Treatment of a Hypertaurodontic Maxillary Second Molar in a Patient with 10 Taurodonts: A Case Report

Amr Radwan, BDS, and Sahng G. Kim, DDS, MS

Abstract

Introduction: Taurodontism is an aberration in tooth morphology characterized by vertically enlarged pulp chambers, apical displacement of pulp floors, and short roots. So far in the literature, no more than 8 taurodonts have been reported in 1 patient. The aim of this case report was to describe the endodontic management of a hypertaurodont maxillary second molar and to present a rare case with 10 taurodonts in a black man with a biometric analysis using cone-beam computed tomographic imaging. **Methods:** An 18 year-old black man was referred to the postgraduate endodontic clinic for emergency treatment. The patient's medical history was noncontributory. Tooth #2 had lingering pain in response to the cold test and was positive to both percussion and palpation. Radiographic examination showed the characteristics of taurodontism and periapical radiolucency around the root apices of tooth #2. Tooth #2 was diagnosed with symptomatic irreversible pulpitis and symptomatic apical periodontitis. The tooth was endodontically treated in 2 appointments. A panoramic radiograph showed multiple taurodontism. At the follow-up, a cone-beam computed tomographic scan was taken to further evaluate and diagnose taurodontism. Ten molars showed taurodontism including 7 hypertaurodonts, 2 mesotaurodonts, and a hypotaurodont. High variations of root canal anatomy were observed among taurodonts including maxillary and mandibular hypertaurodonts with C-shape canals. **Conclusions:** The present case describes 10 taurodonts in a patient with no specific syndromes and endodontic treatment of a hypertaurodont maxillary second molar. Cone-beam computed tomographic imaging may be useful in the evaluation and management of the anatomic complexity of roots and root canals of taurodonts. *(J Endod 2014;40:140–144)*

Key Words

Cone-beam computed tomographic imaging, C-shape, endodontic treatment, hypertaurodont, taurodontism

From the Division of Endodontics, College of Dental Medicine, Columbia University, New York, New York.

Address requests for reprints to Dr Sahng G. Kim, Division of Endodontics, College of Dental Medicine, Columbia University, 630 West 168 Street, PH7Stem #128, New York, NY 10032. E-mail address: sgk2114@columbia.edu

0099-2399/$ - see front matter

http://dx.doi.org/10.1016/j.joen.2013.08.017

Taurodontism is an aberration in tooth morphology characterized by vertically enlarged pulp chambers, apical displacement of pulp floors, and short roots. This dental anomaly was first described by Gorjanovic-Kramberger in 1908 (1), but the term was later coined by Sir Arthur Keith in 1913 (2). Because of the long clinical crown and lack of cervical constriction, the shape of taurodonts appears cylindrical in 3 dimensions, whereas they are rectangular in 2 dimensions. They are found almost exclusively in permanent and deciduous premolars and molars with significantly higher prevalence in second maxillary permanent molars (3). Taurodontism can involve a single tooth or multiple teeth with unilateral or bilateral distribution (4).

The etiology of taurodont formation includes the failure of invagination of Hertwig epithelial root sheath at a proper spatial plane (5), odontoblastic deficiency during root dentin formation (6), and disruptive developmental homeostasis (7). It is also known to be associated with genetic or developmental disorders such as Down syndrome (8), Klinefelter syndrome (9), ectodermal dysplasia (10), Smith-Magenis syndrome (11), thalassaemia major (12), tricho-dento-osseous syndrome (13), cleft lip and palate (14), and Van der Woude syndrome (15). Numerous studies suggest that multiple taurodontism is linked to systemic syndromes (16–19), whereas a few conflicting findings have been also reported (4, 20). Taurodontism was suggested to be characteristic of a primitive pattern because it was commonly observed in the Neanderthal fossil hominids although it is also found in diverse ethnic groups of modern populations (21–25).

Taurodonts can be further classified into hypotaurodonts, mesotaurodonts, and hypertaurodonts according to the severity of taurodontism (26). Later, a quantitative expedient to identify taurodontism from radiographs was suggested by Shifman and Chanannel (27). They proposed a taurodontic index (TI) obtained by dividing the height of the pulp chamber by the distance between the occlusal end of the pulp chamber and the root apex and then multiplying the number by 100. A tooth is diagnosed with taurodontism if the index (TI) is equal to or greater than 20 (27). This biometric method has been largely based on 2-dimensional (2D) periapical radiographs or panoramic radiographs, which may not reflect the real dimensions of all the parameters. Therefore, cone-beam computed tomographic (CBCT) imaging is recommended to aid in the diagnosis of taurodontism. Moreover, CBCT scanning may allow clinicians to fully evaluate the anatomy and size of this dental anomaly. However, there are only a few studies using CBCT imaging for the diagnosis and treatment of taurodonts (15, 20, 28).

The aim of this case report was to present a rare case with extensive taurodontism without a specific syndrome and to describe the endodontic management of a hypertaurodont maxillary second molar. So far in the literature, no more than 8 taurodonts have been reported in 1 patient (4, 20). This case report shows 10 taurodonts in a black man with the biometric analysis using CBCT imaging.

Case Report

An 18-year-old black man was referred to the postgraduate endodontic clinic for emergency treatment on January 24, 2012. The patient's chief complaint was a spontaneous, sharp pain emanating from the maxillary right quadrant. His medical history was noncontributory. No significant signs of pathosis were found during the extraoral examination. The intraoral examination revealed that tooth #2 had extensive occlusal caries. Tooth #2 had lingering pain in response to the cold test with Endo-Ice (Coltene/Whaledent Inc, Cuyahoga, OH) and was positive to both percussion and palpation.

Radiographic examination showed the characteristics consistent with taurodontism including an oversized pulp chamber and short roots in #2 (Fig. 1*A*). A retained root tip with periapical radiolucency was also observed in the #3 position (Fig. 1*A–E*). The pulpal and periradicular diagnosis for tooth #2 was symptomatic irreversible pulpitis and symptomatic apical periodontitis.

After informed consent was obtained from the patient, tooth #2 was anesthetized with 2% lidocaine (1:100,000 epinephrine) and isolated with a rubber dam. All the subsequent procedures were performed under a surgical microscope (Carl Zeiss Meditac Inc, Dublin, CA). Occlusal caries were removed with a high-speed round bur. An access cavity was prepared, and pulp tissues were removed in the pulp chamber with copious irrigation with 6% sodium hypochlorite solution. Three canals (mesiobuccal, distobuccal, and palatal canals) were located at about 14 mm from the occlusal surface. Working lengths were determined to be 17 mm in all canals with an apex locator (Root ZX II; J. Morita USA, Irvine, CA) and confirmed radiographically (Fig. 1*B*). The canals were cleaned and shaped up to size 60 using a step-back technique with hand files and 6% sodium hypochlorite solution. The canals were dried with paper points, and calcium hydroxide (Dental Therapeutics AB, Nacka, Sweden) was placed into the canals with a syringe. The tooth was temporized with Cavit (3M ESPE, St Paul, MN).

At the following appointment 6 weeks later, the patient was asymptomatic. Tooth #2 was not sensitive to percussion and palpation. A panoramic radiograph was taken to further discuss the treatment plan for missing teeth (#3 and #19) with the patient. The panoramic radiograph revealed multiple taurodonts (#1, #2, #14, #15, #16, #17, #18, #30, #31, and #32) (Fig. 1*G*). The tooth was anesthetized with 2% lidocaine (1:100,000 epinephrine) and isolated with a rubber dam. Cavit was removed with a high-speed round bur. The pulp chamber and root canals were irrigated with 6% sodium hypochlorite solution and 17% EDTA to remove residual calcium hydroxide before working lengths were reconfirmed with an apex locator (Root ZX II). Gutta-percha points were fitted to the root canals, and a periapical radiograph was taken to verify the lengths (Fig. 1*C*). The canals were filled using a warm vertical technique with gutta-percha and AH 26 sealer (Dentsply Maillefer, Tulsa, OK) (Fig. 1*D* and *F*). The tooth was restored with a composite core buildup material (Ti-Core; Essential Dental Systems, Inc, Hackensack, NJ) (Fig. 1*E*). The patient was referred to his general dentist for definitive restorative treatment.

At a 2-month follow-up, the patient was asymptomatic. Tooth #2 was not sensitive to percussion and palpation. A CBCT scan was taken for the purpose of treatment planning to determine whether dental implants could be placed in the edentulous areas. It was also used to evaluate the periradicular healing in #2 and further examine the multiple taurodontism. The CBCT scan obtained with i-CAT (Imaging Sciences International, Hatfield, PA) showed a widened periodontal ligament space with an intact lamina dura in tooth #2 (Fig. 2*A–E*). Based on CBCT analysis using i-CAT Vision 3D imaging software (Imaging Sciences International), taurodonts were further classified with the biometric method suggested by Shifman and Chananel (27). There were 7 hypertaurodonts, 2 mesotaurodonts, and 1 hypotaurodont identified using this method (Table 1). The number of roots and

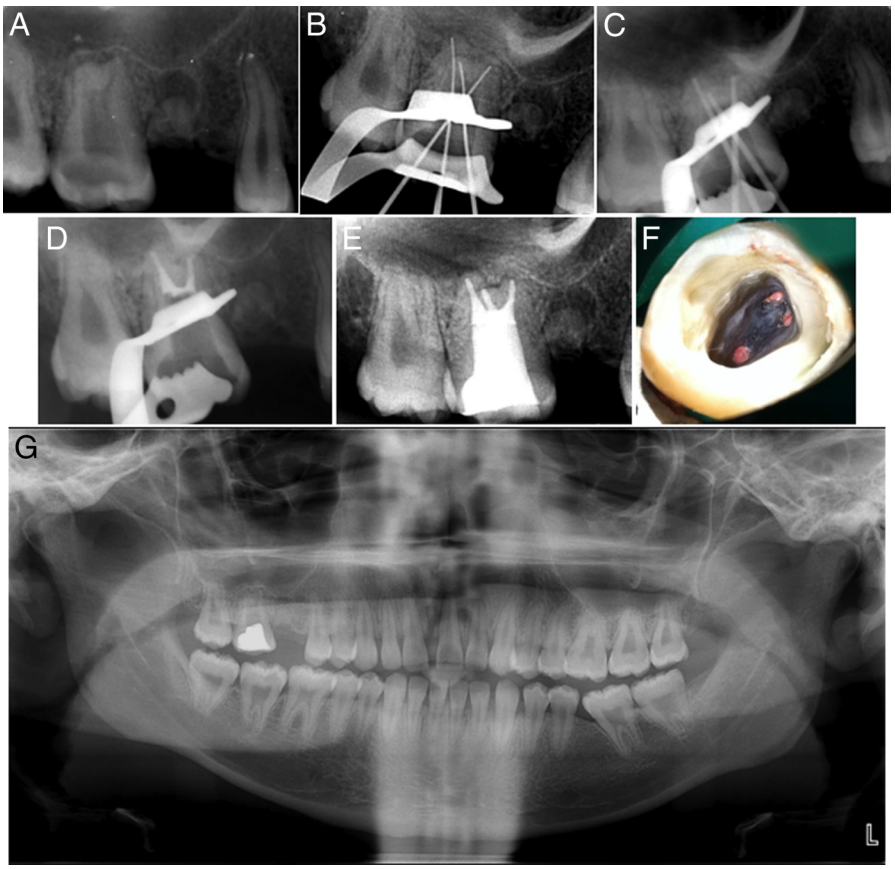

Figure 1. Root canal treatment of the right maxillary second molar. (*A*) A preoperative radiograph, (*B*) working length confirmation, (*C*) master cone fit, (*D*) root canal filling using warm vertical compaction, (*E*) a postoperative radiograph after composite core buildup, (*F*) an occlusal view of the pulp chamber after root canal filling, and (*G*) a panoramic radiograph showing 10 taurodontic molars at the second visit.