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CASE REPORT

Retreatment in endodontics with plastic core obturators. A new technique

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Abstract

The aim of this study was to present a new technique for plastic carrier removal in retreatment situations. The gutta-percha technique that uses plastic carrier obturators is one of the most commonly used; however, removing this core is tedious and time-consuming. Two clinical cases were performed by an expert in the field of endodontics, to expose this technique, in which a conical ultrasonic tip with an active point and a Hëdstrom hand file allowed the removal of the plastic carrier quickly and effectively. The use of magnification is indispensable for a predictable success with this method.

Introduction

The number of endodontic retreatments has increased progressively in recent years (1,2). Although the success rate of endodontic treatments is high, around 90%, there are still failures, especially due to microbiological causes (3,4). The main purpose of non-surgical endodontic retreatment is to obtain direct access to the root canal system, by removing the filling material, allowing its correct cleaning and shaping (5,6).

There are several techniques available to remove filling materials, including the use of solvents, heat, ultrasounds, lasers, stainless steel files or nickel–titanium (NiTi) rotary instruments (7,8). However, despite the presence of multiple devices and methods, many studies reported that the complete removal of previous filling material is not possible, especially at the apical third (5,6,8). Gutta-percha removal can be challenging, and the difficult is related to the quality of the previous treatment, time elapsed since primary therapy and anatomical complexity of the canal system (5,6).

There are different obturation methods, such as carrier-based obturators (a warm gutta-percha obturation technique) (5,9). These obturators have a central carrier, made of a metal, a polymer, or an all-gutta-percha formulation (10,11). The carrier-based obturator is heated prior to its placement in the canal, and once it has been inserted, the stem is separated at the entry of the canal, becoming part of the filling material (9,10,12). Despite being a relative simple technique, to remove the carrier can be challenging and lead to complications (9,11). Wilcox and Juhlin (13) suggested that success in retreatment of canals filled with carrier-based obturators depends more on the ability to remove the carrier device than on the technique employed in gutta-percha removal.

The aim of this article is to expose a new technique for the effective and quickly removal of the plastic carrier obturators.

Technique description

To obtain satisfactory results with this technique, the use of magnification is essential. Once the pertinent anaesthesia technique has been performed and the operating field has been correctly isolated, the access opening has to be made. After locating the canals, a direct access is necessary. A conical ultrasonic tip, with an active point like Start-X ™ #3 (Denstply Maillefer, Ballaigues,

Switzerland), mounted in this case on a Suprasson P5 Booster ultrasonic unit (Satelec, Acteón Group) using a power setting of 7, will be placed in the centre of the plastic carrier and activated for 3–4 s without irrigation in order to soften the carrier through the heat generated.

Next, a new #50 Hëdstrom hand file will be introduced in the created space by turning it clockwise with a slight apical pressure to hook the core. A mosquito forceps or similar could be placed afterwards on the instrument shaft to remove the carrier in a linear axis force and to facilitate this task in posterior sectors if the access was limited. If the subtracting of the carrier was not achieved after this procedure, the whole process will be repeated again.

Once the plastic carrier is removed, exploration of the root canal with a K-file #20 has to be performed. After that, the first rotary instrument used in this technique was a NiTi file of 20.04 due to the obturators plastic carrier has a taper of 0.04 and the lowest diameter tip of them has 0.20 mm. Once the root filling material has been removed using NiTi files, the cleaning, disinfection and shaping of the canal system must be performed. It is especially important to achieve apical constriction (both with the preparation and the subsequent filling material). Finally, the corresponding obturation is done.

Case 1

A 57-year-old woman was referred to our clinic, due to an endodontic failure in the first right mandibular molar. An intraoral clinical examination was made, without any relevant findings. The diagnostic tests revealed sensitivity to percussion and pain when chewing. Mobility and periodontal probe were physiological, and palpation was negative. On the periapical radiograph, a radiolucent periradicular lesion associated with the mesial root of the tooth 46 was observed, as well as an under-extension of the filling material (Fig. 1a). Cone-beam computed tomography (CBCT) was performed (Fig. 1b-d) to obtain more accurate information. Based on the evidence from the clinical and diagnostic imaging techniques, the lesion was diagnosed as acute apical periodontitis. Therefore, the decision was made to perform a selective non-surgical retreatment of the mesial canals, after obtaining the informed consent. As a carrier-based obturator was used in the previous therapy, the technique described above was carried out.

The retreatment began with the access opening (Fig. 2a), using an Endo Access Bur (Dentsply Tulsa Dental Specialties; Tulsa, Oklahoma) and Endo-Z (Maillefer, Dentsply, Switzerland). Once the canals were located, the ultrasonic tip Start-X™ #3 was placed in the centre of the core and activated for a few seconds (Fig. 2b). In the generated space (Fig. 2c), the H-file was introduced, screwing it in the apical direction (Fig. 2d). A mosquito forceps were attached to the file (Fig. 2e), and the plastic carrier was removed following a linear axis (Fig. 2f). After this procedure was performed identically in both mesial canals, chemo-mechanical preparation continued.

Next, a PreK file (Endogal, Sarria, Lugo, Spain) with a 0.12 mm diameter tip and 1% taper was used to make the patency; then, a #15 and #20 K hand files (Endogal, Sarria, Lugo, Spain) were introduced to widen the canal. The working length was established with Endogal apex locator (Endogal, Sarria, Lugo, Spain). Then, rotary instrumentation with a multiple-instrument system (Endogal, Sarria, Lugo, Spain) was performed; an EGB rotary file, with a 0.20 mm diameter tip and 4% taper, was introduced in the space previously occupied by the core. After that, an EGD, with a 0.25 mm diameter tip and 6% taper, was used to finish the instrumentation. The mechanical instrumentation was carried out with 5.25% sodium hypochlorite. Root canal retreatment was performed in two phases with a calcium hydroxide dressing used between the two appointments.

Two weeks later, the calcium hydroxide was removed, and the canals were irrigated with 5.25% sodium hypochlorite and 17% EDTA liquid, activating both solutions with the help of the EndoActivator system (Dentsply Tulsa Dental Specialties, Tulsa, OK). Canals were dried with 25.06 paper points (Endogal, Sarria, Lugo, Spain). Root canal obturation was made using the continuous wave technique. Adseal (Endogal, Sarria, Lugo, Spain) was used as the sealer, and two 25.06 gutta-percha cones (Endogal, Sarria, Lugo, Spain) were used to fill the canal. Coronal restoration was performed by composite, previously sandblasting the remaining resin, to create microretentions at this level. A final radiograph was made (Fig. 2h).

Case 2

A 34-year-old woman came to our clinic with discomfort in the first quadrant. The pertinent intraoral and extraoral clinical exploration was performed, and no significant alterations were found. Pain and sensitivity to percussion in the right maxillary first molar were reported. Mobility and periodontal probe tests were physiological, and palpation was negative. A periapical radiograph was taken, and a deficient endodontic treatment in tooth 16 was observed. In this instance, there was an under-extension of the filling material, as well as an insufficient preparation at the mesio-buccal and distal canals; the palatal root canal presented an apparently non-homogeneous seal. At the same time, a periradicular radiolucent image and the existence of a second canal in the mesial root were

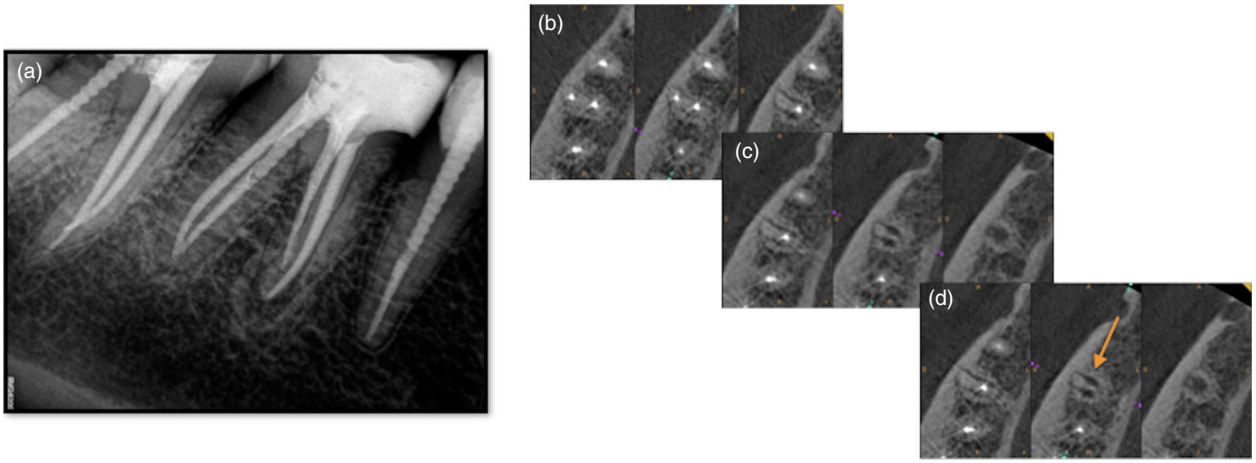

Figure 1 Diagnostic imaging techniques. (a) Preoperative periapical radiograph. (b–d) Cone-beam computed tomography images (axial views). A lesion on the mesial root is observed (*orange arrow*).

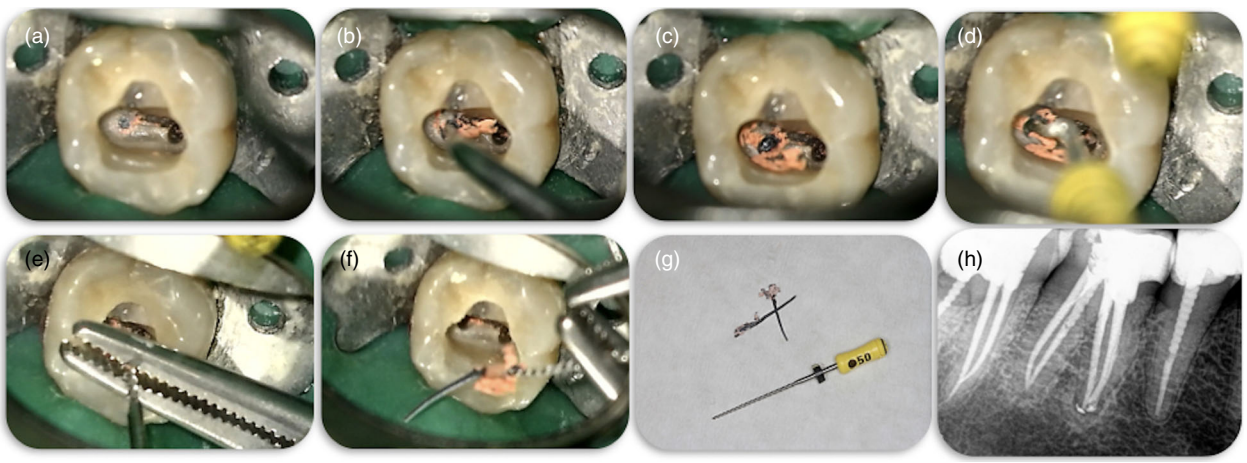

Figure 2 (a) Access opening, exposing only mesial canals. (b) Plastic carrier heating by a Start-X ™ #3 ultrasonic tip. (c and d) Introduction of #50 H-file in the created space. (e—g) Removal of the plastic carriers. (h) Immediate postobturation radiograph.

seen (Fig. 3a). The case was analysed in detail using a CBCT (Fig. 3b-d), and the diagnosis was definitively established as acute apical periodontitis.

The treatment plan established was a non-surgical retreatment. The informed consent was obtained. In the first instance, the access opening (Fig. 4a) was performed in the same way as previously described. The palatal canal was filled with a carrier-based obturator, and therefore, the technique previously exposed was applied (Fig. 4b–e).

This treatment was performed in two phases: on the first visit, patency was achieved with a PreK file (Endogal, Sarria, Lugo, Spain), followed by a #15 and #20 K hand files (Endogal, Sarria, Lugo, Spain). Working length was established with Endogal apex locator (Endogal, Sarria, Lugo, Spain). Then, the rotary instrumentation with a multiple-instrument system was made (Endogal, Sarria, Lugo, Spain); an EGB (20.04) rotary file was introduced in the palatal canal. The instrumentation was finished with an EGE (30.06) rotary file. In the mesio-buccal and distal canals filled with conventional gutta-percha, an EGB (20.04) rotary file was firstly introduced to create a small space, and later, a PreK, followed by a #15 and #20 K hand file, were placed. The instrumentation was finished with an EGD (25.06). The mesio-palatal canal converged with the mesio-buccal canal at the middle third of the root. The instrumentation of this canal was performed with an EGC (25.04) rotary file. A calcium hydroxide dressing was placed.

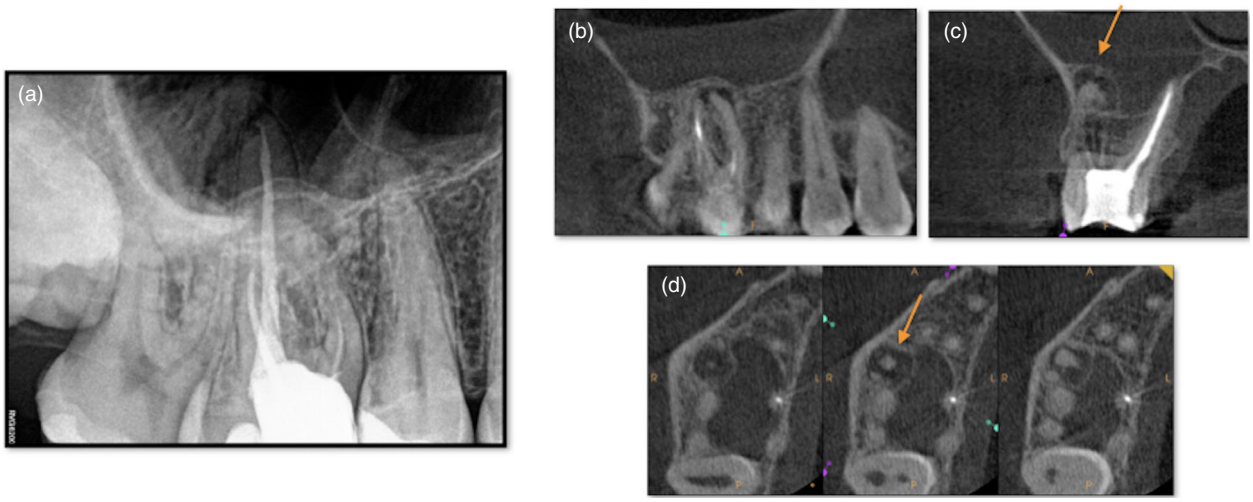

Figure 3 Diagnostic imaging techniques. (a) Pretreatment periapical radiograph. (b–d) Cone-beam computed tomography; coronal, sagittal and axial views, respectively. A periradicular lesion was observed at the mesio-buccal root (*orange arrows*).

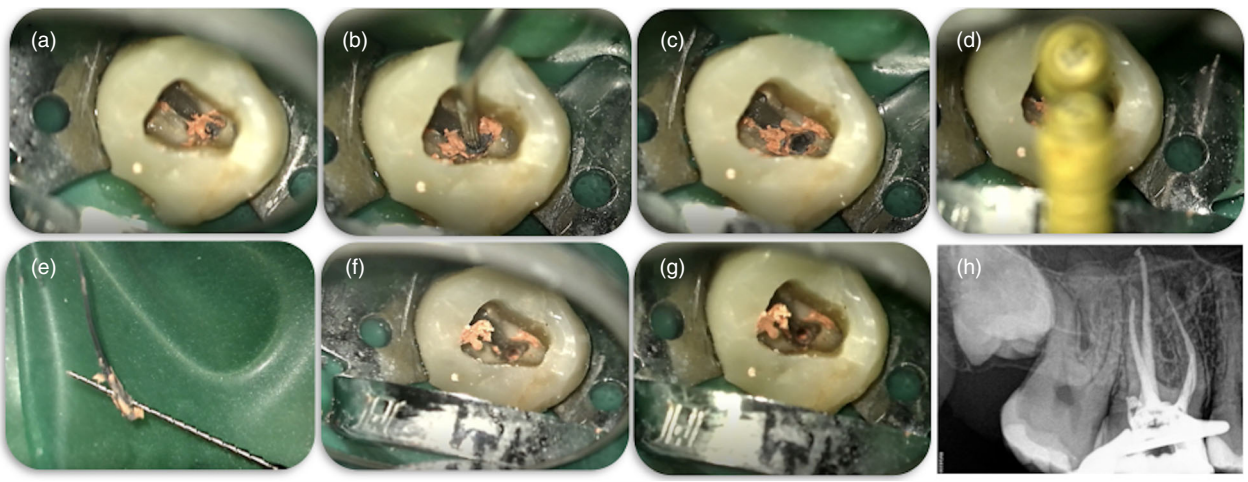

Figure 4 (a) Access cavity preparation. (b) Plastic core softening with ultrasonic tip Start-X™ #3. (c and d) #50 H-file placed in the created space. (e) Subtraction of the plastic core. (f and g) Canal ready to introduce a 20.04 rotary file. (h) Postobturation root canals radiograph.

Two weeks later, before final closure of the canal, the dressing was removed, and the canal system was irrigated with 5.25% sodium hypochlorite and 17% EDTA, both activated with Endoactivator (Dentsply Tulsa Dental Specialties, Tulsa, OK); the canals were dried with paper points (Endogal, Sarria, Lugo, Spain). The filling of the palatal and distal canals was made using a #30 and a #25 carrier-based obturators (Endogal, Sarria, Lugo, Spain), respectively, and for the mesial canals, the continuous wave technique was used. The sealer of choice was Adseal (Endogal, Sarria, Lugo, Spain). An immediate postoperative radiograph was taken to check the correct obturation of the canals (Fig. 4h); ultimately, a new composite reconstruction was placed.

Discussion

Several methods are available to remove filling materials (8,11). Since 1867, gutta-percha has been the main material in root canal obturation. Since then, various techniques have been proposed to increase the obturation quality, especially at the apical level (8,14,15). Thermafil technique was described by Dr. Johnson, and its effectiveness at the apical seal has been tested in several

studies (12,14,16). It is the most classic and well-known example of carrier-based obturators (8).

The complete removal of the plastic core is of utmost importance in endodontic retreatment. However, through the use of direct techniques (in which a rotary instrument was introduced directly on the canal), there is an increased risk for instrument and plastic carrier fracture, and even perforations or apical transportation may occur (5,9,11). This is due to the increased torsional stress and cyclic fatigue that the plastic carrier exerts on the instruments, and to the progressive narrowing of the canal, which results in a thin layer of gutta-percha between the wall and the plastic carrier (5,11,15). NiTi instruments, specifically design to retreatment situations, have been developed. This instrument favours the filling material removal in shorter time (17,18). However, do not have a superior effectiveness in removing the filling material when compared to stainless steel hand files (6,19). That said, the direct retreatment with rotary NiTi instruments could damage the root canal dentin, as observed in several studies (17,18). The additional use of H-files in combination with rotary instruments could give significantly better results (20,21). Its design facilitates the removal of the gutta-percha and allows its anchorage on the plastic core (8,20). Hëdstrom files have a practically circular cross-section and a cutting angle that ranges from 70° to 90°, making them more effective in linear filing action (22).

The proposed technique reduces the risk of fracture of both the plastic carrier and instruments, as well as patient and operator fatigue.

Wilcox (23) conducted a study where the core was removed using a heated Glick #1 instrument (Hu-Friedy, USA) and placing it over the carrier to facilitate its separation from the surrounding gutta-percha. Then, small forceps or cotton pliers were used to extract the metal carrier; however, in some cases, the access was difficult, and the removal of the tooth crown to facilitate the introduction of these instruments became necessary (23). The use of the ultrasonic tip is more effective and ergonomic than the Glick instrument; in addition, using forcerps to remove carrier is not possible in many cases, due to the reduced space that is available, especially in posterior teeth.

Baratto Filho et al. (21) evaluated the removal of the plastic carrier in single-canal mandibular canines with the aid of 0.04 ProFile rotary instruments; they stipulated an average time of 5 min for its removal (21). Wolcott et al. (24) established an average time of 1.8 min for removing the plastic carrier in single root premolars by introducing a System B medium-fine plugger at 225°C to a depth of 10–15 mm for approximately 8 s. This technique was used to melt the gutta-percha, and then, two #50 or #55 Flex-R were placed alongside the carrier on the buccal and lingual surfaces and rotated clockwise to engage the carrier and removed it (24). If the melting point of the plastic carrier is exceeded, it could fracture, complicating its removal. Furthermore, the morphology of the canal does not always allows its insertion of two files of this size at this depth (24). A burning sensation has been reported by patients during the use of System B with this technique (25).

Lipski and Woźniak (25) conducted a study based on the findings of Wolcott et al. (24). They analysed the heat transferred to the root and periradicular tissues, introducing the plugger for 5 and 8 s, respectively. As expected, as the exposure time increased, the heat transmitted increased, exceeding the safe limit (47°C) for cementum, periodontal ligament and alveolar bone (25). Conversely, pluggers or other heat-carrying instruments can overheat the gutta-percha, which could obliterate isthmus and other material-free anatomical structures, thus making its removal more difficult (26). The use of ultrasonic tips is limited, as it can only be used in straight canals due to its hardness and the visual limitation in curved canals (27); however, in this technique, its use was limited to the entry of the canals, so it did not represent a disadvantage.

With the exposed technique, the removal times of the core could be decreased. Endodontic tools to perform this technique are minimal and easy to acquire. Also, the literature reported a high extruded debris and damage to dentin from H files (17,28). However, in this case, the file was used only to hook the plastic carrier. The removal of most of the surrounding gutta-percha was performed with a NiTi instrument, taking advantage of its speed, flexibility and efficiency (29,30). The main disadvantage of this technique is the learning curve required for being able to perform it. At the same time, it is necessary to have magnification and softening the plastic carrier with the ultrasonic tip has to be done carefully, because the objective is to heat the centre of the core without touching the remaining dentin walls.

Conclusions

The removal of the core from carrier-based obturators is tedious and can lead numerous intraoperative complications. The proposed technique allows the removal of the stem quickly and effectively; however, it requires some training and clinical ability for its correct implementation.

Disclosure

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Authorship declaration

All authors have contributed significantly and are in agreement with the manuscript.

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