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Re-treatment in endodontics

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In order to achieve success in endodontics, major emphasis is placed on judicious instrumentation, microbial control, and complete obturation of the root canal system. During re-treatment of previously endodontically treated teeth, one may encounter a variety of different materials, which must be removed before these objectives can be achieved. The intent of this article is to present various methods that the practitioner may use in an attempt to safely remove these materials while adhering to sound endodontic principles. The article further emphasizes that removal of the previous filling material is only the initial step, which, when successfully accomplished, provides access to the root canal system so that therapy objectives can be carried out.
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Patients today are demanding the retention of teeth more than ever before. Our increased understanding of dental materials and the biologic process has given us greater ability to offer a more favorable prognosis. The demand on the part of the patient, along with the increased skill and knowledge of the practitioner, results in the increasing necessity for the re-treatment of teeth. In no discipline of dentistry is the problem of re-treatment as germane as with endodontically treated teeth. Not only do patients personally demand further treatment, but today's sophisticated restorative procedures may necessitate the retention of a particular tooth.

Many times the most challenging aspect of re-treatment is the initial step to remove the existing obturating material. The material may be difficult to remove, and this may entail lengthy treatment periods. In contrast, a material may be removed with ease, but expression of the material into periapical tissue may result in an acute exacerbation, which entails additional treatment visits. Numerous materials have been used to fill root canals; these range from paste, cements, and polymers through semisolid materials such as gutta-percha to solid core materials, including silver points.[1]

The purpose of this article is to present and discuss problems that may arise during removal of the more commonly used endodontic filling materials encountered and to describe techniques that may possibly aid in our re-treatment attempts.

It should be emphasized that removal of the existing material is only the initial step. It is followed by cleaning and shaping of the canal, microbial control, and obturation of the canal in all dimensions. It is important that these principles of root canal therapy receive major attention to ensure success in endodontics.[2]

REMOVAL OF SILVER CONES

Silver cones were a very popular filling material in the past. Although silver cones produced dense radiopaque images, they did not often maintain a satisfactory seal of the root canal system.[3] The lack of seal around silver cones allowed corrosion of the silver, with a possible cytotoxic effect on periapical tissues.[4] Silver cone cases need re-treatment not only because of apical failure; planned restorative procedures will require removal of the cone for post and core retention of a new restoration.

If any portion of the silver cone extends into the chamber, special care is taken during access to prevent severing or damaging the cone. Cement that

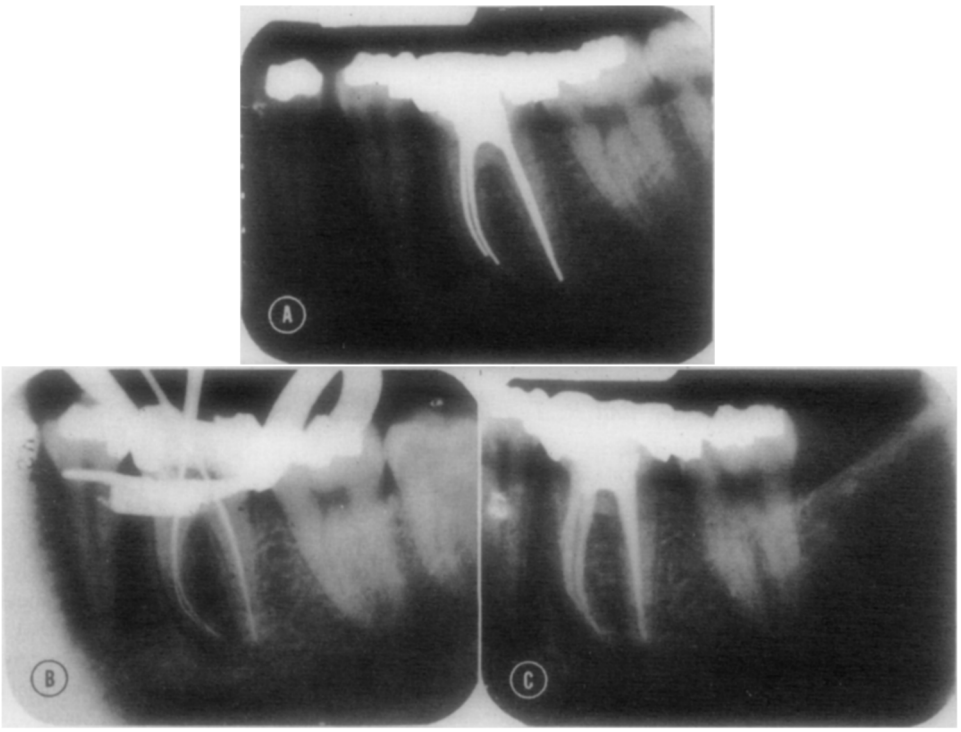

Fig. 1. Re-treatment of silver cone cases. **A,** Radiograph of a mandibular first molar treated 5 years earlier. Re-treatment indicated because of symptoms and periapical pathosis. After placement of rubber dam, round burs and excavators were used to remove cement in the chamber, avoiding damage to the cones. Because of firm resistance on initial grasping of the cones, time was taken to negotiate with files around the cones. Once loosened, the cones were removed with narrow-beaked pliers. **B,** Radiograph of established working distance. Ledges, a frequent problem in endodontic re-treatment, were encountered and bypassed by means of small curved files. All canals were thoroughly cleaned; this was followed by lateral condensation of gutta-percha and sealer. **C,** Four-year recall radiograph. Patient has been without symptoms.

is present in the chamber around the cone is carefully removed with round burs. A thin layer attached to the cone may be left to prevent contact of the bur with the cone. This remaining cement next to the cone can be further removed by means of excavators. The ultrasonic instrument also works well in removing the cement from the chamber. When the cement in the chamber has been removed, the silver cone can now be grasped by any grasping instrument (Steiglitz forceps, narrow-beaked pliers, hemostat).

When a grasping instrument is used, the cone may be slightly rotated (one eighth of a turn at most) in an attempt to loosen the cement bond in the canal. The cone should not be twisted or worked vigorously, as this will cause fatigue of the metal with possible separation of the silver cone in the canal. If the access is limited so that the beaks of a grasping instrument will not fit, a spoon excavator or a Caufield silver point remover can be used in an attempt to pry the cone out of the canal.[5] A technique involving the use of a small wire through a hypodermic needle has been successful in some cases. A small piece of ligature wire is passed through a 25-gauge needle. The loop end of this device is placed around the silver cone and pulled tightly. An attempt is then made to pull the cone from the canal.[6]

If resistance is encountered during attempts to remove the cone with these instruments, it is best to discontinue this process and to place emphasis on loosening the cone before any future attempts at removal are made. A number of methods can be used in an attempt to loosen the silver cone.

A small reamer or file can be worked down alongside the silver cone, with the use of a solvent (chloroform, oil of eucalyptus) to dissolve and remove the sealer. Use of the instrument should be continued until a channel has been prepared around the point. If penetration can be achieved to an acceptable depth, this method has proved very successful and has entailed the sacrifice of a minimal amount of tooth structure. Although it is a rather slow process, the success of this method justifies the time spent.

A Cavitron may be used to loosen the silver cone.

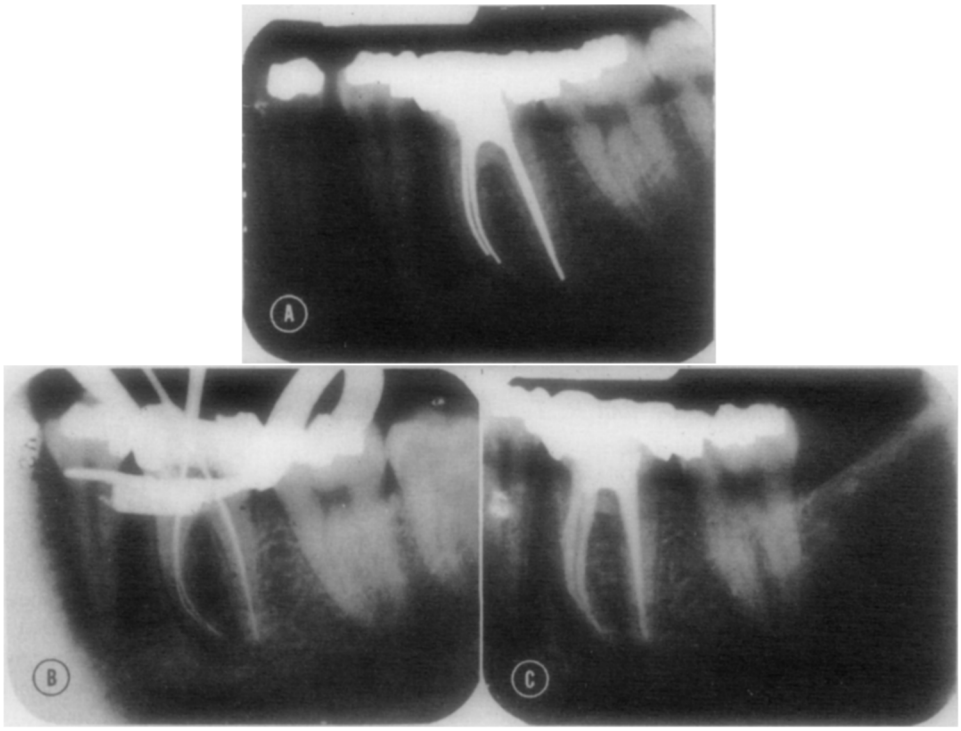

Fig. 2. Re-treatment of gutta-percha cases. **A,** Radiograph of a mandibular first molar treated 2 years earlier. Re-treatment indicated because of symptoms and periapical pathosis. After placement of a rubber dam, gutta-percha was removed from the chamber and cement was removed from around the post by means of burs and excavators. Small files were used to negotiate around and loosen the post; this allowed removal with narrow-beaked pliers. **B,** Radiograph taken during removal of gutta-percha from the canals. Re-treatment necessitated the use of a solvent to soften the gutta-percha. The material was removed by the use of larger files at the top of the canals, progressing to small files as the apical area was approached in an attempt to avoid expression of material into apical tissue. Once working distance was established, all canals were thoroughly cleaned and followed by lateral condensation of gutta-percha and sealer. **C,** An 18-month recall radiograph. Patient has been without symptoms.

The tip is placed as deeply as possible into the canal and held firmly against the silver cone. The ultrasonic vibrations may then loosen the silver point for removal.[7]

These methods of loosening the silver cone may not be applicable to any one case. Combination and integration of techniques are sometimes required to loosen the cone so that it can be grasped or manipulated from the canal.

Most difficult cases that do not allow grasping of the silver cone may be encountered. This problem exists when the previous treatment involved a twist-off technique below the orifice of the canal or results when a cone severs below the orifice on attempts at its removal. In these cases, the cone must be completely freed from binding to the canal walls. A solvent is used in the canal to help dissolve the sealer interface between the cone and canal walls, and small files are used to negotiate a path beside the cone as previously discussed. The objective is to negotiate as close as possible to the apical extent of the cone. Once the depth is obtained, previously described loosening techniques or a combination of techniques are be used.

Additional techniques that have been described when the cone cannot be grasped include use of Hedström files, multiple files, and the Masseran instrument.

A Hedström file may be inserted alongside the silver cone to a depth at which the flutes will solidly engage the silver cone and attempts can be made to pull the cone from the canal.[8]

The multiple-files technique uses two to four Hedström or K-type files placed alongside the silver cone in an attempt to deliver it from the canal.[5] The practitioner should be cautious with this technique, which requires engagement or twisting of instruments, as this can lead to separation of the instruments and further canal blockage.

The Masseran technique used trephan burs, which

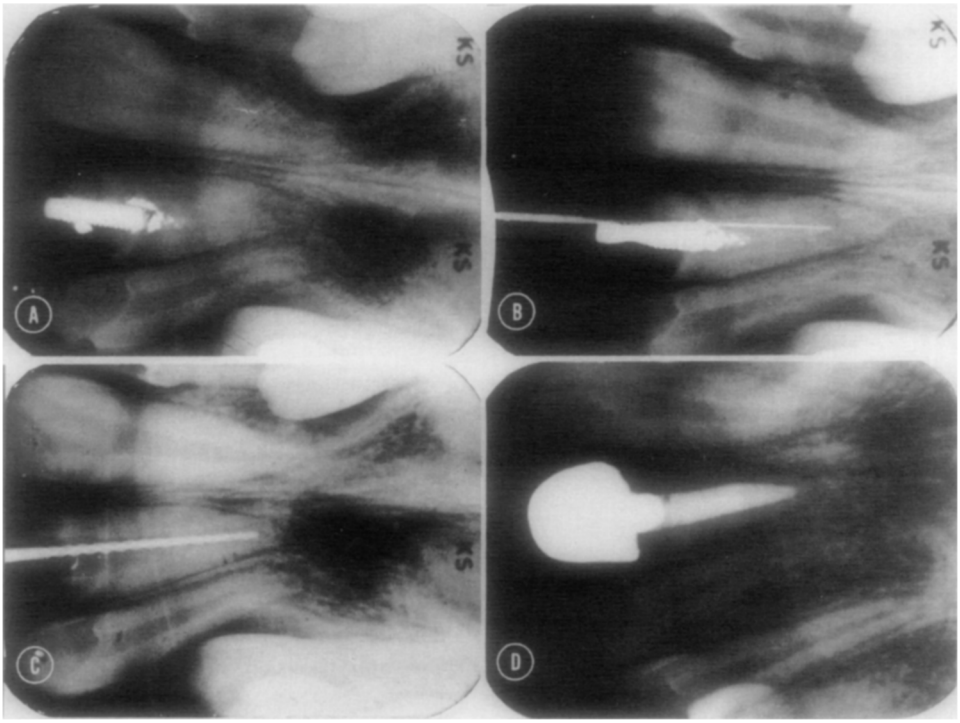

Fig. 3. Re-treatment of paste fills. **A,** Radiograph of maxillary left central incisor with paste fill 1 year earlier. Re-treatment indicated because of acute symptoms and periapical pathosis. **B,** Radiograph of small file used to negotiate around and loosen post. After removal of post, large files were used in the coronal portion of the canal to remove amalgam. Decreasing sizes were used, with frequent irrigation, in a step-down fashion to remove paste. **C,** Radiograph of apical extent of removal of paste. Special emphasis was placed on thorough cleaning, followed by obturation of gutta-percha and sealer. **D,** An 18-month recall radiograph. Patient has been without symptoms.

fit down around the silver cone so that it can be grasped and removed.[9] With this technique, the operator should be most cautious in the prevention of a perforation or removal of too much bulk (Fig. 1).

REMOVAL OF GUTTA-PERCHA

As an endodontic filling material, gutta-percha offers many advantages. The material is inert, biocompatible, radiopaque, and compactable. Along with sealer, the condensation of gutta-percha into the root canal space can adapt well to the walls and afford a seal at the apex.[10] With reference to retreatment, a most important advantage of gutta-percha is the fact that the material can be removed without great difficulty.[10]

Following access, the gutta-percha in the chamber can be removed with hot pluggers, avoiding any vertical pressure. With good access and on location of the orifice, attempts now can be made with a file to negotiate beside the material in the canal. In some cases, especially those involving poorly obturated canals, a file can be introduced along a wall to the desired working distance. When this is possible, then successive files are used in a filing action to enlarge the space created. Once a No. 25 K-file is passive to working distance, Hedström files are used expeditiously to remove the bulk of gutta-percha without necessitating the use of solvents.

If, on attempts with a file, a linear void is not found, then solvents may be used to remove the material. Before the solvent is used, a hot plugger is introduced into the canal, removing gutta-percha well below the orifice. A few drops of solvent are then placed into the created space by means of a disposable syringe. The space created will allow for retention of the solvent and faster action. Chloroform or oil of eucalyptus will work well to dissolve the gutta-percha and sealer. Any time a solvent is used, the possibility of extruding material into periapical tissue exists. The extrusion of the combined solvent and dissolved sealer can be irritating to periapical tissues.[11] To prevent or decrease the amount of extrusion of material, larger files are used in the upper part of the canal first. Then, by decreasing the

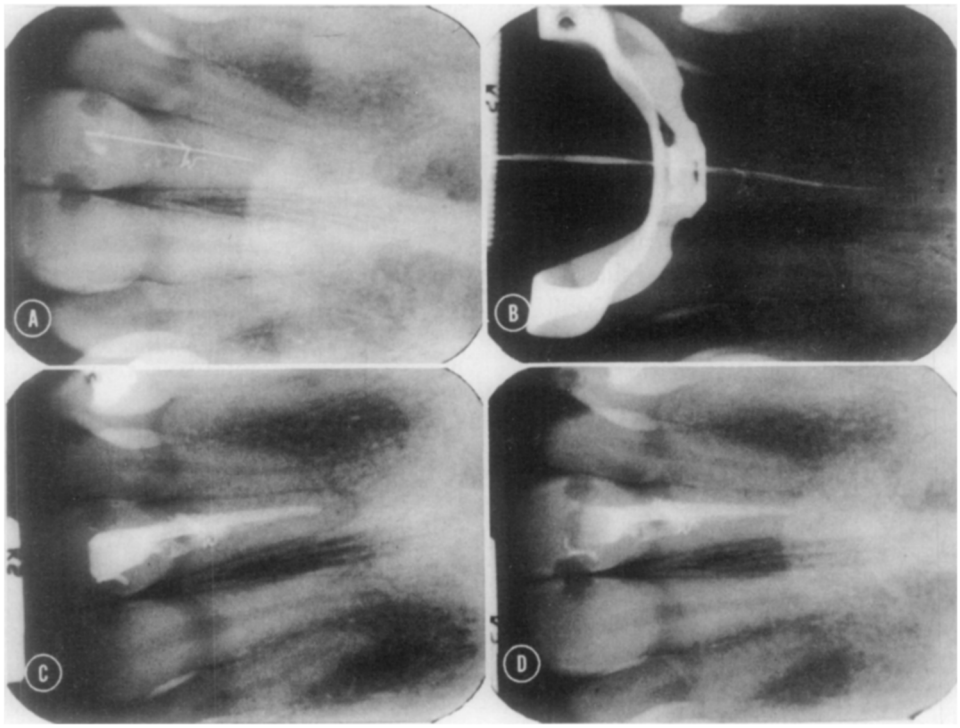

Fig. 4. Re-treatment of materials resistant to common solvents. **A,** Radiograph of maxillary right central incisor treated 3 years earlier. Re-treatment indicated because of acute symptoms and periapical pathosis. After rubber dam placement and access, an extremely hard composite type of material, which had been packed into the canal, was encountered. A metal instrument and fragment were incorporated into the material. **B,** Radiograph of file bypassing filling material. Burs were used to remove material from the chamber and the top part of the canal. An area was found to bypass the material, and access to the apical area of the canal was provided. In view of the increased chance of perforation with burs, files were used in attempt to remove as much of the material as possible. **C,** Radiograph of obturation of canal with gutta-percha and sealer. The hardness of the material prevented complete removal. Surgical endodontics remained an alternative if treatment failed. **D,** A 3-year recall radiograph. Patient has been without symptoms. Surgical intervention was not necessary.

file size, one can slowly progress to the apical portion, removing material until a working distance is established. One should remember that this procedure is used only to remove the bulk of material. Once a working distance is established, the major emphasis is placed on cleaning and shaping the canal with copious irrigation, followed by obturation of the canal, with special emphasis on development of a hermetic seal (Fig. 2).

REMOVAL OF PASTE FILLS

A variety of different pastes are being used by clinicians in an attempt to obturate the root canal system. During re-treatment of the paste fill, the difficulty of removal of material will vary considerably. Some paste materials allow files to be easily inserted and the paste readily removed. Others present a most time-consuming procedure that relies on the use of a solvent to enable files to be introduced into the canal.

Since the components of paste fills may be irritating to periapical tissue,[11] extreme care is taken to avoid extrusion into periapical tissue during removal. If files can be easily inserted into the paste, the material should be removed much as in the technique discussed with respect to gutta-percha. Large files are used initially in the coronal part of the canal to remove the paste; slowly progressing apically, decreasing file sizes are used until a desired working distance is obtained. If the paste material is of a consistency that prevents insertion of a file, then the use of a solvent is indicated. The technique follows that described for gutta-percha, and the material is removed in the same manner (Fig. 3).

In addition to paste materials, the clinician is confronted with removal of cements or acrylics that

resist the action of solvents. In these cases, removal of the material by rotary instruments could be necessary. The rotary instruments are used only at a depth considered safe by the clinician. Clinical judgment is used to prevent rotary instruments from being used too far into a canal; this can result in perforations, which may further complicate the outcome. The objective of using rotary instruments is to locate areas at the canal orifice where a file can be passed between the material and the canal wall. If access is gained past the material with a file, then a filing motion is used for removal of the material. Some cases may not allow complete removal of the material, but access beyond the material to areas not cleansed by previous treatment may be provided (Fig. 4).

CONCLUSION

Endodontic re-treatment does differ from the initial therapy. The clinician is faced with additional criteria for case selection,[12] and removal of the present obturating material can be most challenging. However, the necessity of endodontic re-treatment is being seen with greater frequency. Proper case selection, patient education, and use of the techniques presented may reduce the fatigue and frustration experienced during the treatment of such cases. It should be kept in mind that removal of the material is only a step in the overall objective of successful treatment and retention of the tooth. Basic principles of endodontics cannot be compromised.

The practitioner should also keep in mind the availability of surgical methods of treating a failing endodontic case.[12] Attempts to remove obturation material should not be taken to the point that makes the tooth unsalvageable if surgical endodontics is possible.

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