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Endodontic Management of an Incidental Finding of a Third Root in the Maxillary Second Premolar

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Case Report

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ABSTRACT

The ultimate goal of root canal treatment is to clean, shape, and disinfect all root canals in a tooth. The presence of missed canal/root that is not fully treated might increase the risk of failure of root canal treatment, as pulpal pathology is not completely eradicated. In the present case report, we describe the successful diagnosis and management of an incidental finding of a third root in the maxillary second premolar. Such finding has been described to be of relatively low incidence in literature. The successful diagnosis of comparable cases may require adjuncts to routine radiography.

INTRODUCTION

The main goal of root canal treatment is to clean, shape, and chemically disinfect root canals following irreversible pulpal pathology. Several goals have been documented in the literature regarding instrumentation and irrigation of root canals including the removal of necrotic pulp tissue, debridement of infected dentine and shaping the canal to the facilitate chemical disinfection [1]. This is followed by root canal obturation to ensure seal along the length of the root [2]. Root canal obturation commonly done by gutta percha has two frequently used techniques: lateral and vertical compaction [2].

Dental veneers are thin porcelain/composite restorations used to cover mainly the labial/buccal surfaces of teeth [3]. Veneer placement is a conservative step in aesthetic and biological rehabilitation [4,5]. The preparation is confined to enamel for optimal bonding [5]. The provision of a satisfactory restoration requires a skilled operator. Several factors have been identified in literature that increase the risk of dental veneers failure, this includes bonding to a pre-existing restoration, an unskilled operator and improper depth reduction [3]. In turn, failure of veneer restorations can present in several ways, ranging from stained tooth to pulpal pathology [6]. Pulpitis of varying severity may be caused by chemical, mechanical, or thermal irritation during restorative procedures [7].

Maxillary second premolar can have one or two roots normally. Three-rooted maxillary second premolars are of particular rarity. Indeed, the highest documented incidence rate is 3%, and the majority of authors document no cases at all [8,9]. Vertucci et al. [10] classified the morphology of root canals into eight types.

Type I was the most common, followed by types II, IV, V, III and VI, VII, and VIII, in that order [10]. A study on the Jordanian population showed that 0.46% of maxillary second premolars were three-rooted and typified by Vertucci type VIII configuration [9].

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CASE PRESENTATION

A 55-year-old female patient presented to a private dental clinic complaining of pain localized to the maxillary right second premolar. The pain was spontaneous, interrupted the patient's sleep, and relieved solely by ibuprofen. The pain began 18 months previously following porcelain laminate veneer restoration, but was less severe and poorly localized. Previous examinations by her dentist were unavailing. The medical history was noncontributory.

A preoperative periapical radiograph was obtained from the treating prosthodontist. Radiographic and clinical examination showed the tooth to be caries-free (Figure 1). Cold pulp sensibility testing resulted in prolonged lingering pain localized to the maxillary right second premolar that ceases five minutes after stimulus removal. Further, the tooth was tender to percussion. The patient was diagnosed with symptomatic irreversible pulpitis in addition to acute apical periodontitis presenting as radiographic widening in the periodontal ligament (Figure 2). After discussion with the patient, root canal treatment was deemed to be the treatment of choice.

Figure 1. Preoperative periapical radiograph of the maxillary right second premolar obtained from the prosthodontist taken prior to dental veneers restoration.

Figure 2. Preoperative periapical radiograph of the upper right maxillary second premolar taken on the day of the root canal treatment.

The tooth was isolated using rubber dam following buccal infiltration with 4% articaine and 1:100,000 epinephrine (Ubistesin™ forte). An access cavity was prepared using a high-speed Endo-Access bur (Dentsply Maillefer, Ballaigues, Switzerland). The operator located a buccal orifice and a palatal orifice after removing the coronal pulp. Patency of both canals was achieved using K-files (Kerr Endodontics). The working length was determined using an apex locator

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(Foramatron® Apex Locator). Root canal instrumentation was done using Mtwo®Rotary files (VDW, Munich) along with stainless steel K-files. The canals were prepared to size F2. Sodium hypochlorite 5% and EDTA 17% were used for root canal irrigation.

Cone-fit periapical radiograph was done prior to negotiating the third canal. Although done under rubber dam isolation, the clamp only was removed while taking the periapical radiograph in order to visualize the third canal properly (Figure 3). Using (System B™) endodontic heat source, solid gutta percha was removed from the buccal canal until the K-file could enter the third canal. Presence of the third canal and working length was confirmed using a periapical radiograph (Figure 4). Obturation was completed using vertical compaction. The postoperative radiograph showed three distinct root canals in the maxillary right second premolar (Figure 5). The tooth was then restored using a temporary filling (Cavit™, 3M United States) and referred back to the prosthodontist for the permanent restoration.

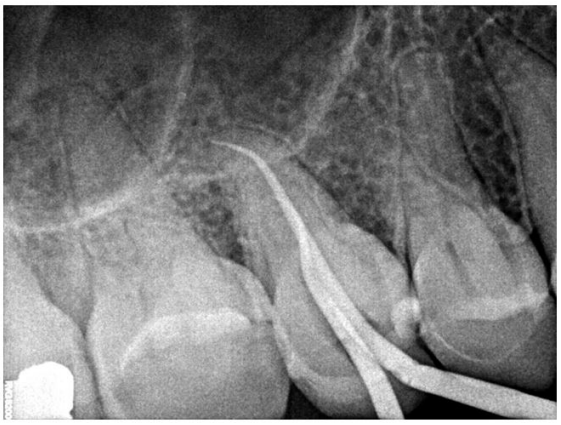

Figure 3. Conefit periapical radiograph using Gutta-percha of the buccal and palatal canals prior to finding the third root.

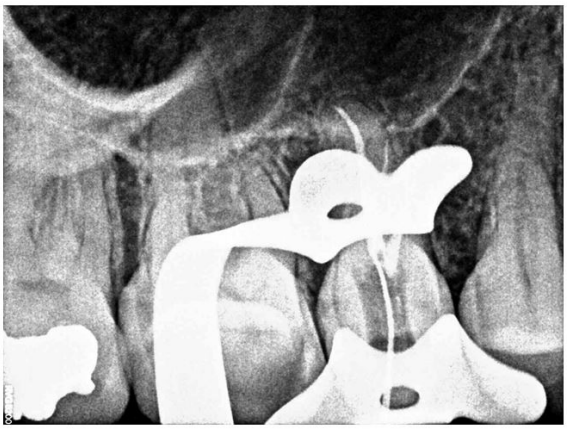

Figure 4. Working length radiograph using a size 15 K-file of the third canal after obturation of the buccal and palatal canals.

Figure 5. Postoperative periapical radiograph showing the obturation of three distinct canals in the maxillary right second premolar.

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DISCUSSION AND CONCLUSION

The signs and symptoms that led to the operator's diagnosis are typical presentation of the pulpal pathology mentioned above [11]. Multiple procedural and patient-related factors have been clearly associated with such pulpal pathology. Thermal or mechanical irritation during preparation and chemical irritation during bonding may be the cause of pulpal pathology. In this case, the exact etiology remains obscure. One must consider all predisposing factors as triggers of the inflammatory cascade. Isolating a single causative factor during veneers restoration is of great difficulty [3,7,12].

During access preparation the location of the canal orifice is indicative of the number of canals. If the orifice was centred in the middle of the tooth; this most probably would confirm the presence of a single canal in the maxillary second premolar [10]. Radiographic examination only provides us with a 2-dimensional view, however with proper angulation, a third root can be visualized more readily [13]. Another method proven effective in detecting missed canals is: cone beam computed tomography (CBCT) [14]. When compared to the previous gold standard in 3D dental imaging (computed tomography), CBCT is found superior in terms of image quality, accuracy, duration of scan and radiation exposure. CBCT still maintains a weak standpoint when evaluating soft tissues due to high scatter radiation during the scan. Further, radiation exposure still remains of high risk although it's significantly lower than its predecessor. Therefore, the use of CBCT is advantageous but must be justified [15].

The root canal morphology in a number of studies commonly followed Vertucci type VIII, three separate canals from orifices to the apex [8,10]. In this case, root canal morphology from the buccal orifice followed Vertucci type V. Such canal morphology presented difficulty in treatment. Presence of a third root in the maxillary second premolar is of relatively low incidence, this especially applies in the Jordanian population [8,9]. However, occurrence is a possibility as evident by this case report and should always be considered. Clearly this complex anatomy would warrant referral to specialist endodontists who are more acquainted in dealing with complex cases.

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