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PEDODONTICS

NON-SYNDROMIC TAURODONTISM

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ABSTRACT

Taurodontism is characterized by teeth with enlarged and elongated pulp chambers and apical displacement of the bifurcation or trifurcation of roots. This anomaly occurs either as an isolated, singular trait or in association with syndromes and with some ectodermal anomalies. This article describes taurodontism in two cases. Both the cases were not associated with any other syndromes.

Key words: *Taurodontism, hypotaurodontism, mesotaurodontism, hypertaurodontism, apexification.*

INTRODUCTION

Taurodontism, is recognized as a clinical entity for almost a century. It is a dental anomaly characterized by enlargement of the pulp chamber[1], which may reach the proximity of the root apex, with the body of the tooth enlarged at the expense of the roots and apically displaced furcation areas[2]. The term taurodontism was first stated by Sir Arthur Keith[3] in 1913, although it was first described by Gorjanovic-Kramberger[4] in 1908 in 70,000-year old pre-Neanderthal fossils, discovered in Kaprina, Croatia. The name was given because of the apparent similarity between these teeth and those of ungulates. Tauro is derived from Latin meaning "**bull**" and dont from Greek meaning "tooth" and hence the term Taurodont[3]. Taurodontism can be seen in primary dentition[5-7] or permanent dentition[2,8] or in both[9-13] and can involve a single tooth or multiple teeth in both jaws. It is more common in molars; although it occurs occasionally in premolars and incisors.

Etiology

Taurodontism develops after the completion of crown of the tooth[1]. The Hertwig's epithelial root sheath which begins to form from the cervical ring, will limit the pulp mesenchyme tissue by forming an apical diaphragm. In its growth towards the apex, this diaphragm will determine the number of roots and thus prepare the floor of the pulp chamber. Therefore, a delay in its development causes a wider pulp chamber than normal[14]. This delay could be due to a genetic disturbance resulting in an interference or dilation in epithelial-mesenchyme tissue induction.

Classification

In 1928, Shaw[15] classified the types of taurodontism as hypotaurodontism, mesotaurodontism and hypertaurodontism based on the relative amount of apical displacement of the floor of the pulp chamber. This subjective, arbitrary classification led normal teeth to be misdiagnosed as taurodontism. Some au-

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thors have attempted a more objective approach to the assessment. In 1977, Feichtinger and Rossiwall[16] suggested that to define taurodontism, the distance from the furcation of the roots to the cemento-enamel junction should be greater than the occlusal cervical distance. Later, in 1978, Shifman and Chanannel[17] proposed the following criteria for determining the presence or absence of taurodontism after considering more objective criteria on the basis of determined measurements of the tooth: Taurodontism is present if the distance from the lowest point at the occlusal end of the pulp chamber (A) to the highest point at the apical end of the chamber (B) divided by the distance from A to the apex (C) is equal to or greater than 0.2mm and when the distance from B to the cemento-enamel junction (D) is greater than 2.5mm (Fig.1)

If premolars are considered to be taurodont, they must have the following anatomical characteristics:

1. Lower cervical constriction.
2. A broad, prism-shaped root with cervical and apical thickening.
3. A dilated, bifurcated and slightly concave root and
4. Enlargement of the pulp chamber with root bifurcation.

Taurodontism may be associated with certain diseases like Hypophosphatasia[18-21], Klinefelter's syndrome[6,22-26], Trisomy 21 or Down's syndrome[27,28], X-Chromosome aneuploid syndrome[16,23,3]∘, XXX-Chromosome syndrome[31], associated with XYY Syndrome[32], Hereditary Ectodermal Dysplasia[33], Tricho-OnychoDental syndrome[34], Orofacial Digital II syndrome or Mohr syndrome[35], Tricho-Dento-Osseous syndrome[36,37], Amelo-Onycho-Hypohidrotic syndrome[38] and Hypohidrotic Ectodermal dysplasia linked to the X-Chromosome[39].

CASE REPORTS

Case **1**

A 7-year old boy reported to the Department of Pedodontics, Meenakshi Ammal Dental College and Hospital, Chennai with the chief complaint ofpain and sensitivity in a carious tooth in the lower right back region. History revealed that the boy was suffering from pain for six days before his visit to the hospital and the pain was spontaneous and aggravated at night. His medical history was not contributory. On intra oral examination, deep carious lesion was found on the occlusal surface of the mandibular right first permanent molar. Carious pits were also seen on the buccal surface of mandibular left permanent first molar and occlusal surfaces of mandibular primary second molars. Intra oral periapical radiograph of mandibular right permanent first molar was advised to evaluate the extent of caries. Radiographic examination revealed caries involving the pulp in the tooth (Fig.2). In addition the following findings were also noted.

1. Permanent first molar and primary first and second molars had their pulp chambers enlarged to an extent to reach the proximity of the roots.
2. Immature apex and periapical radiolucency in right permanent first molar.

From the clinical and radiographic findings, the teeth were diagnosed to be taurodont. To evaluate the other quadrants a panoramic radiograph (Fig.3) was taken which revealed all the maxillary and mandibular primary first and second molars and permanent first molars to be taurodonts.

Apexification was planned because of open apex in the mandibular right permanent first molar. Access was gained to the pulp after local anesthesia and rubber dam isolation. Pulp was extirpated and the root canals were filled with calcium hydroxide (R.C.Cal) in a single visit (Fig.4). Patient was advised to report to the department for follow-up at 2- and 6- weeks, 3- and 6-months intervals (Fig 5, 6).

Case 2

A 10-year old boy reported to the Department of Pedodontics, Meenakshi Ammal Dental College and Hospital, complaining of pain in the lower left back carious tooth. History revealed that the pain was spontaneous and aggravated at night. His medical history was not contributory. Intraoral soft tissue examination revealed a fenestration on the alveolar

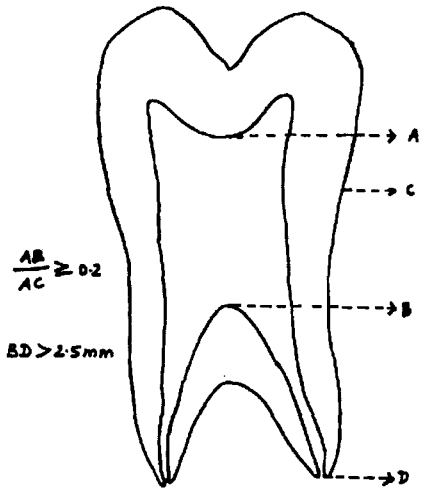

Fig 1. Measurements of taurodont teeth according to the criteria of Shifman and Chanannel17

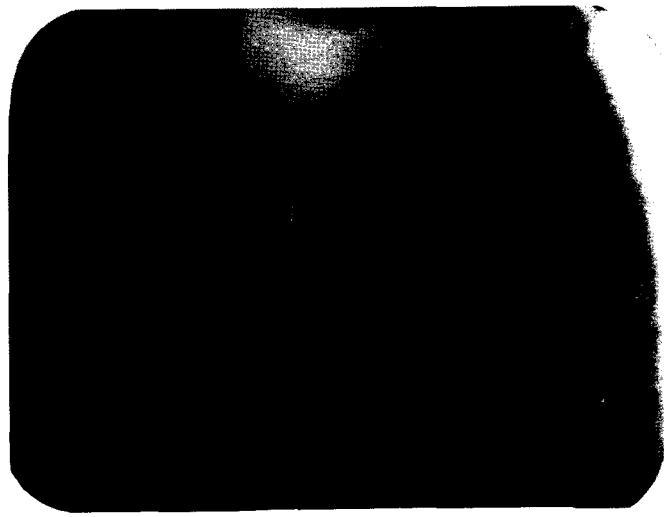

Fig 4. Intraoral periapical radiograph taken immediately after apexification.

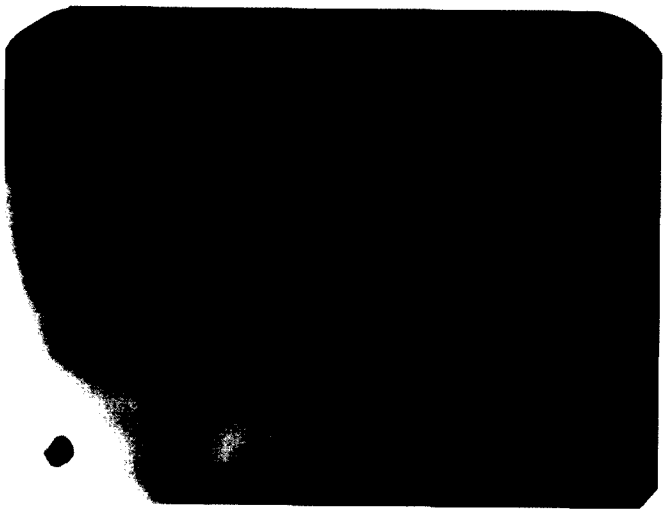

Fig 2.Intraoral periapical radiograph of mandibular right first permanent molar.

Fig 5. Intraoral periapical radiograph taken after 15 days.

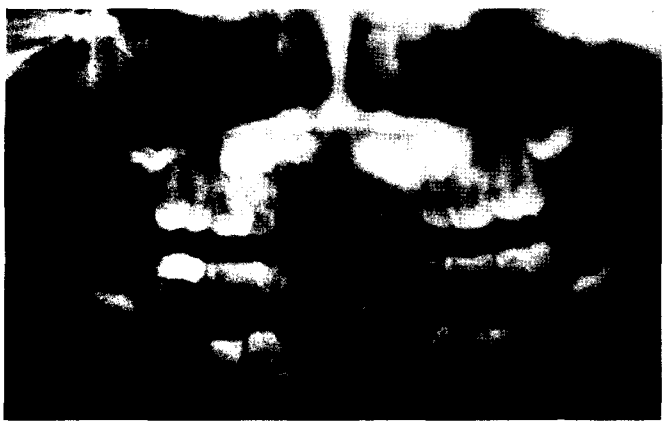

Fig 3. Panoramic radiograph showing the taurodontic maxillary and mandibular primary first and second molars and permanent first molars.

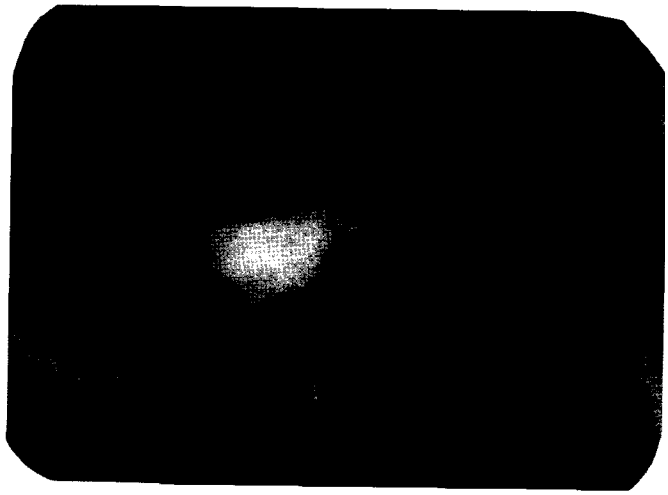

Fig 6. Intraoral periapical radiograph taken after 1 month.

Fig 7. Panoramic radiograph of case:2 showing taurodontic mandibular left primary second molar and maxillary and mandibular permanent first molars.

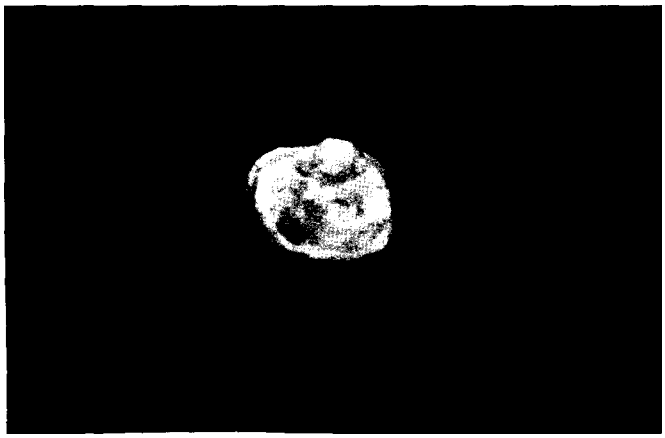

Fig 8. Extracted tooth revealing absence of apical foramen.

mucosa close to the mandibular left primary second molar exposing the root. Hard tissue examination revealed that the morphology of the dentition was larger than normal and secondary caries affecting the mandibular left primary first molar which has been restored with glass ionomer cement. Caries were also noticed on teeth #16, 15, 14, 53, 63, 26, 36 and 46. Retained roots of tooth #62 and #84 were seen. Intraoral periapical radiograph of mandibular left primary second molar revealed that the crowns of the tooth and adjacent permanent first molar were enlarged at the expense of their roots and apically displaced furcation areas. Hence these teeth were diagnosed to be taurodonts. Panoramic radiograph (Fig.7) revealed all the permanent first molars and mandibular left primary second molar were also affected by taurodontism. Maxillary left first premolar and mandibular right canine were found missing. Considering the age of the patient and the fenestration present over the gingiva resulting in loss of periodontal support of mandibular left primary second molar, it was extracted under local anesthesia. The extracted tooth appeared to be rectangular in shape measuring 18mm, with no apical foramen found when probed with an explorer (Fig.8). Radiograph of the extracted tooth showed that the pulp chamber was enlarged with no root canals (Fig.9).

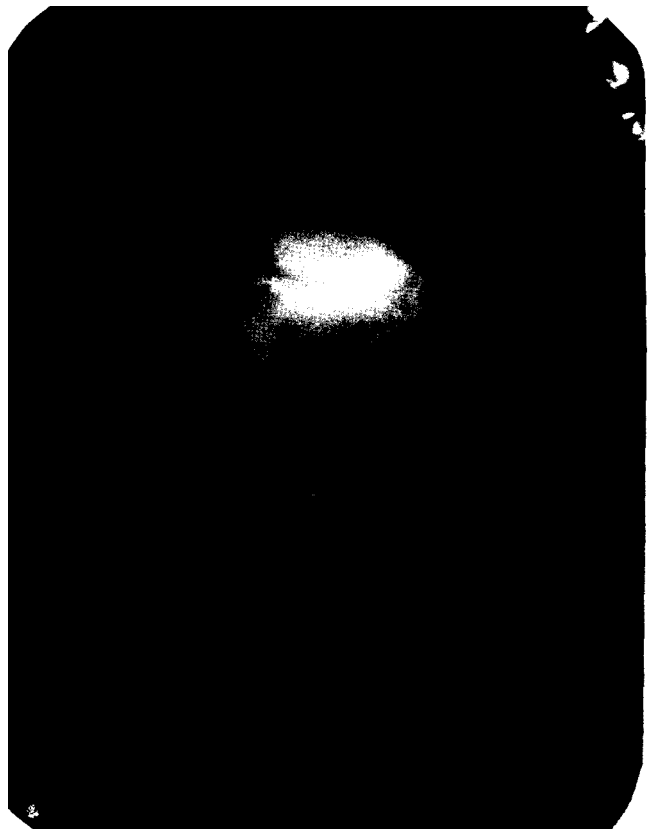

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Fig 9. Radiograph of extracted tooth showing enlarged pulp chamber with absence of root canals.

DISCUSSION

Taurodont teeth vary in morphology where the pulp chamber is enlarged apically by having the floor of the pulp chamber, and thus the furcations, positioned more apically than the normal location[2]. The incidence of taurodontism is variable, depending on the different series and groups studied. It is lower than 1% in modern man.

Pathogenesis of taurodont tooth, according to some authors, may be due to a primitive pattern, a mutation, a specialized or retrograde character, a Mendelian recessive, an atavistic feature[40], a continuous trait without discrete modes of expression, an X-linked system, familial, and an autosomal dominant trait, at least when associated with amelogenesis imperfecta or with the tricho-dento-osseus syndrome. Ackerman and associates[41] believed that tooth root morphology is primarily determined genetically but that it may be environmentally modified. The teeth most frequently affected are the molars although it occasionally can be seen in premolars and incisors and are mostly diagnosed by radiographic study. Various theories have been proposed regarding the pathogenesis oftaurodontic root formation: an unusual developmental pattern, a delay in calcification of the pulp chamber floor, an odontoblastic deficiency, an alteration in Hertwig's epithelial root sheath involving a failure of the epithelial diaphragm to invaginate at the proper horizontal level, and a delayed or incomplete union of the horizontal epithelial diaphragm[27].

Some authors have reported taurodontism to be a primitive tooth form. Witkop[35] said that taurodontism is more prevalent in people who use their teeth as tools. Mj Mj[or42] stated that taurodontism is seen in people such as Eskimos, Aleuts, Europeans, American black people and American white people. But Sciulli found no evidence of taurodontism in prehistoric American Indians, a group of people who must have also used their teeth extensively. Shifman and Chanannel[17] suggested an even wider distribution of taurodontism within population groups. The reported rates of occurrence range from 0.57% through 4.37%. Although there exist many classification systems to determine the severity of the taurodontism, the one proposed by Shifman and Chanannel[17] is the widely used system, to measure the severity of the taurodontism.

In these case reports, the former patient had immature apex in the mandibular right permanent first molar. So, apexification was planned to induce the formation of a calcific barrier for gutta-percha obturation in the future. On the other hand, in the latter case, the mandibular left primary second molar was extracted because the periodontal support was found to be lost due to the fenestration over the attached gingiva exposing the entire root portion of the tooth.

The extracted tooth appeared to be rectangular in shape measuring 18mm, with no apical foramen found when probed with an explorer. Radiograph showed that the pulp chamber is enlarged with no root canals. All the other carious teeth were restored and retained roots were extracted in both the cases.

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