Case Report

Monoradicular primary mandibular first molar: A rare case in Aseer Province of Saudi Arabia

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Abstract

Morphological variations can occur in primary and permanent teeth. Genetic and environmental factors could be responsible for various dental anomalies. Anomalous teeth are usually asymptomatic and are diagnosed during routine oral examination. These anomalies may increase caries susceptibility and complicate dental treatment procedures such as extraction or root canal treatment. We report a rare case of mandibular first molar with a single root and a root canal.

Keywords: Primary mandibular first molar, root anomaly, single-root canal

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INTRODUCTION

Root malformations in humans are mainly due to developmental disorders of the root alone or disorders of radicular development as a result of tooth dysplasia.[1] Tooth development is a complex process that involves reciprocal interaction between epithelial and mesenchymal cells.[2] Development of a tooth root starts following crown formation once the enamel tissue has reached the future cemento-enamel junction.[3] The Hertwig's epithelial root sheath (HERS), a double-layered epithelial structure originating from the lower end of the developing enamel organ comprising inner and outer enamel epithelium, determines the number, length, shape, and direction of root formation.[4]

Following radicular dentin formation, HERS disintegrates, thus forming the epithelial cell rests of Malassez and allowing mesenchymal cells of the dental follicle to gain access to the surface of the outermost radicular dentin layer, where they differentiate into cementoblasts and form radicular cementum. Development of multirooted teeth is a special process with the formation of bi- or trifurcation. The critical structures for furcation formation are tongue-shaped epithelial projections from the cervical loop of the enamel organ; when the root trunk is about to divide, these tongues proliferate and unite to form a continuous bridge. Similar to HERS, the epithelial bridges induce the differentiation of odontoblasts, which subsequently produce the dentin at the floor of the pulp cavity, whereas the bridge cells proliferate and grow apically in concert with the peripheral HERS.[3] Impairment or disruption of this process causes anomalies in multirooted teeth such as taurodontism, single-rooted posterior teeth and misshaped furcations.[5]

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Several growth and transcription factors are expressed during root formation, suggesting that they have crucial function in regulating the epithelial–mesenchymal interactions involved in various steps of tooth development. For example, bone morphogenetic protein (Bmp), transforming growth factor-β and their mediator Smad4, as well as Shh, Msx2 and Dlx2 are expressed in HERS cells. Studies suggest that there are multiple activators and inhibitors that work together to achieve a balanced signaling outcome and produce the proper patterning, number and length of dental roots during the later stages of tooth morphogenesis.[4] The developmental biology of tooth root formation in terms of gene expression and signaling molecules requires further investigations.[3]

Most dental anomalies with respect to roots mainly involve single or supernumerary roots. Root anomalies can also be categorized as dilacerations, rizomegali, rizomicri, concrescence, hypercementosis and taurodontism. Single-rooted molars are described as conical, fused or pyramidal. Very few cases of single-rooted molars have been reported in literature.[5] Females are reported to have more root dysmorphology compared to males, but the exact cause for this is unknown.[6] This clinical report presents a case of a unilateral single canal in a primary mandibular first molar.[4]

CASE REPORT

An 8-year-old female child presented to the Department of Pediatric Dentistry, College of Dentistry, King Khalid University, Saudi Arabia, for a routine dental checkup. Clinical examination revealed caries of the primary mandibular left first molar. The tooth was not tender on percussion. Radiographic evaluation revealed a radiolucent carious lesion involving the mesial and distal surfaces of the primary mandibular first molar with the absence of any periapical pathosis. The most intriguing element was the unordinary anatomy of the root of the primary mandibular left first molar, having a solitary root with a single-root canal. Preoperative periapical radiographs [Figure 1] were taken to better appreciate the root morphology. As proximal caries showed no pulpal involvement, the diagnosis was of deep dentinal proximal caries. A conventional restoration on the mesial and distal surfaces of the primary mandibular left first molar with a stainless steel crown was planned.

Upon clinical cavity preparation, Tofflemire® matrix band was applied around the tooth, and the tooth was restored with glass-ionomer restoration (GC Fuji IX GP - GC Corporation 3-2-14 Hongo, Bunkyo-ku, Tokyo, 113-0033, Japan). As the cavity preparation and restoration was extensive, a stainless steel crown was placed (3M™ ESPE™ stainless steel crowns, Oral Care Solutions Division, 3M Center, St. Paul, MN, USA) [Figure 2] to protect the tooth structure in a subsequent visit.

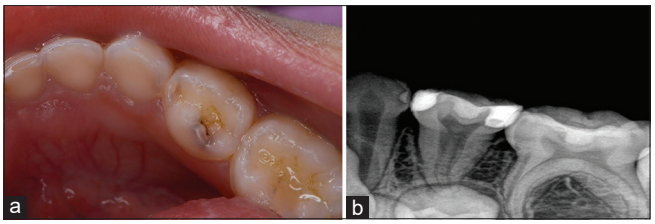

Figure 1: (a) Preoperative clinical picture showing caries of the left deciduous mandibular first molar. (b) Preoperative periapical radiograph showing a single root and a single canal

DISCUSSION

Dental abnormalities are not a bizarre finding in routine dental examination. The impact of dental irregularities can prompt utilitarian, esthetic and occlusal issues. Point-by-point examination of dental anomalies is basic to counteract malocclusion, cosmetic deformations, periodontal issues, caries and troubles amid tooth extraction and root canal treatment. Notwithstanding clinical examinations, radiographic perceptions assume an imperative job in the differential conclusions of these anomalies.[3-5]

The peculiarities that happen most often in kids are missing teeth, supernumerary teeth, fused teeth and talon's cusp. On the off chance that anomaly is interpreted as a variation from the norm of the standard, a dental anomaly is an element of the dentition that can be relied upon to happen in the minority of a given populace. Peculiarities of the dentition hold an interest for some dental specialists, all the more particularly for the individuals who practice pediatric dentistry. The nearness of dental anomalies of the teeth and the probable causes might be perhaps more provocative than highlighting with significant results upon the influenced dentition.[6] It is imperative for each professional to know the overall event of abnormalities in his/her region to direct the individuals who may have any of these oddities and who may look for treatment.

One study was conducted to determine the prevalence and distribution of selected developmental dental anomalies in Saudi children. The authors concluded that a significant number of patients (23.08%) had at least one dental anomaly. Anomalies in tooth numbers were the most common anomaly observed in the study. Congenital missing teeth was the most common anomaly seen, followed by supernumerary tooth. Structural anomalies were the least

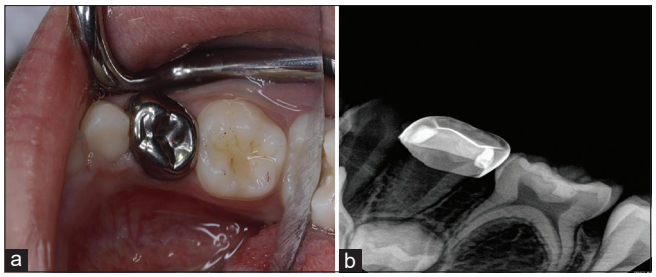

Figure 2: (a and b) Postoperative clinical and radiograph pictures after restoring caries of a left deciduous mandibular first molar with a stainless steel crown

common anomaly, with dentinogenesis imperfecta being the rarest anomaly followed by amelogenesis imperfecta.[7]

Of particular note, single-rooted primary first mandibular molar as a dental anomaly in the Saudi population has never been documented and reported till date. This is the first case of an anomalous single-rooted primary first mandibular molar to be reported in the Saudi population. A literature search was done to discover the presence of such an uncommon morphology in primary first molars. Strangely, there have been reports in Ellis–van Creveld disorder with single-established essential molars related with different anomalies. The first case of a single-rooted primary molar was reported by Ackerman in a 10-year-old female. Gideon *et al*., reported single rooted molars in primary and permanent dentition in two siblings.[5]

Root anomalies such as premature arrest of root formation or any other developmental root alterations frequently result from genetic or environmental influences. A direct trauma to a developing tooth or treatment of childhood cancer using radio- or chemotherapy is the most likely etiology proposed.[5] Apical growth of HERS associated with root elongation as well as the formation of the furcation in multirooted teeth is susceptible to various intrinsic and extrinsic adverse effects and thus contribute to various human root dysplasias.

Failure of the tongue-like projections to completely fuse during radicular dentinogenesis or failure of growth of the epithelial diaphragm in multirooted teeth may be responsible for fused roots in primary teeth.[8] Investigators have proposed single-rooted or pyramidal-shaped roots in molars inherited as an autosomal dominant condition. Parents of our case were unaware of such an anomaly in the family.[8]

The procedure of odontogenesis is under the influence of homeobox (Hox) genes, various distinctive mesenchymal regulatory molecules and their receptors. Hox genes are classified as muscle segment (MSX1 and MSX2), distal less (Dlx), orthodontical, goosecoid, paired box gene 9 (Pax9) and sonic hedgehog (Shh). Msx1 and Msx2 genes are in charge of the formative position and further advancement of tooth buds, respectively. Dlx-1, Dlx-2 and Barx-1 genes are associated with the improvement of molar teeth. Pax9 is a translation factor required for tooth morphogenesis and assumes a job in the foundation of the inductive limit of the tooth mesenchyme as it is important for the mesenchymal articulation of Bmp4, MSX1 and Lef1 genes. Tumor necrosis factor, fibroblast development factor, Bmp, Shh and Wnt pathways are engaged with the flagging pathways of organogenesis on the 9th–11th embryonic days to start tooth epithelium. Any mutation in these genes and any disruption of regulatory molecules may result in the anomaly of dental characteristics.[4]

Genetic control has a major role in tooth agenesis Steele-Perkins *et al*. Role of gene NFI-C is reported in the agenesis of molars in mice, yet literature with respect to agenesis or abnormalities in human teeth is exceptionally rare.[9]

The knowledge and understanding of the root and root canal morphology are the basic requirements for a successful endodontic treatment. Endodontic treatment of such teeth has to be carefully evaluated. Fused roots should be carefully evaluated from single roots. Fused roots may be confluent roots with separate pulp canals, and pyramidal-shaped roots may have a single wide canal.[10]

Radiographic evaluation should be thoroughly done to evaluate the root and root canal morphology. Proper evaluation of such root or tooth anomalies should be done to assess its prevalence in the general population and for a successful treatment procedure.

CONCLUSION

The current case highlights a rare occurrence of single-rooted mandibular molar. No such reports have been reported in this population group earlier. More knowledge and research on its actual incidence is required, especially in the Saudi Arabian population. Although such root anomalies do not pose any clinical problems, their prevalence may help the clinician in responding appropriately, especially during endodontic treatment.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and

other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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