**Bilateral Bull teeth with root dilacerations in primary dentition: An unusual and rare report of a case with challenges in pediatric treatment**

**Abstract:**

Bull teeth or taurodont is a rare entity with large pulp chambers in which the bifurcation or trifurcation are displaced apically. Taurodontism was a frequent finding in early humans and is most common today in Eskimos. The origin of this term is from Greek word “tauros” which means “Bull” and “adontos” which means “Tooth”. Prevalence of taurodontism varies based on population from 0.1% to 48% commonly seen in permanent premolars and molars, however prevalence in primary dentition is very rare, as low as 0.4%, which is seen in mandibular first primary molars whereas in our case all the primary molars, both upper and lower jaws had taurodontism. Here by reporting a case with bull teeth involving all primary molars with clinical Implications so that a dentist will be able to manage such a condition successfully.

**Key words: large pulp chambers, primary teeth, taurodont.**

**Case report:**

A 5 year old boy visited the Department of Pedodontics and Preventive dentistry for a routine dental checkup. His medical and personal history was non-contributory. Physical and extra oral examination revealed no abnormalities. On intra oral examination deep carious lesions were seen in relation to left and right mandibular first primary molars. No soft tissue abnormalities were found. Intra oral periapical radiographs of carious teeth showed caries involving enamel and dentin approximating the pulp in right and left primary mandibular first molars. Incidentally maxillary and mandibular primary molars on both the side showed enlarged pulp chambers with less defined cervical constriction with furcation located 2mm above the apices along with dilacerations of the roots. A diagnosis of hypertaurodontism in relation to both the mandibular 1st and 2nd primary molars bilaterally, bilateral mesotaurodontism in relation to both the maxillary 1st and 2nd primary molars was made and confirmed with orthopantomograph(OPG).Missing 51 and 64 due to caries. Caries excavation and restorations of the teeth were planned.

**Figure1:**

**Figure 2:**

**Figure 3:**

Genetic and Rare Diseases Information Centre (GARD), National Institutes of Health (NIH) and Orphanet, European rare diseases database considers enlarged pulp chambers with root dilacerations in primary teeth as a rare disease.

**Definition:** Bull teeth or taurodontism by definition as given by Witkop1, teeth with large pulp chambers in which the bifurcation or trifurcation are displaced apically and hence the chamber has greater apico-oclusal height than normal teeth and lacks cervical constriction at CEJ.

**History:** Bull teeth or Taurodontism was first described in 1908 by Gorjano-vic-Kramberger2in a 70,000 year old pre-Neanderthal fossil, discovered in Kaprina, Croatia3. Taurodontism was a frequent finding in early humans and is most common today in Eskimos, possibly as a selective adaptation for cutting hide. The term ‘taurodontism’ was however first stated by Sir Arthur Keith in 1913. The origin of this term is from Greek “tauros” which means “Bull” and “adontos” which means “Tooth”1. The origin of the word taurodont is from a combination of Latin and Greek giving the meaning of Bull tooth, hence the teeth resemble teeth of the cud chewing animals.

**Epidemiology of taurodontism:** Taurodontism is seen with highest frequency in eskimos as reported in the literature.4 it has also been reported among hybrids of Australoids, the Bush people of South Africa, Mongoloid and Negroid populations as well5.

**Prevalence:** Prevalence of taurodontism varies based on population, from 0.1% to 48%6-8. Prevalence in primary dentition i,e in primary first molar is as low as 0.4%9. Further studies on primary teeth are lacking.

The modern day prevalence of Taurodontism in populations varied from 0.54%, in the primary dentitions of Japanese population to as high as 5.6%, in the permanent dentitions of Israeli adults 10.Among young adults in China it was found to be 46.4%, Finnish population had highest prevalence at 60%. Turkish population showed prevalence of 22.8%, whereas Indian population showed prevalence of taurodontism in mandibular primary first molars to be 0.4%.**11**

Most commonly affected teeth are molars followed by premolars in the permanent dentition, while primary molars are commonly affected in the primary dentition of both arches.

**Theories:** Multiple theories have been proposed to suggest a possible etiology. One theory states that failure of Hertwig’s epithelial root sheath diaphragm to invaginate at the normal level results in short roots and enlarged pup chamber. It is inherited as autosomal dominant as well as recessive trait. Other theories include: Interference with induction of epithelial mesenchyme; disrupted homeostasis; high dose of chemotherapy during childhood; Bone marrow transplantations; and delay in the calcification of the pulp chamber floor7.

**Syndromes Associated:** Certain syndromes have been found to occur in association with taurodontism those include Down, Klinefilter’strichodento-osseous7, Mohr12, Apert13, Smith-Magenis, Williams, McCune Albright and Vander Woude syndromes9.

**Classifications:** Different classifications have been proposed. Shaw (1928) classified into hypotaurodontism, mesotaurodontism, hypetaurodontism based on the size of pulp chamber and furcation7.FeichtingerandRossiwall (1977) stated that the distance from the bifurcation or trifurcation of the root to the cement-enamel junction should be greater than the occluso-cervical distance for a taurodontic tooth14.

**Classification especially for primary dentition which identifies two types15**

**Type 1**: 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 <2.5mm.

**Type 2**: is when the height of the root stem is more than 2.5mm. However this system is dependent on the overall dimension of the tooth.

In our case the taurodont teeth belonged to type 2 taurodontism based on the above classification.

According to diagnostic criteria by Shifman and Chanannel16, 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 ≥0.2mm; and when the distance from the highest point to the floor, (B) to the CEJ (D) is >2.5mm.

Based on the measurements using the criteria by Shifman and Chanannel, we found that in our case both the primary 1st and 2nd molars, bilaterally were taurodont.

**Figure 4:**

**Taurodont index17:** It is another method used to diagnose taurodontism.

**T1 = d1/d2×100.**

Where,

 d1: height of the pulp chamber

d2: root canal length.

d3: distance from the floor of the pulp chamber to the maximum width of the pulp chamber. (Used in teeth with incomplete root development).

If T1 ≥20, diagnosed as taurodontism.

In incompletely formed roots, d3 should be greater than 3.5mm.

**Figure 5:**

**Figure 6:**

**Radiographic Features**: Different radiographs such as intaoralperapical, bitewing, lateral oblique and panoramic radiographs are used to identify taurodonts. Radiographically they appear rectangular in shape, devoid of normal tapering toward the apices. The pulp chambers will be large with increased apico-occlusal height. Absence of normal constriction at the cervix of the tooth, Furcation is present at the root apex or few millimeter above.18

Importance of recognizing a taurodont and their application in different specialties is challenging so a thorough knowledge about taurodont helps in recognizing, managing the rare entity successfully.

**Challenges in Pediatric Treatment**

Bull teeth may complicate pediatric, endodontic, orthodontic, prosthetic treatment planning. So timely accurate clinical and radiological diagnosis will help clinician to plan the treatment

**Conservative challenge**: In dentinal caries, during restoration cavity preparation in bull teeth is distinct as buccal surfaces approximate each other which need a conservative cavity preparation such as minimal invasive procedures.

**Endodontic challenge in primary teeth**: As the taurodontism tooth shows wide variations in the size and shape of pulp chamber, varying degrees of obliteration and canal configuration, apically placed canal orifices, from a pedodontist point of view, presents a challenging situation in negotiation, instrumentation and obturation in root canal treatment. As bull teeth shows enlarged pulpchambers in primary teeth it is difficult to treat the pulpally involved deep carious lesions, pulpectomy in taurodontism teeth is challenging as the access opening design is different as compared to normal because ofthe proximity of buccal orifices. Another consideration is during pulp extirpation, wherein bleeding or hemorrhage is more because of large pulp chamber, which could be confused with perforation of the floor19. In these cases, 2.5% sodium hypochlorite can be used as irrigant to ensure complete removal of pulp, since the pulp content is voluminous. Biomechanical preparation is distinct as the canal orifices are apically positioned and obturation is done with either incremental filling or with syringe technique using Vitapex as resorption of root is delayed with zinc oxide eugenol resulting with delayed eruption of permanent teeth20. In case of any other abnormality like dilacerated roots are associated with taurodont teeth, as in our case flexi files, NiTi files or sometimes S1 Protaper rotary files can be used to aid in biomechanical preparation.Though taurodontism is of rare occurrence, the clinician should be aware of the complex canal system for its successful endodontic management.

**Pediatric consideration in primary teeth:** Placement of crown or space maintainer is difficult because of the anatomy and morphology of the crown and loss of cervical constriction at CEJ which extends to the bifurcation or trifurcation of root.Because of the anatomy and morphology of the crown in taurodont tooth, retention of the crown is difficult. So in such cases custom made crownmay be advised.

During placement of space maintainers in primary teeth, because of altered morphology of the tooth, preformed bands may not fit appropriately, hence custom made bands need to be used accordingly.

**Surgical consideration:**

The extraction of taurodont tooth is usually complicated because of the shift in the furcation to apical third. It is reported that extraction of such teeth may not be a problem as large body with little surface area of a taurodont tooth is embedded in the alveolus, unless the roots are widely divergent. Few authors believe that hypertaurodonts may pose some problem during extraction because of apical shift of tri -furcation or bifurcation due to difficulty in placement of forceps beaks. This problem can be overcome by proper use of surgical teeth elevators21. Extraction is also difficult because of the divergence of the root along with dilacerations as chances for root breakage is more common.

**Prosthetic Considerations in primary teeth:**

For the prosthetic treatment of taurodont tooth which is grossly decayed tooth (loss of crown) with missing permanent successor, it has been recommended that post placement be avoided for tooth reconstruction, because of less surface area of the tooth is embedded in the alveolus. A taurodont tooth may not have as much stability as cynodont when used as an abutment for prosthetic purposes so extraction and followed by functional space maintainer should be the choice of treatment.

**Othodontic application in primary teeth**: A taurodont tooth is not stable as compared to cynodont when used as an abutment for orthodontic purposes. The lack of cervical constriction would deprive the tooth of the buttressing effect against excessive loading the crown. 9

It is very important for a general dental practitioner to be familiar with bull teeth or taurodontism not only with regards to clinical complications but also its management.

**Conclusion:**

Taurodont teeth are known to show wide variations in morphology of the pulp chamber and canal complexity. Although it is a very rare entity in deciduous dentition, recognition of such cases is important specially when considering endodontic and surgical treatment in pediatric patients. Knowledge of such conditions helps us to understand the anatomic variations of the pulp chamber and render the treatment accordingly.

**REFERENCES:**

1. Witkop CJ. Clinical aspects of dental anomalies. Int Dent J 1976; 26:378-90.
2. Gorjanovic-Kramberger K. Uber prismatischeMolarwurzelnrezen-ter and diluvialer Menschen. AnatAnz 1908; 32:401-13.
3. Prakash R, Vishnu C,Suma B, Velumurugan N, Kandaswamy D. Endodontic management of taurodontic teeth. Indian J Dent Res 2005; 16:177-81.
4. Goldstein E,Gottlieb MA. Taurodontism: familial tendencies demonstrated in eleven of fourteen case reports. Oral Surg Oral Med oral Pathol 1973; 36:131-44.
5. Mena CA. Taurodontism. Oral Surg Oral Med Oral Pathol 1971; 32:812-23.
6. Gomes RR, Habckost CD, Junqueira LG, Leite AF, Figueiredo PT, Paula LM, et al. Taurodontism in Brazilian patients with tooth agenesis and first and second- degree relatives: A case control study. Arch Oral Biol 2012; 57:1062-9.
7. Khanna R, Kansal N, Kansal R, Kumar N,Bhullar K. Taurodontism: Etiology, classification and clinical significance. Indian J Dent Sci 2012; 4:116-8.
8. Jafarzadeh H, Azarpazhooh A, Mayhall JT. Taurodontism:A review of the condition and endodontic treatment challenges. IntEndod J 2008; 41:375-88.
9. Manjunath BS,Kovvuru SK. Taurodontism- A review on itsetiology, prevalence and clinical consideration. J ClinExp Dent 2010; 2:e187-90.
10. Jaspers MT, Witkop CJ Jr. Taurodontism an isolated trait associated with syndromes and X-chromosomes aneuploidy. Am J Hum Genet 1980; 32(3):396-413.
11. Huseyin S, Ibrahim SB, Yasin Y, Kenan C.Prevalence of Taurodont Primary Teeth in Turkish children. OHDM 2015; 14(1):23-26.
12. Joshy VR, Jose M,Mohammed R. Taurodontism of multiple teeth-A case report. Oral Maxillofacial Pathol J 2011; 2:132-5.
13. Tyagi P, Gupta S. Bilateral taurodontism in deciduous molars: A case report. People’s J Sci Res 2010; 3:21-3.
14. Feichtinger C, Rosiwall B. Taurodontism in human sex chromosome aneuploidy. Arch Oral Biol 1977; 22:327-9.
15. Jorgensen KD. The deciduous dentition: A descriptive and comparative anatomical study. ActaOdontScand 1956; 14Suppl 20:1-202.
16. Topcuoglu HS, Karatas E, Arslan H, Koseoglu M, Evcil MS. The frequency of taurodontism in the Turkish population. J ClinExp Dent 2011; 3:e284-8.
17. Miroslava Y,Svetlana Y,Tomov G.Orthodontic problems in patients with hypodontia and taurodontism of permanent molars.Journal of IMAB-Annal Proceedings (Scientific) 2011; 17(2):109-113.
18. Srikanth HS.SRM Journal of Research in Dental Sciences 2014; 5(2):111-113.
19. Panigrahi A, Panigrahi RG, K. T.S, Bhuyan R,Bhuyan SK. Non syndromic Familial Bilateral Deciduous Taurodontism-A First Case report. Journal of Clinical and Diagnostic Research. JCDR 2014; 8(12):ZDO1-ZDO2.
20. Reddy V, Rao V, Arun P, Kumar R. Endodontic Treatment in Primary Molars with Taurodontism-A Case report. Annals and Essences of Dentistry 2010; 2(2):52-55.
21. Durr DP, Campos CA, Ayers CS. Clinical significance of Taurodontism. J Am Dent Assoc 1980; 100:378-81.

Legends for Figures:

Figure 1: Intraoral Periapical radiograph in relation to 74, 75.

Figure 2: Intraoral Periapical radiograph in relation to 84, 85.

Figure 3: OPG of the patient.

Figure 4: Showing measurements for Taurodontic teeth.

Figure 5: Showing Taurodont index of permanent teeth

Figure 6: Showing Taurodont index of permanent tooth with incomplete root development.