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RESEARCH ARTICLE

CHALLENGES IN ENDODONTIC MANAGEMENT OF TAURODONTISM

***,[1]Ramachandran Tamil Selvi, [2]Veronica Arunakumari, [3]Ilango Porkodi, [4]Bhaskaran Sathyapriya and [5]Purushothaman Lakshmanan**

[1]Reader, Department of Endodontics, Sree Balaji Dental College & Hospital, Bharath Institute of Higher Education and Research, Chennai, Tamilnadu
[2]Reader, Department of Endodontics, Madha Dental College, Chennai, Tamilnadu
[3]Reader, Department of Endodontics, Best Dental Science College, Madurai
[4]Reader, Department of Anatomy, Sree Balaji Dental College & Hospital, Bharath Institute of Higher Education and Research, Chennai, Tamilnadu
[5]Consultant Orthodontist, Apollo White Dental, Chennai, Tamilnadu

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ABSTRACT

Taurodontism is the dental anomaly caused by the failure of Hertwig's epithelial sheath diaphragm to invaginate at the proper horizontal level. The characteristic features are, enlarged pulp chamber, apical displacement of the pulpal floor, and no constriction at the level of the cemento-enamel junction. Both the permanent and deciduous dentition presents taurodontism, unilaterally or bilaterally, and in any combination of teeth or quadrants. Permanent molar teeth are most commonly affected. The complexity of the root canal is the challenging task while performing endodontic treatment on such teeth. Careful diagnosis and investigation with the three dimensional imaging technique like computed tomography, use of surgical microscope and ultrasonic irrigation and thermoplasticised obturation technique helps in success of endodontic treatment with taurodontism.

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INTRODUCTION

Taurodontism is one of the most important dental anamoly. The term taurodontism comes from the Latin term tauros, which means 'bull' and the Greek term odus, which means 'tooth' or 'bull tooth'. (Keith, 1913) 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. (Rao and Arathi, 2006) Taurodontism was first described in 1908 by Gorjanovic - Kramberger 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. (Coon, 1963) The term 'taurodontism' was however first stated by Sir Arthur Keith in 1913. Taurodontism has been found in the dentition of modern races. (MacDonald-Jankowski, 1993; Darwazeh *et al*., 1998) The prevalence is reported to range from 2.5% to 11.3% of the population (Joseph, 2008; Sert and Bayrl, 2004). Taurodontism may be unilateral or bilateral with no sex predilection and affects permanent teeth more frequently than primary teeth. Mandibular molars are found to be affected more often than maxillary molars and the mandibular second molar is the most frequently involved tooth. (Sathyapriya *et al*., 2017) It is characterized by enlargement of the pulp chamber, 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. (Mena, 1971) The bifurcation or trifurcation may be only a few millimeters above the apices of the roots. This review addresses the aetiology, anatomic and radiographic features of taurodontism and endodontic management of taurodontism.

Aetiology

The aetiology of taurodontism is by the failure of Hertwig's epithelial sheath diaphragm to invaginate at the proper horizontal level. (Hamner *et al*., 1964; Terezhalmy *et al*., 2001)

******Corresponding author:* **Ramachandran Tamil Selvi,**
Reader, Department of Endodontics, Sree Balaji Dental College & Hospital, Bharath Institute of Higher Education and Research, Chennai, Tamilnadu

Taurodontism was suggested to have genetic transmission and was considered to be associated with an increased number of X chromosomes. (Gage, 1979) Later, it was found to have no simple genetic association but have noticed a trend for X chromosomal aneuploidy amongst patients with more severe forms of the trait. (Jaspers *et al*., 1980) The people with heavy masticatory habits (for example, the Neanderthals and Inuit (Eskimos), who prepared skins for protection from the cold by chewing) or in populations in which teeth were used as tools, taurodontism was found to be a genetically determined trait. (Witkop, 1976) The other external factors can also damage developing dental structures in children and adolescents. The external factors like, infection (osteomyelitis) (Reichart and Quast, 1975), disrupted developmental homeostasis (Witkop *et al*., 1988), high-dose chemotherapy (Greenberg and Glick, 2003) and a history of bone marrow transplantation (Vaughan *et al*., 2005) contributes to taurodontism.

Anatomic Features

The pulp chamber of the teeth with taurodontism is extremely large and with greater apicoocclusal height and extends apically below the CEJ. (Yeh and Hsu, 1999; Sert and Bayrl, 2004) Taurodont presents with rectangular shape and the CEJ constriction is less marked than that of the normal tooth. The roots are shorter than the crown due to the apically displaced crown. (Keith, 1913; Durr *et al*., 1980)

Clinical and radiographic characteristics

The body and roots of a taurodont tooth lie below the alveolar margin. The distinguishing features cannot be recognized and exhibits normal appearance clinically. (White and Pharoah, 2004) Hence, the diagnosis of taurodont is made from diagnostic radiographs usually a subjective determination made. (Neville *et al*., 2002) Radiographically, taurodont tooth has the characteristic features of, normal crown size extension, rectangular pulp chamber into the elongated body of the tooth, shortened roots and root canals, location of furcation near the root apices. (Terezhalmy *et al*., 2001) Developments in image quality have aided in the analysis of root canal morphology, especially with respect to canal identification and length, and also enhanced postoperative evaluationof endodontic treatment. Computerized tomography can be useful for the diagnosis and treatment of taurodontism, as it helps in visualisation of taurodontic tooth roots from different dimensions.

Endodontic management

A taurodont exhibits a wide variation in the size and shape of the pulp chamber, varying degrees of obliteration and canal configuration, apically positioned canal orifices, and extra canals which increases the difficulty of instrumentation and obturation. A mandibular taurodont tooth with five canals, only three of which could be instrumented to the apex was reported. (Hayashi, 1994) Hence, a careful exploration of the grooves between all orifices using magnification helps in location of additional orifices and canals. During cleaning and shaping procedure, sodium hypochlorite with ultrasonics is the recommended irrigant for the complete extripation and dissolution of the voluminous pulp tissue. The combination of the lateral compaction technique and the warm vertical compaction technique can be used to obturate a taurodont tooth. (Tsesis *et al*., 2003) Sectional sealing of apical portion of the canal and backfill with thermoplasticized gutta-percha ensures a three- dimensional obturation of the canals and also prevents apical extrusion of the material. (Prakash *et al*., 2005)

Conclusion

Taurodont teeth show wide anatomical variations with potential for additional root canal systems. Hence, while performing root canal treatment, the complexity of the root canal system has to be appreciated. Careful clinical and radiographic diagnosis with additional aids like cone beam computed tomography, exploration of the grooves between all orifices with magnification, ultrasonic irrigation, and modified thermoplasticied obturation techniques are recommended. Long term follow-up studies are required regarding endodontically treated taurodont teeth.

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