

Non-Instrumented Silver Point Retreatment Using the GentleWave Procedure: A Maxillary Central Incisor Case Report

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Abstract

Introduction: Apicoectomies are indicated for endodontically treated teeth when biological or technical factors such as non-healing periapical lesions, persistent clinical symptoms, separated instruments or silver points and the presence of long posts are present and other treatment options are not recommended. **Background:** A 67-year old female patient was referred for possible apicoectomy after previous endodontic treatment with a large post placement and silver point obturation within the apical third. The patient presented with mild pain of the upper jaw and a periapical lesion. **Methods:** Following conservative endodontic access, the previously placed post was removed utilizing a Roto-Pro™ Rotosonic Scaler Tip and the silver point was removed utilizing a thin ultrasonic tip without touching the canal walls. In an attempt to preserve tooth structure, maintain as much of the original canal anatomy as possible, and reduce the possibility of complications associated with standard endodontic treatment, no instrumentation was utilized. The GentleWave® Procedure was used to remove pulp tissue remnants, debris, smear layer, and bacteria from the entire root canal system. Single cone obturation was completed with gutta-percha and BC Sealer™. **Results:** Post-GentleWave Procedure cone fit radiographs depict a patent canal and post-obturation radiographic assessment displays clinically significant obturation of the non-instrumented canal. **Discussion:** This case report demonstrates the ability of the GentleWave Procedure to clean previously endodontically treated anterior teeth without the use of instrumentation, thereby conserving the natural tooth structure and decreasing the chance of intra-procedure complications as seen in standard endodontic treatment.

Key Words: Uninstrumented canal, Retreatment, GentleWave procedure, Apicoectomy, Multisonic ultracleaning

Introduction

Apicoectomies are required for endodontically treated teeth instead of the preferred non-surgical endodontic therapy when biological or technical factors necessitate this therapy [1]. These biological or technical factors may include, but are not limited to, non-healing periapical lesions, persistent clinical symptoms, separated instruments or silver points and the presence of long posts [1,2]. Success rates for apicoectomies have been reported up to 78% with as many as 4% of endodontically treated teeth requiring this type of surgery [3,4]. Although success rates are relatively high, once the tooth is no longer a candidate for non-surgical endodontic treatment, the alternatives in lieu of apicoectomy are limited to extraction with no replacement or replacement with a fixed prosthesis, removable prosthesis or implant [5]. Due to this, the American Association of Endodontics (AAE) only recommends apicoectomies when no other treatment option is available [2-6].

The GentleWave® Procedure (Sonendo®, Laguna Hills, CA), utilizes Multisonic Ultracleaning™ technology, in which advanced fluid dynamics, acoustics, and tissue dissolution chemistry are applied to clean and disinfect the entire root canal system, even in areas that conventional endodontic treatment cannot reach [7-10]. Tissue dissolution with the GentleWave System was seven times faster as compared to standard endodontic techniques, including sonic and ultrasonic devices [10]. Penetration of sodium hypochlorite into dentin within the apical third was four times more effective with the GentleWave® System than active ultrasonic activation [8]. In addition, the GentleWave System was shown to have minimal dentin erosion [11]. Separated hand files within the apical and middle third of root canals were reported to be removed with the GentleWave System without the need

for increased dentin removal [12]. Clinical studies evaluating the GentleWave Procedure have demonstrated high success rates of 97% at 6 and 12-months post GentleWave Procedure [13,14]. In this case report, a non-instrumentation GentleWave Procedure was selected as the best treatment modality for a maxillary incisor with persistent clinical symptoms and apical periodontitis following previous endodontic treatment with an 8mm post and apical obturation with a silver point.

Case Report

A 67-year-old female was referred for possible apicoectomy. The patient presented with previous endodontic treatment and mild pain of the upper jaw. The patient's medical history was non-contributory.

Diagnosis

Upon clinical examination of the subject tooth, the maxillary central incisor (#9), was found to have mild pain response to percussion, mild sensitivity to palpation and no presence of mobility or soft tissue lesions. Radiographic analysis revealed previous root canal therapy with a large 8mm post with placement into the middle third of the canal and a silver point placed within the apical third. A periapical lesion was present upon radiographic analysis (Section "a" of *Figure 1*). Based on the clinical and radiographic findings, a diagnosis of symptomatic apical periodontitis was made. Although the referring general dentist suggested apicoectomy, with availability of the GentleWave Procedure for cleaning and disinfection of the root canal system this novel method of endodontic treatment was preferred to retain as much of the natural tooth structure as possible. The endodontic treatment plan and fair prognosis of the tooth was discussed with the patient and the patient consented for treatment.

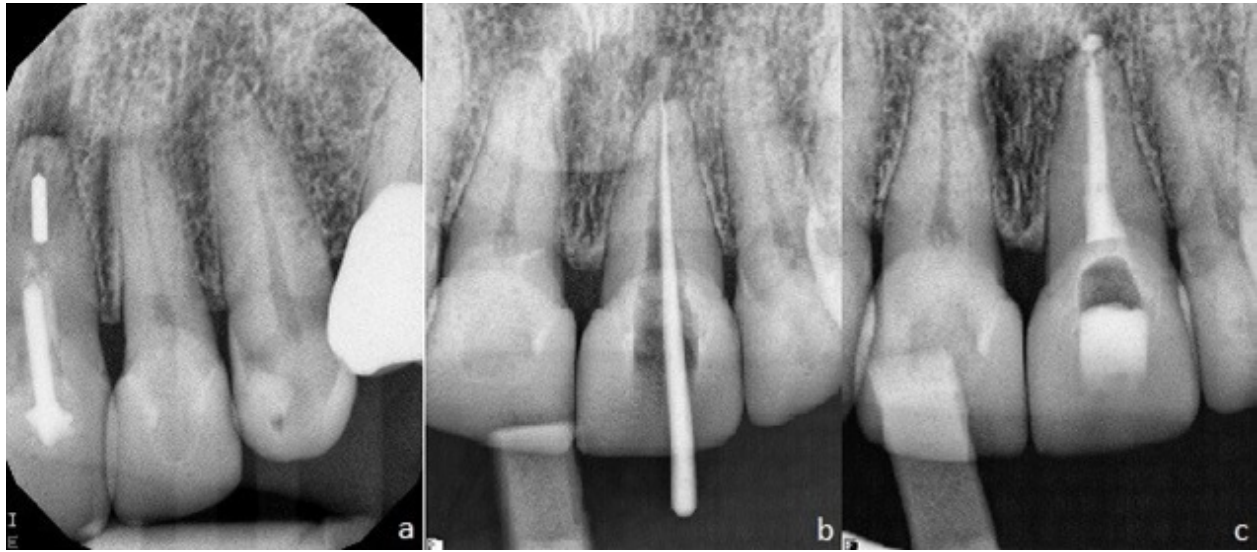


Figure 1. Radiograph (a) pre-GentleWave procedure (b) during cone-fit (c) post-GentleWave procedure.

Procedure

A standard anesthesia protocol was administered, the tooth was isolated with a rubber dam and a dental operating microscope was utilized throughout the procedure. Upon performing conservative, straight-line endodontic access no carious lesions were exposed. Utilizing a Roto-Pro™ Rotasonic Scaler Tip (Ellman International Inc, Hicksville, NY), the titanium post of 8mm in length was able to be removed. Once the canal orifice was exposed, the silver point was visualized within the single canal (Section “a” of Figure 2). By inserting an ultrasonic tip into the canal, the silver point contained within the apical third was able to be vibrated from the canal without contacting any tooth structure. Working length was obtained utilizing cone beam computed

tomography (CBCT) images taken pre-operatively and a gutta-percha try-in radiograph.

In an attempt to preserve tooth structure, maintain as much of the original canal anatomy as possible, and reduce the possibility of complications associated with standard endodontics, no instrumentation was utilized. A temporary build-up was placed utilizing a gingival protectant (Kool-Dam™, PulpDent®, Watertown, USA) to maintain a sealed environment for optimum MultiSonic™ UltraCleaning during the GentleWave Procedure. The GentleWave Procedure Instrument sits on top of the temporary build-up while pulp tissue remnants, debris, smear layer, and bacteria are removed from the entire root canal system (Figure 3).

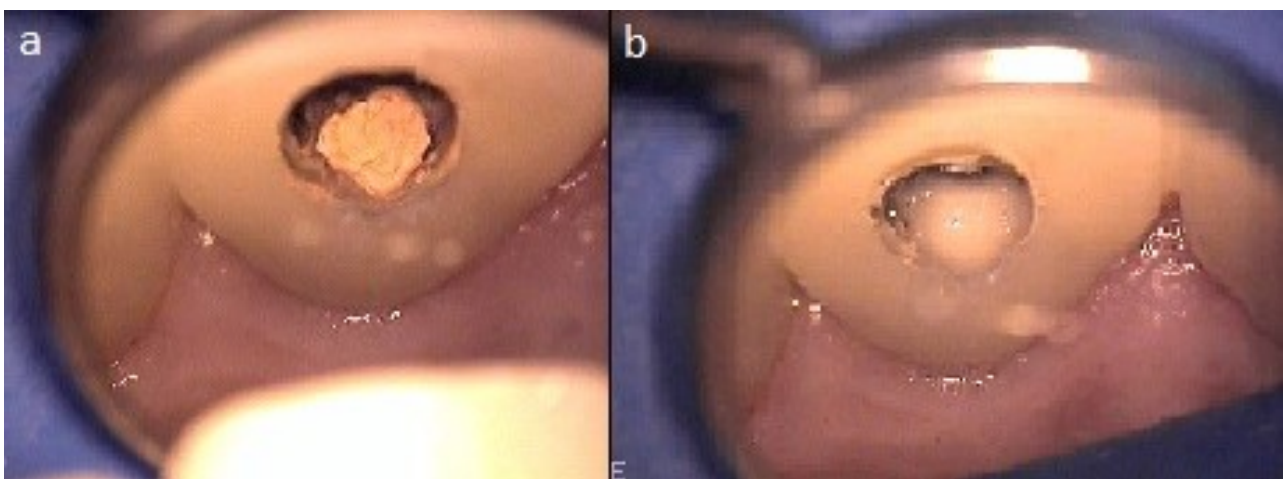


Figure 2. Microscope images of pulp chamber (a) prior to and (b) after the GentleWave.

Discussion

Higher clinical success rates have been reported to correlate with the preservation of the natural root canal anatomy of the tooth during endodontic treatment [15-18]. At the same time, greater effectiveness, cleaning and disinfection rates are associated with the increase of both file diameters and tapers during the instrumentation process to allow for greater debris and biofilm removal, as well as irrigants to penetrate the apical third of the root canals [15-19]. Added to the potential of lower clinical success rates, the increase in file sizes have also been reported to increase the chance of intra-procedure complications [20,21]. Intra-procedure complications include apical transportation, ledge formation, instrument separation, root perforations and root fractures, among others [21-24]. Studies have shown ledge formation occurs in around 50% of endodontic treatments and is one of the most commonly observed procedural errors. Although ledge formation is quite common, it has the potential to prevent adequate shaping, disinfection and subsequently obturation thereby being know for a causal relationship with unfavorable outcomes [23-28]. Another complication which can cause blockage of root canals thus effecting cleaning and disinfection, especially in the apical third, is instrument separation [12]. Instrument separation has seen decreased rates since the invention of rotary and nitinol files, but continues to occur worldwide at a rate of 5% [29]. As instrumentation is increased in endodontics to facilitate irrigation and greater debris and biofilm removal, additional dentin is removed thereby weakening the root. Weakening of the root is common in endodontics, especially when the root is oval, requiring additional instrumentation or canal shaping [30,31]. When extracted teeth that had undergone previous endodontic therapy were analyzed, up to 13.4% were reported to be extracted due to vertical root fractures [21,32]. Root perforations, which can cause bacterial infections from the root canal system or the surrounding periodontal tissue, are reported in 2-12% of endodontically treated teeth [33-36]. These perforations prevent healing and promote inflammatory sequela where the supporting tissue are exposed and have been reported to increase the likelihood of eventual loss of the tooth [34,35]. Due to the increase in intra-procedure complications reported with the increase in file sizes, alternative methods for cleaning and disinfection, such as the GentleWave Procedure, should be endeavored to achieve successful endodontic outcomes.

In this case report, a previously endodontically treated and silver point obturated maxillary central incisor was referred for apicoectomy, but determined appropriate for treatment with the GentleWave Procedure. Haapasalo et al. [10], reported seven times faster tissue dissolution with the GentleWave System than standard root canal techniques including the use of sonic and ultrasonic devices. Sodium hypochlorite penetration in the apical third was four times more effective with the GentleWave® System than active ultrasonic activation, yet the system has been shown to cause minimal dentin erosion [8,11]. In addition, the GentleWave System has been reported to be effective in removing separated hand files from the apical and middle thirds of molar root canal systems without the need for increased dentin removal [12]. Lastly, clinical studies evaluating the

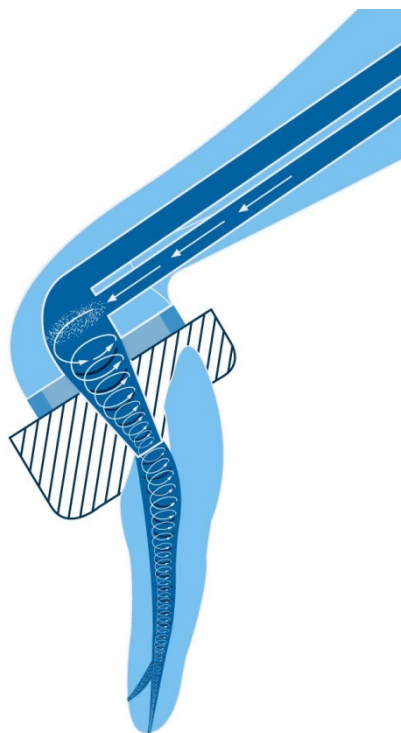


Figure 3. The GentleWave® system anterior/premolar procedure instrument.

Procedure

Afterwards, visualization through the microscope revealed a clean pulp chamber and canal (Section “b” of *Figure 2*) that was subsequently dried with paper points. None of the typical corrosive black sediment from standard silver point retreatment cases was visible when drying the canal with paper points. Obturation was completed utilizing a single cone technique with gutta-percha and BC Sealer (Brasseler USA®, Savannah, GA). A coronal seal was placed and the cavity filled with a glass ionomer (GC Fuji Triage® Alsip, IL). The patient was advised to return to their general dentist for comprehensive dental care.

There was no reported discomfort during or after the procedure. Two days after the procedure, the patient was contacted for post-procedure inquiry. The patient indicated they had not experienced any discomfort since the procedure.

Results

Pre-procedure radiographs exhibit a titanium post of 8mm in the coronal and middle thirds of the single canal and a silver point within the apical third (Section “a” of *Figure 1*). A periapical lesion is visible on the radiograph. Section “b” of *Figure 1* portrays a cone fit post-GentleWave Procedure radiograph providing evidence of a patent canal without the use of instrumentation. Radiographic review of the post-procedure image (Section “c” of *Figure 1*) displays complete obturation of the non-instrumented canal. A small sealer puff is visible in the periapical region verifying canal patency.

GentleWave Procedure have demonstrated high success rates of 97% at 6 and 12-months post GentleWave Procedure [13,14]. Although many factors would typically require this case to be treated with apicoectomy, including a post greater than 5 mm in length, silver point only within the apical third, persistent apical periodontitis and persistent clinical symptoms, due to the published success rates with the GentleWave Procedure, this endodontic treatment modality was preferred.



Figure 4. Post and silver point after removal.

Obturation with silver points was originally introduced in the 1930's due to their simplicity of placement and rigidity [37,38]. Later, studies began to examine the reasons for clinical failures surrounding silver point obturation and found that the silver points lead to corrosion and did not adequately fill the root canal space [39]. Reports soon showed that electrochemical corrosion occurred and that the byproducts of this corrosion were highly cytotoxic [38,40,41]. When silver points are removed, a black sediment is typically seen coating the root canal, this sediment has been reported as being created from this cytotoxic byproduct [41,42]. Typically, after standard root canal instrumentation and irrigation, paper points remain coated with this black sediment even after additional irrigation and paper point usage. Additional time and resources are spent after the cleaning and disinfection phase of a silver point retreatment case in an attempt to remove as much of this corrosive material as possible. In this case, after treatment with the GentleWave Procedure, no black sediment was visible when paper points were utilized to dry the canals, although black sediment was visualized pre-GentleWave Procedure as seen in *Figure 4*. By utilizing the GentleWave Procedure, the case time and resource usage was able to be reduced while, in theory, reducing the possibility of leaving cytotoxic byproduct behind in the root canals.

This case report demonstrates the ability of the GentleWave Procedure to clean previously endodontically treated anterior teeth without the use of instrumentation, thereby conserving the natural tooth structure and decreasing the chance of intra-procedure complications as seen in standard endodontic treatment. Additional recall with the patient may be warranted to assess long-term healing and clinical outcomes. Additional research on non-instrumentation endodontics in retreatment

cases with the GentleWave Procedure is needed to provide evidence for a larger population.

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Disclosure

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