Taurodontism is one of the morphogenic anomalies which characterized by unusual anatomy including an enlarged body and pulp chamber, lack of constriction at the level of cementoenamel junction (CEJ), as well as apical displacement of the pulp chamber floor.[1,3] These characteristics manifest themselves as result of invagination failure of Hertwig’s sheath at the proper horizontal level.[2] Taurodontism is associated with several developmental syndromes and anomalies such as Amelogenesis imperfecta, Down’s syndrome, ectodermal dysplasia, Klinefelter syndrome, Tricho-dento-osseous syndrome, Mohr syndrome, Wolf–Hirschhorn syndrome, and Lowe syndrome; however, most of the times, it can occur between normal population.[2] The external morphology of a taurodont tooth is similar to that of a normal tooth and always it is accidentally diagnosed by dentists in patient’s radiographs evaluation.[4] Taurodontism was a repeated finding that was discovered in early human fossils. In recent times, taurodont teeth are more prevalent between Eskimos than other races.[4] It might be an evolutionary change in shape of tooth to adjust eating habits.[2] Taurodontism can be seen in both the permanent and deciduous dentitions, but permanent molar teeth are most commonly affected.[5–7] High degree of variation of the size and shape of the pulp chamber, canal configuration, apically positioned canal orifices, and possible additional root canal systems have made the endodontic treatment of taurodont teeth so complicated.[8] In immature teeth, making an apical seal is the biggest problem endodontically.[9] Many studies have shown that mineral trioxide aggregate (MTA) due to some features including less leakage, high marginal adaptation, PH of 12.5, biocompatibility, and bioinductivity is the material of choice for use as a barrier to create an apical seal in immature teeth with an open apex.[9] In our case, we should not only manage the potential complexity of taurodont tooth root system. Furthermore, we had another challenge with an incomplete apex formation.

Case Report

A 10-year-old boy presented to the Endodontic Department of Imam Khomeini Clinic of Dentistry with a chief complaint of pain in lower right back teeth in chewing. The patient had a history of pain >4 months. The patient’s medical history was non-contributory. Clinical and radiographic examinations were performed. Intraoral examination revealed a normal shape of crown with a deep caries on the right first mandibular molar (tooth 30). The tooth was tender to vertical percussion. A vitality test of the tooth was negative. Radiographic examination of the affected tooth revealed an abnormal tooth with a big mesio-occlusal lesion with an involvement of pulp chamber [Figure 1].
Other radiographic findings of affected tooth included apical displacement of pulp chamber floor, no constriction at the level of CEJ, and an elongated pulp chamber led to a hypertaurodont diagnosis. Three roots were seen at the furcation area in the apical third. Radiolucency was seen around the apical region of mesial and distal roots. Open apex was remarkable on distal root. According to subjective and objective findings, a diagnosis of pulp necrosis with chronic apical periodontitis was made.

After inferior alveolar nerve block injection of lidocaine with 1:100,000 epinephrine (Darou Pakhsh, Tehran, Iran), the access cavity was prepared on the occlusal surface and all carries were removed. The tooth was isolated by rubber dam. At the furcation area, distal, mesiobuccal, and mesiolingual canal orifices were observed. An electronic apex locator (Raypex5, VDW GmbH, Munich, Germany) was used to determine the initial working lengths. Initial files set in root canals, and then, initial radiograph was taken [Figure 2a]. The initial radiograph verified an open apex on distal root. The instrumentation of distal and mesial root canals was performed up to 100# and 40# K-files (Mani, Tochigi, Japan), respectively. Besides, a rotary system (Protaper, Dentsply Sirona, New York City, USA) was used to complete the canal preparation. To remove necrotic pulp completely, 2.5% sodium hypochlorite was used as an irrigant to digest pulp tissue. In addition, 17% EDTA (Dentonics, North Carolina, USA) was used several times during procedure to remove smear layer. The distal canal was dried by sterile paper points. MTA mixture (Dentsply, Tulsa Dental, Johanson city, USA) was made and placed with Endo Gun (Medidenta, Las Vegas, USA) in apical portion of distal root canal to create an apical plug. Radiographically, the apical plug of MTA about 3 mm was confirmed [Figure 2b]. Calcium hydroxide was placed in mesial root canals and a moistened sterile cotton pellet was placed over the distal canal orifice followed by establishing cavit (3M, Seefeld, Germany) as a temporary coronal seal. After 48 h, we used the recommended modified obturation technique including lateral condensation apically except distal root canal which sealed by plug MTA in apical region and thermoplasticized gutta-percha (Obtura III Max, Kerr, Bioggio, Switzerland) coronally. Temporary filling material and cotton pellet were removed and calcium hydroxide flushed out by washing canals gently with 2.5% NAOCL. Remainder of distal root canal and mesial roots was obturated by lateral condensation technique and elongated pulp chamber obturated by thermoplasticized gutta-percha. The final radiograph confirmed an ideal condensed root filling material in mesial root canals, remained distal root, and elongated pulp chamber as well as a fine apical seal in distal root canal [Figure 2c]. In the same visit, the access cavity was restored with amalgam. At 9-month follow-up visit, panoramic, periapical radiograph [Figure 3a and b], and cone-beam computed tomography (CBCT) [Figure 4a] were requested. Axial, coronal, and sagittal images were retrieved from CBCT analysis (i-CAT, Imaging Sciences International, Hatfield, PA, USA) [Figure 4b]. The patient was asymptomatic clinically and the radiographic examination showed healthy periodontium and periradicular tissue.

Discussion

Taurodontism is more prevalent in the first molar than other teeth in permanent dentition. According to Shiffman...
classification,[10] the present case has been classified under hypertaurodont with three orifices and three separate root canals. Complete filling of the root canal system in taurodontism is challenging due to the complexity of the root canal anatomy. Modified filling technique which is a combination of lateral condensation in the apical region with thermoplastic obturation system for obturating elongated pulp chamber has been recommended.[5,7,8] Moreover, in this case, we had another challenge that was an open apex of distal root. It was not possible to make an entire seal apically with lateral condensation technique in immature root canals. MTA has many important characteristics including biocompatibility, marginal adaption, and less cytotoxicity than other materials which has been suggested to use as an apical plug at the end of immature roots with and open apices.[8] Hence, plug MTA was used to seal the apical region of distal root. This technique made it easier to have control during obturation of distal root by lateral condensation technique. In many cases, copious irrigation of root canals with 2.5% sodium hypochlorite was suggested for dissolving of the remaining pulp tissues as we did in our treatment.[3,5,8]

CBCT, periapical, and dental panoramic radiograph were taken after 9 months which revealed healing of radiolucency around distal and mesial root canals; however, it is necessary that clinical and radiographic follow-up to be continued. We used CBCT to evaluate our treatment after 9 months as it has been suggested in many current studies due to providing detailed information of the anatomy of roots.[4,7,8]

**Figure 4:** Transverse cuts on cone-beam computed tomography (CBCT) (a) and coronal, sagittal, and axial view on CBCT (b) of tooth #30 after 9 months of follow-up
Conclusion

Endodontic treatment of taurodont tooth is a time-consuming procedure that needs an extra attention of clinicians. Sufficient investigation on additional canals, precise preparation and irrigation of canals, and modified obturation technique are essential to reach a successful treatment.

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References