Black Sea Journal of Health Science
doi: 10.19127/bshealthscience.940405

Open Access Journal
e-ISSN: 2619 – 9041

Case Report
Volume 4 - Issue 3: 314-318 / September 2021

MOLAR INCISOR MALFORMATION IN THREE CASES

Handan VURAL[1], Sacide DUMAN[1]*

[1]*Department of Pediatric Dentistry, Faculty of Dentistry, Inonu University, 44280, Malatya, Turkey*

Abstract: Molar-incisor malformation (MIM) or molar root-incisor malformation (MRIM) is a dental anomaly that affects molar teeth and maxillary central incisors. Even though, the etiology is not exactly known, it has been reported that several factors such as staphylococcal infection in the neonatal period, neurological diseases such as meningitis and hydrocephalus, ongoing medications, infectious diseases and premature delivery were effective. In this case report, the clinical and radiographic characteristics of 3 cases with MIM were specified. Early diagnosis and follow up of MIM is of great importance and there is a need for a multidisciplinary treatment approach in MIM.

Keywords: Molar-incisor malformation, Molar root-incisor malformation, Root anomalies, Oral pathology, Pediatric dentistry

***Corresponding author:** Department of Pediatric Dentistry, Faculty of Dentistry, Inonu University, 44280, Malatya, Turkey
E mail: sacidetuncduman@gmail.com (S. DUMAN)
Handan VURAL https://orcid.org/0000-0003-3155-5837
Sacide DUMAN https://orcid.org/0000-0001-6884-9674

Received: May 21, 2021
Accepted: June 09, 2021
Published: September 01, 2021

Cite as: Vural H, Duman S. 2021. Molar incisor malformation (MIM) in three cases. BSJ Health Sci, 4(3): 314-318.

1. Introduction

Dental anomalies may affect crown and roots separately or together. They may occasionally impact complete denture as well as they may emerge in a single tooth or multiple teeth simultaneously. Dental hard tissue anomalies may occur due to environmental and etiological factors which affect the teeth during histogenesis (Wright et al., 2016). The potential growth anomalies may cause anomalies in the number, shape or mineral matrix of the tooth (Brook, 2009).

Molar-incisor malformation (MIM) (Lee et al., 2014) or molar root-incisor malformation (MRIM) (Wright et al., 2016) is a dental anomaly that has been first described in 2014 in the literature and that affects molar teeth and maxillary central incisors. The prevalence of MIM has not been definitely identified yet and it commonly appears in first permanent molars (PFMs), nevertheless, it may also emerge in the primary second molar teeth, although rare (Neo et al., 2019).The typical findings of molar teeth with MIM are malformed roots that appear hypoplastic, incomplete or short and narrowed, and narrowed crowns from the cervical portion, reduced ceiling-floor distance in pulp chamber and a slit-shaped image of pulp chamber in the radiography. Similarly, narrowed crowns of maxillary central teeth towards cervical portion and/or groove-like enamel defects may also appear (Lee et al., 2014; Wright et al., 2016; Neo et al., 2019; Vargo et al., 2020). In this study, clinical and radiographic features of 3 cases with MIM are presented.

2. Case Series Description and Findings

The clinical and radiographic examination of the 6, 7 and 11-years-old pediatric patients that applied to the Clinic of Pediatric Dentistry due to the various reasons, revealed anomalies in the roots and crowns of some teeth. As a result of the findings in the affected teeth of patients, it was concluded that the present anomaly was MIM. The demographic data of patients and the affected teeth are shown in Table 1 and Table 2. The medical anamnesis of all patients reported that health problem prenatal period and within 2 years of postnatal period (Table 1).

Table 1. Demographic informations and medical history of all cases

	Gender/age	Reason to apply	Medical history
Case 1	Male/6	Pain-like discomfort in the cervical regions of the lower primary molar teeth	• Premature delivery (34th gestational week)
Case 2	Male/7	Toothache	• Premature delivery • Cerebral haemorrhage on the postnatal 4th day
Case 3	Female/11	Tooth decay	• Bitten by a scorpion (30th-32nd gestational weeks)

Table 2. Clinical and radiographic findings of MIM-affected teeth in all cases.

	Case 1		Case 2		Case 3	
	Primary	Permanent	Primary	Permanent	Primary	Permanent
Mim to affected teeth	55,65,75,85	16,26,36,46	85 (74,75,84;loosing teeth, unknown)	16,26,36,46	X	16,26,36,46,17,27,37,47: Root malformation 14,24 : Enemal defect
Clinic symptoms	No decay, crack or filling was detected in the complained teeth. There was a slight pain during percussion, sensitivity and mobility particularly in the primary lower second molars.		A remarkable mobility was present in all the PFMs although no decay was encountered.		A wedge-shaped enamel defect was detected on the buccal surface of the maxillary first premolars. A remarkable mobility and sensitivity were present in all the PFMs.	
Radiographic symptoms	Sudden narrowing in the cervical regions of the primary second molars, abnormal resorption in the roots and slit-shaped pulp chambers. In all of PFMs, images of slit-shaped pulp chambers, narrowing in the cervical portion and abnormal widening of root canals (Figure 1).		Roots of the PFMs and left mandibular second primary molars were shortened and narrowed, pulp chambers were slit-shaped and their crowns showed a sudden narrowing on the cervical portions (Figure 2).		Pulp chambers of the maxillary PFMs were narrowed radiographically and root canals could not be clearly visualized, and narrowing in the pulp chamber of mandibular PFMs led to atypical root resorption or root malformation that can be described as formation of a short and narrowed root.(Figure 3A)	

PFMs= permanent first molar.

For all patients, precautionary consultation was performed with Departments of Pediatric Endocrinology, Medical Genetic and Neurology and no complication was reported. The patients and their families were informed about that result. PFMs were affected by MIM in all cases and also, some primary second molars were affected in first and second cases (Figure 1, Figure 2B). Malformations in the affected teeth showed typical MIM findings; the radiological examination displayed a sudden narrowing in the cervical regions of effected teeth, abnormal resorption in the roots and slit-shaped pulp chambers (Lee et al., 2014; Wright et al., 2016). On the other hand, images of slit-shaped pulp chambers, narrowing in the cervical portion and abnormal widening of root canals were noticeable in PFMs of all patients (Figure1, Figure 2A, and Figure 3A).

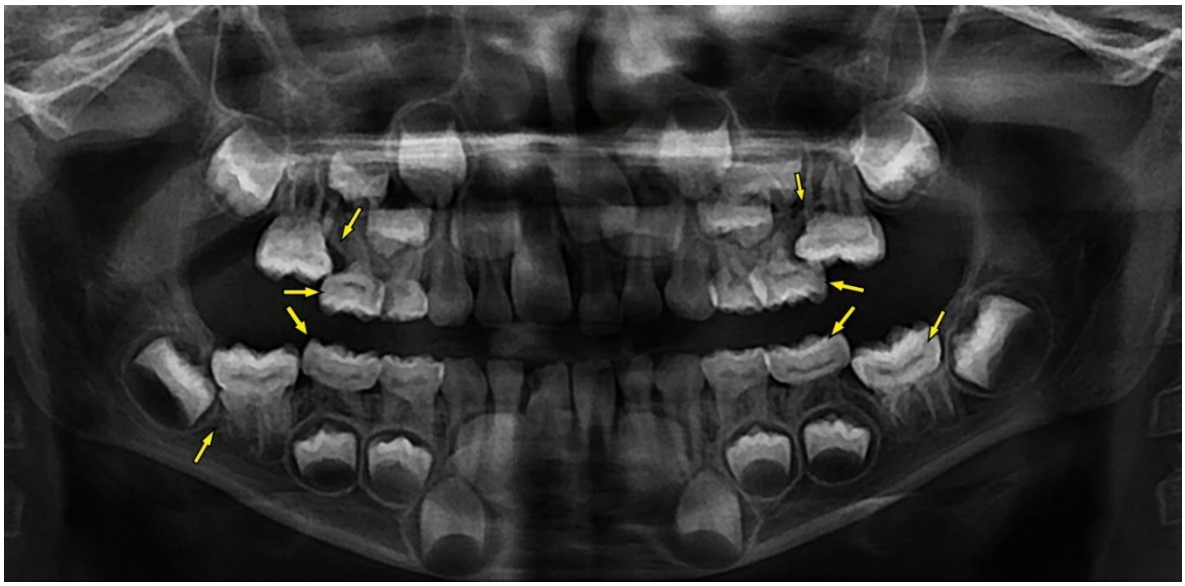

Figure 1. OPG images of the narrowed pulp chamber in primary second molar and all PFMs and root anomalies accompanied with sudden narrowing in the cervical crowns in first case.

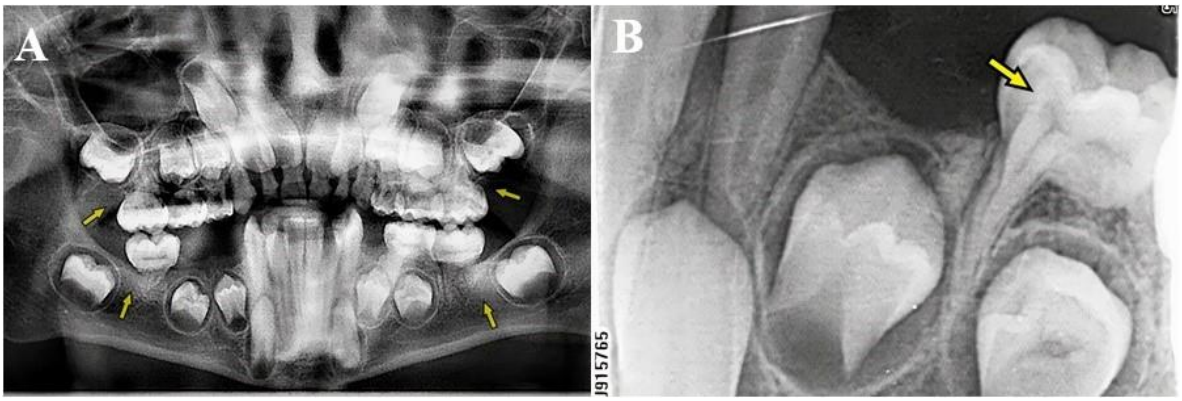

Figure 2. OPG image of all PFMs and left lower primary second molar affected by MIM in second case. B: Periapical radiography of the narrowed pulp chamber in the left lower primary second molar and the affected roots.

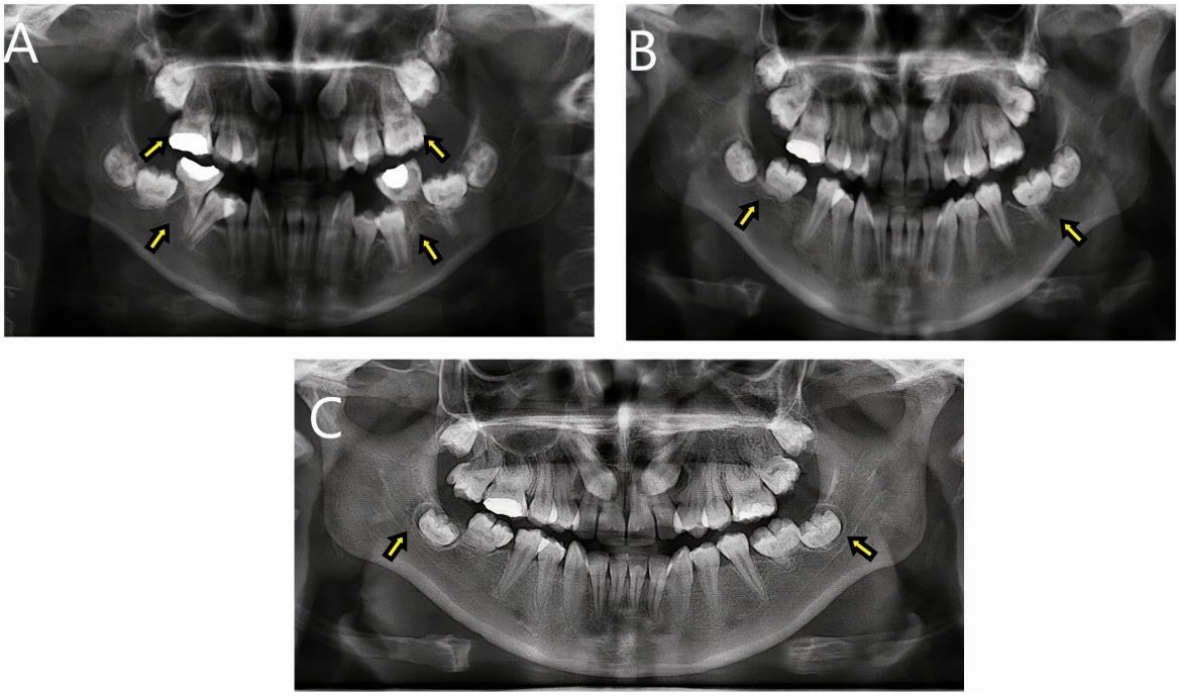

Figure 3. A: The first OPG image of the third case (11 years old), B: OPG image obtained 3 years later (14 years old) C: OPG image obtained 5 years later (16 years old).

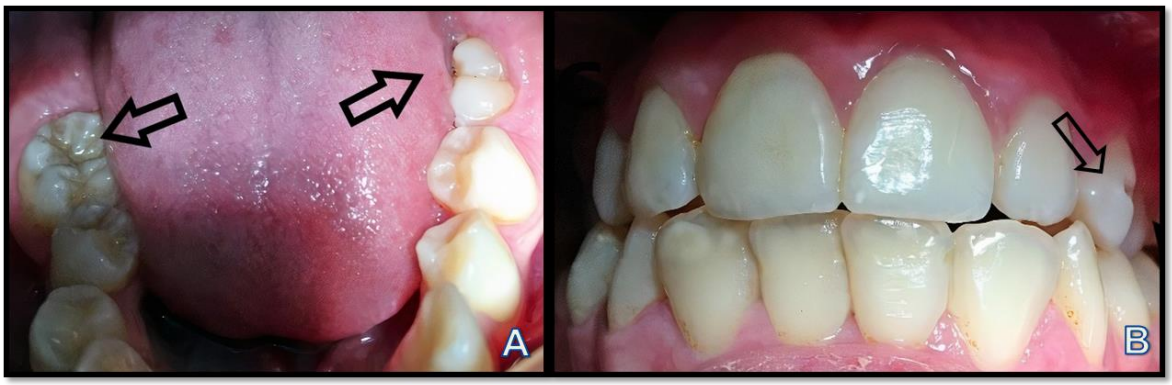

Figure 4. A: The inclination of lower second molars to lingual at the 5th-year follow-up process of the third case, B: Dentin defect in the maxillary first premolar.

In first case, orthopantomograpy (OPG) clearly encountered the presence of remarkable abnormal resorption in the distal roots of the maxiller primary second molars and mesialization of PFMs towards the resorption region (Figure 1). A more slightly form of the same situation was present in the mandible bilaterally.

Because of that, the patient and his family were also briefed about probable space inadequacy in permanent dentition, prognosis of PFMs and alternative treatment modalities. In second case, it was stated that right lower PFM was extracted because of severe pain due to family's demand at the first month control examination.

In third case, clinical examination did not show any malformation in the crowns of PFMs. However, in the radiographic evaluation, permanent second and third molars together with all PFMS were affected by MIM (Figure 3A). The crown part of the mandibular second molars appeared morphologically normal; however, growth of the roots was found to be delayed hypoplastic and pulp chambers were narrowed as slit-shaped. Dental treatments of the patient were performed. The patient and her family were informed, and regular examinations were planned for follow-up. 1 year later the patient re-applied due to the complaints of severe pain and increased mobility in the right mandibular PFM and referred for tooth extraction because root canal treatment could not be performed for that tooth. Six months later, left mandibular PFM was extracted due to similar complaints. The growth and eruption pattern of the lower permanent second molars encountered with a similar growth process with lower PFMs were followed-up via annual periodic examinations (Figure 3B). The 5-year follow-up process of the patient demonstrated increased mobility in the lower second molars and crowns of these molars were found to incline towards the lingual (Figure 4A). Also, a wedge-shaped enamel defect was detected on the buccal surface of the maxillary first premolar in the clinical examination (Figure 4B). The patient reported occasional sensitivity in the cervical parts. Root growth of the third permanent molars was almost non-existent on radiographic examination (Figure 3C).

3. Discussion

The number of cases reported in the study performed between the date "MIM'' has been first described in 2014 and 2020 was 65 (Neo et al., 2019). Even though, the etiology is not exactly known, it has been reported that several factors such as epigenetic mechanism, previous staphylococcal infection in the neonatal period, neurological diseases such as meningitis and hydrocephalus, medical history until 2 years of age, previous diseases, ongoing medications, previous urinary tract infection in the prenatal period, infectious diseases and premature delivery were effective (Lee et al., 2014; Wright et al., 2016; Yue and Kim, 2016; Brusevold et al., 2017; Choi et al., 2017; Neo et al., 2019; Vargo et al., 2020). Premature delivery was present in medical history in two of the reported cases whereas the mother of the third case was exposed to an insect bite in the prenatal period, and those data were supporting the previous case reports (Choi et al., 2017, Vargo et al., 2020).

The diagnosis of a patient with MIM may be coincidental; it may be also diagnosed due to the complaints such as early tooth loss, spontaneous pain, periapical abscess, tooth sensitivity, periodontal complications, aesthetic dissatisfaction, narrow space in the jaws, mobility of the teeth and ectopic eruption (Lee et al., 2014). The radiographic diagnostic techniques also play an important role in diagnosis as well as intraoral findings. In the present case report; Case 1 and Case 2 applied due to pain and sensitivity-like complaints in the teeth whereas Case 3 applied because of tooth decay and diagnosed coincidentally by radiographic examination.

In the differential diagnosis of MIM, "idiopathic root resorption", "regional odontoplasia", "Type 1 dentin dysplasia" (DD1) and molar incisal hypoplasia (MIH) should be considered (Witt et al., 2014; Brusevold et al., 2017; Vargo et al., 2020). In contrast to regional odontodysplasia and MIH, crown portions of the teeth affected by MIM are normal (Witt et al., 2014). On the other hand, DD1 phenotypically involves clinically normal-appearing crowns, pulp chamber obliterated with dentin with a pathological appearance of "cascading waterfall" and root growth with abnormal morphology (Witt et al., 2014). In MIM, although the ceiling-to-floor distance of the pulp chamber becomes narrow, pulp chamber is not completely obliterated. In addition, DD1 is a hereditary condition that may affect all teeth whereas MIM is localized in several teeth and not hereditary (Toomarian et al., 2010; Lee et al., 2014; Neo et al., 2019). Even though, the presence of affected PFMs and second molars in the differential diagnosis of the Case 3 made us consider these diseases, nevertheless, absence of a familial history and negative results of the genetic tests directed us to concentrate on MIM. Additionally, non-obliterated state of the pulp chambers according to the result of long-term follow-up also supported the diagnosis of MIM.

Vargo et al. have reported that PFMs, primary second molars and permanent central incisors were affected by 98.9%, 39%, and 35.6%, respectively, and that permanent second molars (1.1%) permanent first premolars (1.1%) were also found to be affected in some cases, although rare (Vargo et al., 2020). Neo et al. have noted in their study that lower impact of MIM on the maxillary teeth compared with the mandibular teeth may be associated with earlier onset of root growth in the maxillary teeth (Neo et al., 2019). In our study, although lower PFMs were affected in all of our cases, we have no case that has unaffected permanent central incisors. The primary second molars accompanied with this clinical picture in our first and second case whereas permanent second molar and permanent second premolars were also affected in the third case. Early loss of the affected primary teeth before diagnosis should be considered as data loss. MIM can be diagnosed in the permanent second molars that root growth completes at approximately 13-15 years of age (Berkovitz et al., 2002; Ten Cate, 2014) compared with PFMs that eruption begins at approximately 6-7 years and root growth completes at

approximately 9-10 years of age (Berkovitz et al., 2002; Ten Cate, 2014).

The treatment success rate of endodontic treatment is very limited and the conditions such as abnormal root morphology, presence of the independent accessory canals and complicated root canals make endodontic treatment difficult (Yue and Kim, 2016). Since the basement membrane of the pulp chamber is hypercalcified (Lee et al., 2015), some difficulties may be experienced in detection of the canal entries. The micro computed tomography scan of the PFM extracted due to MIM revealed numerous independent root canals arising from the pulp chamber (Brusevold et al., 2017). The conservative treatment of pulp can be performed using radiographic tools such as cone-beam computed tomography (CBCT) and in the light of detailed findings (Lee et al., 2015).

As a conclusion; the prevalence, aetiology and clinical progression picture of MIM have not been exactly clarified yet. MIM may be associated with other systemic diseases or syndromes as the further genetic studies on MIM are increasingly carried out. MIM demonstrates interpersonal differences as well as its characteristic findings. These differences necessitate application of a treatment protocol that is definitely specific for the dentist and the patient. Early diagnosis and follow-up have a great importance in MIM. The long-term follow-ups will present different data associated with MIM in the literature.

Author Contributions

All authors have equal contribution. All authors reviewed and approved the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval/Informed Consent

Necessary information was given to the family and an informed consent form was obtained.

Acknowledgments

No funding was received for conducting this study.

References

Berkowitz BKB, Holland GR, Moxham BJ. 2002. Oral anatomy, histology and embryology. 3rd edition, Edinburgh: New York, Mosby.

Brook AH. 2009. Multilevel complex interactions between genetic, epigenetic and environmental factors in the aetiology of anomalies of dental development. Arch Oral Biol, 54 (Suppl 1): 3-17.

Brusevold IJ, Bie TMG, Baumgartner CS, Das R, Espelid I. 2017. Molar incisor malformation in six cases: description and diagnostic protocol. Oral Surg Oral Med Oral Pathol Oral Radiol, 124(1): 52-61.

Choi S, Lee J, Song J. 2017. Molar-Incisor Malformation: Three Cases of a Newly Identified Dental Anomaly. J Korean Acad Pediatr Dent, 44(3): 370-377.

Lee HS, Kim SH, Kim SO, et al. 2014. A new type of dental anomaly: molar-incisor malformation (MIM). Oral Surg Oral Med Oral Pathol Oral Radiol, 118(1): 101-109.

Lee HS, Kim SH, Kim SO, Choi BJ, Cho SW, Park W et al. 2015. Microscopic analysis of molar--incisor malformation. Oral Surg Oral Med Oral Pathol Oral Radiol, 119(5): 544-552.

Neo HL, Watt EN, Acharya P. 2019. Molar-incisor malformation: A case report and clinical considerations. J Orthod, 46(4): 343-348.

Ten Cate A. 2014. Oral anatomy: development, structure and function. St Louis, MO: Mosby-Year Book Inc.

Toomarian L, Mashhadiabbas F, Mirkarimi M, Mehrdad L. 2010. Dentin dysplasia type I: a case report and review of the literature. J Med Case Rep, 4: 1.

Vargo RJ, Reddy R, Da Costa WB, Mugayar LRF, Islam MN, Potluri A. 2020. Molar-incisor malformation: Eight new cases and a review of the literature. Int J Paediatr Dent, 30(2): 216-224.

Witt CV, Hirt T, Rutz G, Luder HU. 2014. Root malformation associated with a cervical mineralized diaphragm--a distinct form of tooth abnormality? Oral Surg Oral Med Oral Pathol Oral Radiol, 117(4): 311-319.

Wright JT, Curran A, Kim KJ, et al. 2016. Molar root-incisor malformation: considerations of diverse developmental and etiologic factors. Oral Surg Oral Med Oral Pathol Oral Radiol, 121(2): 164-172.

Yue W, Kim E. 2016. Nonsurgical Endodontic Management of a Molar-Incisor Malformation-affected Mandibular First Molar: A Case Report. J Endod, 42(4): 664-668.