CASE REPORT

# ENDODONTIC MANAGEMENT OF A MANDIBULAR PRIMARY FIRST MOLAR WITH FIVE CANALS UNDER DENTAL OPERATING MICROSCOPE: A RARE ANATOMIC VARIATION

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The root canal morphology of primary molars is highly variable, with most mandibular primary first molars typically presenting with three or four canals. The presence of an additional canal is rare and poses a challenge in endodontic treatment. Identifying and managing such anatomical variations is critical to ensure complete debridement, disinfection, and obturation of the root canal system, ultimately leading to successful treatment outcomes. This case report describes the endodontic management of a mandibular primary first molar with an unusual morphology of five canals in a 6-year-old patient. The patient presented with symptoms indicative of pulpal involvement, and clinical and radiographic examinations were performed. Intraoral periapical radiographs, along with careful exploration of the pulp chamber, confirmed the presence of an additional canal in the mesial root, resulting in a total of five canals, which was done under an endodontic microscope. A thorough understanding of root canal variations in primary molars is crucial for successful endodontic treatment. This case highlights the significance of detailed radiographic assessment, careful exploration, and precise canal preparation in managing complex root canal anatomy. Early diagnosis and appropriate treatment of such cases are essential for preserving primary dentition, which plays a vital role in occlusal development and space maintenance for the eruption of permanent teeth**.**

**Keywords:** Extra Canals, Primary molar, Pulpectomy, Canal morphology variation, Case report, Endodontic microscope

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## INTRODUCTION

The primary goal of pulpectomy is to meticulously cleanse the root canals of pulpally involved primary teeth, as the presence of bacterial biofilms within them can lead to treatment failure. The procedure is influenced by the complex anatomy of primary teeth and the child's behaviour, both of which play a significant role in its success. To do so, the operator must understand the ongoing morphological changes in these teeth so as to familiarize themselves with their atypical root canal anatomy with the aim of precisely locating, cleansing, and fill the root canals.[1]

Treatment for pulpally involved primary teeth is necessary to maintain arch integrity and to guide the permanent tooth eruption. Pulpectomy is therefore a viable alternative to extraction for nonvital or irreversibly inflamed primary teeth with accessible root canals and healthy supporting bone.[2]

The primary mandibular first molar is widely recognized as a key tooth in the primary dentition due to its unique crown morphology, which bears no resemblance to its permanent successor. Typically, the primary mandibular first and second molars possess three canals, aligning with the external root canal structure. In primary mandibular molars, approximately 75–85% of the mesial roots contain two canals; conversely, only 25% of distal roots in either tooth contain more than one canal.[2] KG Malvika *et al*. (2023) in their systematic review found that the vast majority (99.9%) have two roots, with four straight canals in 81.25% of cases, a root length ranging from 6.4 to 9.4 mm, and predominantly exhibiting Vertucci's Type I and IV configurations.[3]

Root growth relies on constant elongation of Hertwig's epithelial root sheath (HERS), which also determines the size, shape, and number of the radicular pulp.[4,5] The dental pulp is made up of connective tissue having an ectomesenchymal origin, surrounded by bilayered mineralized tissues, including the enamel, dentine, and/or cementum. The basal layer of the dental organ consists of inner and outer enamel epithelium, which form HERS. Failure to invade Hertwig's epithelial root sheath results in root dysmorphology.[5,6]

A comprehensive understanding of root anatomy and canal structures is essential for conducting effective endodontic procedures. The case report presented here explores the successful

endodontic treatment of primary mandibular first molars featuring additional canals.

## CASE REPORT

A six-year-old girl presented to the Department of Paediatric and Preventive Dentistry with the main complaint of pain in the lower right back tooth region for the past 1-2 weeks. The pain was dull, severe, localized, and aggravated on exposure to hot or cold stimuli, as well as during chewing. During the history-taking, the parents did not report any significant medical history. The patient was rated as definitely negative (--) according to Frankl's behavior rating scale at the first dental visit.

Clinical examination revealed deep dental caries along with gingival swelling and tenderness to percussion with respect to 84 (lower right second molar). Radiographic examination suggested radiolucency involving the enamel, dentine and pulp. Root resorption in the distal root was seen (Fig.1a). The parents were informed about the poor prognosis of the tooth; hence, extraction was initially suggested, which they declined, seeking alternative treatment options. Subsequently, the final treatment plan was to proceed with pulpectomy followed by post-operative restoration.

Following local anaesthesia, access opening was done w.r.t 84. After access cavity preparation, meticulous examination revealed that the tooth exhibited five distinct root canal orifices; three within the mesial root and two within the distal root. This was confirmed by an endodontic microscope Labomed® under 2.5X magnification, as depicted in (Fig. 2). Cone Beam Computed Tomography (CBCT) was advised to understand the morphology of canals; however, it could not be done due to the patient's uncooperative behaviour. Working length was determined by radiograph (Fig.1b) followed by chemo-mechanical preparation with Paediatric Hand Protaper File System (KEDO SH®), Copious irrigation was done using normal saline. The root canals were then obturated using $Ca(OH)_2$ (Metapex®) . Post-operative restoration was done using Composite material (Ivoclar Vivadent Te-Econom Plus®) (Fig.1c). Stainless Steel crown was not given to the patient because the root resorption is already started in the distal root w.r.t. 84.

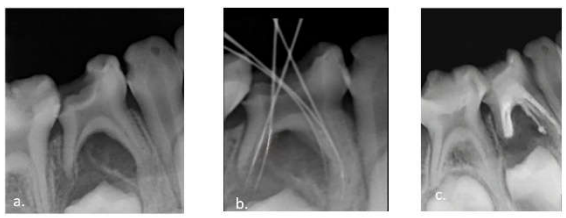


**Figure 1: A.Pre-operative radiograph. B. Working length radiograph. C. Post-operative radiograph**

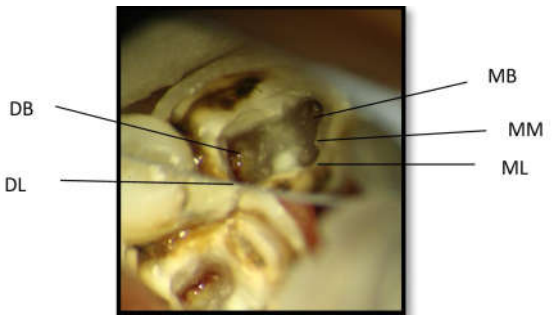


**Figure-2: Showing 5 orifices of the canals: 3 mesial and 2 distal under endodontic microscope Labomed® under 2.5X magnification**

## DISCUSSION

In primary teeth, the root canal structure can be intricate and often deviates from the typical pattern, exhibiting variations in shape, size, and the number of roots and canals.[7] Despite this, limited documentation exists on unusual root anatomy in primary teeth, obscuring the true prevalence of such occurrences.[1] This scarcity of reports may be attributed to the brief timeframe between root formation and resorption, during which evidence of anomalies may be lost due to ongoing root resorption processes.[8] Extra canals can be identified by carefully examining the pulpal floor and wall anatomy to locate potential canal openings. Occasionally, a developmental groove between the mesiobuccal and mesiolingual orifices can hinder direct access to these additional canals. However, this groove can be carefully explored using a sharp endodontic probe DG 16 or gently troughed with a round bur or fine ultrasonic tip.[9] Zoremchhingi *et al.*(2008), using CT scans, examined 15 primary first molars and identified that all the teeth with two canals: one mesial one distal.[10] Sim and Mah, in their CT-based study on primary molars, noted that mesial roots commonly possess two canals.[11] Bagherian A *et al.* (2010) analyzed 27 extracted teeth and found that in the mesial root, 18.5% had one canal, while 81.5% had two canals. In the distal root, 77.8% had one canal, whereas 22.2% had two canals.[6] Wang *et al.* conducted a CBCT study involving 98 root canals of primary molars. They found that the primary mandibular first molar typically has two canals in the mesial root, while the distal root may contain either one or two canals. They identified seven distinct variations in the root canal anatomy of these teeth. Additionally, he proposed a classification system based on the number of roots and canals.[12] However, this classification is not widely used at present. Ozcan G *et al.* (2015) analyzed CBCT images of 72 children and found that in all cases, the mesial root had two canals (100%) and none had a single canal (0%). In the distal root, 77.8% had one canal, while 22.2% had two canals.[13] KG Malvika *et al.* (2023), in their systematic review, found that an overwhelming majority of cases (99.9%) presented with two distinct roots. Additionally, four straight canals were identified in

81.25% of the examined cases. The study also reported that the length of the roots varied between 6.4 mm and 9.4 mm. Furthermore, the most frequently observed canal configurations were classified under Vertucci's Type I and Type IV, indicating a predominant pattern in the morphology of the root canal system.[3]

Ahmed *et al*.[14] introduced a novel classification system that facilitates precise and accurate descriptions of root and canal morphology (Fig 3). This system effectively overcomes the limitations of previous classification systems, which often inaccurately categorized complex canal configurations. According to this classification, in the present case $^{2}84\ M^{3}\ D^{2}$ canal morphology present which is very rare in primary mandibular first molars.

| Tooth type | Code |
|---|---|
| Single-rooted | $^{1}TN^{O\text{-}C\text{-}F}$ |
| Double-rooted | $^{2}TN\ R1^{O\text{-}C\text{-}F}\ R2^{O\text{-}C\text{-}F}$ |
| Multirooted | $^{n}TN\ R1^{O\text{-}C\text{-}F}\ R2^{O\text{-}C\text{-}F}\ Rn^{O\text{-}C\text{-}F}$ |

TN, Tooth number; R, Root; O, Orifice; C, Canal; F, Foramen.

**Figure-3: Showing the summary of the codes allocated for single-, double- and multirooted teeth[14]**

To be a skilled and proficient professional, a dentist must possess two essential qualities: exceptional motor skills and sharp visual acuity. The use of magnification makes possible the visualization of microscopic details of the operating field and has a positive influence on the ability to diagnose and restore dental lesions. Traditionally, endodontic procedures were performed without visual assistance, relying solely on the endodontist's tactile skills, mental imagery, and expertise. However, the introduction of the dental operating microscope (DOM) has transformed the field, allowing for direct visualization of even the most challenging areas within the straight portion of the root canal system, including the apical region. This advancement has significantly enhanced the precision and effectiveness of endodontic treatments.[15]

**Limitations:**

Rubber dam application and Cone Beam Computed Tomography (CBCT) could not be done due to the patient's uncooperative behaviour.

## CONCLUSION

Locating extra canals in primary molars can pose challenges, yet they are not uncommon. It is important to make diligent efforts to explore these additional canals to achieve a successful outcome in endodontic treatment.

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