

Prevalence of Taurodontism of Permanent Molars in Dental School of Shahid Beheshti University from 2000 to 2006

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Abstract

Objective: Taurodontism is a dental anomaly characterized by elongation of root body and apical displacement of the pulp chamber floor associated with shortening of roots and their narrowing at the cemento-enamel junction (CEJ). Due to having a dilated apical one-third, these teeth may cause complications during extraction, locating canal orifices and instrumentation. This study aimed to assess the prevalence of taurodontism of permanent molars in a small Iranian population.

Methods: This retrospective descriptive study was conducted on 1,100 dental records of patients that were randomly selected among 5,672 records available in the archives of School of Dentistry, Shahid Beheshti University of Medical Sciences from 2000 to 2010 that met the inclusion and exclusion criteria. Teeth with extensive restorations or carious lesions were excluded. One observer evaluated all the radiographs and the teeth were classified based on the presence or absence of taurodontism. All positive cases were re-evaluated by two examiners and accurate measurements were made using a caliper according to Shifman and Chanannel criteria.

Results: A total of 1,184 radiographs were evaluated; of which 447 (47.7%) belonged to males and 737 (62.3%) belonged to females. A total of 5,532 first and second molars of both jaws were evaluated in these radiographs. There were 1,310 (23.7%) maxillary first molars, 987 (17.8%) mandibular first molars, 1,731 (31.3%) maxillary second molars and 1,504 (27.7%) mandibular second molars. Overall, 293 teeth had taurodontism; of which, 179 belonged to females and 114 belonged to males.

Conclusion: The prevalence of taurodontism in the understudy population was 6.41%. It appears that taurodontism is not as rare as it is thought to be.

Key words: Dentition, Molar, Permanent, Population, Taurodontism.

Please cite this article as:

Moshfeghi M, Mirzaeipour A, Kheirkhahi M. Prevalence of Taurodontism of Permanent Molars in Dental School of Shahid Beheshti University from 2000 to 2006. *J Dent Sch* 2015; 33(3):205-209.

Received: 21.04.2015

Final Revision: 20.06.2015

Accepted: 20.07.2015

Introduction:

Taurodontism is a dental anomaly characterized by elongation of root body and apical displacement of pulp chamber floor. This condition is associated with shortening of root and their narrowing at the CEJ (1). The prevalence of this anomaly ranges from 5.6 (2) to 60% (3) in different communities. To put it simply, taurodontism is a malformation of teeth characterized by elongation of pulp chamber. The furcation is displaced apically in this

anomaly. Providing an accurate definition for taurodontism prior to its quantitative assessment is important (4).

Shaw classified teeth with taurodontism into three categories of hypotaurodont, mesotaurodont and hypertaurodont based on the relative amount of apical displacement of pulp chamber floor (5). In most relevant studies, diagnosis of taurodontism has been made based on radiographic assessment, direct observation (6) and occasionally, custom criteria, which are not necessarily acceptable globally (7).

The etiology of taurodontism has yet to be identified; but it appears to be due to impaired invagination of Hertwig's sheath at its accurate horizontal level (8). Due to having a dilated apical one-third, these teeth may cause complications during extraction (9), locating canal orifices and instrumentation (10). However, teeth with taurodontism have one advantage. The large pulp can synthesize higher amounts of dentin to compensate for the lost tooth structure due to attrition (11). Passive eruption via another mechanism compensates for the lost tissue. Moreover, furcal involvement only occurs following severe periodontal destruction (12).

Permanent teeth are more commonly involved than primary teeth and taurodontism may be unilateral or bilateral. Both sexes are affected equally. Second and third molars are more commonly affected and first molars have the least prevalence of taurodontism (1).

Taurodontism associated with numerous syndromes and genetic defects, its true significance is still obscure (13). Developmental syndromes with taurodontism include amelogenesis imperfecta, Down's syndrome, ectodermal dysplasia, Klinefelter syndrome, Lowe syndrome (14) and rare syndrome such as Smith-Magenis syndrome (15), Williams syndrome (16), McCune-Albright syndrome (17) and Vandenbroucke syndrome (18).

Taurodontism changes the shape, size and structure of tooth (19), modify the surgical treatment, endodontics, and restorative dental procedure (20) and identification of prevalence of these can be helpful to prevent surgical accidents, guide a more effective dental treatment (21). This study aimed to assess the prevalence of taurodontism of permanent molars in an Iranian population.

Methods:

This retrospective, descriptive study was

performed based on the available data extracted from panoramic radiographs present in patient records in the archives of School of Dentistry, Shahid Beheshti University of Medical Sciences. The extracted data were recorded in data sheets. Patient records were selected using non-probability sampling. According to the previous study, sample size was calculated to be 1,100 patient records. For this purpose, 5,672 patient records were randomly chosen from the patient records available in the archives of the School of dentistry, Shahid Beheshti University of Medical Sciences from 2000 to 2006. A total of 1,184 records of patients over 18 years of age, who had first and second molars and a panoramic radiograph available in their records were selected. Teeth with extensive restorations or caries were excluded. In teeth with root resorption or immature roots (with adequate mineralized tissue, pulp chamber and furcation area), the location of apex area was estimated based on the adjacent teeth. Of all records, 300 cases were evaluated by two observers to assess intra- and inter-observer reliability.

All radiographs were evaluated by one observer and classified based on the presence or absence of taurodontism. Questionable cases were assigned to the taurodontism group. All the positive (taurodontism) cases were evaluated by both observers and accurate measurements were made using a caliper according to Shifman and Chananel criteria (2). Based on their definition, a tooth was diagnosed as having taurodontism when "the distance from the most inferior occlusal point of the pulp chamber (A) to the highest point in the apical end of the pulp chamber (B)" divided by the distance from point A to apex" was 0.2 or more and the distance from point B to CEJ was more than 2.5 mm.

Results:

Of 5,672 patient records present in the archives of School of dentistry, Shahid Beheshti

University, 2,023 contained panoramic radiographs of patients; out of which, 1,184 were evaluated including 447 (47.7%) radiographs of male and 737 (62.3%) radiographs of female patients. A total of 5,532 first and second molars of both jaws were evaluated including 1,310 maxillary first molars (23.7%), 987 mandibular first molars (17.8%),

1,731 maxillary second molars (31.3%) and 1,504 mandibular second molars (27.7%). Due to the incomplete registry of genetic conditions of patients (i.e. Down's syndrome, Klinefelter's syndrome, trisomy, etc.) in their dental records, we could not assess the relationship of possible genetic conditions of patients with occurrence of taurodontism. (Table 1)

Table 1- Type of taurodont teeth

	Male	Female	Total
Right maxillary first molar	10 (3.6%)	15 (3.6%)	25 (3.6%)
left maxillary first molar	11 (4%)	12 (3.4%)	23 (3.7%)
Right maxillary second molar	17 (5.7%)	24 (4.8%)	41 (5.1%)
left maxillary second molar	20 (4.6%)	25 (4.9%)	45 (4.8%)
Right mandibular first molar	12 (6.3%)	21 (6.7%)	33 (6.6%)
Right mandibular first molar	10 (5.3%)	14 (4.7%)	24 (4.9%)
Right mandibular second molar	19 (7%)	37 (7.1%)	56 (7.1%)
left mandibular second molar	18 (6.1%)	28 (6.6%)	46 (6.4%)
total	114	179	293

Discussion:

Of a total of 1,184 understudy patients, 76 (6.41%) and of a total of 5,532 molar teeth evaluated, 293 (5.29%) showed some degrees of taurodontism. No significant difference was found in prevalence of taurodontism between males (6.48%) and females (6.37%). The maxillary right first molars had the lowest (3.6%) and the mandibular right second molars had the highest (7.1%) prevalence of taurodontism. The prevalence of taurodontism in the understudy population was 6.41%. Shokri *et al.* reported this rate to be 9.29% in Hamedan among 7-35 year olds (22). This value was reported to be 0.4% by Santosh *et al.* (2015) in India (23), 5.5% in premolars and molars by Bonoosh *et al.* (2012) in southern Iran (24), 22.8% of patients and 4.2% of extracted teeth by SinanTopcuoglu *et al.* (2011) in Turkey (25), 2.25% of patients by Sebastian *et al.* (2011) in Germany (26), 2.49% by Saurabh *et al.* (2011) in India (27), 7.5% by EzoddiniArdakani *et al.* (2007) in Yazd (Iran) (28), 11.3% by Ruprecht, *et al.* (1987) in Saudi Arabia (29), 5.6% by

Shifman and Channanel (1978) in Israel (2) and 8% by Darwazeh *et al.* (1998) in Jordan (30).

Controversy exists about the extent of displacement and the degree of morphological changes that are considered to be indicative of taurodontism (4). The majority of researchers prefer a quantitative estimate to visual diagnosis. In the current study, the Shifman and Chanannel criteria (2) were used, which provide a quantitative estimate to determine the prevalence of taurodontism.

Another issue complicating the accurate assessment of the prevalence of taurodontism is that some authors have defined taurodontism not only for molars but also for premolars. Shifman and Chanannel also included premolars in their evaluation. However, we did not include premolars in the current study because considering the buccolingual positioning of premolar roots and their superimposition on radiographs, distinction of the two roots and accurate localization of pulp chamber floor would be difficult. Thus, the required measurements could not be done. Radiographic evaluation of taurodontism in premolars requires

mesiodistal sections.

Pulp chamber enlargement may be seen in conditions such as hypophosphatasia, attributed to the defective development of mineralized tissue and has no functional cause (31-34). Witkop (1975) believes that taurodontism is usually seen in populations that use teeth to do things (35). On the other hand, Mjor states that taurodontism is found in ethnic groups like the Eskimo, Aleots, Europeans, African Americans and Caucasian Americans (36). Sciulli (1971) found no evidence of taurodontism in prehistoric American Indians, who used to do things with

their teeth (37).

Conclusion:

The prevalence of taurodontism was 6.41% (76 of 1,184 patients) in the understudy population. The results of previous studies using the Shifman and Chanannel criteria, similar to ours, indicated the higher than expected prevalence of taurodontism in different populations. It appears that taurodontism is not as rare as it is thought to be.

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