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Comparison of Root Resorption in Primary Mandibular Molars in Radiograph and Actual Resorption

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Abstract

The eruption of the primary dentition, their exfoliation due to root resorption, and then the eruption of the permanent dentition follow in an orderly sequence. After the apices close, initial resorption starts between one and three years later, and exfoliation happens about three years later.Radiographs of primary lower molar teeth among children in the age group 5 to 12 years were taken. Age Groups were divided into less than 8 years, 8 to 9 years, 10 to 11 years and 12 years or more from 2020 to 2023 around 250 patients data were collected. Digital radiographs (RVG) of the primary mandibular molar were used to measure the resorption in EZ DentI software. In the actual extracted tooth, the root resorption was measured with a scale from CEJ of the tooth to the resorbed apex for the mesial root & distal root respectively. Based on results obtained in the radiograph, the number of 79 teeth had < ¼ resorption, 86 teeth had ¼ - ¾ resorption and 85 teeth had > ¾ resorption. In actual teeth, the number of 75 had < ¼ resorption, 85 had ¼ - ¾ resorption and 90 had > ¾ resorption. The resorption was symmetrical in 115 teeth, maximum in the mesial root was seen in 75 and the maximum in the distal root was seen in 60. When comparing root resorption in IOPA to actual root resorption, there was not much of a difference in the degree of resorption.

Keywords: *IOPA, Primary Mandibular Molar, Root Resorption.*

Introduction

The eruption of the primary dentition, their exfoliation due to root resorption, and then the eruption of the permanent dentition follow in an orderly sequence [1]. When the follicle of the next permanent tooth aligns with the root surface and active eruption of the succeeding permanent tooth commences, the roots of primary teeth resorb [2] [3]. Primary teeth eventually resorb in the absence of a permanent replacement, however, exfoliation may take longer than typical [4]. The resorption of primary molar roots is influenced by several circumstances, including dental caries, congenital absence of the permanent tooth bud, and various clinical reasons which are more essential to determine treatment planning [4][5].

Premolar growth begins between the diverging primary molar roots, and the placement and size of the premolar follicles determine the pattern of root resorption [6]. Primary molar root resorption can be similar or irregular, with one root being much more resorbed than the other. Anatomically, the roots of the lower second molars are extremely bent and divergent, and the space between them is frequently larger than the size of the follicle that will replace it [7]. Depending on where the successor is in the succession, different impacts may be applied to the roots. This may be the cause of the uneven root resorption that is

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occasionally observed in more than one-third of lower second molars [4].

The purpose of this study is to evaluate the accuracy of radiographic assessment in diagnosing root resorption in primary mandibular molars compared to actual resorption as observed through direct examination. By comparing radiographic findings with clinical outcomes, the study aims to determine the reliability of radiographic imaging in detecting root resorption, which is crucial for effective diagnosis, treatment planning, and management of primary teeth. This comparison will help in understanding the limitations and potential discrepancies between radiographic and actual resorption, ultimately improving diagnostic practices in pediatric dentistry.

By comparing the length of the resorbed root to the total root length, radiographs have been utilized to ascertain the degree and timing of root resorption of the primary tooth [8]. On radiographs, the pattern of root resorption can vary, appearing as a rounded or sharp apical margin, obvious or extra lateral thinning at the beginning stages of resorption, and a horizontal or diagonal edge at the end stages [8] [9]. The patterns of primary tooth root resorption are poorly understood regionally which complicates the treatment planning as the 2D radiographs may not be accurate at all times. Accurate determination of working length is essential in pediatric dentistry, especially in cases of Dental trauma, to ensure proper treatment planning and outcomes [10–13]. Hence, the study aimed to compare and evaluate the root resorption in primary mandibular molars in IOPA and actual resorption.

Materials and Methods

The radiographs and extracted teeth of the age group from 5 years to 12 years who had undergone extractions were collected from the Dental Information Archival System (DIAS) of Saveetha Dental College and hospitals in Chennai, India. Age Groups were divided into 4 groups such as less than 8 years, 8 to 9 years, 10 to 11 years and 12 years or more. 2020 to 2023 around 250 patients data were collected. The root resorption was classified based on an extension of resorption of the root as follows: [14]

1. Resorption <¼
2. Resorption ¼ - ¾
3. Resorption >¾

If the two roots have a varied score of resorption in such a case the higher score will be considered. Digital radiographs (RVG) of the primary mandibular molar were used to measure the resorption in EZ DentI software (Figure 1). All examination procedures were carried out by a single examiner, who had been taught and calibrated (kappa=0.84) by senior faculty in capturing aspects of root resorption patterns. The following radiograph selection criteria were used for the current study: clear images of the primary mandibular molar roots, clear images of the cementoenamel junction (CEJ), absence of pulp treatment, and absence of stainless-steel crowns. The resorption of the mesial and distal roots (i.e., symmetrical or if one of the roots was more resorbed); symmetry was defined as the CEJ at the mesial and distal surfaces being parallel to a line connecting the apices.

In the actual extracted tooth, the root resorption was measured with a scale from CEJ of the tooth to the resorbed apex for the mesial root & distal root respectively (Figure 2). The collected data was analyzed in spss 26.0 and graphs were obtained.

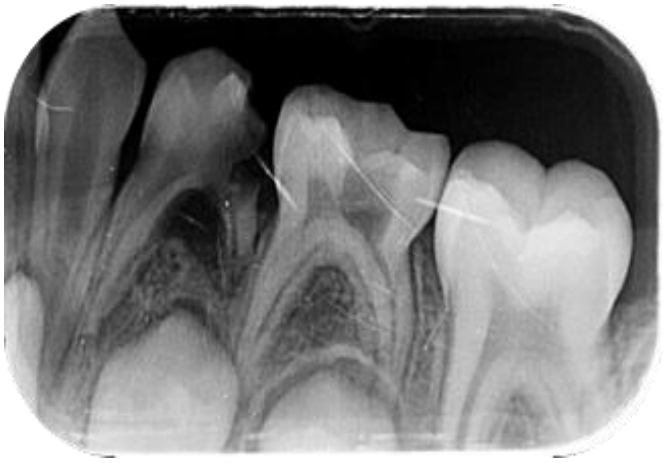

Figure 1. Illustrates the Radiograph of 84

Figure 2. Illustrates the Extracted 84 Tooth

Results

Based on results obtained in the radiograph, the number of 79 teeth had < ¼ resorption, 86 teeth had ¼ - ¾ resorption and 85 teeth had > ¾ resorption. In actual teeth, the number of 75 had < ¼ resorption, 85 had ¼ - ¾ resorption and 90 had > ¾ resorption (Figure 3). The resorption was symmetrical in 115 teeth, maximum in the mesial root was seen in 75 and the maximum in the distal root was seen in 60 (Figure 4). The radiograph shows more resorption compared to the actual tooth. The mesial and distal roots of both molars displayed considerably less than a quarter of the root resorption, followed by one-fourth to three-fourth levels of root resorption ($p<0.001$). In primary first molars, there was relatively greater root resorption in the mesial roots than in the distal roots (Figure 4). Root resorption is a three-dimensional process, thus it is undoubtedly limited when viewed in two dimensions.

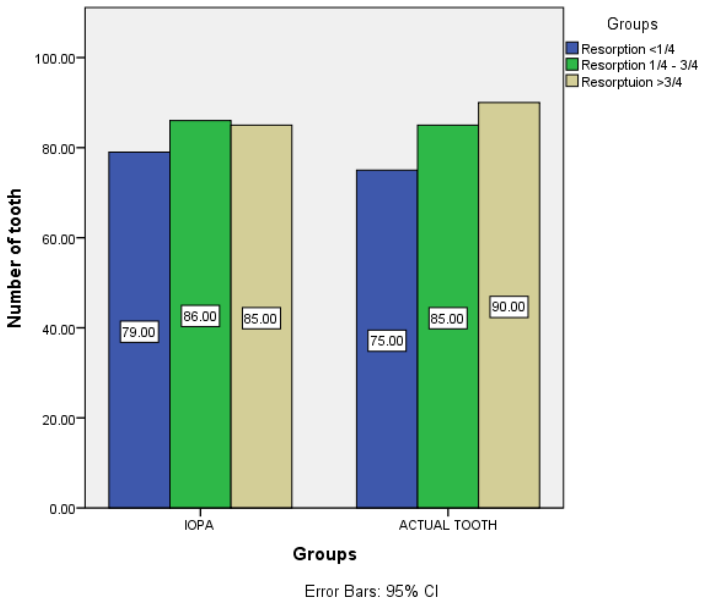

Figure 3. Illustrates the comparison of extension of resorption between IOPA and actual tooth in which blue represents < ¼ resorption, green represents ¼ - ¾ resorption and beige represents > ¾. In IOPA the frequency of < ¼ resorption was 79,¼ - ¾ resorption was 86 and > ¾ resorption was 85. In actual tooth, the frequency of < ¼ resorption was 75,¼ - ¾ resorption was 85 and > ¾ resorption was 90. In IOPA, resorption is perceived to be greater than actual teeth.

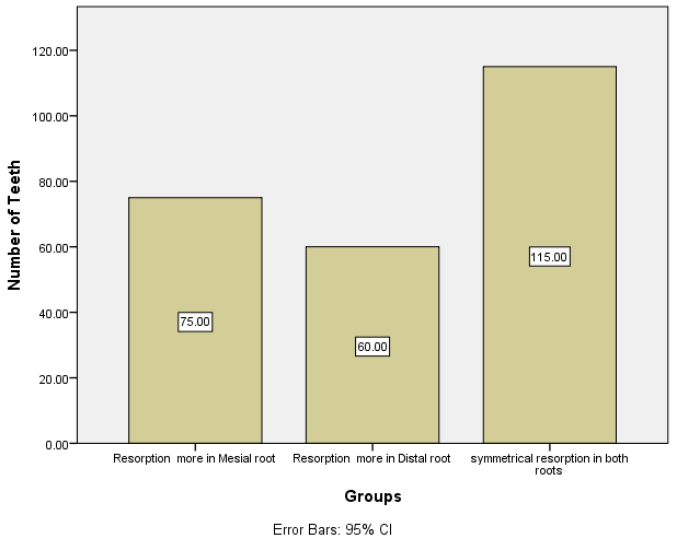

Figure 4. Illustrates frequency of extension of resorption in mesial root (75), distal root (60) and symmetrical resorption (115).

Discussion

The uneven pattern of primary tooth root resorption is significantly influenced by the location and size of the permanent tooth bud [21]. When upper primary molars are taken into account, this may be further justified because the palatal root is frequently protected from resorption due to its extremely divergent structure. Similar to the anterior tooth, the permanent successor's finished crown can be seen to be lingual to the primary tooth's apex [15]. This permanent successor's eruption in the labial and incisal directions causes the lingual surfaces of the apical third of the primary tooth root to resorb [22]. All of the mandibular primary molars in this investigation displayed

significantly less than a quarter of root resorption on both the mesial and distal roots [16]. Compared to the roots of the mandibular primary first molars, the mandibular primary second molars demonstrated a larger propensity for symmetrical root resorption in this investigation [17].

Based on a previous research study that included 84 kids between the ages of 7 and 10 who were recruited from the University of Queensland dental school [16]. According to previous research, both primary molars exhibit a significant incidence of ankylosis, which has affected the premolars' eruption and development [23]. However, the ankylosed molar frequently spontaneously exfoliates within six months, leading to issues such as arch-length loss, occlusal disruption, hooked roots, or impaction of permanent successors due to delayed exfoliation [18]. The present study was done to combat the early extraction of primary teeth with misguidance of a 2D radiograph as in most of cases the resorption in radiograph is varied with actual tooth [24]. The current study is performed to find how much difference of root resorption is present in radiographs when compared to actual tooth to help the clinician to plan the treatment wisely.

The extent of root (resorption in the mandibular deciduous second molars without succedaneous teeth tended to increase from mild to moderate from childhood to adulthood. Twenty-five per cent of the teeth had infra occlusion in the sample studied [19]. Mandibular second molars in infra occlusion showed a greater extent of root resorption [20]. In comparison to the results obtained by the present study the extension of root resorption observed in IOPA showed ¼ - ¾ resorption among 250 kids which on comparison with actual tooth root resorption showed a similar extension of resorption which confirms that a 2D radiographic investigation can be nearly accurate for diagnosing the root resorption pattern and extension for planning treatment [25].

The mesial and distal roots of the mandibular primary molar in our investigation displayed considerably more root resorption than half. The permanent crown replacement width is less than its inter-root distance, and the roots of the mandibular primary second molars are divergent and curved. As a result, the roots of these teeth tend to survive resorption, leaving behind root pieces that could negatively impact the surviving teeth. To make sure that issues from over-retained primary teeth don't arise, such an unequal distribution of the degree of root resorption calls for careful observation and prompt treatment. Early intervention and appropriate treatment protocols are essential in pediatric dentistry to prevent long-term complications associated with dental trauma [26][27].

To improve on future investigations, various limitations in this study deserve to be mentioned. The cross-sectional design and the absence of several additional factors, including the position of erupting permanent successors, the clinical condition of the resorbing primary teeth, and the assessment of canine root resorption, may be viewed as severe shortcomings. Thus, to better understand the patterns of primary dentition root resorption, additional research with a longitudinal design and the aforementioned criteria may be carried out.

Conclusion

When comparing root resorption in radiograph to actual root resorption, the radiograph shows more resorption compared to the extracted actual tooth which may mislead a clinician to diagnose and plan an appropriate treatment. Thus radiograph is to be rechecked twice by the clinician prior to planning the treatment. Within the constraints of this study, it was obvious that there was a relatively high incidence of uneven levels of root resorption. The angulation or manner of the x-ray should be taken into consideration, along with

additional research using a variety of samples, to lessen bias.

Acknowledgement

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Conflict of Interest

The author declares that there was no conflict of interest in the present study.

References

[1]. Turan Y, Akal N, Yildirim B, Kaymaz F, Baris E. Apoptosis in physiological root resorption of primary teeth. Niger J Clin Pract. 2023 Mar;26(3):307–13.

[2]. Sanjeev MN, Kaur H, Mayall SS, Rishika, Yeluri R. Resorbable Collagen Barrier Impeding the Extrusion of Obturating Material in Primary Molars Undergoing Resorption - A Randomized Clinical Trial. J Clin Pediatr Dent. 2021 Nov 1;45(5):312–6.

[3]. Datta P, Zahir S, Kundu GK, Dutta K. An in vitro study of the root canal system of human primary molars by using multidetector computed tomography. J Indian Soc Pedod Prev Dent. 2019 Apr-Jun;37(2):120–6.

[4]. Movahedian N, Abedi S, Memarpour M. Comparison of the Demirjian and Root Resorption Methods to Estimate Dental Age in Radiographic Images. J Dent Child. 2018 May 15;85(2):45–50.

[5]. Buldur B, Hascizmeci C, Aksoy S, Nur Aydin M, Guvendi ON. Apical extrusion of debris in primary molar root canals using mechanical and manual systems. Eur J Paediatr Dent. 2018 Mar;19(1):16–20.

[6]. Raslan N, Mansour O, Assfoura L. Evaluation of antibiotic mix in Non-instrumentation Endodontic Treatment of necrotic primary molars. Eur J Paediatr Dent. 2017 Dec;18(4):285–90.

[7]. Sahni A, Kapoor R, Gandhi K, Kumar D, Datta G, Malhotra R. A Comparative Evaluation of Efficacy of Electronic Apex Locator, Digital Radiography, and Conventional Radiographic Method for Root Canal Working Length Determination in Primary Teeth: An Study. Int J Clin Pediatr Dent. 2020 Sep-Oct;13(5):523–8.

[8]. Ricardi MP, De Toledo OA. [The physiologic root resorption of deciduous teeth (author's transl)]. Arq Cent Estud Fac Odontol UFMG. 1974 Jul-Dec;11(2):217–30.

[9]. Wedenberg C. Development and Morphology of Internal Resorption in Teeth: A Study in Humans, Monkeys and Rats. 1987. 136 p.

[10]. Sruthi S, Gurunathan D. Working length of maxillary primary second molars in children aged 2-6 years-a retrospective study. Int J Dent Oral Sci. 2021;8(2):1780–4.

[11]. Saberi E, Zahedani SS, Ebrahimipour S. Apical Extrusion of Intracanal Bacteria with Single File and Multifile Rotary Instrumentation Systems. J Int Soc Prev Community Dent. 2017 Sep 18;7(5):292–6.

[12]. Assessment of working length of root canal in mandibular first primary molar in children aged between 2 to 6 years. Indian J Forensic Med Toxicol [Internet]. 2020 Oct 7.

[13]. WORKING LENGTH DETERMINATION IN MANDIBULAR PRIMARY SECOND MOLARS-A RETROSPECTIVE STUDY. Available from: https://archives.palarch.nl/index.php/jae/article/view/1447.

[14]. Taravati S, Balak Z, Rakhshan V. Diagnostic Accuracy of Periapical Radiography in Detection and Measurement of the External Root Resorption in Primary Molars: A Single-Blind Prospective Clinical Study. Int J Dent. 2022 Aug 3;2022:7031086.

[15]. Bezerra LM, Ando T. Various aspects of root resorption of the lower deciduous molars and the development of their successors and the lower first and second permanent molars. Rev Fac Odontol Sao Paulo. 1978 Jul-Dec;16(2):169–75.

[16]. Fuks A, Peretz B. Pediatric Endodontics: Current Concepts in Pulp Therapy for Primary and Young Permanent Teeth. Springer; 2016. 164 p.

[17]. Davidovitch Z ’ev. Biological Mechanisms of Tooth Eruption, Resorption and Replacement by Implants: Proceedings of the International Conference Held at the Sheraton Tara Hotel and Resort, Danvers, Massachusetts, October 21-24, 1993. 1994. 779 p.

[18]. Murthy P, Bhojraj N, Hegde U. Changes in Pulp and Roots of Deciduous Teeth during Different Stages of Physiologic Resorption: A Histologic Study. Int J Clin Pediatr Dent. 2023 May-Jun;16(3):437–43.

[19]. Yanoshita M, Hirose N, Onishi A, Nishiyama S, Kubo N, Kita D, et al. Orthodontic Treatment for a Patient with Root Resorption of All Four Maxillary Incisors due to Bilaterally Impacted Canines. Case Rep Dent. 2022 Sep 19;2022:5628030.

[20]. Calheiros-Lobo MJ, Costa F, Pinho T. Infraocclusion level and root resorption of the primary molar in second premolar agenesis: A retrospective cross-sectional study in the Portuguese population. Dent Med Probl. 2022 Apr-Jun;59(2):195–207.

[21]. Acharya S, Sahoo D, Singh B, Gurunathan D. Revascularization Revisited with Modified Triple Antibiotic Paste and NeoPutty MTA®. J Pharm Bioallied Sci. 2024 Apr;16(Suppl 2):S1871.

[22]. Saikiran KV, Gurunathan D, Nuvvula S, Jadadoddi RK, Kumar RH, Birapu UC. Prevalence of Dental Trauma and Their Relationship to Risk Factors among 8-15-Year-Old School Children. Int J Dent. 2022 Dec 22;2022:3343827.

[23]. Jeyashree T, Gurunathan D, Padmapriya S. Association of malocclusion and trauma in children: A retrospective study. J Adv Pharm Technol Res. 2022 Nov;13(Suppl 1):S212–6.

[24]. Gandhi JM, Gurunathan D. Short- and long-term dental arch spatial changes following premature loss of primary molars: A systematic review. J Indian Soc Pedod Prev Dent. 2022 Jul-Sep;40(3):239–45.

[25]. Suresh C, Gurunathan D, Padmapriya S. Prevalence of Class V caries in maxillary and mandibular canines of 3–5-year-old children: A retrospective study. J Adv Pharm Technol Res. 2022 Dec;13(Suppl 2):S584.

[26]. Varshini A, Gurunathan D, Padmapriya S. Prevalence of class I caries in the second mandibular primary molar in 3–6-year-old children. J Adv Pharm Technol Res. 2022 Nov;13(Suppl 1):S72.

[27]. Harini B, Gurunathan D, Padmapriya S. Prevalence of class I caries in the second maxillary primary molar in 3–6-year-old children: A retrospective study. J Adv Pharm Technol Res. 2022 Nov;13(Suppl 1):S190.