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Case Report

Management of "Taurodontic" Tooth: A Rare Case

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ABSTRACT

Taurodontism is a type of variation in tooth morphology that occurs predominantly in molars. Taurodontism refers to change in tooth shape caused by the failure of Hertwig's epithelial sheath diaphragm to invaginate at the proper horizontal level. An enlarged pulp chamber, apical displacement of the pulpal floor, and no constriction at the level of the cemento-enamel junction are the characteristic features. Although permanent molar teeth are most commonly affected, this change can also be seen in both the permanent and deciduous dentition, unilaterally or bilaterally, and in any combination of teeth or quadrants. In performing root canal treatment on such teeth, one should appreciate the complexity of the root canal system, canal obliteration and configuration, and the potential for additional root canal systems.

Introduction

The term taurodontism comes from the Latin term *tauros*, which means 'bull' and the Greek term *odus*, which means '*tooth*' or '*bull tooth*. Taurodontism can be defined as a change in tooth shape caused by the failure of Hertwig's epithelial sheath diaphragm to invaginate at the proper horizontal level[1]. Taurodontism is a morpho-anatomical change in the shape of the tooth in which the body of the tooth is enlarged and the roots are reduced in size[2].

This abnormality is a developmental disturbance of a tooth that lacks constriction at the level of the cementoenamel junction (CEJ) and is characterized by vertically elongated pulp chambers, apical displacement of the pulpal floor, and bifurcation or trifurcation of the roots (Brkic´ & Filipovic´ 1991, Hargreaves & Goodis 2002, Neville et al. 2002, Rao & Arathi 2006)[3]. Although permanent molar teeth are most commonly affected, this change can also be seen in both the permanent and deciduous dentition, unilaterally or bilaterally, and in any combination of

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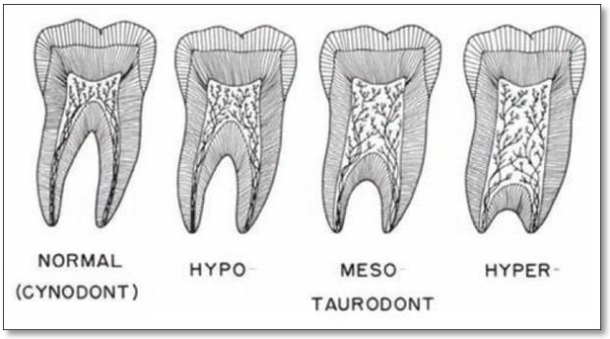

Fig: A Shaw classification

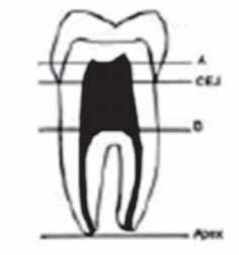

Fig: B Classification by Shifman & Chananel

teeth or quadrants. Whilst it appears most frequently as an isolated anomaly, its association with several syndromes and abnormalities has also been reported [1].

History

Taurodontism was first described in 1908 by Gorjanovic – Kramberge a 70,000 year old pre-Neanderthal fossil, discovered in Kaprina, Croatia. Taurodontism was a frequent finding in early humans and is most common today in Eskimos, possibly as a selective adaptation for cutting hide. However, the term *taurodontism* was first introduced by Sir Arthur Keith in 1913.

The literature contains reports of taurodontism with high frequency in Eskimos. Taurodontism has been found in the dentition of modern races. Shaw reported the incidence to be as high as 30 per cent in hybrids of Australoids and the Bush people of South Africa. Taurodontism has been found in mongoloid and negroid populations.

It seems taurodontism is a great deal more prevalent than it was previously thought Seow and Lai found that 38.4% of 66 patients with hypodontia had at least one mandibular first permanent molar that showed taurodontism compared with only 7.5% of a control group without hypodontia [2].

Prevalence

Review of the literature reveals a wide discrepancy in the prevalence of taurodontism in different populations. Its prevalence has been reported to range between 5.67% and 60% of subjects. The prevalence of taurodontism in children was found in 0.3%.

A study on a group of Jordanian dental patients has shown an overall prevalence of 8% for individuals. Ruprecht et al found a prevalence of 11.3% for individuals in Saudi dental patients, whilst the results of Shifman and Channanel were 5.6% in Israeli dental patients, compared with 46.4% in young adult Chinese. These variations in prevalence between different populations may be due to ethnic variations, but may also be influenced by differences in criteria used for interpretation of taurodontism and also the specific teeth examined.

Some studies have included premolars, while others believe that premolar teeth may not be affected by taurodontism. It is commonly observed among the Eskimos and Natives of Australia and Central America [2].

Classification

Shaw (1928) further classified taurodont teeth according to their severity into hypo-, meso- and hypertaurodont forms, hypotaurodontism being the least pronounced form, mesotaurodontism the moderate form and

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hypertaurodontism being the most severe form in which the bifurcation or trifurcation occurs near the root apices *(Fig:A)*[4].

He classified taurodont as-

(a) *Cynodont:* normal tooth

(b) *Hypotaurodont:* moderate enlargement of the pulp chamber at the expense of the roots

(c*) Mesotaurodont*: pulp is quite large and the roots short but still separate

(d) *Hypertaurodont:* prismatic or cylindrical forms where the pulp chamber nearly reaches the apex and then breaks up into 2 or 4 channels.

Single or pyramidal root (*cuneiform*): usually in the lower second molar where the pulp extends throughout the root without cervical constriction and exits via a single wide apical foramen.

Shifman & Chananel 1978(Fig: B) classified taurodontism as

Point A: lowest point at the occlusal end of the pulp chamber

Point B: highest point at the apical end of the chamber (distance from A to B)/(distance from A to the apex of the longest root) ≥0.2mm

Distance from B to CEJ ≥2.5mm[3].

The etiology of taurodontism is unclear. The possible causes of taurodontism have been enumerated by Mangion as follows:

1) A specialized or retrograde character,

Fig: C Clinical view

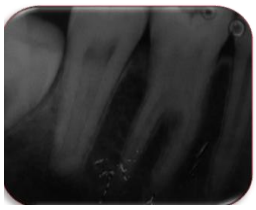


Fig:D Radiographic view

2) A primitive pattern,

3) A Mendelian recessive trait,

4) An atavistic feature, and

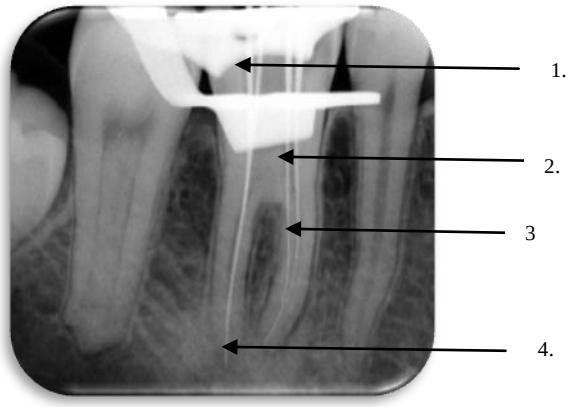
5) A mutation resulting from odontoblastic deficiency during dentinogenesis of the roots[4].

According to Hamner et al., taurodontism is caused by the failure of Hertwig's epithelial sheath diaphragm to invaginate at the proper horizontal level. In addition, it has been reported that many patients with the Klinefelter syndrome exhibit taurodontism, but it is not a constant feature of this syndrome[4].

Case Report

A 16 year old male patient was reported to the department of Conservative Dentistry and Endodontics, Manav Rachna Dental College, Faridabad, with a chief complaint of, pain in lower right back tooth. Patient gives history of moderate to severe pain since last 1 month which subsided after a course of analgesics. Clinical examination revealed deep carious lesion on mandibular right first molar *(Fig: C)*. The tooth was tender to percussion.

Radiographic examination reveled radiolucency involving enamel dentin and pulp with widening of periodontal ligament space. Radiograph also reveled an abnormal tooth anatomy with the pulp chamber extended beyond the cervical area reaching the furcation with two short roots *(Fig: D)*. Based on



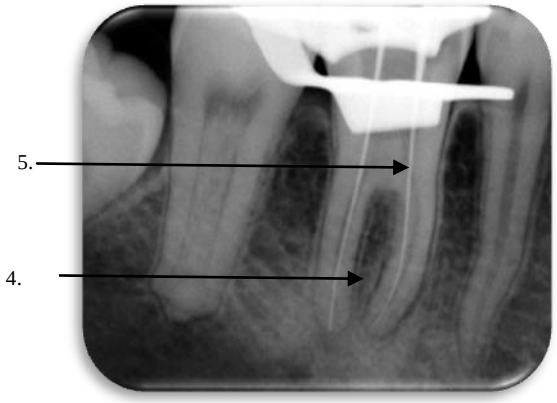


Fig: D Fig: E

1. Disto Lingual 2. Middle Mesial 3. Mesio Buccal 4. Disto Buccal 5. Mesio Lingual

Fig: F:The radiograph shows obturation of the canals with 0.5mm gutta percha cone beyond the apex in Mesio buccal canal

Fig: G: Radiograph after 30 days follow up showing seal into the accessory canal with warm vertical compaction

clinical and radiographic examination, the treatment advised was root canal therapy.

After adequate isolation with rubber dam, access was gained to the pulp chamber. The coronal necrotic pulp tissue was removed and the chamber irrigated with 3% sodium hypochlorite solution. On close inspection of the pulp chamber, very deep pulpal floor was found. Five distinct canals were found- 3 mesial-mesio buccal, middle mesial, mesio lingual, and 2

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Distal canals-distobuccal, distolingual. Initial negotiation of the root canals was performed with an ISO 8 No. K-file. Working length was taken by electronic apex locator (Endy 6200) and conformed by radiograph *(Fig: D)*. A separate radiograph for mesiolingual was taken separately with corrected working length of distobuccal canal *(Fig:E)*.

All canals were prepared to working length with NEONITI A1 files with intermittent copious

irrigation 3% sodium hypochlorite and normal saline along with ultrasonic tips. Calcium hydroxide was used as inter appointment dressing. Patient was re called after a week. The patient was asymptomatic. A final irrigation with 17%EDTA was performed. Canals were obturated using warm vertical compaction *(Fig: F).* Patient was re called a weak later and the patient was completely asymptomatic *(Fig:G).*

Discussion

Taurodontism refers to a condition in which the pulp chamber is widened apico-occlusally and thus, the furcation are positioned more apically than normal. Taurodontism is frequently associated with other anomalies and syndromes[5]. The patient discussed above, systemic disturbances or malformations could not be identified and hence considered to be of non syndromic taurodontism. A taurodont tooth shows wide variation in the size and shape of the pulp chamber, varying degrees of obliteration and canal configuration, apically positioned canal orifices, and the potential for additional root canal systems [1].

There are different views regarding *access cavity design and preparation:* Shifman & Buchner (1976) argued that access to the root canal orifices can easily obtained as the floor of the pulp chamber cannot affected by the formation of reactional dentine as in normal teeth. In contrast, Durr et al. (1980) suggested that morphology could hamper the location of the orifices, thus creating difficulty in instrumentation and filling.

From an Endodontist's view, taurodontism presents a challenge during negotiation, instrumentation and obturation in root canal therapy. Because of the complexity of the root canal anatomy and proximity of buccal orifices, complete filling of the root canal system in taurodont teeth is challenging[2]. Because the pulp of a taurodont is usually voluminous, in order to ensure complete removal of the necrotic pulp, 3% sodium hypochlorite has been suggested initially as an irrigant to digest pulp tissue (Prakash et al. 2005).

Moreover, as adequate instrumentation of the irregular root canal system cannot be anticipated. Application of final ultrasonic irrigation may ensure that no pulp tissue remains (Prakash et al. 2005)[1]. Therefore root canal treatment becomes challenge (Hargreaves & Goodis 2002, Tsesis et al. 2003, Rao & Arathi 2006). Moreover, whilst the radiographic feature of a taurodont tooth is characteristic, pre-treatment radiographs produce little information about the root canal system.

In addition to the difficulty of the endodontic procedure, a recent case report suggests the possibility of taurodont teeth having an extraordinary root canal system which is challenging for endodontists [4]. Each taurodont tooth may have extraordinary root canals in terms of shape and number. A complicated root canal treatment has been reported for a mandibular taurodont tooth with five canals, only three of which could be instrumented to the apex.

Therefore, careful exploration of the grooves between all orifices, especially with magnification has been recommended to reveal additional orifices and canals (Yeh & Hsu 1999) [1].

Conclusion

Although taurodontism is a rare occurrence its discovery can allow insight into other associated

syndromes and anomalies and proper understanding of the root canal morphology allows us to carry out successful endodontic treatment prolonging the longevity of the tooth in function.

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