18-month case study of a C-shaped mandibular molar: Preserving dentin and deep cleaning utilizing an innovative procedure

Author: Khang T. Le, DDS, SC Endodontics, Santa Ana, Calif.

Introduction

Complexities within the root canal system provide intricate regions for tissue, debris and bacteria-rich environments that remain untouched after standard root canal treatment. When the complicated anatomies of a C-shaped canal are introduced, occurring in about 8 percent of mandibular second molars, the endodontic challenges for debridement and disinfection are increased.1-3 An innovative technology, the GentleWave® Procedure (Sonendo®, Laguna Hills, Calif.) has been shown to enhance root canal cleaning and disinfection through advanced fluid dynamics, acoustics and tissue dissolution chemistry (Fig. 1).4-8 Studies have shown the GentleWave Procedure to have seven times faster tissue dissolution than standard root canal systems and demonstrated success rates of 97 percent at 12 months.6,9

Background

A 47-year-old female presented with a chief complaint of spontaneous pain and sensitivity to cold and chewing. The patient reported a history of hypothyroidism, but all other medical history was unremarkable. Upon clinical examination, the mandibular second molar (#31) showed moderate sensitivity to percussion and palpation. Vitality testing elicited a lingering response (Fig. 2a). A diagnosis of symptomatic irreversible pulpitis and symptomatic apical periodontitis was made.

Methods

Following conservative endodontic access, examination of the pulp chamber floor revealed a C-shaped canal. To preserve tooth structure, orifice openers were not utilized. Two file paths were created to an apical diameter of #20 merely to facilitate a fluid and obturation path. This preservation of dentin is crucial, as clinical success in endodontics has been correlated to the maintenance of original canal shape.10 While excessive apical enlargement may lead to complications like apical transportation, ledges and instrument separation, it also has the potential to weaken the tooth, thereby increasing the likelihood of root fractures.11-13

The GentleWave System was utilized to remove pulp tissue remnants, debris, smear layer and bacteria from the entire root canal system.5-8 The GentleWave Procedure was the endodontic treatment modality of choice for this case, due to its ability to thoroughly
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case study  GentleWave Procedure

Figs. 2a-d. Radiographs: a) Pre-GentleWave Procedure; b) Post-GentleWave Procedure; c) 12-month recall; and d) 18-month recall. (Images/ Provided by Dr. Khang Le)

Figs. 3a-d. CBCT: a-b) Post-GentleWave Procedure; and c-d) 12-month recall.

clean and disinfect the entire root canal system without removing excessive dentin. The canals were subsequently dried with paper points and obturated using a warm vertical compaction technique with gutta-percha and a resin-based sealer. A coronal seal was immediately achieved by restoring the access cavity with composite build-up.

Post-operative radiographic analysis revealed the C-shaped anatomy (Fig. 2b). It should be noted that a major cause for endodontic failure is the inability to locate and treat all root canal anatomy.\textsuperscript{14-15} Without adequate debridement, successful obturation would not be possible. As obturation of the entire root canal system is an indication of success for the endodontic cleaning and debridement process, the ability to clean and then obturate all of the root canal system, as in this case report, is crucial to a successful endodontic procedure.\textsuperscript{16}

**Results**

While post-procedure radiographs show the C-shaped anatomy, the cone-beam computed tomography (CBCT) images highlight the complex anatomy of the C-shaped canal, the uninstrumented webbing and a periapical lesion that are not visualized upon radiography (Figs. 2b, 3a and 3b). Studies report CBCT imaging is more sensitive in detection of periapical lesions than radiography, even in cases diagnosed with irreversible pulpitis.\textsuperscript{17-19} Clinical, radiographic and CBCT analysis was completed at the 12-month recall. The tooth was asymptomatic, and the periapical lesion, previously visible on CBCT, had healed (Figs. 2c, 3c and 3d). A final recall was completed 18 months post-procedure. The patient continued to be asymptomatic, and radiographic assessment revealed normal periradicular tissue (Fig 2d).

**Discussion**

The challenge of C-shaped canals is the webbing and ribbon-like structures throughout the root system, creating small areas and recesses for tissue, debris and bacteria to remain.\textsuperscript{120} This case report portrays the complex anatomy associated within the C-shaped canal, yet the standard root canal therapy protocol that is associated with a high rate of procedural errors was bypassed in favor of the innovative GentleWave Procedure.\textsuperscript{21-24} The case revealed normal periradicular tissue and no clinical signs or symptoms at both the 12- and 18-month recalls. This case report demonstrates the ability of the GentleWave Procedure to clean and disinfect C-shaped mandibular molars in a single visit while conserving natural tooth structure and decreasing the chance of intra-procedure complications as seen in standard endodontic treatment._

Disclosure: None. A list of references is available from the publisher.

**about the author**

Dr. Khang Le earned his doctor of dental surgery degree from the University of Colorado School of Dentistry in 1991. He was commissioned as a dental officer in the United States Navy in 1994 and proudly served for 11 years. In 2002, he received a certificate of advanced clinical programs in general dentistry from the Naval Dental Center Southwest, San Diego. He went on to receive his endodontic certification from the Herman Ostrow School of Dentistry at the University of Southern California in 2008. He serves as part-time faculty for the Advanced Endodontics Program at the Herman Ostrow School of Dentistry, University of Southern California. He is an active member of the American Association of Endodontists, the American Dental Association, the California Dental Association and the Orange County Dental Society. He may be contacted at Khangle3888@yahoo.com.