CASE REPORT

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Fusion In Primary Teeth: Report of Three Cases

Süt Dişlerinde Füzyon: Üç Farklı Olgu

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ABSTRACT

Objective: Fusion is a developmental dental anomaly resulting from the union of two adjacent teeth. The etiology of fusion is not definitively known. This developmental anomaly can lead to functional and aesthetic problems in individuals' lives. Furthermore, in the majority of cases with fusion in primary teeth, a lack of permanent teeth is identified. The aim of this case report is to present three patients diagnosed with fusion in primary dentition.

Case Report: The first patient, a 4-year-old child, presented to our clinic for routine examination. Clinical and radiological assessments revealed fusion in the mandibular anterior region, as well as the absence of one primary lateral tooth and a permanent lateral tooth. The second patient, a 6-year-old, visited our clinic due to dental pain. Oral and radiographic findings indicated fusion in the mandibular anterior region and the absence of a lateral permanent tooth. The last patient was a 5-year-old who presented with dental pain. Radiographic findings showed fusion in the mandibular region. The guardians of the patients were informed about the relevant anomalies. Written and verbal consent was obtained from the legal guardians prior to the necessary treatments. The patients whose treatments were completed are being monitored regularly for potential complications arising from their anomalies.

Conclusion: Fusion in primary teeth represents a rare dental anomaly with significant clinical implications. Early diagnosis, preventive interventions like fluoride applications, and a multidisciplinary approach are essential to addressing potential complications effectively. Additionally, the long-term follow-up of these patients is critical to monitor developmental changes and ensure optimal outcomes. This study underscores the importance of collaborative efforts between pediatric dentists, orthodontists, and restorative specialists in formulating individualized treatment plans for such anomalies.

Keywords: *Fused Teeth, Pediatric Dentistry, Tooth Abnormalities*

ÖZET

Amaç: Füzyon, birbiriyle komşu olan iki dişin birleşimden kaynaklı gelişimsel bir dental anomalidir. Füzyonun etyolojisi kesin bir şekilde bilinmemektedir. Bu gelişimsel anomali bireylerin yaşamında fonksiyonel ve estetik açıdan problemlere sebep olabilir. Bununla birlikte, süt dişlerinde füzyon görülen vakaların çoğunluğunda sürekli diş eksikliği tespit edilmektedir. Bu olgu raporunun amacı süt dentisyonda füzyon tespit edilmiş üç hastanın sunumu amaçlanmıştır.

Olgu sunumu: 4 yaşında kontrol amacıyla kliniğimize başvurmuş hastanın klinik ve radyolojik incelemelerinde mandibular anterior bölgede füzyon, tek süt lateral ve daimi lateral dişlerin eksik olduğu saptanmıştır. İkinci hasta ise; 6 yaşında olup, diş ağrısı dolayısıyla kliniğimize gelmiştir. Hastanın oral ve radyografik bulgularında mandibular anteriorda füzyon ve lateral daimi diş eksikliği saptanmıştır. Son hastamız ise; 5 yaşında olup diş ağrısı kaynaklı kliniğe başvuruda bulunmuştur. Hastanın oral radyolojik bulgularında mandibular bölgedeki dişlerinde füzyon olgusuna rastlanılmıştır. Hastaların velileri ilgili anomali hakkında bilgilendirilmiştir. Gerekli tedaviler öncesinde yasal vasilerinden yazılı ve sözlü onamları alınmıştır. Tedavileri tamamlanan hastaların anomali kaynakları olası durumlar için düzenli takipleri gerçekleştirilmektedir.

Sonuç: Süt dişlerinde füzyon, klinik uygulamada benzersiz zorluklar oluşturan nadir bir dental anomalidir. Erken teşhis, olası komplikasyonların yönetiminde kritik bir rol oynar. Çürük riskini ve diğer ilişkili sorunları en aza indirmek için flor uygulamaları gibi koruyucu önlemler önemlidir. Etkilenen hastaların bireysel ihtiyaçlarını karşılayan tedavi planları geliştirmek için pedodontistler, ortodontistler ve restoratif uzmanların yer aldığı multidisipliner bir yaklaşım gereklidir. Gelişimsel değişikliklerin izlenmesi ve olumlu sonuçların sağlanması için uzun vadeli takip kritik öneme sahiptir. Bu çalışma, bu tür vakalarda kapsamlı bakım sağlamak için diş hekimleri arasındaki iş birliğinin önemini vurgulamaktadır.

Anahtar Kelimeler*: Füzyon Dişler, Pedodonti, Diş Anomalileri*

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Introduction

Dental Anomalies are defined as irregularities observed in the number, volume, shape, tissue, and eruption status of teeth during their development. These anomalies can manifest in both primary and permanent dentition. While the precise etiology of dental anomalies remains unclear, environmental and genetic factors are known to play significant roles in their emergence.[1] Dental anomalies can be classified into several categories: structural anomalies (such as amelogenesis imperfecta, dentinogenesis imperfecta, and enamel hypoplasia), number anomalies (including hypodontia and hyperdontia), size anomalies (like microdontia and macrodontia), eruption anomalies (such as transposition and delayed eruption), and shape anomalies (including fusion and gemination).[1,2]

Fusion is a specific developmental anomaly characterized by the union of at least two independently developing primary or permanent teeth. Abnormalities occurring during the morphodifferentiation stage of tooth development can lead to variations in tooth form and size. Fusion represents the merging of two distinct tooth germs and may also be referred to as a double tooth or conjoined tooth.[2,3] Clinically, the appearance of fused teeth can vary, appearing normal or larger depending on the embryological stage at which the fusion occurs. Fusion is believed to result from physical forces acting between two or more tooth germs before calcification, leading to the fusion of the inner enamel epithelium and adjacent dental papillae while keeping the pulp chamber and roots separate.4,5 Racial and genetic factors can influence the occurrence of fusion, which is particularly prevalent in primary dentition and often observed in the lower anterior region. While fusion in the posterior region of permanent dentition is rare, it can occur in both types of dentition, with a higher prevalence in primary dentition (approximately 0.5%) compared to permanent dentition (about 0.1%).[6-8] Accurate diagnosis of fusion necessitates radiographic imaging.[8]

Fusion can occur between teeth of the same or different dentitions, as well as between normal and supernumerary teeth. Depending on the stage of fusion, it may result in a complete fusion, which creates a wide tooth crown, or an incomplete fusion, which involves root merging. Complete fusion is characterized by a single pulp chamber and root canal, while incomplete fusion may present as one pulp chamber with two separate roots or two pulp chambers with two root canals.[9,10]

The exact causes of fused teeth are not fully understood, but potential contributing factors include pressure, trauma, physical stress, or contact between developing teeth, which may lead to necrosis of the epithelial tissue.[8] Environmental factors such as fetal exposure to alcohol, hypervitaminosis, and thalidomide embryopathy have also been suggested as possible influences.[9,11,12] Given that thalidomide has not been used for routine medical conditions for decades and women prescribed thalidomide for specific indications today are required to adhere to strict contraceptive protocols, its relevance as an etiological factor is considerably limited. Additionally, some researchers propose that autosomal inheritance may play a role in the etiology of fusion.[8,10,13]

This study presents the clinical and radiographic findings of fusion observed in three patients who visited a pediatric dental clinic for various dental needs. Fused teeth are considered a rare dental anomaly, and this study aims to highlight the potential complications associated with fusion and raise awareness among dental professionals regarding this condition.

Case Reports

Case I

A 4-year-old healthy male patient presented to our clinic for a routine check-up. The patient's anamnesis revealed no systemic health problems. It was learned that the patient had undergone dental treatments at another healthcare facility under general anesthesia due to severe decay and material loss in the upper jaw. Consequently, all teeth in the maxilla were extracted. A dental prosthesis was fabricated for the upper jaw; however, the patient refused to use it due to difficulties in adaptation and discomfort, resulting in non-compliance with

its usage. The parents were informed about the importance of prosthesis use, and strategies to encourage adaptation were discussed.

Clinical and radiographic findings revealed fusion in teeth 82 and 83, unilateral absence of primary lateral incisors, and bilateral absence of permanent lateral incisors (Figure 1 and Figure 2). In this case, initial caries were detected in the fused teeth, but no significant material loss was observed. As a preventive measure, the patient was subjected to regular fluoride applications, and the fused teeth were closely monitored over time. Additionally, a root fragment of a tooth was detected in the upper jaw. Initially, the parent was informed about the relevant anomalies. Following this, written informed consent was obtained from the patient's parents. Subsequently, the root fragment in the upper jaw was surgically removed.

The systemic health of the patient in this case was unremarkable, with no reported medical conditions or developmental disorders. Such information underscores the nonsyndromic nature of the observed fusion anomaly. Nonetheless, future studies should consider evaluating systemic influences, such as nutritional deficiencies, metabolic disorders, or environmental exposures, as potential contributing factors to similar cases.

The use of dental prostheses in children presents unique challenges compared to adults due to ongoing growth and developmental changes. Children often experience discomfort and resistance to prosthesis use, particularly in the early stages.[14] Adaptation difficulties are commonly associated with the sensation of a foreign object in the mouth, which can interfere with daily activities like eating and speaking. Families play a crucial role in providing encouragement and support during this adjustment period.[14,15]

Proper maintenance and hygiene are critical for the success of pediatric prostheses. However, ensuring consistent cleaning practices can be challenging for young patients. Parental involvement in maintaining prosthesis hygiene is essential to prevent complications such as plaque accumulation and associated oral health issues.[15]

Psychological factors also influence prosthesis acceptance. Children may feel self-conscious about wearing a prosthesis, which could affect their social interactions and self-esteem. Open communication with both the child and the family, along with emphasizing the health benefits of prosthesis use, can help mitigate these concerns.[15,16]

In this case, the patient's upper teeth had been completely extracted, and a removable dental prosthesis was fabricated. However, the child declined to use it, reportedly due to discomfort and an inability to adapt to the prosthesis. Psychological factors, such as anxiety or unfamiliarity, may have contributed to this refusal.[16] Further evaluation by a pediatric psychologist or prosthodontist could provide deeper insights into the reasons behind the non-use and potentially improve compliance in future similar cases.

The patient was encouraged to use the prosthesis, and the family was advised on ways to promote its use. The parents were informed about the importance of maintaining oral hygiene, and regular follow-ups were conducted to ensure the condition remained stable. Finally, the patient was placed on regular follow-up schedules to be referred to the orthodontics clinic.

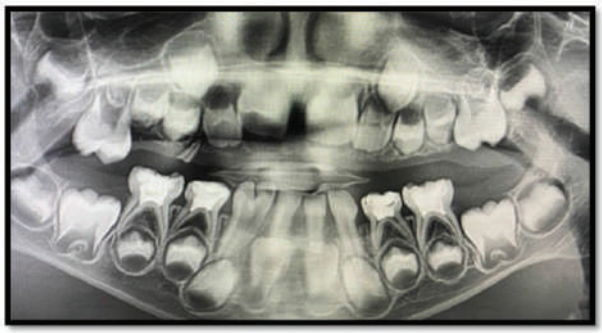

Figure 1. Fusion of teeth 82 and 83 in the panoramic radiograph of a 4-year-old male patient.

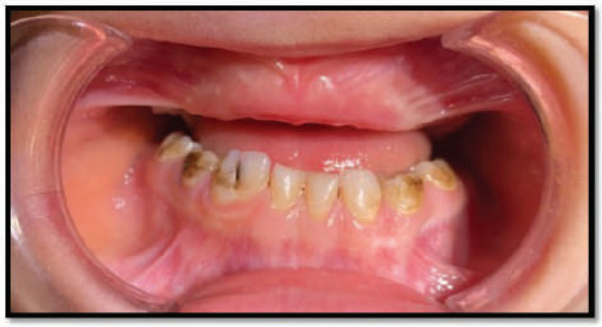

Figure 2. The intraoral appearance of the patient.

Case II

A 6-year-old male patient presented to our clinic with a complaint of pain. Radiographic and clinical examinations revealed deep dentin caries, and the source of the pain was identified. Additionally, fusion was detected in teeth 82 and 83, along with the absence of permanent lateral incisors in the same area (Figure 3 and Figure 4). The medical history obtained from the patient's parents indicated that the patient had no systemic diseases and was not taking any regular medications. Furthermore, there was no history of trauma in the head and neck region. In this case, initial caries were detected in the fused teeth, but no significant material loss was observed. As a preventive measure, the patient was subjected to regular fluoride applications, and the fused teeth were closely monitored over time. The parents were informed about the importance of maintaining oral hygiene, and regular follow-ups were conducted to ensure the condition remained stable.

Initially, the family was informed about dental anomalies and the potential complications that could arise. Subsequently, verbal and written informed consents were obtained from the patient's parents for the necessary dental treatments, and appropriate information was provided. After addressing the relevant dental treatment needs, oral hygiene motivation was provided, and the patient was referred to the orthodontics clinic for further management and placed on regular follow-up.

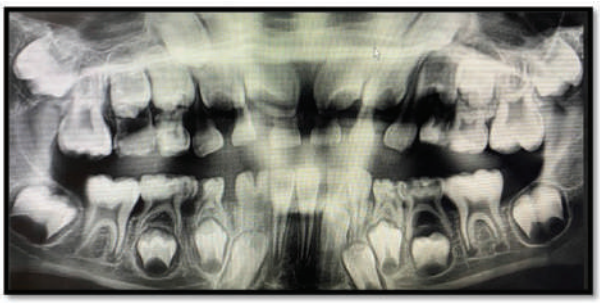

Figure 3. Fusion of teeth 82 and 83 was observed in the panoramic radiograph of a 6-year-old male patient.

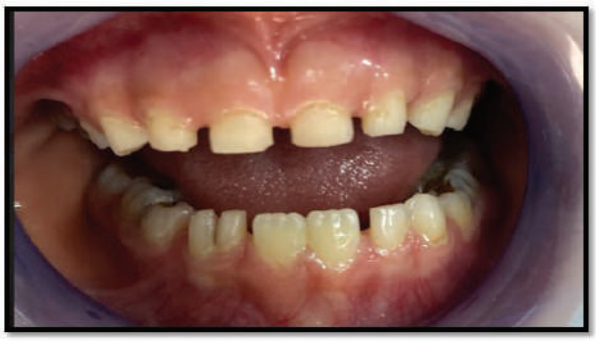

Figure 4. The intraoral appearance of the patient.

Case III

A 5-year-old healthy male patient presented to our clinic with a complaint of pain. Clinical and radiographic findings revealed deep dentin caries and fusion in teeth 71 and 72 (Figure 5 and Figure 6). No absence of permanent teeth was observed. The medical history obtained from the patient's guardian indicated that the patient had no systemic conditions and had not experienced any trauma to the head and neck region.

The necessary verbal and written informed consents were obtained from the patient's parents prior to initiating dental treatment. After addressing the relevant dental treatment needs, oral hygiene motivation was provided. The patient's parents were informed about the detected dental anomaly, and the patient was placed on regular follow-up to monitor for any potential complications.

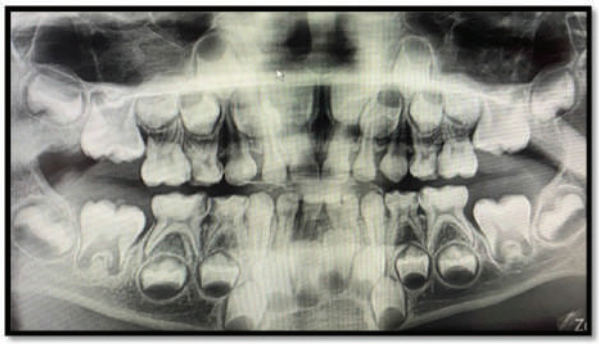

Figure 5. Fusion of teeth 71 and 72 was observed in the panoramic radiograph of a 5-year-old male patient.

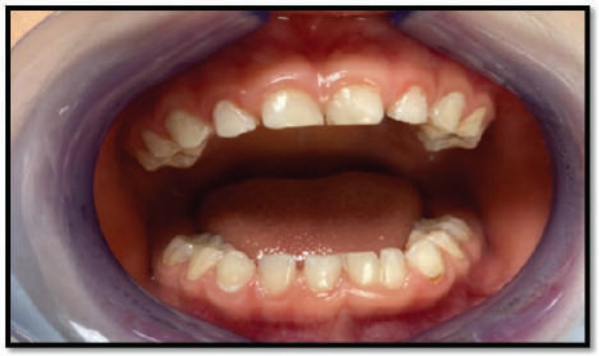

Figure 6. The intraoral appearance of the patient.

Discussion

Fusion in primary teeth can lead to complex clinical scenarios, including the potential for delayed eruption of permanent teeth due to altered resorption patterns. Studies indicate that hypodontia in permanent teeth often accompanies fusion in primary teeth, with reported incidences ranging from 20% to 37.5%.[17] Mechanistically, the absence of a permanent tooth following primary tooth agenesis is attributed to disruptions during odontogenesis, suggesting a developmental linkage rather than a general rule. Genetic loci, such as MSX1 and PAX9, have been implicated in nonsyndromic tooth agenesis and may also influence fusion anomalies, though definitive evidence is limited.[18] These genetic markers are associated with various patterns of tooth development and anomalies, highlighting the need for further research in this area. Relevant studies provide valuable insights into the genetic predispositions that may underlie such conditions.[1] While MSX1 and PAX9 mutations are well-documented contributors to nonsyndromic tooth agenesis, their role in dental fusion remains less clear. Theoretically, disruptions in genes regulating dental development could contribute to anomalies such as fusion by altering the timing and spatial organization of tooth bud formation.[17,18] However, direct evidence linking these loci to fusion anomalies is scarce.[1,18] Genetic studies involving next-generation sequencing could provide valuable insights into potential associations and mechanisms underlying these conditions.[17]

Fusion teeth and the complications they may create necessitate multidisciplinary treatment approaches. Collaboration between pediatric dentistry and orthodontics is crucial for identifying dental anomalies and achieving more effective prognoses in treatment during both primary and mixed dentition. Fusion is a dental anomaly that is more frequently observed in primary dentition.[2,3] Which is why pediatric dentists typically diagnose most cases. Furthermore, cooperation between orthodontics and pediatric dentistry is essential to prevent potential complications that may arise in the future. In such cases, it is vital for pediatric dentists to be aware of other anomalies that may occur alongside fusion. Additionally, various imaging methods are helpful in diagnosing complex cases. The literature suggests that the use of computed tomography is also recommended for complicated cases.[19,20] In this context, oral radiologists play a significant role in the diagnostic process.

Fusion in primary teeth can lead to increased root volume or a wider root surface area compared to the crown size of the permanent tooth, potentially resulting in delayed root resorption.[1] This can cause delays in the eruption of the permanent tooth or even ectopic eruption. Numerous studies have shown that the fusion of primary teeth can influence various anomalies in permanent dentition, such as hypodontia, fusion, supernumerary teeth, and microdontia.[2,8] Nik Hussein and Abdul Majid noted that the presence of fusion in primary dentition is associated with findings in approximately 60% of permanent dentition cases.[21] While many studies report no impact on permanent teeth when fusion occurs between primary incisors, some have indicated a prevalence of hypodontia

in permanent dentition ranging from 20% to 37.5%.[11,13,22] Gellin's investigations revealed that when fusion is observed in primary anterior teeth, 100% of cases showed hypodontia of the permanent lateral teeth.[23] Over half of our cases exhibited hypodontia, a rate that is similar to some studies in the literature, although further research is warranted.

The occurrence of fusion in primary teeth is infrequent, and the treatment approach should be customized for each individual case. The aesthetic consequences of fusion in primary dentition can result in various forms of malocclusion.[24] The precise etiology of these anomalies remains unclear, although existing literature indicates a potential interplay of genetic and environmental influences.[25] Upon examining the clinical cases, it was observed that there was no reported family history of fusion or congenital tooth absence among the patients' families. Similar findings in other studies have also shown a lack of correlation between genetic and environmental factors in instances of dental fusion.[22,26,27] Fusion takes place during the morphodifferentiation phase of tooth development, and the proximity of two tooth germs may generate pressure or physical forces that could contribute to the occurrence of fusion.[9] Nonetheless, additional evidence and epidemiological research are necessary to better elucidate the causes of this developmental anomaly.

Dental fusion can often be mistaken for gemination, which is identified by an increased bifid crown and sulcus due to the invagination of a single tooth germ.[9] Differentiating between a fused tooth and a geminated tooth can be accomplished through both clinical assessments and radiographic evaluations. A frequently encountered differential diagnosis highlights that geminated teeth may cause crowding, whereas fusion typically leads to the ectopic eruption of the permanent tooth because of the larger root area associated with the fused tooth.[6] In a standard clinical evaluation, this abnormality may manifest as a broad tooth with the appearance of having two crowns separated by a groove. An extensive patient history, in conjunction with radiographic and clinical assessments, is essential for accurate diagnosis and formulating an effective treatment plan. Both periapical and panoramic radiographs are required to identify fused teeth.[4,6]

In some cases of fused teeth, visible labial and lingual grooves extend to the root surface. This can lead to plaque accumulation, caries, and various periodontal and endodontic issues.[25,27,28] The morphological differences of primary teeth and the presence of anomalies can complicate the implementation of endodontic treatment due to reasons such as deep dentin caries and excessive root resorption. However, such situations have not been encountered in our cases. [25,28-30]

Fused teeth are often asymptomatic; however, they can lead to orthodontic problems. When two teeth are fused, they occupy less space in the dental arch, potentially leading to orthodontic issues such as diastema and similar problems. The fusion of a normal tooth with a supernumerary tooth can also result in orthodontic complications such as crowding and space issues.[25,27] In our cases, no orthodontic problems such as diastema or crowding have been observed yet, likely due to the young age of the diagnosed patients, who are still in their growth and development stages. Future monitoring of these patients is essential to assess potential complications arising from this anomaly.

Morphological anomalies in primary dentition are a significant concern for pediatric dentists due to the potential for associated clinical problems, such as dental caries, delayed eruption, and anomalies in permanent dentition (including crowding, supernumerary teeth, or hypodontia).[8,25] Early diagnosis of such anomalies facilitates a more comprehensive, long-term treatment plan, leading to a more favorable prognosis and reducing the need for complex orthodontic interventions. Each patient-specific treatment plan should be formulated as a protocol addressing their specific needs. It is crucial to identify this anomaly early and conduct a detailed analysis of potential problems in each case, thereby enabling the initiation of a conservative, individualized treatment plan.

Concrescence is a dental anomaly characterized by the union of two adjacent teeth at the root level, often due to the deposition of cementum. While it shares similarities with fusion, concrescence is distinct in that it typically occurs after root formation is complete and involves cementum rather than dentin. Understanding these distinctions is crucial for accurate diagnosis and appropriate treatment planning.[31] Additionally, studies indicate that fusion in primary teeth may lead to delayed eruption of permanent successors.[32,33] This delayed eruption is likely due to the altered resorption patterns and increased root volume associated with fused teeth. In contrast, concrescence does not directly affect eruption but may complicate dental extractions and other procedures due to the shared cementum layer. Both conditions require a detailed clinical and radiographic evaluation to differentiate and manage effectively.[31-33]

Fusion and concrescence are developmental anomalies often conflated due to their similarities. Fusion involves the union of two tooth germs during the developmental stage, leading to shared dentin and enamel structures.[34,35] In contrast, concrescence is a post-developmental anomaly characterized by the fusion of tooth roots through cementum deposition, typically caused by external factors such as trauma or localized inflammation. Unlike fusion, concrescence does not impact the crown morphology significantly.[36,37] A clear understanding of these anomalies is crucial for accurate diagnosis and appropriate management strategies.

Concrescence, a related anomaly characterized by cementum fusion post-root formation, should be differentiated from fusion, which involves dentin and occurs during development. This distinction is critical for diagnosis and treatment planning.[37] While it shares similarities with fusion, concrescence is distinct in that it typically occurs after root formation is complete and involves cementum rather than dentin. Understanding these distinctions is crucial for accurate diagnosis and appropriate treatment planning.[35-37] Recent literature highlights the importance of understanding these associations to improve treatment outcomes.

Fusion anomalies in primary teeth are frequently associated with delayed eruption of their permanent successors.[33] This delay is hypothesized to result from altered eruption pathways and abnormal root morphology in fused teeth, which may interfere with the resorption process necessary for normal eruption. Studies have documented prolonged eruption times, particularly in cases where fusion involves the incisor and canine regions.[33-35] Clinical monitoring and radiographic follow-ups are essential to anticipate and address such delays effectively. Moreover, the clinical implications of fusion extend beyond eruption delays, as fused teeth often present with larger-than-normal crowns, irregular shapes, or complex root canal systems, which can complicate restorative and endodontic treatments.[38,39]

Fusion may also predispose teeth to an increased risk of caries and periodontal issues due to the presence of irregular contact points and grooves at the fusion site.[38,40] Recent literature underscores the importance of identifying these challenges early and adopting a multidisciplinary approach that involves pediatric dentists, orthodontists, and restorative specialists to formulate individualized treatment plans. A comprehensive understanding of the long-term developmental changes in both fused and concrescent teeth is crucial to improving patient outcomes and avoiding complications.[9,31-34]

Fusion teeth and the complications they may create necessitate multidisciplinary treatment approaches. And achieving more effective prognoses in treatment during both primary and mixed dentition. Fusion is a dental anomaly that is more frequently observed in primary dentition, which is why pediatric dentists typically diagnose most cases.[12,19] Furthermore, cooperation between orthodontics and pediatric dentistry is essential to prevent potential complications that may arise in the future. In such cases, it is vital for pediatric dentists to be aware of other anomalies that may occur alongside fusion. Additionally, various imaging methods are helpful in diagnosing complex cases. The literature suggests that the use of computed tomography is also recommended for

complicated cases on text; oral radiologists play a significant role in the diagnostic process.[33,40]

Conclusion

Fusion in primary teeth represents a rare dental anomaly with significant clinical implications. Early diagnosis, preventive interventions like fluoride applications, and a multidisciplinary approach are essential to addressing potential complications effectively. Additionally, the long-term follow-up of these patients is critical to monitor developmental changes and ensure optimal outcomes. This study underscores the importance of collaborative efforts between pediatric dentists, orthodontists, and restorative specialists in formulating individualized treatment plans for such anomalies.

Dental fusion is one of the more common dental anomalies observed in primary dentition compared to permanent dentition. Dental fusion may be associated with a genetic predisposition and permanent tooth hypodontia. Comprehensive clinical and radiographic evaluations are crucial for the early detection of developmental dental anomalies. The diagnosis and treatment of fusion teeth in young children have always been challenging. The most appropriate dental intervention is conducted through a multidisciplinary approach involving pediatric dentists, orthodontists, and restorative specialists, taking into account the child's condition, expectations, and level of cooperation with dental treatment. Dentists need to be aware of the various complications caused by fusion. In cases of fused teeth, preventive procedures and close monitoring are critical, even in the absence of signs and symptoms. Furthermore, the frequency of fusion teeth occurring in similar areas supports evidence of shared genetic control over developmental dental disorders among individuals with a positive family history.

Early diagnosis and a multidisciplinary approach are vital in managing fusion anomalies. Clinicians should maintain vigilance for complications, provide preventive care, and coordinate with specialists for comprehensive management. This study emphasizes the importance of early diagnosis, preventive care, and a multidisciplinary approach in managing fusion anomalies in primary teeth. Clinicians should adopt individualized treatment plans that consider both functional and aesthetic needs, including regular fluoride applications, orthodontic evaluations, and restorative procedures as necessary. Furthermore, the inclusion of genetic counseling and psychological support for patients and families may improve overall outcomes. Regular follow-ups are critical to monitor eruption patterns, ensure proper occlusion, and address complications proactively.

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Conflicts of Interest

None of the authors of this article has any relationship, connection, or financial interest in the subject matter or material discussed in the article.

Authors' Contribution

Idea/Concept: C.K Design: C.K, T.A Control/ Supervision: Ö.M.A Literature Review: C.K, T.A Data Collection and/or Processing: C.K, T.A Analysis and/or Interpretation: Ö.M.A, C.K Writing the Article: C.K, T.A, Ö.M.A Critical Review: Ö.M.A.

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