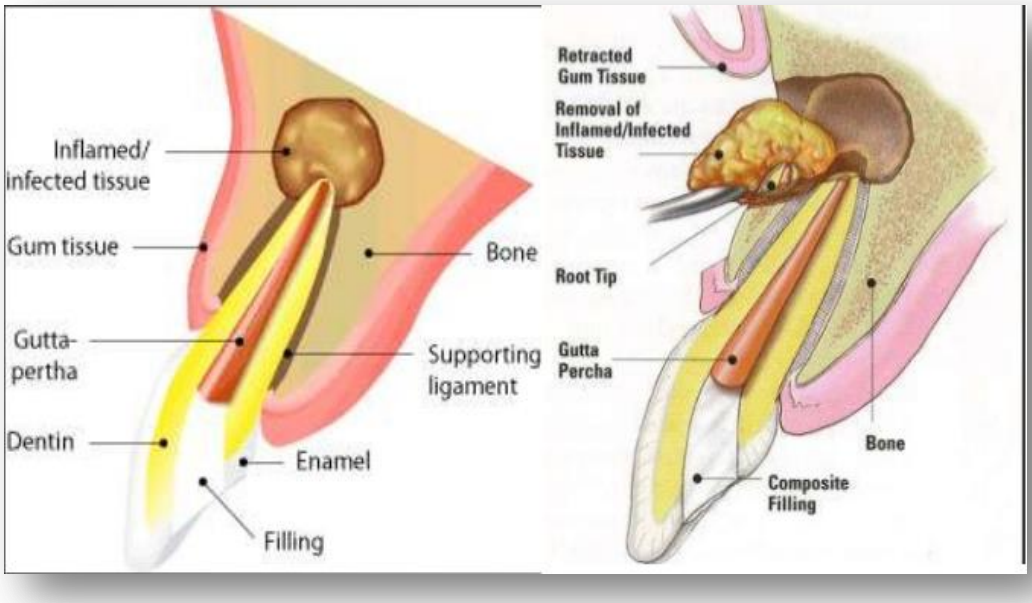


Fig (11)

2.1-INDICATIONS

1-Need for surgical drainage

2-Failed non-surgical retreatment

3-Procedural error:

A-Fracture instrument.

B-Non-negotiable ledging.

C-Root perforation.

D-Symptomatic overfilling.

4-Anatomic variation:

A-Root dilacerations.

B-Apical root fenestration.

5- When biopsy indicated.

6-Corrective surgery.

7-Replacement surgery.

(Peter Jonasson, Magnús Friðjón Ragnarsson, 2018, Surgical endodontic retreatment, Clin Dent Rev, University of Gothenburg)

2.2-Procedure:

A thorough clinical and radiographic examination, including adjacent and opposing teeth, should be performed to choose the treatment option. Along with the other basic assessments, the following considerations should also be made during surgical retreatment planning(Kvist T (ed), 2017):

2.2.1-Technical considerations: Surgical retreatment should be considered when orthograde retreatment fails to control the infection or cannot be undertaken due to blocked canals caused by dystrophic calcifications or iatrogenic errors such as ledges, broken instruments, and the presence of posts. **Figure. (12)**

Fig (12): Radiograph of the upper left first molar with a fractured instrument in the mesiobuccal root diagnosed with symptomatic apical periodontitis, immediately postoperatively,C.A 1-year follow-up.

2.2.2-Anatomical considerations: The accessibility of the site of infection should be judged preoperatively.Periapical radiographs should be carefully evaluated in different angulations for planning and performing treatment.**Figure (13)**. In the lower jaw, proximity to the mandibular nerve and/or a thick cortical bone buccal to the tooth may limit the accessibility. In the upper jaw, the accessibility to the palatal root is limited surgically, mainly for the second maxillary molars. Surgical treatment on teeth with apex or a periapical lesion close to the maxillary sinus should be carefully performed.

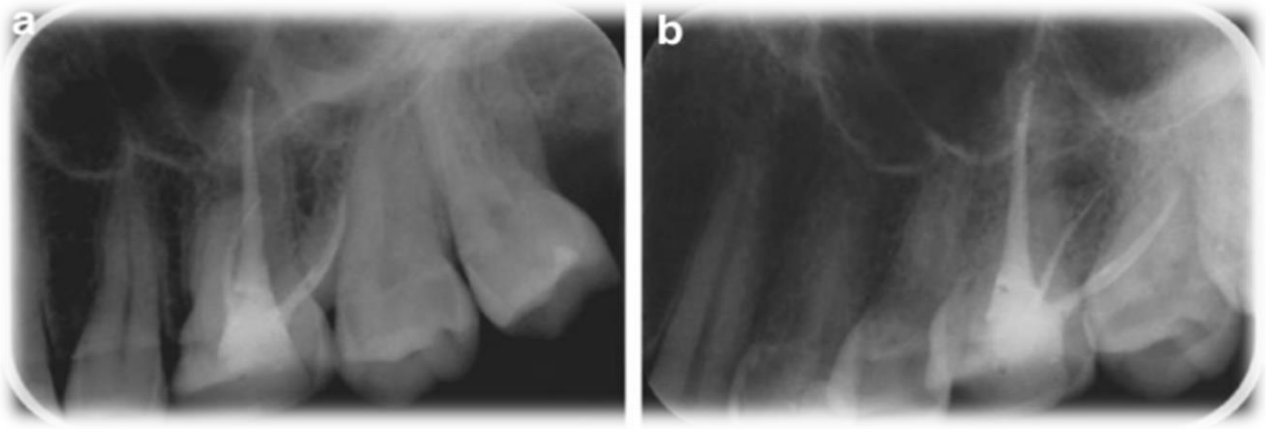


Fig (13): An upper molar with asymptomatic apical periodontitis, A- The radiographs show a periapical radiolucency and fractured instrument in the apical third of the mesiobuccal root. b-With mesial eccentric radiographs, the root-filled canal in the mesiobuccal root moves from the X-rays, not centralized in the canal, indicating a second untreated canal.

2.2.3-Medical considerations:

There are no absolute medical contraindications to endodontic surgery. However, several medical conditions and medications cause a depressed immune system, where surgical intervention is contraindicated until white blood cell count and antibody levels become normal. Patients with an increased risk for bleeding need special attention. Patients with hemophilia or impaired liver function should only be treated after consultation and agreement with the patient's physician. Medication with antiplatelet and anticoagulant agents increases the bleeding time intra-and postoperatively. Surgical treatment is possible in most cases but needs specific treatment protocols (Peter Jonasson, Magnús Friðjón Ragnarsson,2018, Surgical endodontic retreatment, Clin Dent Rev, University of Gothenburg)

2.3-Endodontic surgery technique

Today's state-of-the-art in surgical endodontic retreatment is a minimally invasive microsurgical approach which is described in the following:

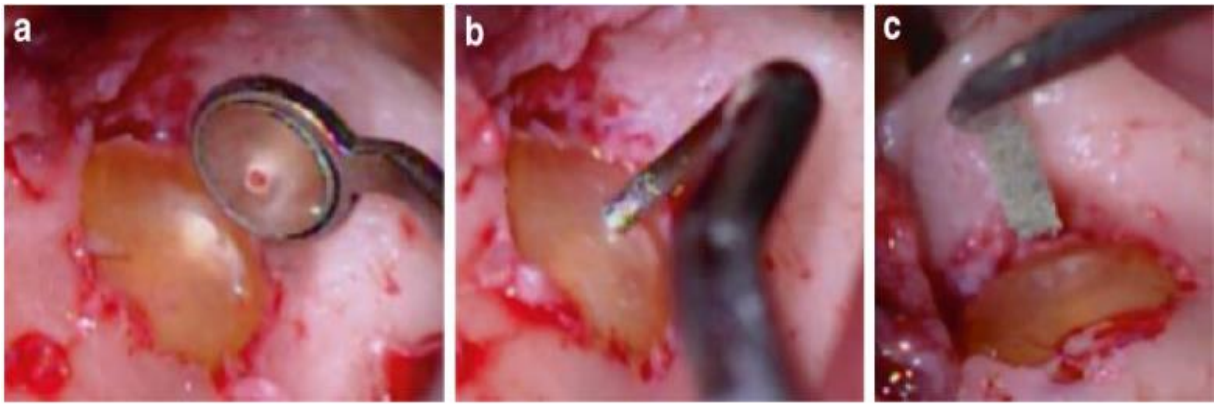
1-To gain access to the root, a horizontal incision is given, either including the papilla or cutting through the base of the papilla. The submarginal incision is often recommended to minimize the risk of gingival recession in the esthetic zone. Subsequently, a full-thickness fapflap is raised.

2-The highly vascularized granulation tissue in the bone crypt is removed. Hemostasis is achieved using local anesthesia containing epinephrine. Aluminum chloride or ferric sulfate can also control bone crypt hemorrhage (von Arx T, Jensen SS, Hanni S, 2007). If more severe bleeding occurs, electrocauterization may be considered.

3-Root resection is performed to eliminate infected ramifications, lateral canals, and contaminated dentin.

A root resection of 3 mm apically is sufficient to remove most of the infected ramifications and lateral canals (Kim S, Kratchman S, 2006). It is performed at a 90° angle to the long axis of the root. This minimizes any leakage that can occur through cut dentinal tubules. Retrograde root-end cavities are prepared by ultrasonic tips in exposed canal orifices.MTA (Valois CR, Costa ED Jr, 2004) is used for root-end filling (Fig.14)

4-The wound surface is thoroughly irrigated with the saline and the wound is closed using surgical sutures for optimal healing. Surgical sutures should hold. (P. Jonasson and M.F. Ragnarsson,2018, Surgical endodontic retreatment, Apical Periodontitis in Root-Filled Teeth: Endodontic Retreatment and Alternative Approaches)



Fig(14): Single-rooted maxillary incisor treated by surgical retreatment using the microsurgical technique, a-The resected root and canal with gutta-percha seen in the micro-mirror and microscope (×6) with good hemostatic control-Retrograde preparation with a contra-angled ultrasonic tip (3 mm),c Application of the retrograde filling (MTA).

Note the edges of a fap in apposition until the wound has healed sufficiently to withstand the normal functional stresses and resist reopening. Resorbable or non-resorbable threads in diameters 5–0 or 6–0 and three-eighths reverse-cutting or tapered needle are used. The sutures are removed after 7–14 days.

CONCLUSION

The success of endodontic retreatment is good (94-98%) when it is being undertaken to achieve a technical improvement in potential failures periradicular pathology is present, the success rate is much lower (62-78%) retreatment itself can bring its problems:

1-perforation.

2-fractured instruments.

3-compromised, cleaning, disinfection, and obturation of root canal system.

Patients must be informed of such factors before embarking on this procedure.

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