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Taurodontism

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ABSTRACT

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. 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. Whilst it appears most frequently as an isolated anomaly, its association with several syndromes and abnormalities has also been reported. Despite the clinical challenges, taurodontism has received little attention from clinicians. Due to the prevalence of taurodontism in modern dentitions and the critical need for its true diagnosis and management, this review addresses the etiology, clinical and radiographic features of taurodontism, its association with various syndromes and anomalies, as well as important considerations in various areas of expertise dental treatments of such teeth.

KEY WORDS: Radiographs, syndromes, taurodontism

Dental anomalies are formative defects caused by genetic disturbances during tooth morphogenesis. One such anomaly is taurodontism. Taurodontism is a morpho-anatomical changes in the tooth shape in which the roots are reduced in size and the body of the tooth is enlarged. It is recognized as a clinical variant for almost a century. It has been found in the dentition of modern day races. It is characterized by pulp chamber enlargement, which may approximate of the root apex, with the body of the tooth enlarged at the expense of the roots and apically displaced furcation areas.[1] The bifurcation may be only a few millimeters above the apices of the roots.

Taurodontism was first described by Gorjanovic-Kramberger in 1908. However the term "taurodontism" was first proposed by Sir Arthur Keith in 1913. He coined the term that is derived from Greek "tauros" means "bull" and "odontos," which means "tooth" because of the morphological resemblance of affected tooth to the tooth of hoofed animal, especially bulls.[2]

Witkop defined taurodontism as "teeth with large pulp chambers in which the bifurcation or trifurcation is displaced apically and hence that the chamber has greater apico-occlusal height than in normal teeth and lacks the constriction at the level of cemento-enamel junction (CEJ). The distance from the trifurcation or bifurcation of the root to the CEJ is greater than the occluso-cervical distance."[3]

The diagnosis of taurodontism is mainly based on features that are particularly best visualized on the radiograph.[4] The most dental literature about taurodontism is relatively rare and most are case reports and only few reviews present.

Etiology and pathogenesis

Theories concerning the etiology of taurodontism have been diverse and is commonly attributed to the failure of invagination

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of the epithelial root sheath sufficiently early to form the cynodont.[3] This alteration in the Hertwig's epithelial root sheath involves failure of the epithelial diaphragm to form a bridge prior to dentin deposition resulting in large pulp chambers.[5] It has been indicated that the anomaly typify a primitive pattern, a specialized or retrograde character, a mutation, an X-linked trait, an atavistic feature, an autosomal dominant trait or familial. Although it has been described that it can be associated with genetic defects, certain syndromes and some its true sense is still obscure.[6] Taurodontism appears most often as an isolated anomaly, but it has been also affiliated with several developmental anomalies and syndromes [Table 1].

Pathogenesis of taurodontic root formation revolves around several theories

- An unusual developmental pattern, a delay in the calcification of pulp chamber
- An odontoblastic deficiency and an alteration in Hertwig's epithelial root sheath[7]
- Some believe that taurodontism is most likely the result of disrupted developmental homeostasis.[8]

Classification

In 1928 Shaw first classified as mild (hypotaurodontism), moderate (mesotaurodontism) and severe (hypertaurodontism) this condition based on the relative displacement of the floor of the pulp chamber, to more accurately define to which this condition is manifest.[7] Hypotaurodontism is the least pronounced form, in which the pulp chamber is enlarged; mesotaurodontism is the moderate form, in which the tooth roots are divided only at the middle third; and hypertaurodontism is the most severe form, in which bifurcation or trifurcation occurs near the root apices.[1]

In 1977, Feichtinger and Rossiwall stated that the distance from the bifurcation or trifurcation of the root to the CEJ should be greater than the occluso-cervical distance for a taurodontic tooth.[9]

Though, there are many classification systems to determine the severity of taurodontism, Shifman and Chanannel in 1978 proposed a new classification and is the widely used system until now.[10]

Radiographic features

Identification of the taurodontism can only be done by radiographic examination as the external teeth morphology within normal configurations. The radiographic examination is the best way to visualizing pulp chamber in a rectangular configuration. Diagnosis of taurodontism has been mainly based on subjective radiographic assessment. Taurodont tooth appearance is a very characteristic condition and is best visualized on the radiograph. Involved teeth presume a rectangular shape relatively tapering towards the roots. The pulp chamber is exceedingly large with a greater apico-occlusal height than normal and lacks the usual constriction at the cervical region of the teeth with exceedingly short roots. The trifurcation or bifurcation may be few millimeters above the apices of the roots.[11]

Clinical considerations

The clinical implications of taurodontism have potentially increased chance of pulp exposure due of decay and dental procedures. It may complicate prosthetic and/or orthodontic treatment planning. Taurodontism, although not very common have to be highlighted due to its influence on diverse dental treatments.

A taurodont tooth shows wide variation in its shape and size of the pulp chamber, varying degrees of obliteration and canal configuration, apically positioned canal orifices, and the potential for additional root canal systems.[12]

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. A modified filling technique, which consists of combined lateral compaction in the apical region with vertical compaction of the elongated pulp chamber, has been proposed.[13] 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

Recently, a case report highlights the use of high-end diagnostic imaging modalities such as cone-beam computed tomography is a relatively new diagnostic imaging modality that has been used due to obturation failure at the distobuccal root of taurodont teeth.[14]

The endodontic therapy of choice in these situations will be conservative. Therefore, root canal treatment becomes a challenge. Though taurodontism is of rare occurrence, the

Table 1: Syndromes associated with taurodontism

Amelogenesis imperfecta
Down's syndrome
Aperts syndrome
Focal dermal hypoplasia or goltz gorlin syndrome
Ectodermal dysplasia
Hypophosphatasia
Hyperphosphatasia-oligophrenia-taurodontism
Microcephalic dwarfism-taurodontism
Microdontia-taurodontia-dens invaginatus
Oculo-dento-digital dysplasia
Oral-facial-digital, Type II
Rapp-hodgkin syndrome
Dyskeratosis congenital
Klinefelter syndrome
Tricho-dento-osseous syndrome
Mohr syndrome
Wolf-hirschhorn syndrome
Lowe syndrome
Smith-magenis syndrome
Williams syndrome
Mccune-albright syndrome
Van der woude syndrome

clinician should be aware of the complex canal system for its successful endodontic management.

For the prosthetic treatment of a taurodont tooth, it has been recommended that post placement be avoided for tooth reconstruction.[15] Because less surface area of the tooth is embedded in the alveolus, a taurodont tooth may not have as much stability as a cynodont when used as an abutment for either prosthetic or orthodontic purposes.[12] The lack of a cervical constriction would deprive the tooth of the buttressing effect against excessive loading of the crown.

The extraction of a taurodont tooth is usually complicated because of shift in the furcation to apical third.[16] In contrast, it has also been hypothesized that the large body with little surface area of a taurodont tooth is embedded in the alveolus. This feature would make extraction less difficult as long as the roots are not widely divergent.[12] It is reported that extraction of such teeth may not be a problem unless the roots are not widely divergent. However, some authors believe that hypertaurodonts may pose some problem.

From a periodontal standpoint, taurodont teeth may, in specific cases, offer favourable prognosis. Where periodontal pocketing or gingival recession occurs, the chances of furcation involvement are considerably less than those in normal teeth because taurodont teeth have to demonstrate significant periodontal destruction before furcation involvement occurs.[11]

It is very important for a dentist to be familiar with taurodontism not only with regards to clinical complications but also its management. Taurodontism also provides a valuable clue in detecting its association with many syndromes and other systemic conditions.

Conclusion

Taurodontism is one of the rare dental anomalies in modern man which needs special attention while performing any treatment. The review attempts to provide knowledge regarding its etiology, related syndromes, classification, radiographic features and clinical considerations in the treatment of such taurodont teeth. It can be seen that taurodontism has until now received insufficient attention from clinicians. No long-term follow-up studies have been published regarding treatment of taurodont teeth.

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