Successful endodontic management of hypo, meso and hypertaurodontism: Two case reports

Girish Kulkarni, Rajeev K. G., Ambalavanan P., Krishnamurthy H. Kidiyoor

Abstract

Taurodontism is a morphoanatomical developmental anomaly rarely seen in teeth. Permanent mandibular molars are most commonly affected. Endodontic treatment of a taurodont tooth is challenging and requires special handling because of proximity and apical displacement of roots. This paper presents a successful endodontic therapy of all three types of taurodonism with two case reports - the first case with mesotaurodontism of mandibular left first molar and hypotaurodontism of mandibular left second molar and the second case with hyper taurodontism of mandibular left second molar.

Keywords: Endodontic therapy, hertwigs epithelial root sheath, mandibular molars, radix entomolaris, taurodontism

Introduction

Taurodontism is a developmental anomaly in tooth morphology characterized by lack of constriction at the level of cementoenamel junction, vertically elongated pulp chamber and apical displacement of pulpal floor.[1] It was first reported by Gorjanovic-Kramberger in a 70,000 year old pre Neanderthal fossil, described in Kaprina, Croatia. The term taurodontism was 1st stated by Sir Arthur Keith in 1913. The origin of this term is from Greek. Tauros means "Bull" and odontos means "Tooth".[2] It has been suggested that the anomaly represents a primitive pattern, a mutation, a specialized or retrograde character, an atavistic feature, an X-linked trait, familial or an autosomal dominant trait.[3]

Theories concerning the pathogenesis of taurodontic root formation also varied. According to Hamner *et al*. it can be due to failure of hertwigs epithelial root sheath diaphragm to invaginate at proper horizontal level.[4] It can also be an unusual developmental pattern, a delay in calcification of pulp chamber or changes in the mitotic activity of cells of the developing teeth that can affect root formation or influence from external factors on the development of the teeth.[5]

Department of Conservative Dentistry and Endodontics, PMNM Dental College and Hospital, Bagalkot, Karnataka, India

Correspondence: Dr. K. G. Rajeev, Senior lecturer, Department of Conservative Dentistry and Endodontics, PSM Dental College and Hospital, Akkikavu, Thrissur, Kerala, India. E-mail: kgrajeev_1984@yahoo.co.in, manojkmohan.drrajeev@gamil.com

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The prevalence is reported to range from 2.5 to 11.3% of the population. It can be unilateral or bilateral. Permanent teeth are affected more than primary teeth. No sex predilection was reported. Mandibular molars are found to be affected more often than maxillary molars and mandibular second molar is most frequently involved tooth in the dentin.[5]

An adapted clinical approach to diagnosis and root canal treatment of taurodontism are required to avoid procedural errors during endodontic therapy since it shows wide variation in size and shape of pulp chamber and root canal anatomy.

Case Reports

Case 1

An 18-year-old female patient reported with pain in lower left side of the jaw to the Department of Endodontics. Her medical history was noncontributory. On intraoral examination, there was deep carious lesion in mandibular left first and second molar. First molar tooth showed delayed response to pulp vitality testing (electric and cold pulp testing) and second molar showed no response at all. Teeth were tender to percussion. Intraoral periapical radiograph of first molar revealed that the presence of large pulp chamber with small thinned-out roots and a coronal radiolucency involving pulp chamber without any periapical changes. There was an isolated radioopaque density with respect to the distal root periapical region. The second molar also showed large pulp chamber with coronal radiolucency involving it with widening of apical periodontal ligament space [Figure 1]. Based on the clinical and radiographic findings, a diagnosis of mesotaurodontism with advanced stage of irreversible pulpitis was given to mandibular left first molar and hypotaurodontism with symptomatic apical periodontitis was given to mandibular left second molar. The radio-opaque mass seen with respect to periapical region of mandibular left first molar was diagnosed as idiopathic osteosclerosis. Upon approval from the patient, root canal treatment was advised for both the molars.

Mandibular left second molar (37) was anesthetized with inferior alveolar block using 2% lignocaine with epinephrine 1:100000 and pulp chamber of 37 was accessed under rubber dam isolation. Working length were determined with # 15 K files in mesial canals and # 20 K file in distal canal by ingles method and confirmed with electronic apex locator and radiovisiography [Figure 2]. Biomechanical preparation of pulp chamber was achieved by circumferential filing with ISO K files of size # 25 in all canals followed by further shaping using ProTaper files (F4 for distal canal and F3 for mesial canals) [Figure 3]. Canals were irrigated with 2.5% sodium hypochlorite, 17% aqueous solution of EDTA and 2%W/V chlorhexidine gluconate and saline as the final irrigant using 26-G needles. After thorough drying of canals with paper points, calcium hydroxide intracanal medicament was placed. Patient recalled after 4 weeks. In next visit tooth was asymptomatic and canals were dry. Obturation of the canals were done using GP cones and AH plus sealer with conventional lateral compaction technique. Access cavity was cleaned with dampened cotton and restored with varnish and amalgam.

In mandibular left first molar (36), after access opening an extra canal was located lingual to the distal root [Figure 4]. Root canal therapy of 36 was done similar to 37 along with the extra-distolingual canal. Canals were enlarged using ProTaper files upto F3 in all four canals. Obturation of the canals was done using lateral compaction in root canals and vertical compaction using softened gutta percha in pulp chamber. Access cavity was cleaned with dampened cotton and restored with amalgam [Figure 5].

Case 2

A 23-year-old male patient was referred to the postgraduate clinic of the department of Endodontics, for opinion and management of left mandibular molars. The patient complained of recurrent pain over the left mandibular molars for a period of 2 months. His medical history was not contributory. At the time of intraoral examination both the left mandibular molars revealed caries and were extremely sensitive to percussion. Radiographic examination of the affected teeth revealed an abnormal tooth anatomy with the left mandibular second molar with unusually long pulp chamber which had no constriction at the cemento-enamel junction, two short roots were seen at the furcation

Figure 1: Preoperative radiograph of (mesotaurodontism on mandibular left first molar and hypotaurodontism in second molar can be appreciated)

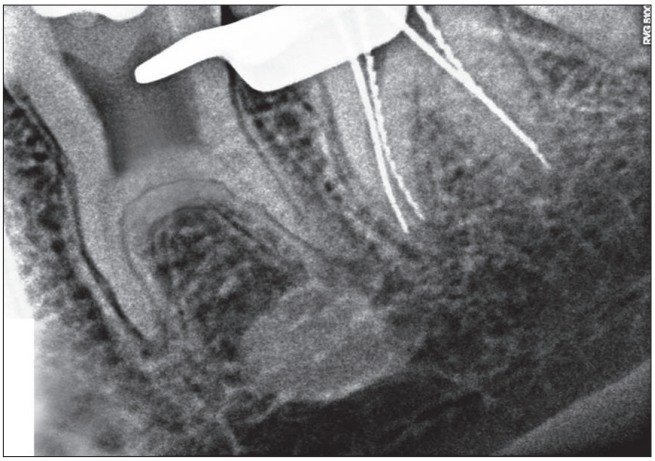

Figure 2: Working length radiograph of mandibular left second molar

Figure 3: Master cone radiograph of mandibular left second molar

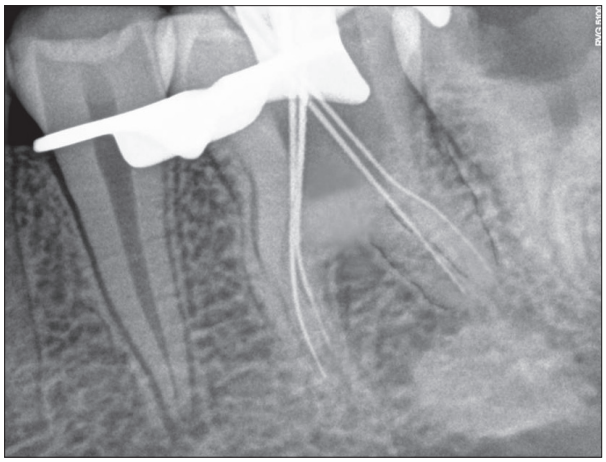

Figure 4: Working length radiograph of first molar (4th canal-distolingual canal can be appreciated)

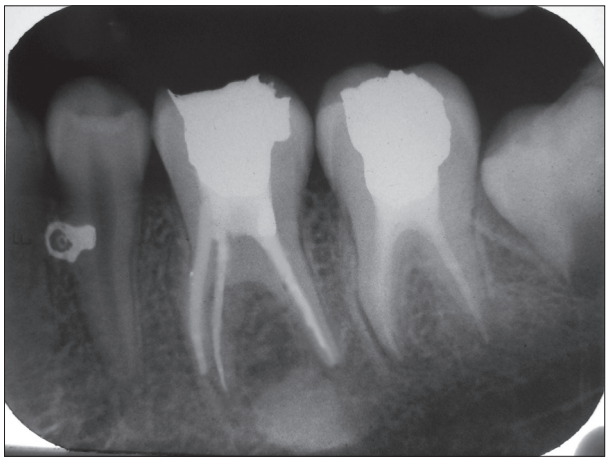

Figure 5: Postobturation radiograph of mandibular left first and second molars

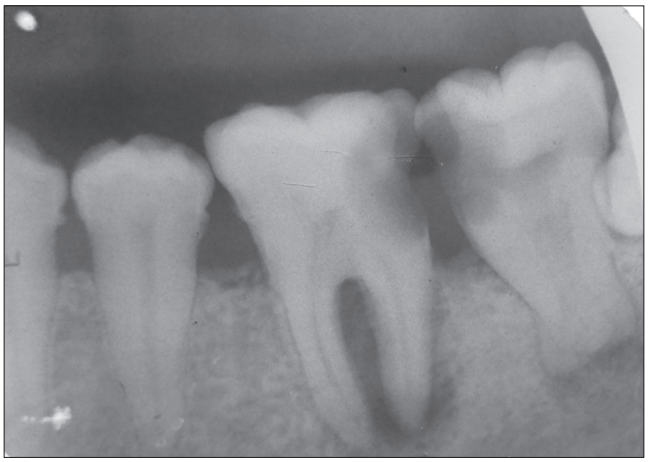

Figure 6: Preoperative radiograph. Large pulp chamber of second molar with apical division of root canals can be noticed

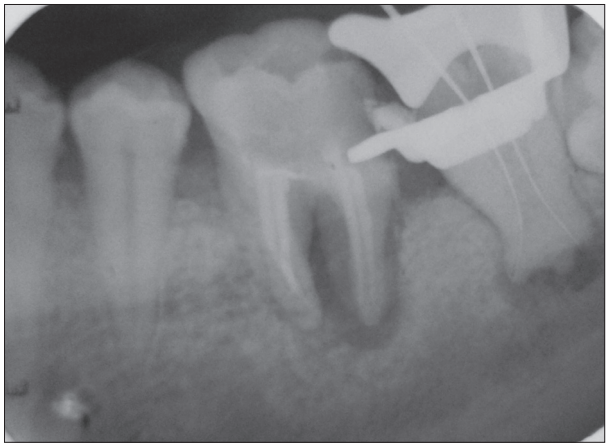

Figure 7: Working length radiograph

Figure 8: Master cone radiograph

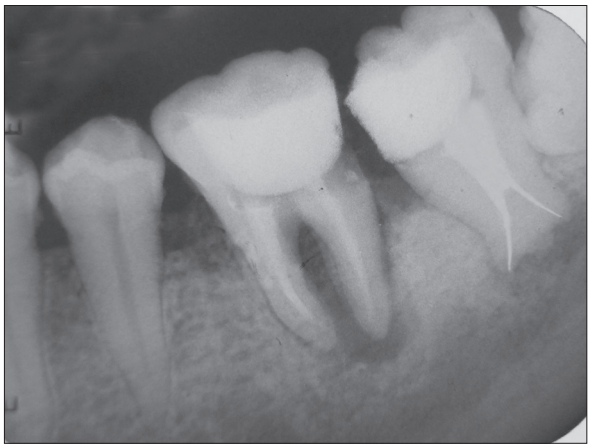

Figure 9: Obturation radiograph. Pulp chamber back filled using obtura 2

area in the apical third, root resorption at the apical end. Radiographic examination of left mandibular second molar revealed deep dental caries involving pulp with periapical changes [Figure 6]. Based on the clinical and radiographic findings, a diagnosis of hypertaurodontism with chronic periapical periodontitis accompanied by root resorption was given to mandibular left 2nd molar. The left mandibular first molar was diagnosed with combined endo-perio lesion with chronic periapical periodontitis. Root canal treatment was advised for both the left mandibular molars accompanied by periodontal therapy.

Upon approval of the patient the teeth were treated as in case 1. The pulp chamber of 2nd molar was huge and the floor could not be visualised, which on further exploration in the apical furcation area revealed two divisions one on the mesial side and one on the distal side with wide apical foramina. The apical divisions were almost near the apex, to about 3 mm and they were separately cleaned and shaped using hand K-files till ISO size 30. Working length as well as biomechanical preparation was performed as in case 1. [Figure 7] [Figure 8] The AH plus sealer was then applied using a # 20 reamer along the canal walls. Obturation was then done with lateral compaction technique in the mesial and distal canal. After that, the elongated pulp chamber was obturated by thermoplasticized gutta percha using OBTURA 2. The final radiograph confirmed a well condensed filling of

the canals [Figure 9]. The patient was reviewed after three months and was found to be asymptomatic. They were referred to the Department of Periodontia and Prosthodontia, for further management.

Discussion

Clinically the taurodont crown has normal form, structure, color and texture; so can only be diagnosed by radiographs. Taurodontism is predominantly found in molars but also has been seen in premolars, mandibular canines and incisors.[6] In 1928, Shaw classified the subtypes of this condition as hypotaurodontism, mesotaurodontism and hypertaurodontism based on the relative displacement of the floor of the pulp chamber. This subjective, arbitrary classification led normal teeth to be misdiagnosed as taurodontism.[7] Shifman and Chanannel proposed an index to calculate the degree of taurodontism. According to this index, taurodontism is present if the distance from the lowest point at the occlusal end of pulp chamber to highest point at the apical end of the chamber divided by distance from occlusal end of pulpchamber to the apex and multiplied by 100 is 20 or above (Hypotaurodonism TI 20-30, MesotaurodontismTI 30-40 and Hypertaurodontism TI 40-75). Taurodontism can also be determined if the distance from the highest point of the pulp chamber floor to the cemento enamel junction is more than 2.5 mm.[8]

This paper presented all the types of taurodontism (hypo, meso and hypertaurodontism) which were diagnosed radiographically and confirmed by using taurodontism index proposed by Shifman and Chanannel. Based on Shifman and Chanannel classification, in the first case mandibular left first molar had a TI score of 38 (mesotaurodontism) and mandibular lower left second molar had a TI score of 23 (hypotaurodontism). In the second case, left mandibular second molar had a TI score of 65 (Hypertaurodontism).

Taurodont form may not interfere with operative procedures; but endodontic therapy may be more difficult and complex especially in hyper and meso taurodontism cases. The long rectangular shape of pulp chamber seems to cause difficulty in locating the canal orifices and subsequent difficulties in instrumentation and obturation. Because of pulp of a taurodont is usually voluminous and adequate instrumentation of irregular root canal system may not be anticipated. Wideman and Serene have suggested that additional efforts should made by irrigating the canals with 2.5% sodium hypochlorite to dissolve as much necrotic materials as possible.[9] Owing to the complexity of root canal anatomy and proximity of the orifices to the root apex, complete filling of root canal system in taurodontism is challenging.

In the case 2 (hypertaurodontic mandibular second molar) the mesial and the distal canal orifices were very narrow due to which the negotiation of these canals was difficult. During instrumentation, as the canals were very short, they were instrumented only with the apical third of the files. Therefore the instrumentation was time consuming. Sodium hypochlorite irrigation was limited to the initial use as the apical foramina were wide due to resorption and as a precautionary measure to avoid a hypochlorite accident. Since good apical stops were obtained using the ProTaper master cones, it was decided to back fill the pulp chamber with thermo-plasticized gutta percha.

Conclusions

Although taurodontism are of rare occurrence, clinician should be aware of the complex canal system for it successful endodontic treatment. Sometimes its discovery may help to disclose systemic conditions as well.

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