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CASE REPORTS

The Use of Two Pluggers for the Obturation of an Uncommon C-Shaped Canal

Nehme Walid, DDS, DESE

The complex configuration of C-shaped canals in mandibular second molars make root canal treatment unusually difficult. The present case highlights their unpredictable canal anatomy and describes the use of two pluggers simultaneously to downpack the main canals. The effect of such a modification on the high-flow characteristics of thermosoftened gutta-percha in vertical condensation is discussed.

Central to successful endodontics is knowledge, respect, and appreciation for root canal anatomy and careful, thoughtful, meticulously performed cleaning and shaping procedures (1). It is understood that well-shaped canals will enhance a three-dimensional seal of the canal system that is the aim of root canal obturation. However some canal configurations like the C-shaped canals are known to present a complex canal anatomy (2–4) with numerous fins connecting individual canals (5), thus requiring supplementary effort to accomplish a successful root canal treatment. The purpose of this article is to describe the use of two pluggers to enhance three-dimensional obturation of an unusual C-shaped canal.

CASE REPORT

A 52-yr-old male was referred for root canal therapy of the right second mandibular molar for prosthetic reasons. The radiographic examination revealed an obturated pulp chamber with fused roots (Fig. 1). Xylol was used to soften the old filling materials and to clean the pulp chamber. The pulp floor showed a C-shaped orifice from the distal to mesiolingual canals and a separate mesiobuccal orifice. Exploration of these canals with a #10 and #15 K-files (Maillefer, Ballaigues, Switzerland) revealed diversion of distal and mesiolingual canal to separate apical exits. In the mesiobuccal canal proceeding in the apical direction was impossible. K-files were blocked 2 to 3 mm from the apex (Fig. 2). Because such anatomy was not uncommon in C-shaped canals (6) we considered that this canal might present a sharp apical curve preventing the instrument from passing to the foramen. All canals were preflared with Gates Glidden: #2 and #3 files to establish a straight-line access. Nitiflex files (Maillefer), #35 to #60 were used to shape the middle third, and Flexofiles (Maillefer) #20 to #35 were used to

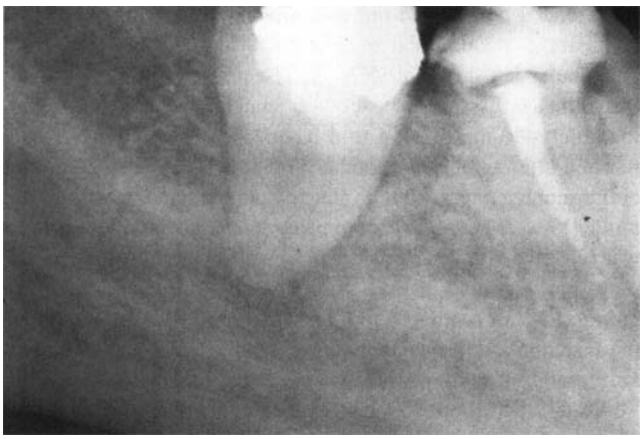

FIG 1. Preoperative radiograph revealing a large amalgam and fused roots with occluded canal space.

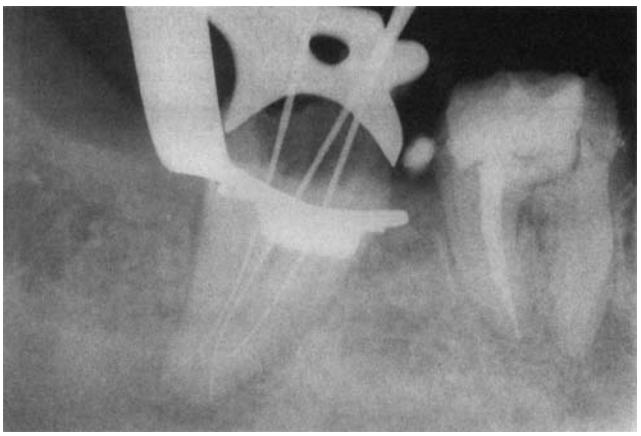

FIG 2. Initial working length with file #15 in the C-shaped main canals (distal and mesiolingual), and a #20 in the mesiobuccal canal that is 3 to 4 mm shorter than the others.

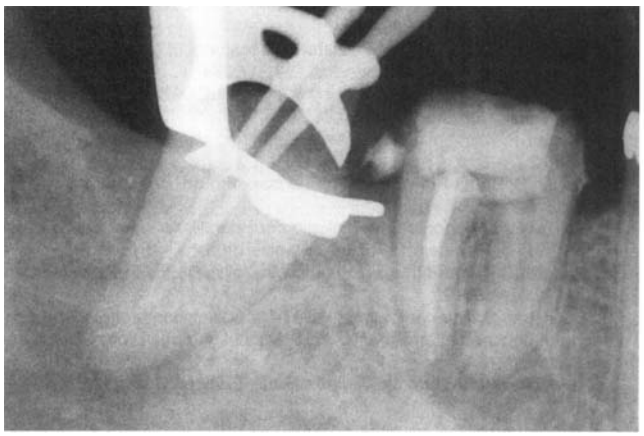

FIG 3. Two master gutta-percha points were fitted in the C-shaped main canals.

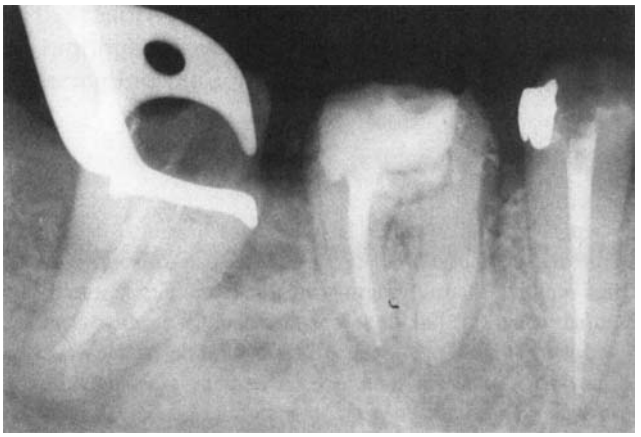

FIG 4. Radiograph taken after down-packing the C-shaped canal showing communication with the mesiobuccal canal.

shape the apical third. Cleaning and shaping of main canals were completed under copious irrigation with 5.25% sodium hypochlorite. An ultrasonic #10 file was activated for 5 min to increase the removal of debris from the inaccessible areas of the root canal system (7). Canals were dried with sterile paper points, filled with a nonsetting calcium hydroxide paste (Pulpdent Corporation, Brooklyn, MA) and temporized with cotton pellets and Cavit (ESPE, Dental-Medizin, GmbH&Co., Seefield, Germany). One week later, the root canals were irrigated, recapitulated with the final instruments, and gutta-percha points were selected. In the distal and the mesiolingual canals two fine-medium cones (Analytic Technology, Redmond, WA) were selected, and no accessory cones were placed in the fin between them. A medium point was fitted in the separate mesiobuccal canal (Fig. 3). Three pluggers (Hu-Friedy, Chicago, IL)—#8, #9.5, and #11—were selected for obturation. Canals were dried with Endodry (Roth drug) then with sterile paper points. Sealer (Pulp Canal Sealer, Kerr, Romulus, MI) was applied with a paper point in the main canals and in the narrow space between them. A Touch'N Heat (Analytic Technology) was used to sear off gutta-percha at the mesiolingual orifice level where the largest plugger selected was placed while down packing the distal canal with the smallest plugger. Then the smallest plugger used in the distal canal was held in place while packing the mesiolingual canal. Once the down pack was accomplished in the two main canals of the C-shape a radiograph was taken (Fig. 4). It

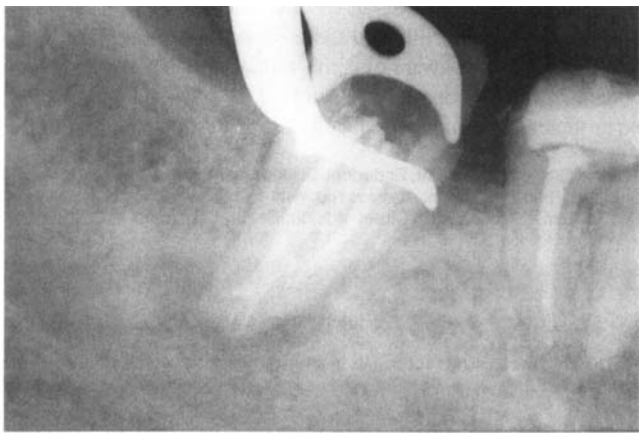

FIG 5. Radiograph after endodontic therapy revealing the presence of communications at different levels between the three main canals and an apical trifurcation.

showed a communication with the separate (mesiobuccal) canal. This communication was undetected while cleaning and shaping. The master gutta-percha point was fitted in the mesiobuccal canal, and the compaction was accomplished while holding the #8 plugger in the mesiolingual portion of the C-shape. The latter was in the middle between distal and mesiobuccal canals because the fusion was from the lingual side. The Obtura II gutta-percha gun (Texceed, Costa Mesa, CA) was used to backpack the root canal system. The postoperative radiograph showed the obturation of a third apical exit (Fig. 5).

DISCUSSION

For the vertical condensation technique, the aim is to move the thermosoftened gutta-percha into narrow cross-sectional diameters of the preparation, creating a piston force on entrapped cement that produces significant sealer hydraulics (8). The compaction of softened gutta-percha and sealer throughout a well-prepared root canal space should predictably move gutta-percha and sealer into root canal aberration (9). But in C-shaped canals, conditions are different for two reasons. (i) Divergent areas that are frequently unshaped and may offer resistance to obturating material flow (4). (ii) Communications between the main canals of the C-shape, through which the entrapped filling materials that should be captured between the apical tugback area and the level of condensation may pass from one canal to another. Consequently the hydraulic forces will dramatically decrease, and this could seriously compromise the obturation quality. In this case, placing two master points and blocking canal entrance with a plugger increases the resistance toward the passage of obturating material from one canal to another. Then holding the smaller plugger in place while down packing the second canal offers a backpressure on entrapped filling materials and enhances the seal. Usually when two canals merge to a common path, one gutta-percha point is fit to full length, and the second is fit to the intersecting zone (10). This was difficult to do in this case because communication with the mesiobuccal canal was undetected until filling the two portions of the C-shape. Nevertheless the mesiobuccal was obturated while blocking the down-packed mesiolingual canal with the smallest plugger to maintain sufficient pressure on obturating materials. It is the author's belief that this generated more hydraulic measure and per-

mitted the obturation material to flow to other areas, such as the third portal of exit. Although these cases occur infrequently, the clinician should be aware of their existence and should be able to undertake the appropriate measures to fill root canal systems in three dimensions and consequently to avoid a potential failure.

Dr. Walid is an assistant, Endodontic Department, Saint Joseph University of Beirut, Beirut, Lebanon. Address requests for reprints to Dr. Nehme Walid, Space Center, New Jdeide Street, Jdeide, Beirut, Lebanon.

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