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Bilateral Single-Rooted Primary Mandibular Molars: A Rare Morphological Variant

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Abstract: ***Primary mandibular molars usually present with two roots; however, rare anatomical variations such as a single root with a single canal have been reported. This case report describes a rare bilateral occurrence of single-rooted mandibular primary first molars in a 6-year-old female patient. Clinical and radiographic examination revealed deep carious lesions in teeth 74 and 84 with Vertucci Type I canal configuration. Tooth 84 was diagnosed with chronic irreversible pulpitis and was treated with pulpectomy using zinc oxide eugenol followed by stainless steel crown placement. Tooth 74 showed deep dentinal caries approaching the pulp and was managed conservatively. This report highlights the importance of recognizing such rare root morphology for accurate diagnosis and appropriate endodontic management in pediatric dentistry.***

Keywords: Single-rooted primary molar; Mandibular primary first molar; Root canal morphology; Vertucci Type I; Pulpectomy; Pediatric dentistry; Rare dental anomaly

1. Introduction

The root morphology of primary molars is generally well defined, with mandibular primary molars typically exhibiting two roots and maxillary molars presenting with three roots. This predictable anatomy plays a crucial role in diagnosis, pulp therapy, and restorative procedures in pediatric dentistry.[1] Nevertheless, variations in root morphology may occur due to developmental disturbances during odontogenesis. Reported anomalies include additional roots, root fusion, taurodontism, concrescence, and, rarely, a reduced number of roots.

Among these anomalies, the presence of a single root with a single canal in primary molars is considered one of the rarest anatomical variations.[3] Such teeth have been described in the literature as pyramidal, conical, or tubular in form and are believed to result from incomplete or failed division of Hertwig's epithelial root sheath during root development.[4] A review of available literature reveals only about eight to nine reported cases of single-rooted primary molars, of which approximately five have demonstrated bilateral involvement, underscoring the exceptional rarity of this condition.

Incidence/prevalence of single rooted primary molars

Morphological dental anomalies involving the roots may affect a single tooth, multiple teeth or the entire dentition. Root abnormalities include dilaceration, concrescence, rhizomegaly and hypercementosis. Variations in the number of roots, particularly the occurrence of single-rooted primary molars, represent one of the rarest developmental anomalies in pediatric dentistry. Several terms such as *conical, fused,* and *pyramidal* have been used to describe these teeth.[3] The term *fused roots* refer to roots that are connected but retain two or more canals, whereas *pyramidal* denotes a solitary enlarged root with a single root canal.

Single-rooted molars are reported more commonly in the permanent dentition, especially in second and third molars. In contrast, **single-rooted primary molars are exceedingly rare**, with documentation largely confined to isolated case reports and small case series. Consequently, true prevalence or incidence data are unavailable. The anomaly is believed to result from failure of invagination or bifurcation of Hertwig's epithelial root sheath during root development, leading to the formation of a single root, frequently associated with a single canal.

Earlier literature documented sporadic familial occurrences, whereas more recent reports—particularly from the Indian subcontinent- have described both unilateral and bilateral involvement of mandibular primary first molars.[5] Although some authors have suggested a female predilection for root dysmorphology in general, the limited number of reported cases of single-rooted primary molars does not allow definitive conclusions regarding sex predilection.[6] Awareness of this rare anatomical variation is clinically important, as it has direct implications for diagnosis, endodontic treatment and extraction planning in pediatric dental practice.

Sl. No.	Author (Year)	Tooth/Teeth Reported	Laterality
1	Ackerman et al. (1973)[7]	Primary molars	Unilateral
2	Holan & Chosack (1973)[8]	Primary molars – side not specified	Unilateral / Familial
3	Anne Marie H. Nguyen et al. (1996)[9]	Primary and permanent molars	Unilateral
4	Jeevanandan et al. (2012)[10]	74 & 84	Bilateral
5	Chaudhari et al. (2013)[11]	74	Unilateral
6	Haridoss et al. (2014)[12]	74	Unilateral
7	Bahrololoomi et al. (2014)[3]	84 (+ another case not specified)	Unilateral (2 cases)
8	Marwah et al. (2015)[13]	74	Unilateral
9	Chowdhury et al. (2020)[14]	74 & 84	Bilateral
10	Ujariya et al. (2022)[15]	74 & 84	Bilateral
11	Sadhar (2022)[16]	74 & 84	Bilateral
12	Prakash et al. (2024)[17]	Mandibular primary first molar	Unilateral

Compilation of reported cases of single-rooted primary molars

Etiology

Environmental factors such as chemotherapy, radiation therapy and trauma during odontogenesis have been reported to influence the morphology of developing roots. However, literature pertaining specifically to the etiology of single-rooted primary molars predominantly implicates disturbances in the development of **Hertwig's epithelial root sheath (HERS)**.[10]

HERS originates as a bilayered epithelial structure from the cervical loop of the developing enamel organ and extends apically between the dental papilla and the dental follicle. During normal root development, the root sheath proliferates vertically to surround the dental papilla, with the most apical region subsequently forming the future apical foramen.[18] Root number and morphology are determined by the formation of epithelial extensions or tongue-like projections from the lateral walls of HERS. In multirooted teeth, these projections grow centripetally and fuse, thereby dividing the developing root trunk into two or more roots. Double-rooted teeth develop through the fusion of two such projections, while three-rooted molars arise in a similar manner with three epithelial extensions.[19] (Fig.1)

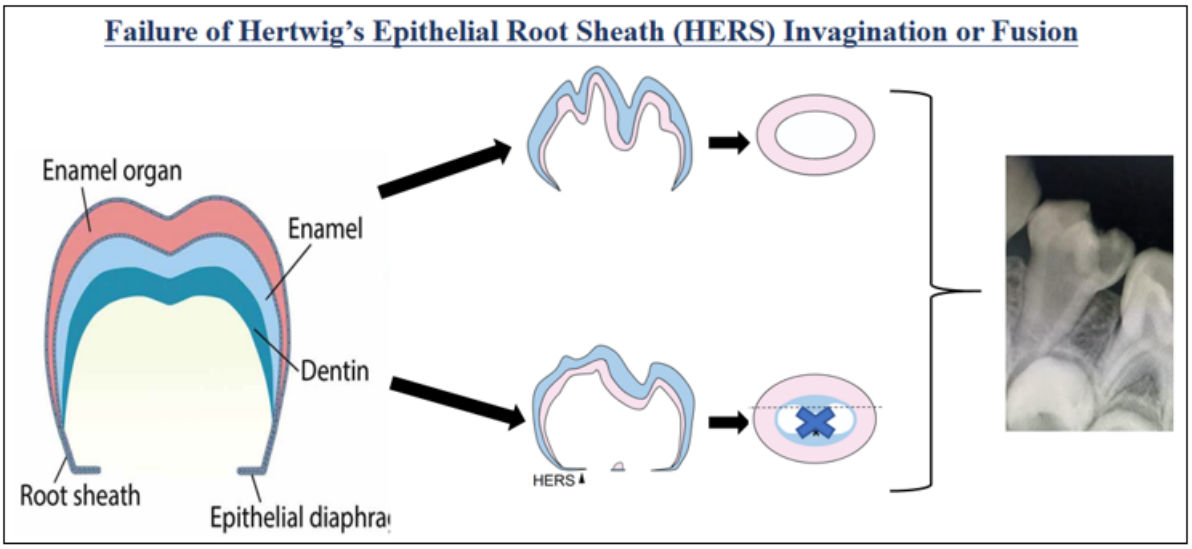


Figure 1: Failure of Hertwig's Epithelial Root Sheath (HERS) Invagination or Fusion

The development of pyramidal or single-rooted molars is believed to result from failure of HERS to completely encompass the dental papilla during its initial vertical growth phase, or from incomplete formation or fusion of the lateral epithelial projections. Such developmental disturbances ultimately lead to the formation of a solitary root, often associated with a single root canal.[20]

Genetic and molecular mechanisms governing root morphogenesis remain poorly understood. While genes such as *MSX1* and *PAX9* have been associated with selective tooth agenesis in humans, their direct role in determining root number has not been clearly established.[21] Experimental studies have demonstrated agenesis of molar roots in mice lacking the *NFIC* gene, highlighting its role in root formation. Nevertheless, data regarding gene expression patterns and signaling pathways specifically responsible for the development of single-rooted molars are sparse, and further research is required to elucidate these mechanisms.[22]

The present clinical report describes a rare case of **bilateral single-rooted primary mandibular first molars** and emphasizes the importance of understanding developmental variations in root morphology. Recognition of such anomalies is essential for appropriate diagnosis, treatment planning and management of dysmorphological roots in the primary dentition.

2. Case Report

A 6-year-old female patient reported to the Department of Pediatric and Preventive Dentistry with a chief complaint of pain in the lower right back tooth region for three weeks. The pain was spontaneous, continuous and throbbing, aggravated by hot food intake and lying down, and partially relieved by medication. The patient was medically healthy, with no history of trauma, allergies or previous dental treatment, and no reported family history of dental anomalies.

Clinical examination revealed a complete primary dentition with deep carious lesions in relation to teeth 74 and 84, without sinus tract, swelling or mobility. Dentinal caries was also present in relation to teeth 51, 54, 61, 62, 64, 75 and 85. (Fig.2)

Figure 2: Deep carious lesions in relation to teeth 74 and 84. Dentinal caries irt 51, 54, 61, 62, 64, 75 and 85

Intraoral periapical radiographs showed pulpal involvement in tooth 84 and deep dentinal caries approaching the pulp in tooth 74. Both teeth exhibited an unusual single-rooted, single-canal configuration consistent with Vertucci's Type I morphology. The pulp chambers appeared wide with mild cervical constriction suggestive of a taurodontic tendency, while the surrounding bone and succedaneous tooth buds were normal. (Fig.3)

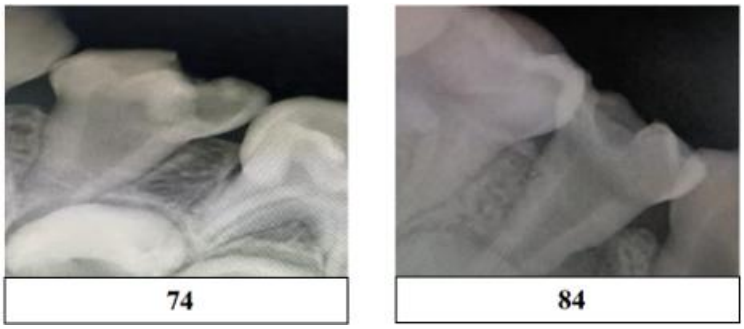
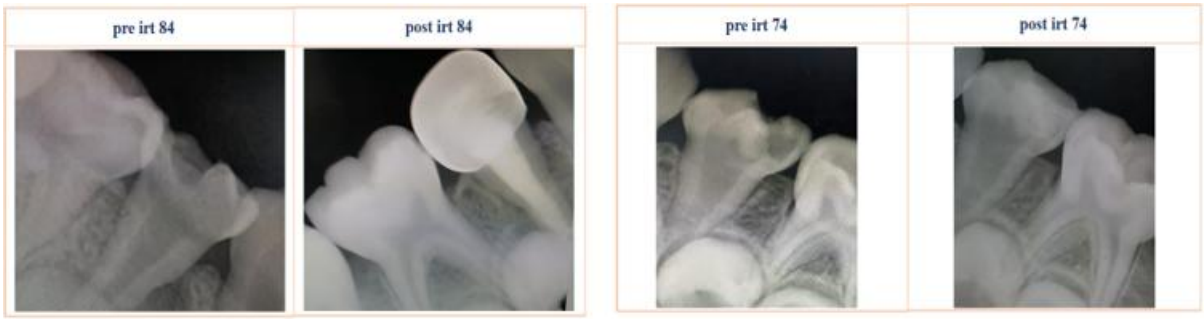


Figure 3: Intraoral periapical radiographs irt 74,84

A diagnosis of chronic irreversible pulpitis was established for tooth 84, and deep dentinal caries approaching the pulp for tooth 74. Following behavior management and local anesthesia, pulpectomy was performed in relation to tooth 84. Access revealed a single wide canal, which was irrigated with 2.5% sodium hypochlorite and normal saline, obturated with zinc oxide–eugenol paste, and restored with a stainless steel crown irt 84. (Fig.4)



Tooth 74 was managed with indirect pulp capping using calcium hydroxide followed by glass ionomer cement restoration.

3. Discussion

The primary goal of pediatric dentistry is to preserve the primary dentition until the eruption of permanent successors. Variations in root and canal morphology of primary molars are rare and inconsistently reported. Among these, single-rooted primary mandibular first molars constitute an exceptionally uncommon developmental anomaly.[3] Such pyramidal or single-rooted morphology was first documented by Ackerman et al. and Holan and Chosack in 1973. Subsequent reports, including familial cases described by Gideon et al., have suggested a possible autosomal dominant inheritance; however, no family history of dental anomalies was identified in the present case, precluding confirmation of a genetic basis.[7,8]

From a clinical standpoint, single-rooted primary molars differ significantly from their normally rooted counterparts in terms of crown contour, pulp chamber anatomy and canal configuration.

Feature	Normal Primary First Molar	Single-Rooted Primary First Molar
Tooth contour	Conventional crown form with distinct cervical constriction	Broader crown with smooth cervical contour
Root configuration	Two separate roots	Single conical or pyramidal root
Crown-root proportion	Normal cervical constriction and root divergence	Mildly taurodontic appearance with widened pulp floor
Canal morphology	Multiple fine canals	Single wide canal (Vertucci Type I)
Pulp chamber	Short and constricted at canal orifices	Elongated with minimal cervical constriction

Such morphological features may pose diagnostic and operative challenges during endodontic procedures. Excessive bleeding encountered during access opening or pulp extirpation may mimic perforation, while the absence of multiple canal orifices can lead to unnecessary dentin removal during the search for additional canals. Awareness of these anatomical variations is therefore essential to prevent iatrogenic complications.

Radiographic evaluation is crucial for detecting atypical root morphology. Although cone-beam computed tomography provides detailed three-dimensional assessment, its use in pediatric patients is limited by radiation concerns; hence, the use of a preoperative radiograph and an additional radiographic view from a 20-degree mesial and distal projection is a good way to detect any abnormalities in root canal morphology.[23]

Endodontic treatment of single-rooted primary molars is facilitated by a single wide canal, though obturation may be challenging due to the risk of overfilling. Zinc oxide eugenol was used in the present case for its antimicrobial activity, biocompatibility, and ease of handling; however, its slow resorption rate necessitates careful follow-up to avoid interference with physiological root resorption.

Documentation of such rare developmental anomalies is important to improve understanding of their clinical presentation and management. Increased awareness among clinicians can aid in accurate diagnosis, appropriate treatment planning and prevention of procedural errors, while contributing to the limited body of evidence regarding the prevalence and clinical behavior of single-rooted primary molars.

4. Conclusion

Single-rooted primary mandibular molars are rare developmental anomalies that may affect diagnosis and endodontic management. Accurate radiographic assessment and awareness of such variations are essential to prevent procedural errors.

With appropriate technique and material selection, favorable treatment outcomes can be achieved, though regular follow-up is necessary to monitor physiological root resorption and eruption of permanent successors.

References

[1] Dhillon JK, Ghosh S, Mathur VP. Root canal morphology of primary molars - A cone beam computed tomography (CBCT) study. Indian J Dent Res. 2022 Jan-Mar;33(1):14-17. doi: 10.4103/ijdr.IJDR_748_20. PMID: 35946238.

[2] Shrestha, Ashish & Marla, Vinay & Shrestha, Sushmita & Maharjan, Iccha. (2014). Developmental anomalies affecting the morphology of teeth - A review. RSBO. 12. 10.21726/rsbo.v12i1.732.

[3] Bahrololoomi Z, Ghafourifard R, Soleimani AA. Primary mandibular first molar with single root and single canal: a case report of a rare morphology. J Dent (Tehran). 2014 May;11(3):355-60. Epub 2014 May 31. PMID: 25628671; PMCID: PMC4290764.

[4] Zeichner-David M, Oishi K, Su Z, Zakartchenko V, Chen LS, Arzate H, Bringas P Jr. Role of Hertwig's epithelial root sheath cells in tooth root development. Dev Dyn. 2003 Dec;228(4):651-63. doi: 10.1002/dvdy.10404. PMID: 14648842.

[5] Tewari N, Pandey RK. Bilateral fusion in primary mandibular teeth: a report of two cases. J Indian Soc Pedod Prev Dent. 2011 Jan-Mar;29(1):50-2. doi: 10.4103/0970-4388.79936. PMID: 21521919.

[6] Almas, Büşra. (2025). Dental Anomalies: an Updated Review on Development, Morphology, and Clinical Management. International Journal of Health & Medical Research. 04. 10.58806/ijhmr.2025.v4i12n05.

[7] Ackerman JL, Ackerman AL, Ackerman AB. Taurodont, pyramidal and fused molar roots associated with other anomalies in kindred. Am J Phys Anthrop 1973; 38: 681-94

[8] Holan G, Chosack A. Single-rooted molars in the primary and permanent dentition in two siblings: Case report. Pediatr Dent 1991; 13: 367-9.

[9] Nguyen AH, Tiffee JC, Arnold RM. Pyramidal molar roots and canine like dental morphologic features in multiple family members: A case report. Oral Surg Oral Med Oral Path Oral Radiol Endod 1996; 82: 411-6.

[10] Jeevanandan, Ganesh; Subramanian, EMG1; Muthu, M S2,. Single-rooted primary first molars. Indian Journal of Dental Research 23(1):p 104-106, Jan–Feb 2012. | DOI: 10.4103/0970-9290.99050

[11] Chaudhari, P. & Mallikarjuna, Rachappa & Swadas, Milan & Dave, Bhavna. (2013). Unilateral single-rooted primary mandibular first molar. BMJ case reports. 2013. 10.1136/bcr-2013-200034.

[12] Haridoss S, Swaminathan K, Rajendran V, Rajendran B. Single-rooted primary first mandibular molar. BMJ Case Rep. 2014 Aug 22; 2014: bcr2014206347. doi: 10.1136/bcr-2014-206347. PMID: 25150245; PMCID: PMC4154040.

[13] Marwah N, Goenka P, Gumber P. Single rooted primary first molar with nonsyndromic hypodontia: A rare case report. J Oral Maxillofac Pathol. 2015 May-Aug;19(2):268. doi: 10.4103/0973-029X.164559. PMID: 26604513; PMCID: PMC4611945.

[14] G Chowdhury, Tazdik & Jahan, K & Tasnim-A-Jannat, & Imon, Ashik Abdullah. (2020). Mandibular Primary First Molar with Single Root and Single Canal: A Rare Case Report. Journal of National Institute of

Neurosciences Bangladesh. 6. 67-71. 10.3329/jninb.v6i1.48034.
[15] Ujariya, Urvashi et al. "A Rare Occurrence of Bilateral Single-Rooted Mandibular First Molar." Case Reports in Dentistry 2022 (2022): n. pag.
[16] Sadhar, S. (2022). Single Rooted Primary Molars in Addition to Taurodontism – A Rare Case Report. UNIVERSITY JOURNAL OF DENTAL SCIENCES, 8(4). https://doi.org/10.21276//ujds.2022.8.4.17
[17] Prakash S, Sharma V, Khan W, Saraf BG, Sheoran N, Shaw M. Deciduous Mandibular First Molar with Single Root and Single Canal: An Astounding Occurrence. Int J Clin Pediatr Dent. 2024 Feb;17(2):198-201. doi: 10.5005/jp-journals-10005-2743. PMID: 39184877; PMCID: PMC11339481.
[18] Zeichner-David M, Oishi K, Su Z, Zakartchenko V, Chen LS, Arzate H, Bringas P Jr. Role of Hertwig's epithelial root sheath cells in tooth root development. Dev Dyn. 2003 Dec;228(4):651-63. doi: 10.1002/dvdy.10404. PMID: 14648842.
[19] Li J, Parada C, Chai Y. Cellular and molecular mechanisms of tooth root development. Development. 2017 Feb 1;144(3):374-384. doi: 10.1242/dev.137216. PMID: 28143844; PMCID: PMC5341797.
[20] Driesen RB, Gervois P, Vangansewinkel T, Lambrichts I. Unraveling the Role of the Apical Papilla During Dental Root Maturation. Front Cell Dev Biol. 2021 May 6; 9: 665600. doi: 10.3389/fcell.2021.665600. PMID: 34026757; PMCID: PMC8134663.
[21] Shahid M. Genetic Anomalies and Tooth Agenesis: Review Article. Biomed Pharmacol J 2013;6(1)
[22] Kim TH, Bae CH, Yang S, Park JC, Cho ES. Nfic regulates tooth root patterning and growth. Anat Cell Biol. 2015 Sep;48(3):188-94. doi: 10.5115/acb.2015.48.3.188. Epub 2015 Sep 22. PMID: 26417478; PMCID: PMC4582161.
[23] de Moor RJ. C-Shaped root canal configuration in maxillary first molars. Int Endod J 2002; 35: 200-8.