Taurodontism is a developmental disturbance of a tooth, which lacks constriction at the level of the cement-enamel junction and characterized by vertical elongation of the pulp chamber, apically displaced pulpal floor and bifurcated or trifurcated roots. This condition is probably the result of failure of the epithelial root sheet to differentiate and induce the normal root formation. It may affect the deciduous (rarely) or permanent dentition. It refers to a tooth form, characterized by an external block configuration and often goes unnoticed by the clinician. In some families, it is inherited as autosomal dominant trait, with no gender predilection. Taurodontism in first primary molar is a rare phenomenon. This paper attempts to review taurodontism, both in the primary and permanent dentition and report a case of taurodontism in the primary first molars.

Key Words: Deciduous molars, non-syndromic, taurodontism.

Review of literature
Taurodontism may occur unilaterally or bilaterally, having an affinity for permanent teeth more than primary teeth, with a low prevalence rate in the general population and ethnic variance, with the Eskimos and Natives of Australia and Central America being more commonly affected. The modern-day prevalence of taurodontism in populations has varied from 0.54%, in the primary dentitions of Japanese children to as high as 5.6%, in the permanent dentitions of Israeli adults.
In 1928, Shaw classified taurodontism as hypotaurodontism, mesotaurodontism, and hypertaurodontism and included a pyramidal form of root canal as well, which was attributed to the relative amount of apical displacement of the pulp chamber floor.
Jorgensen discounted the classification of Shaw as being inapplicable for the primary dentition. He suggested a classification specifically for the primary dentition, which identified two types. Type I being when the height of the root stem, the vertical distance between the amelo-cemental junction and the most apical point of the root bifurcation, is <2.5 mm; while Type II is when the height of the root stem is more
than 2.5 mm; However, this system is dependent on the overall dimension of the tooth.\(^5\) Some of the syndromes associated with taurodontism are amelogenesis imperfecta - taurodontism IV, Klinefelter syndrome, Rapp–Hodgkin’s syndrome, Down’s syndrome, and oral-facial-digital-1.\(^6\)

According to the diagnostic criteria by Shifman and Chanannel, a tooth is taurodont when the distance from the lowest point of the pulp chamber roof, \(A\) to the highest point of the floor \(B\), divided by the distance from the pulp chamber roof, \(A\) to the root apex \(C\) is \(\geq 0.2\) mm; and when the distance from the highest point of the floor, \(B\) to the CEJ \(D\) is \(>2.5\) mm.\(^6\) Theories related to the pathogenesis of taurodontic tooth formation include, an unusual pattern of development, with a delay in the calcification of the pulp chamber floor, an alteration in Hertwig’s epithelial root sheath, along with an apparent failure of the epithelial diaphragm to invaginate at the normal horizontal level and “a delayed or incomplete union of the horizontal flaps of the epithelial diaphragm.”\(^6\)

In primary dentition

The first report of taurodontism in modern man’s dentition was published in 1909 by Pickerill, who used the term “radicular dentinoma” to describe the condition. He described two maxillary first molars exhibiting an overall cuboidal or “bale” shape with normal crowns, and one central quadrilateral-shaped pulp cavity instead of individual root canals. Since Lunt’s description of a single tooth in 1954, the recent literature contains not infrequent reports of taurodontism as an isolated oddity, a familial trait, a trait with high frequency in Eskimos, and associated with several types of other systemic disturbances.\(^3\)

Even though the first report was in 1909, Gorjanovic-Kramberger in 1908 described taurodontism in a 70,000 years old pre-neanderthal fossil skull discovered in Kaprina, Croatia.\(^7\)

In 1965, Lysell reported a case of taurodontism in deciduous molars of a Swedish boy. The first permanent molars did not show this trait.\(^8\)

Senyurek in 1939 noted taurodontism in the teeth of ancient Egyptians, ancient Icelanders and early American Indians.\(^9\)

Following this initial case report, few case of taurodontism was reported in the literature during the next 50 years. Pillai \textit{et al.} in 2007 reported the presence of taurodontism in premolar in a section of Trinidadian population. Prevalence of taurodontism was assessed by the radiographic study 4.79%, and was found to be higher in the males as compared to females. Significant differences were also observed between mandibular and maxillary premolars.\(^10\)

Joshy \textit{et al.} in 2011 reported a rare case of a 15-year-old male patient who presented with taurodontism involving all the developed molars in all four quadrants, which was not associated with any other anomaly or syndrome.\(^11\)

In primary dentition

Cesar in 1971, published the first reported case of taurodontism in the deciduous dentition, where he described it as a definite family trait in Afro-American children.\(^12\) Subsequently, more cases were reported. Goldstein and Gottlieb in 1973 reported cases of taurodontism in families of 14 persons. Familial relationships of taurodontism are evidenced by the fact that 11 of the 14 persons were members of three families. Of the remaining three cases, one is an isolated report, and two appear to have no familial relationship.\(^13\) Bhat \textit{et al.} in 2004 reported a case of 5-year-old male child having taurodontism in all the deciduous molars. The permanent molars were normal. The mandibular deciduous molars required pulp therapy, which was performed under local anesthesia in multiple sittings.\(^14\) Rao and Arathi in 2006 reported taurodontism involving all the deciduous and permanent molars (non-syndromic).\(^15\)

Bharti \textit{et al.} in 2009 reported a case of endodontic treatment in a maxillary right first primary molar with taurodontism. In this case, the maxillary right second molar and maxillary left first and second molars were also taurodontic along with the maxillary right first primary molar.\(^9\) Tyagi in 2010 reported a case of a 5-year-old boy with taurodontic lower left second primary molars, which was endodontically treated.\(^6\) Reddy, 2010 reported a unique case of endodontic treatment in a 5-year-old male child with four taurodontic primary molars.\(^1\)

Case Report

An 8-year-old girl child reported to the pediatric dental clinic, with a complaint of pain in the lower right and left back teeth region of about 3 weeks duration. Clinical examination revealed the presence of a mixed dentition with high caries activity. Routine diagnostic radiographs (Figures 1 and 2) were advised, which revealed taurodontic mandibular first primary molars bilaterally (74 and 84) characterized by the presence of large pulp chambers and short roots. An orthopantogram (Figure 3) was advised, which confirmed the finding and also ruled out the presence of any other anomaly. General examination did not reveal any significant finding. Bilateral functional space maintainer was delivered after extraction of 75 and 85, followed by restoration of 74, 84 and regular recall visits were scheduled.

Discussion

Taurodontism is a condition in which trunk of the tooth is elongated, and the pulpal floor is displaced apically with proportionately shortened roots. The term is meant to shed light on the close similarity between human teeth and those present in ungulates, particularly bulls.
Several attempts have been made to define the term "taurodontism" objectively. These attempts followed Shaw's sub classification of taurodont teeth into hyper-, meso-, and hypertaurodont teeth. Keene attempted to define certain radiographic features of mandibular root morphology in biometric terms in a study of 247 white males. He developed a "taurodontism index" by comparing the vertical height of the pulp chamber to the vertical height of the tooth portion containing the pulp. Using this index, Keene was able to biometrically define Shaw's hypo-, meso-, and hypertaurodont teeth. Keene's "taurodontism index," however, was criticized by Stenvik et al., who felt that a biometric description of taurodontism such as Keene's did not consider the changes in the size of the pulp chamber brought about by physiological aging.

Blumberg et al. attempted to define taurodontism by the use of metrical attributes, which were considered not likely to be influenced by environmental factors. From a population sample of 200 individuals, a discriminant analysis was developed. Through this analysis, the authors were able to distinguish certain tooth dimensions that permitted distinguishing between taurodontic and non-taurodontic molars. The analysis found no influence on the sample from caries, sex, or age, but did find differences due to race. The dimensions utilized are constant throughout the life and are unaffected by aging or wear.

A summary of the literature indicates that taurodontism occurs as an isolated trait with predilection for association in certain familial groups with common racial, geographical, and ethnic backgrounds; in certain syndromes with greater than expected frequency; and in patients with a male habitus and aneuploidy of the X chromosome.

Dental management, especially endodontic treatment in taurodontic teeth is a complex and difficult procedure. Pulp therapy for taurodontic teeth is a treatment challenge, with increased incidence of hemorrhage during access opening procedure, which may be mistaken for perforation of the root canal. Since the roots are short, and floor of the pulp chamber is placed more apically than normal teeth, care should be taken to prevent iatrogenic perforation.

The present case is significant owing to the presence of taurodontic primary molars, which requires a thorough clinical and radiographic examination to help in proper diagnosis and treatment planning.

References

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