MANAGEMENT OF BILATERAL TAURODONIC TEETH WITH LARGE PULP STONES IN PERMANENT DENTITION : A CASE REPORT.

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Abstract
The present case report highlights about management of taurodontism which is a developmental anomaly characterized by the lack of constriction at the level of the cementoenamel junction, vertically elongated pulp chambers and apical displacement of the pulpal floor. Permanent molar teeth are commonly affected teeth. Its morphology might hamper the location of orifices and can create difficulties in effective instrumentation and obturation of the teeth requiring endodontic treatment. The present case report highlights the importance of radiographs, use of Ni-Ti files and use of vertical condensation method for obturation of the canal in the management of anomaly.

Keywords: Bilateral, Taurodontic Teeth, Pulp Stones, Permanent Dentition.

INTRODUCTION
Taurodontism is a developmental anomaly in tooth morphology characterised by the lack of constriction at the level of the cementoenamel junction, vertically elongated pulp chambers and apical displacement of the pulpal floor[1]. The term Taurodontism is derived from the Latin term- tauros, for ‘bull’ and the Greek term odus, for ‘tooth’; or ‘bull tooth’, first introduced by Sir Arthur Keith in 1913[2]. Taurodents have pulp chambers in which the bifurcation or trifurcation is displaced apically, so the distance from the bifurcation or trifurcation of the roots to the cementoenamel junction is greater than the occlusal/cervical distance, giving it a rectangular shape[1]. Although permanent molar teeth are the most commonly affected, this change can also be seen in other permanent and deciduous teeth, unilaterally or bilaterally, and in any combination of teeth or quadrants.

The etiology of taurodontism is unclear. It is thought to be caused by the failure of Hertwig’s epithelial sheath diaphragm to invaginate at the proper horizontal level or changes in the mitotic activity of cells of the developing teeth that can affect root formation[3] or influence from external factors on the development of the teeth resulting in a tooth with short roots, elongated body, an enlarged pulp, and normal dentin. Previously, taurodontism was related to syndromes such as Down’s and Klinefelter’s syndrome. Today, it is considered as an anatomic variance that could occur in a normal population.

Because of high variability in prevalence of 0.25 to 11.3 % and its association with various syndromes, there is a critical need for its true diagnosis and management of such teeth. It is suggested that its morphology might hamper the location of orifices and could create difficulties in effective instrumentation and obturation of the teeth requiring endodontic treatment. This case report highlights important considerations in the endodontic treatment of such teeth and successful completion of endodontic treatment in hypertaurodontic teeth.[4,5]

Case Report
A 34-year-old male patient was referred to the Department of Conservative Dentistry and Endodontics at Genesis Institute of Dental Sciences and Research, Ferozepur, Punjab, India with severe pain in right mandibular second molar. Medical history was non-contributory. On intraoral examination, there was a deep carious lesion in the mandibular right second molar. An intraoral periapical (IOPA) radiograph of right mandibular second molar revealed the presence of a coronal radiolucency involving the pulp chamber and a diffuse radio-opacity throughout the pulp chamber suggestive of pulp stone(fig 1). The radiograph also revealed the presence of an elongated pulp chamber extending beyond the cervical area reaching the furcation that signifies taurodontism. To rule out other taurodont tooth in the oral cavity OPG was done (fig 2) which reveals that taurodontism also exist in left mandibular second molar. Vitality tests were performed on left mandibular second molar which showed exaggerated response to heat with lingering response and a diagnosis of irreversible pulpitis was established. Root canal therapy was advised for tooth 36 and 46.

At first, root canal treatment was started on right mandibular second molar.After the tooth was anaesthetised, access cavity was prepared under rubber dam isolation and a large pulp stone was found blocking the entire pulp chamber. The removal of stone was quite challenging and it was removed ultrasonically using start-X tips (DentsplyMaillefer, Switzerland)(fig 3). Then the pulp was extirpated and a single large canal orifice was initially negotiated. The access cavity was modified and remaining pulp tissue was extirpated. The pulp was voluminous and to ensure complete removal, 5 ml of 3% sodium hypochlorite (Prevest Denpro Ltd, India) was initially used as an irrigant to soften the pulp. The pulp chamber was found to be huge and the floor of the chamber could not be visualized. The elongated pulp chamber posed a challenge to trace canal orifice. Three different pathways were negotiable: a wide distal orifice (P) and two narrow orifices – a mesiobuccal (MB) and a mesiolingual (ML). The coronal shaper (Sx) of the Pro taper rotary (DentsplyMaillefer, Switzerland) was used to enlarge the orifice of the canal and create a straight line access.

After determination of working length with an electronic apex finder (J. Morita, USA) and confirming radiographically (fig 4), canals were prepared using a ProTaper instruments (DentsplyMaillefer, Switzerland) using crown down technique. MB and ML canals were finished up to finishing file F2 and distal canal after the gauging the apical diameter was finished up to F3. Canals were irrigated with 5 ml of 3% NaOCl (Prevest Denpro Ltd, India) after each instrument, delivered by means of a 27 gauge needle. Final irrigation with 17% EDTA was performed. Respective master cone were selected.

Calamus system (Dentsply, Tulsa Dental, Switzerland) was used for obturation. The master cone, protaper F2 gutta percha was inserted to the full working length and apical tugback was checked. Three manual pluggers of diameters, 0.7 mm, 0.9 mm, and 1.3 mm (Dentsply Tulsa Dental Specialties) were selected to compact the gutta percha in coronal, middle and apical third respectively.
During this procedure there is transfer of heat in the coronal 3-4mm of gutta-percha. A large prefilled plugger generates the first WOC (wave of condensation) and automatically compacts warm gutta-percha vertically and laterally into the root canal system. The pack handpiece was activated again, the EHP (electrically heated plugger) was plunged to 3-4 mm of the previously compacted material, deactivate, then remove, along with a "bite" of gutta-percha. The medium prefilled plugger carries a second wave of condensation and compact middle third of root canal system. This procedure was repeated for apical third of root canal. The downpack was now completed. The apical third obturation was now complete. The backfill phase was started by dispensing a longer 3 to 4 mm segment of warm gutta-percha into middle region of the canal. The working end of the medium size pre-fit plugger is stepped circumferentially around the preparation to clean the dentinal walls, flatten the dispensed material. Utilizing the plugger in this manner will promote successful hydraulics, and generate "reverse" waves of condensation. The back fill phase was continued till the entire canal was filled. Different horizontally angulated post-treatment radiographs were taken to confirm the root canal system has been densely obturated, laterally and vertically, to the canal terminus. Orafil G (Prevest DenPro Ltd, India) was used as a temporary filling and a final radiograph was taken (Fig. 5).

Endodontic management was done in left mandibular second molar in the similar way.

**DISCUSSION**

Usually, taurodontism is it an isolated anomaly, but can occur in several well-known syndromes, due to alterations of the sex chromosomes. These syndromes include Klinefelter syndrome [9] and trisomy 21, or Down syndrome [10]. Taurodontism is more strongly associated with syndromes involving an ectodermic defect [9]. Endodontic treatment of a taurodontic tooth requires special management because the tooth morphology can make it difficult to identify the location of the orifice.

Thus, endodontic treatment may be complicated. The number of root canals in taurodontic teeth varies. Mandibular molars with 5 canals and maxillary molars with 4 or 5 canals have been reported [9]. Its distinguishing features cannot be recognized clinically. The diagnosis of taurodontism is usually a subjective determination made from diagnostic radiographs. The radiographic characteristics of taurodont tooth are: (i) extension of the rectangular pulp chamber into the elongated body of the tooth, (ii) shortened roots and root canals, and (iii) location of furcation near the root apices, despite a normal crown size [9, 11].

Shaw (1928), classified subtypes of condition as: Hypotaurodont: moderate enlargement of the pulp chamber at the expense of the roots. Mesotaurodont: pulp is quite large and the roots short but still separate. Hypertaurodont: prismatic or cylindrical forms where the pulp chamber nearly reaches the apex and then breaks up into 2 or 4 channels Single or pyramidal root (cuneiform): usually in the lower second molar where the pulp extends throughout the root without cervical constriction and exits via a single wide apical foramen. The present case is a hypertaurodont tooth. Apically positioned canal orifices, varying canal configurations, and wide variations in the size of pulp chamber may be observed in the taurodont teeth and because of this, the endodontic treatment of this case was a challenge [9, 13]. Pretreatment radiographs gave little information about the canal system. Access to pulp chamber was easy because of the large pulp chamber. However, Durr et al. suggested that its unique appearance may hamper the location of the canal orifices and therefore create difficulty in instrumentation [12]. In the present case, negotiation of the orifices was complicated owing to apically positioned canal orifices and by presence of a large pulp stone obstructing them. Careful exploration of the grooves between all orifices was carried out under magnification using surgical operating microscope. The use of operative microscope magnified the vision of field and proved very useful in locating the orifice and removal of stone. Because of the voluminous pulp in taurodont teeth, 3% sodium hypochlorite has been proposed as a suitable irrigant in order to ensure a complete removal of the pulpal remnants [10]. Owing to the proximity of the buccal orifices and difficulty in accessing them, instrumentation and complete obturation of the canal system was challenging. Nickel–titanium rotary instruments have become an important adjunct in endodontic therapy. Most of the time, we get predictable shaping outcomes with Nickel–titanium rotary instruments despite presence of difficult root canal anatomy. Better irrigation and obturation is possible with Nickel–titanium rotary instruments [14]. The patient was reviewed after three, six months and one year and he was found to be asymptomatic.

**CONCLUSION**

The successful treatment of the taurodontic patient in the present study can be mainly attributed to the use of magnification, which made even rotary instrumentation in such complex anatomy accessible and convenient. Endodontic treatment of a taurodont tooth is challenging as it requires special care in handling and identifying canals. While performing root canal treatment on such teeth, one would encounter variations in pulp space morphology, canal configuration, accessory canals and even obliterated canals. With advancement in diagnostic imaging, enhanced magnification aids like loupes & surgical operating microscopes, advanced apex locator, rotary endodontics, newer irrigation regimens and obturation systems, treatment of such challenging cases can be more predictable and rewarding to both patient and endodontist.

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**References**


Figure 1

PREOPERATIVE OPG

Figure 2

PULP STONE REMOVED

Figure 3

WORKING LENGTH

Figure 4

POSTOPERATIVE

Figure 5

PREOPERATIVE OPG WRT 47

PREOPERATIVE OPG WRT 37

PULP CHAMBER SHOWING PULP STONE