Uşak Üniversitesi Diş Hekimliği Fakültesi Dergisi

Journal of Dentistry Faculty of Usak University

Cilt: 2 Sayı: 3 2023

Uşak Üniversitesi
Diş Hekimliği Fakültesi Dergisi
Journal of Dentistry Faculty of Usak University
dergipark.org.tr/tr/pub/usakdhf
e-ISSN: 2980-3195

Review

Dental Erosion in Primary Teeth

Oyku PEKER[1*], Rukiye ARIKAN[2]

[1] Department of Paediatric Dentistry, School of Dentistry, Mustafa Kemal University, Hatay, Turkey, ORCID ID: 0000-0002-3698-6225
[2] Department of Paediatric Dentistry, School of Dentistry, Mustafa Kemal University, Hatay, Turkey, ORCID ID: 0000-0001-7445-0459

Article History
Received: 07.11.2023
Revised : 22.11.2023
Accepted: 05.12.2023

Keywords
Deciduous Teeth,
Dental Erosion,
Review

Abstract
Dental erosion is recognized as an increasingly common condition in pediatric dentistry with complications of tooth sensitivity, esthetic problems, eating difficulties and loss of occlusal vertical dimension. The dental erosion process is characterized by softening of the outer layer of enamel as well as a decrease in microhardness. In microhardness studies, it has been shown that primary tooth enamel is softer than the enamel of permanent teeth and the erosion process is faster in primary tooth enamel than permanent tooth enamel. Since the sizes of primary teeth are smaller than permanent teeth, the risk of dental erosion-related damage increases. The purpose of this article is to critically review dental erosion in children in terms of its prevalence, etiology, diagnosis, clinical presentation, and prevention.

Süt Dişlerinde Dental Erozyon

Makale Geçmişi
Alındı : 07.11.2023
Düzeltildi : 22.11.2023
Kabul Edildi: 05.12.2023

Anahtar Kelimeler
Dental Erozyon,
Süt Dişleri,
Derleme

Öz
Diş erozyonu, pediatrik diş hekimliğinde diş hassasiyeti, estetik sorunlar, yeme güçlükleri ve oklüzal dikey boyut kaybı gibi komplikasyonlarla birlikte giderek yaygınlaşan bir durum olarak kabul edilmektedir. Diş erozyonu süreci, diş minesinin dış tabakasının yumuşaması ve mikro sertliğin azalmasıyla karakterize edilir. Mikrosertlik çalışmalarında süt dişi minesinin daimi diş minesine göre daha yumuşak olduğu ve süt dişi minesindeki aşınma sürecinin daimi diş minesine göre daha hızlı olduğu gösterilmiştir. Ancak süt dişlerinin boyutları daimi dişlere göre daha küçük olduğundan diş erozyonuna bağlı hasar riski artar. Bu makalenin amacı çocuklarda diş erozyonunun prevalansı, etiyolojisi, tanısı, klinik görünümü ve önlenmesi açısından eleştirel olarak gözden geçirilmesidir.

OPEN ACCESS CrossMark CC BY

*Corresponding Author (oykupeker@hotmail.com)

Introduction

Unlike dental caries, dental erosion is the process of hard tissue and mineral loss from dental tissues due to chemical reasons without microorganism factors and is defined as irreversible losses (1). While dental erosion is known as the loss of the outer layer of the tooth as a result of demineralization and exposure to acid, erosive tooth wear occurs under the influence of both chemical and mechanical factors (2). The dental erosion process is characterized by softening of the outer layer of enamel and also a decrease in microhardness (3,4). In microhardness studies, it has been shown that primary tooth enamel is softer than the enamel of permanent teeth and the erosion process is faster in primary tooth enamel than permanent tooth enamel. The most common erosion areas are occlusal surface of the molars and palatal and incisal surfaces of the incisors.

Dentin involvement of erosion in primary teeth is faster than permanent teeth, due to morphological differences and thinner enamel structure (5). Due to the smaller size of primary teeth compared to permanent teeth, the risk of dental erosion-related damage increases (6).

In primary dentition, restorative treatment of dental erosion lesions is not indicated if the child does not have any symptoms. In the case of tooth sensitivity, small areas of erosion observed can be covered with resin materials. Depending on the etiologic factors, severity and progressive pattern of disease, all patients with dental erosion should be checked regularly (5).

Epidemiology of Dental Erosion

Dental erosion, which causes changes in the external structure of the tooth, is mostly encountered in the occlusal, facial and lingual regions (7). S. mutans, the main microorganism of dental caries, cannot continue its life activities in the pH where erosion is seen. For this reason, erosion and caries lesions are generally not seen together. Microscopically and clinically, erosion is viewed differently from dental caries (8). In the case of erosion, it is not possible to talk about complete wear. Enamel weakened by acid causes other types of wear to occur more easily. The acid in the oral cavity weakens the enamel surface components. This outer layer is then separated from the surface and the relatively intact enamel surface emerges from the bottom. This solid enamel surface can also be damaged by possible subsequent acid attacks (9).

According to Linnett and Seow's study, the prevalence of dental erosion has increased, especially among children and adolescents (10). In children aged 2-7 years, the incidence of enamel erosion alone has been reported more than cases of erosion involving dentin. In studies conducted with children aged 12-14 years, the rate of erosion involving dentin has increased. The distribution of the eroded teeth in the jaws is not regular. It has been reported that the upper anterior teeth and first molars are affected more frequently in children and adolescents (6).

In studies conducted in England, the prevalence of dental erosion in the primary dentition was found to be between 8% and 65% (11) In Germany, dental erosion was seen at a rate of 71% in children aged 8-11 years (12). Zhang et al. found dental erosion lesions in 75% of 12-year-old Hong Kong children (13). The results obtained in studies conducted on adolescents show that the prevalence of erosion in permanent teeth varies between 10% and 90% (14).

The prevalence of dental erosion in studies conducted in our country; It was detected in 25% of children aged 6-12, 52% in children aged 13-15, and 25.9% in the 11-15 age group (15,16)

Pathogenesis of Dental Erosion

Regardless of the etiology of dental erosion, the major pathology that occurs is the demineralization of superficial hard tissues by the dissolution of hydroxyapatite crystallites. This situation can cause serious destruction of dental tissues due to acidic pH, the presence of chelating agents, low calcium-phosphorus concentration in saliva and frequency of erosive attacks (17).

Etiology of Dental Erosion

Demineralization and dissolution of tooth enamel occur when the pH of the oral environment is less than critical. There are 3 major reasons for this low pH in the oral cavity. These; are stomach acids that pass into the oral cavity caused by stomach ailments, acids produced by acidogenic bacteria, and exogenous acids taken with nutrition. Of these acids, acidogenic bacteria-induced ones cause dental caries, while others cause dental erosion (18).

The Effect of Nutrition on Dental Erosion

Nowadays, unfortunately, children are the first to be affected by the negative changes in society's lifestyle and eating habits due to the easier access to fast foods, the preference for snack foods due to time constraints, and the influence of the media. Erosion, one of the dental problems we encounter due to these changes, is the most common form of tooth wear in pediatric patients (5).

The most important external factor that causes dental erosion is shown to be excessive intake of acidic beverages (19). When beverages with this acid content come into contact with the teeth, the demineralization process begins (20). Acids that are common in nutrition and related to the erosion process; citric, phosphoric, malic and tartaric acids (21).

Vegetables, fruits and beverages consumed for diet mainly contain citric acid and then malic acid. Lemon and orange juice contain high levels of citric acid. Citric acid is also included in the content of many food products (cola, etc.) produced. The erosive potential of citric acid is very high. The reason for this high erosive potential is that its ability to bind calcium (Ca) in the enamel content continues despite the increase in pH value. Malic acid is present in apples, plums and peaches. Tartaric acid is included in the content of wine and grapes. While lactic acid is found in fermented foods, phosphoric acid is in the content of cola-derived beverages (22).

It is not correct to show any acid-containing food or drink as the main etiological agent causing erosion. Evidence from the research highly supports the contribution of soda and food intake in dental erosion. In clinical studies investigating the effects of low-pH foods on teeth, it is stated that these beverages cause some changes in the enamel of the teeth (21). Some researchers explain the difference in the responses of different subjects to erosion by different factors. To these factors; The way the liquid is taken into the oral environment, the tooth surfaces that the acidic liquid touches, the exposure time of the teeth to acid, lip-cheek movements, swallowing habits and salivary flow rate can be given as examples. In addition, the buffering ability of saliva, the morphology of the teeth, and the physical and chemical properties of enamel may cause differences in the erosion process (21,23).

Differences in the way drinks are taken affect erosion. Drinks swallowed by holding in the mouth cause the oral environment to be exposed to high concentrations of acidic beverages, while beverages consumed with a straw provide a minimal oral environment and tooth contact, reducing the spread of the beverage into the mouth. Using the straw by positioning it at the very back of the tongue reduces the erosive potential of the beverage (6).

Consumption of acidic beverages at times when the salivary flow rate is low (before going to bed at night, between sleep, after exercise, between meals, etc.), keeping them in the mouth, drinking with more contact with the teeth, and brushing the teeth immediately after consumption of beverages are factors that increase the formation of erosive lesions (8).

Mostly citrus fruits, fruits, vegetables, vinegar foods, snack foods, ketchup, tomato and cooking sauces are some of the foods with erosive potential. These foods have been proven to be associated with dental erosion in adults, children and adolescents. Compared to normal individuals, erosive lesions were observed 37 times more in people who consumed more than two citrus and citrus fruits a day (18).

Effect of Drugs on Dental Erosion

Frequent and long-term use of drugs with low pH can lead to erosion of dental hard tissues (24). These erosive lesions can occur mostly due to the acidity of drugs in syrup or effervescent form (25). The low production of stomach acid is called achlorhydria. Patients with this condition take oral hydrochloric acid for treatment. This treatment option has been reported for very severe erosive lesions (21).

Recently, the use of fortifying vitamin C has become popular. The pH of vitamin C supplements is quite low. It can be shown as a cause of erosion, especially when used for a long time and when drugs come into direct contact with tooth surfaces (21,24). Studies have been conducted to evaluate the pH and in vitro enamel demineralization potential of different vitamin C preparations. In these studies, it is reported that the pH is less than 5.5 and tooth erosion occurs after 100 hours of exposure. In a clinical study conducted in individuals with normal salivary flow, it was found that vitamin C preparations do not erosive affect tooth structures in cases where they are not in direct contact with the teeth (21). A meta-analysis of nutrients reveals that vitamin C is a risk factor for dental erosion (26,27).

Dental erosion, which is followed by the effect of acidic drugs that are used for a long time and taken orally, does not occur only by direct contact of the drugs with the teeth. It may also be caused by the use of drugs that indirectly cause vomiting. Vomiting is among the complications of many drugs (8). One of the most commonly used drugs worldwide is aspirin (Acetylsalicylic acid). In a study on children with juvenile rheumatoid arthritis, the presence of erosion on the chewing surfaces of patients using aspirin as a chewable tablet was reported, while the presence of erosion was not observed in patients who swallowed the tablet (28).

An important factor in the formation and acceleration of dental erosion is that the drugs used cause dry mouth as a side effect. Unstimulated salivary flow is important in detecting the pathogenesis of erosion (28). Long-term use and low pH value analgesics, antibiotics, gastrointestinal drugs, cardiovascular drugs, antipsychotics, potassium supplements, antiemetics, asthma drugs, etc. They have erosive potential due to their acidic nature (29–32).

According to the results of a laboratory study, guaifenesin, ferrous sulfate and salbutamol sulfate are commonly prescribed to children. The erosive potential of these ingredients in primary teeth has been investigated. Salbutamol sulfate reduced the microhardness of deciduous enamel from day 7, while other drugs significantly reduced it after day (28,33).

The Effect of Lifestyle and Habits on Erosion

Wrong eating habits gained from an early age are effective in the formation of erosion. Especially consuming acidic beverages using a bottle and going to bed at night with a bottle are more destructive due to the decreasing saliva flow rate at night. Cleaning the teeth with abrasive toothpaste frequently and using excessive force can make the teeth prone to erosion. Due to these abrasive applications, the outer part of the enamel with high mineral content has been removed and the pellicle thickness, which acts as a barrier to dental erosion, has decreased. In addition, athletes swimming in pool facilities without pH regulation were also exposed to dental erosion (18).

Tooth wear is mainly due to parafunctional habits such as teeth grinding. With the involvement of erosion factors affecting the teeth, the wear process accelerates. Dental occlusion plays a role in the etiology of non-carious cervical lesions caused by tooth flexion. Thus, the stress caused by eccentric chewing forces causes cracks in the cervical of the tooth. The presence of these cracks increases the susceptibility to acid erosion (21).

Endogenous acid sources have been cited as the cause of endogenous erosion in the oral cavity. Erosion may occur as a result of regurgitation, vomiting, gastroesophageal reflux (GER) and the pH value of stomach contents coming to the oral environment and dental structures with a pH value of 1-1.5. The severity of dental erosion varies from patient to patient, depending on the frequency of these disorders, the amount of saliva flow, and the structure of the teeth (34).

The pH of the stomach contents is around 1-1,5, which is well below the critical pH at which demineralization begins in dental hard tissues. For this reason, it is stated to be a strong corrosive factor (35). In the study of Jarvinien et al., it was determined that dental erosion is 4 times more common in patients who regurgitate once a week, and 18 times more in patients who vomit constantly (36). Dental erosion process; It may vary depending not only on the duration and frequency of vomiting, but also on the oral hygiene habits of individuals such as vigorous brushing after vomiting, the structure of dental hard tissues, the amount of mineralization, fluoride use, and the quality and quantity of saliva (36,37).

In the research, it was emphasized that the most affected area by the stomach acid contents reaching the oral cavity is the palatal parts of the maxillary incisors. Erosion lesions manifest themselves as the thinning of the enamel layer in the early stages, and the exposure of dentin and pulp in the later period (35).

Another deterioration that causes the fluid in the stomach to reach the oral cavity by backward movement is called regurgitation. Regurgitation is distinguished from vomiting by decreased abdominal diaphragmatic muscle contraction and less expulsion of gastric contents (34).

Effect of Tooth Composition, Structure and Type on the Erosion Process

The contents of the teeth are highly variable and diverse. Studies have shown that there are significant differences in the acid response of human teeth exposed to acidic foods and beverages. This biological change is explained by in vitro model systems using the natural surfaces of human teeth (21,38). Primary teeth are more prone to dental erosion than permanent teeth due to the differences in their structures. Due to the thinner enamel of primary teeth and morphological differences, dentin involvement occurs faster in primary teeth than in permanent dentition. In immature teeth with large pulps, dental erosion seems more likely to lead to pulp exposure and inflammation. At the same time, primary tooth enamel has a higher water content and is more permeable compared to permanent tooth enamel. This explains the relatively rapid occurrence of dental erosion in primary teeth (25,39).

There are different explanations for dental erosion susceptibility of primary and permanent teeth. In an in vitro study by Amaechi et al., it has been proven that erosion occurs 1.5 times faster in primary teeth compared to permanent teeth (40). Lussi et al., in their in vitro study, compared the erosive potentials of acidic liquids in permanent and deciduous teeth, and they stated that there was no significant difference between primary and permanent teeth in terms of erosion susceptibility (41).

Tooth contours, tooth shapes, drinking and swallowing patterns are defined as factors affecting the erosion process in the oral cavity. Enamel becomes more susceptible to attrition when exposed to acidic content. Therefore, occlusion plays an important role in erosion-induced tooth wear (21).

Clinical Appearance of Dental Erosion

Early-stage enamel erosion does not cause discoloration or softening of the surface. There is no pain and it is at a level that cannot be detected clinically. Erosive lesions at this level have an “orange peel” appearance (42). Tooth enamel is not shiny in cases of active erosion. On the contrary, eroded enamel has a brighter structure. When the abrasion descends to the dentin, it takes on a yellow-brown color. In these cases, the tooth is more sensitive to temperature changes. In the initial stage of dentin erosion, the superficial lesions show dentin characteristics. It has a more white and light yellow appearance. When the lesion is severe, dentin; It has a rounded, diffuse, diffuse shape and a distorted color. Thus, dark yellow-brown sclerotic dentin was formed (43).

Treatment of Dental Erosion

First of all, the causes of dental erosion should be eliminated. If lesions have begun to form, they can be treated with restorative methods. The main goal of erosive lesion treatments is to preserve the tooth structures at the maximum rate without the preparation of the teeth. However, low pH affects not only natural teeth but also

materials used for restoration. Myklebost et al. They examined this in a study in which gastric contents fluids were simulated. According to this study; it has been proven that Tetric Ceram composites, compomers, resin-modified glass ionomer cements, glass ionomer cement used for the posterior region and amalgam restorative materials significantly increase the surface roughness rates. For this reason, the polishing processes of restorative materials should be perfect and controls should be made at regular intervals (44).

If the erosion process has caused loss in the appearance and function of the tooth, it can be treated prosthetically. The purpose of prosthetic treatments; is to reduce the sensitivity of dentin, to obtain an aesthetic appearance, to change the decreasing vertical dimension due to abrasions and to prevent the progress of the process (45). Desensitizing toothpastes, gels and varnishes can also be used. It has been stated that the use of fluoride toothpastes containing potassium citrate (5.5%), and potassium nitrate (5%) can relieve tooth sensitivity as a result of the precipitation of calcium carbonate in the dentinal tubules (46). Patients' complaints of sensivity can be reduced for a while with HEMA and agents with glutaraldehyde, flouride varnish and ingredients with potassium oxalate (47). It has been proven that gels with a high fluorine content provide surface hardening in erosive lesions and protect the enamel against a second acid exposure thanks to the calcium fluoride layer (47,48).

Conclusions

Dental erosion in the primary dentition is commonly encountered in children. Its multifactorial aetiology and its associations with other dental conditions such as enamel hypoplasia and caries add complexity to the diagnosis, prevention and management of these conditions. The high prevalence of dental erosion reported in children calls for further research into its prevention, such as the use of protective additives to alleviate the erosive effects of acidic foods and beverages and medicaments.

Conflict of Interest Statement

The authors declare that they have no conflict of interest.

Authors Contribution Statement

O.P. and R.A. contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript. All authors read and approved the final manuscript.

References

1. Lussi A. Erosive Tooth Wear – A Multifactorial Condition of Growing Concern and Increasing Knowledge. Monog Oral Sci. 2006;23(2):1–8.
1. Lussi A, Buzalaf MAR, Duangthip D, Anttonen V, Ganss C, et al. The Use of Fluoride for the Prevention of Dental Erosion and Erosive Tooth Wear in Children and Adolescents. Eur Arch Paediatr Dent. 2019;5:517–27.
2. Ganss C. Definition of Erosion and Links to Tooth Wear. Monogr Oral Sci. 2006;20:9–16.
3. Zanatta RF, Esper MÂLR, Valera MC, Melo RM, Bresciani E. Harmful Effect of Beer on Bovine Enamel Microhardness - In Vitro Study. PLoS One 2016;11(10):163-80.
4. Atatürk Üniv. Diş Hek. Fak. Derg. J Dent Fac Atatürk Uni Supplement: 10, Yıl: 2015, Sayfa : 81-90
5. Koch G, Poulsen S. Pediatric Dentistry: A Clinical Approach; John Wiley & Sons, 2013,29-38.
6. Civelek A, Özel E. Dental Erozyon ve Ayırıcı Tanısı. Gazi Üniversitesi Diş Hekimliği Fakültesi Dergisi 2005;22(1):69–74.
7. Güngör S. Gastroözefagal reflü (GÖR) hastalarında gözlenen dental erozyonun diş hekimliğindeki önemi ve ağız içindeki erozyon risk faktörlerinin sağlıklı bireyler ile karşılaştırılması. Doktora Tezi, Hacettepe Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara, 2001.
8. Ganss C, Lussi A. Current Erosion Indices-Flawed or Valid? Clin Oral Investig. 2008;12(1):1–3.
9. Linnett V, Seow WK. Dental Erosion in Children: A Literature Review. Pediatr Dent. 2001;23(1): 37–43.
10. Walker A, Gregory JR, Bradnock G, Nunn J, White D. National Diet and Nutritional Survey: young people aged 4 to 18 years. London: HMSO, 2000.
11. Ganss C, Klimek J, Giese K. Dental erosion in children and adolescents – a cross-sectional and longitudinal investigation using study models. Community Dent Oral Epidemiol 2001;29:264–71.
12. Zhang S, Chau AMH, Lo ECM,Chu CH.Dental caries and erosion status of 12-year-old Hong Kong children. BMC Public Health 2014,14:7.
13. Al-Majed I, Maguire A, Murray JJ. Risk factors for dental erosion in 5–6 year old and 12–14 year old boys in Saudi Arabia. Community Dent Oral Epidemiol 2002;30:38–46.
14. Öcal D. 11-15 yaş aralığındaki çocuklarda dental erozyon prevalansının ve etiyolojik faktörlerin belirlenmesi. 2014 Ankara Üniversitesi, Sağlık Bilimleri Enstitüsü, İstanbul.

15. Çoğulu D, Menderes M, Ersin N. Çocuklarda Dental Erozyon. Turkiye Klinikleri J Dental Sci 2009;15:87-92.
16. Ganss C. How Valid Are Current Diagnostic Criteria for Dental Erosion? Clin Oral Investig. 2008; 12(1):41–9.
17. Kirzioğlu Z, Yetiş CÇ. Çocuklarda Dental Erozyon Ve Koruyucu Uygulamalar. Ankara Univ Hekim. Fak. Derg. 2015;10(10):19-28.
18. Lussi A, Jaeggi T, Zero D. The Role of Diet in the Aetiology of Dental Erosion. Caries Res. 2004;38(1):34–44.
19. Yan-Fang Ren DDS. Dental Erosion: Etiology, Diagnosis and Prevention. ADA: The academy of dental therapeutic and stomatology, Chicago. 2011,9.
20. Zero DT. Etiology of Dental Erosion ? Extrinsic Factors. Eur J Oral Sci. 1996;104(2):162–77.
21. West NX, Hughes JA, Addy M. Erosion of Dentine and Enamel in Vitro by Dietary Acids: The Effect of Temperature, Acid Character, Concentration and Exposure Time. J Oral Rehabil. 2000;27(10):875–80.
22. Loke C, Lee J, Sander S, Mei L, Farella M. Factors Affecting Intra-Oral pH - a Review. J Oral Rehabil. 2016;43(10):778–85.
23. Hellwig E, Lussi A. Oral Hygiene Products and Acidic Medicines. Monogr Oral Sci. 2006;20:112–8.
24. Taji S, Seow WK. A Literature Review of Dental Erosion in Children. Aust Dent J 2010;55(4):358- 67.
25. Carvalho TS, Lussi A, Jaeggi T, Gambon DL. Erosive Tooth Wear in Children. Monogr Oral Sci. 2014;25:262–78.
26. Li H, Zou Y, Ding G. Correction: Dietary Factors Associated with Dental Erosion: A Meta-Analysis. PLoS One 2016;1(8):15-26.
27. Sullivan R E, Kramer WS. Iatrogenic Erosion of Teeth. J Dent Child. 1983;50:192–6.
28. Nunn JH, Ng SK, Sharkey I, Coulthard M. The Dental Implications of Chronic Use of Acidic Medicines in Medically Compromised Children. Pharm. World Sci. 2001;23(3):118–9.
29. O'Sullivan EA, Curzon MEJ. Drug Treatments for Asthma May Cause Erosive Tooth Damage. BMJ 1998;317(7161):20.
30. Dugmore CR, Rock WP. Asthma and Tooth Erosion. Is There an Association? Int J Paediatr Dent. 2003;2:36-52.
31. Xavier AFC, Moura EFF, Azevedo WF, Vieira FF, Abreu MHNG, et al. Erosive and Cariogenicity Potential of Pediatric Drugs: Study of Physicochemical Parameters. BMC Oral Health 2013;13:71.
32. Scatena C, Galafassi D, Gomes-Silva JM, Borsatto MC, Serra MC. In Vitro Erosive Effect of Pediatric Medicines on Deciduous Tooth Enamel. Braz Dent J. 2014;25(1):22–7.
33. Scheutzel P. Etiology of Dental Erosion--Intrinsic Factors. Eur J Oral Sci. 1996;104(2):178-90.
34. Dahshan A, Patel H, Delaney J, Wuerth A, Thomas R, et al. Gastroesophageal Reflux Disease and Dental Erosion in Children. J Pediatr Dent. 2002;140(4):474–8.
35. Järvinen VK, Rytömaa II, Heinonen OP. Risk Factors in Dental Erosion. J Dent Res. 1991;70(6): 942–7.
36. Meurman JH, ten Cate JM. Pathogenesis and Modifying Factors of Dental Erosion. Eur J Oral Sci. 1996;104(2):199–206.
37. Meurman JH, Frank RM. Progression and Surface Ultrastructure of in Vitro Caused Erosive Lesions in Human and Bovine Enamel. Caries Res. 1991;5:81–7.
38. Hunter ML, West NX, Hughes JA, Newcombe RG, Addy M. Erosion of Deciduous and Permanent Dental Hard Tissue in the Oral Environment. J Dent Res, 2000;28(4):257–63.
39. Amaechi BT, Higham SM, Edgar WM, Milosevic A. Thickness of Acquired Salivary Pellicle as a Determinant of the Sites of Dental Erosion. J Dent Res. 1999;78(12):1821–8.
40. Lussi A, Kohler N, Zero D, Schaffner M, Megert B. A Comparison of the Erosive Potential of Different Beverages in Primary and Permanent Teeth Using an in Vitro Model. Eur J Oral Sci. 2000;108(2):110–4.
41. Ercan E, Kaya AD. DENTAL EROZYON-Dental Erosion. J Ist Faculty Med. 2013;47(3):73–82.
42. Lussi A. Dental Erosion Clinical Diagnosis and Case History Taking. Eur J Oral Sci. 1996;104(2):191–8.
43. Mykle-Bost P, Mosseng OE, Gjerdet NR. Roughness of Filling Materials Subjected to Simulated Gastric Juice. In J Dent Res, INT AMER ASSOC DENTAL RESEARCHI ADR/AADR 1619 DUKE ST, ALEXANDRIA, VA 22314, 2003;82:68-80.
44. Cengiz S, Cengiz Mİ. Saraç YŞ. Gastroözefajial Reflü Hastalığında Dental Yaklaşımlar. The Journal of Gazi University Faculty. 2008;8(2):45-69.
45. Schiff T, Dos Santos M, Laffi S, Yoshioka M, Baines E, et al. Efficacy of a Dentifrice Containing 5% Potassium Nitrate and 1500 PPM Sodium Monofluorophosphate in a Precipitated Calcium Carbonate Base on Dentinal Hypersensitivity. J Clin Dent. 1998;9(1):22–5.
46. Maden EA. Dental Erozyonda Tanı ve Tedavi Yöntemleri. Gulhane Medical Journal 2012;54(1):56- 74.
47. Gaffar A. Treating Hypersensitivity with Fluoride Varnish. Compend Contin Educ Dent. 1999;20(1):27–33.

Uşak Üniversitesi
Diş Hekimliği Fakültesi Dergisi
Journal of Dentistry Faculty of Usak University
dergipark.org.tr/tr/pub/usakdhf
e-ISSN: 2980-3195

Review

The Sealing Ability of Biodentine: A Literature Review

Hasibe Elif KURU[1*]

[1] Department of Paediatric Dentistry, Faculty of Dentistry, Usak University, Uşak, Turkey, ORCID ID: 0000-0002-0396-7677

Article History
Received: 13.09.2023
Revised : 01.12.2023
Accepted: 09.12.2023

Keywords
Microleakage,
Tri-Calcium Silicate Cement
Dentin

Abstract

Microleakage, the passage of cariogenic elements between dental restorations and cavity walls, is a major concern in dentistry. Microleakage is a frequently seen factor contributing to the failure of dental restorations, tooth loss, and hypersensitivity. Biodentine, a tri-calcium silicate cement introduced in 2009 as a dentin replacement material, shows promise due to its composition, easy handling, faster setting time, antimicrobial properties and bioactivity. Biodentine has been stated to have broader clinical use than the Mineral Trioxide Aggregate (MTA) including pulp capping, pulpotomy, perforation repair, bifurcation lesion repair, internal and external root resorption, apexification, liner material for the coronal restorations as well as deep cervical and root cavities. Thus, the sealing ability of Biodentine is critical for dentin remineralization and restoration success. The objective of this review was to assess in-vitro studies that have focused on the microleakage of Biodentine in different applications and to suggest clinical recommendations.

Biodentine'in Sızdırmazlık Kabiliyeti: Bir Literatür Derlemesi

Makale Geçmişi
Alındı : 13.09.2023
Düzeltildi : 01.12.2023
Kabul Edildi: 09.12.2023

Anahtar Kelimeler
Mikrosızıntı
Tri-Kalsiyum Silikat,
Siman,
Dentin

Öz

Mikrosızıntı, diş restorasyonları ile diş dokuları arasında karyojenik maddelerin geçişi olarak tanımlanır. Mikrosızıntı, diş restorasyonlarının başarısızlığı, diş kaybı ve aşırı hassasiyet sebeplerinden en sık görülen faktörlerdendir. 2009 yılında dentin yerine geçen restoratif malzeme olarak tanıtılan tri-kalsiyum silikat simanı olan Biodentine, bileşimi, kolay kullanımı, hızlı sertleşme süresi, antimikrobiyal özellikleri ve biyoaktivitesi nedeniyle umut vaat etmektedir. Biodentine, Mineral Trioksit Agregat'tan (MTA) daha geniş bir klinik kullanıma sahip olduğu bildirilmiştir; bunlar arasında pulpa kaplama, pulpotomi, perforasyon onarımı, bifurkasyon lezyonu onarımı, internal ve eksternal kök rezorpsiyonu, apeksifikasyon, koronal restorasyonlar için kaide malzemesi ve derin servikal ve kök çürükleri bulunmaktadır. Bu nedenle, Biodentine'in sızdırmazlık yeteneği, dentin remineralizasyonu ve restorasyon başarısı için kritiktir. Bu derleme, Biodentine'in farklı uygulama alanlarında mikrosızıntı üzerine çalışan in-vitro çalışmaları değerlendirmek ve klinik önerilerde bulunmak amacıyla yapılmıştır.

*Corresponding Author (elif.kuru@usak.edu.tr)

Introduction

Microleakage is defined as a transport passage of emerging bacteria, liquids, molecules, and ions between the cavity wall and restoration material that cannot be observed clinically (1). Microleakage is one of the most common causes of restoration failure, tooth loss, and sensitivity (1,2). Cariogenic microorganisms colonized in the gaps between the restoration margin and the cavity wall as a result of microleakage may cause secondary caries and pulp pathologies (3). The main factors for microleakage are, the differences in the number of thermal expansion coefficients between the restorative material and the dental tissue, shrinkage of the polymerization material, abrasion of the material surface over time, inability to follow the required rules during material placement (1,4).

Biodentine is a water-based material containing tricalcium silicate. It has been introduced to dentistry as a "dentin replacement material" in 2009. It contains tricalcium silicate, dicalcium silicate, tricalcium aluminate and tetra-calcium aluminoferrite (5). Biodentine is produced in the form of a capsule with powder and liquid in ideal proportions. The powder content contains 80.1% tricalcium silicate, 14.9% calcium carbonate and 5% zirconium oxide. Calcium carbonate is for calcium filler content, improve biocompatibility and reduce setting time; zirconium oxide is used to increase radiopacity (6).

Biodentine has been stated to have broader clinical use than the Mineral Trioxide Aggregate (MTA) including pulp capping, pulpotomy, perforation repair, bifurcation lesion repair, internal and external root resorption, apexification, liner material for the coronal restorations as well as deep cervical and root cavities (5,7,8). Biodentine has been shown to have a greater ability to seal, a higher compression strength, a faster setting time (12 minutes), less colour change, and better antimicrobial properties in studies (9).

The sealing ability of Biodentine is critical for dentin remineralization and restoration success. This review aims to discuss current literature about the microleakage of Biodentine in different dentin treatments.

Sealing Ability on the Root-Canal Dentin

The sealing effect of Biodentine in both root and coronal dentin has been investigated in-vitro. Bani et al and El-Khodary et al found that Biodentine has the adequate sealing capacity as apical plug (10,11). On the other hand, Butt et al stated that the sealing capacity of the Biodentine has been found significantly higher than the MTA (Angelus) (12). It has been suggested that increasing the adhesion of Biodentine causes ion transfer and crystal growth in the dentinal tubules, resulting in occlusion of tubules with *de-novo* crystal formation. This leads to improved micromechanical adhesion, better seal, and reduced leakage (13).

In studies assessing microleakage through dye penetration, Biodentine exhibited significantly lower microleakage than MTA in some investigations (14-16), while in other studies, it surpassed MTA in this aspect (17-18). Mandawa et al. specifically compared the ProRoot MTA and Biodentine as retrograde filling materials using Rhodamin-B dye penetration, finding a superior marginal seal in the MTA group due to its higher hydrophilic nature and enhanced adhesion capability (15). Notably, under acidic storage conditions, no significant difference in impermeability was observed between ProRoot MTA and Biodentine (14).

Nepal et al made a spectophotometric analysis to detect the sealing ability of, Biodentine, glass ionomer cement (GIC) and MTA in retrograd root canal filling, resulting that MTA and Biodentine showed better sealing ability than GIC (19). According to these studies, Biodentine shows promise in terms of sealing ability and has easy handling characteristics and less time-consuming placement than MTA.

The permeability of the Biodentine is also affected by the solution in which the samples are stored. Camilleri et al investigated the microleakage of Biodentine on root dentin. Cracks in the Biodentin and changes in the microstructure were found in samples kept in a dry environment (20). According to Aggarwal et al, Biodentine kept in a Phosphate-Buffered solution (PBS), developed calcium-phosphate precipitates in the samples and this situation resulted in improved margin compatibility and impermeability (21).

Sealing Ability on the Coronal Dentin

There has been a limited amount of research conducted on the microleakage of Biodentine in coronal restorations. Koubi et al. conducted an in-vitro investigation to examine the microleakage values of Biodentine and RMCIS when applied under the composite using the open sandwich technique. The comparison was made with the glucose diffusion method. The average microleakage values of Biodentine and RMCIS were found to be similar after the study (22). The study conducted by Raskin et al. aimed to assess the microleakage values when Biodentine and Fuji IX glass ionomer cement were used as a base material together with composite filling, using the open sandwich method. The researchers reached the conclusion that there was not a statistically significant difference in microleakage between Biodentine and glass ionomer cement (23). In another research, Biodentine and Fuji IX cement were used in open sandwich method in class II cavities prepared in deciduous and permanent teeth. Dye penetration with basic fuchsin were used as assessment method and Biodentine showed significantly lower microleakage than glass ionomer cement (24). Such a controversy in the results of studies may be due to differences in the understudy samples or different methodology of studies.

Researchers observed an interactive interface between Biodentine and dentin, in which the tubules are occluded as tag-like structures. This layer has been interpreted as the presence of intra-tubular mineralization (7,25,26). This layer, according to Atmeh et al., was mediated by the cement's alkaline caustic effect on the organic component of the dentine, which facilitated mineral transfer, resulting in the formation of a "Mineral Infiltration Zone" (MIZ) (27). Therefore, MIZ can reduce microleakage and improve the remineralization potential.

Clinical Implication and Future Directions

This review highlights Biodentine's promising sealing capability on dentin. However, due to varying findings in different studies, additional research is needed, especially concerning Biodentine's efficacy in treating caries-affected dentin within deep cavities. To improve future studies, it is advisable to conduct clinical examinations and enhance standardization for a more robust evidence base.

Conflict of Interest Statement

The authors declare that they have no conflict of interest.

Authors Contribution Statement

The author (H.E.K) conducted the compilation independently and was solely responsible for the conception, research, and writing of the work.

References

1. Kidd EA. Microleakage: a review. J Dent. 1976;4(5):199–206.
2. Auschill TM, Koch CA, Wolkewitz M, Hellwig E, & Arweiler NB. Occurrence and causing stimuli of postoperative sensitivity in composite restorations. Oper Dent. 2009;34(1):3–10.
3. Raskin A, D'Hoore W, Gonthier S, Degrange M, & Déjou J. Reliability of in vitro microleakage tests: a literature review. J Adhes Dent. 2001;3(4): 295–308.
4. Trowbridge HO. Model systems for determining biologic effects of microleakage Oper Dent. 1987;12(4): 164—172.
5. Watson TF, Atmeh AR, Sajini S, Cook RJ, & Festy F. Present and future of glass-ionomers and calcium-silicate cements as bioactive materials in dentistry: Biophotonics-based interfacial analyses in health and disease. Dent Mater. 2014;30(1):50–61.
6. Kaur M, Singh H, Dhillon JS, Batra M, & Saini M. MTA versus biodentine: Review of literature with a comparative analysis J Clin Diagnostic Res. 2017;11(8):ZG01–ZG05.
7. Atmeh AR, Chong EZ, Richard G, Boyde A, Festy F, & F WT. Calcium silicate cement-induced remineralisation of totally demineralised dentine in comparison with glass ionomer cement: tetracycline labelling and two-photon fluorescence microscopy J Microsc. 2015;257(2):151–160.
8. Jefferies SR. Bioactive and biomimetic restorative materials: a comprehensive review. Part I. J Esthet Restor Dent Off Publ Am Acad Esthet Dent. 2014;26(1):14–26.
9. Grech L, Mallia B, & Camilleri J. Characterization of set Intermediate Restorative Material, Biodentine, Bioaggregate and a prototype calcium silicate cement for use as root-end filling materials. Int Endod J. 2013;46(7):632–641.
10. Bani M, Sungurtekin-Ekçi E, & Odabaş ME. Efficacy of Biodentine as an Apical Plug in Nonvital Permanent Teeth with Open Apices: An In Vitro Study. Biomed Res Int. 2015; 359275.
11. El-Khodary HM, Farsi DJ, Farsi NM, & Zidan AZ. Sealing Ability of Four Calcium Containing Cements used for Repairing Furcal Perforations in Primary Molars: An in vitro study. J Contemp Dent Pract. 2015;16(9):733–739
12. Butt N, Talwar S, Chaudhry S, Nawal RR, Yadav S, & Bali A. Comparison of physical and mechanical properties of mineral trioxide aggregate and Biodentine. Indian J Dent Res Off Publ Indian Soc Dent Res 2014;25(6):692–697.
13. Naik MM, de Ataide I de N, Fernandes M, & Lambor R. Assessment of apical seal obtained after irrigation of root end cavity with MTAD followed by subsequent retrofilling with MTA and Biodentine: An in vitro study. J Conserv Dent. 2015;18(2):132–135.
14. Agrafioti A, Tzimpoulas N, Chatzitheodoridis E, & Kontakiotis EG. Comparative evaluation of sealing ability and microstructure of MTA and Biodentine after exposure to different environments. Clin Oral Investig. 2016; 20(7):1535–1540.
15. Mandava P, Bolla N, Thumu J, Vemuri S, & Chukka S. Microleakage evaluation around retrograde filling materials prepared using conventional and ultrasonic techniques. J Clin Diagn Res. 2015; 9(2):ZC43-6.
16. Soundappan S, Sundaramurthy JL, Raghu S, & Natanasabapathy V. Biodentine versus Mineral Trioxide Aggregate versus Intermediate Restorative Material for Retrograde Root End Filling: An Invitro Study. J Dent (Tehran). 2014;11(2):143–149.

17. Jeevani E, Jayaprakash T, Bolla N, Vemuri S, Sunil CR, & Kalluru RS. Evaluation of sealing ability of MM-MTA, Endosequence, and biodentine as furcation repair materials: UV spectrophotometric analysis. J Conserv Dent. 2014;17(4):340–343.
18. Nanjappa AS, Ponnappa KC, Nanjamma KK, Ponappa MC, Girish S, & Nitin A. Sealing ability of three root-end filling materials prepared using an erbium: Yttrium aluminium garnet laser and endosonic tip evaluated by confocal laser scanning microscopy. J Conserv Dent. 2015;18(4):327–330.
19. Nepal M, Shubham S, Tripathi R, Khadka J, Kunwar D, Gautam V, & Gautam N. Spectrophotometric analysis evaluating apical microleakage in retrograde filling using GIC, MTA and biodentine: an in-vitro study. BMC Oral Health. 2020;20(1):37.
20. Camilleri J, Sorrentino F, & Damidot D. Characterization of un-hydrated and hydrated BioAggregate and MTA Angelus. Clin Oral Investig. 2015;19(3):689–698.
21. Aggarwal V, Singla M, Yadav S, Yadav H, & Ragini. Marginal Adaptation Evaluation of Biodentine and MTA Plus in "Open Sandwich" Class II Restorations. J Esthet Restor Dent. 2015;27(3):167–175.
22. Koubi S, Elmerini H, Koubi G, Tassery H, & Camps J. Quantitative evaluation by glucose diffusion of microleakage in aged calcium silicate-based open-sandwich restorations. Int J Dent. 2012;105863.
23. Raskin A, Eschrich G, Dejou J, & About I. In vitro microleakage of Biodentine as a dentin substitute compared to Fuji II LC in cervical lining restorations. J Adhes Dent. 2012;14(6):535–542.
24. Raju VG, Venumbaka NR, Mungara J, Vijayakumar P, Rajendran S, & Elangovan A. Comparative evaluation of shear bond strength and microleakage of tricalcium silicate-based restorative material and radioopaque posterior glass ionomer restorative cement in primary and permanent teeth: an in vitro study. J Indian Soc Pedod Prev Dent. 2014;32(4):304–310.
25. Qi Y, Li N, Niu L, Primus CM, Ling J-Q, Pashley DH, & Tay FR. Remineralization of artificial dentinal caries lesions by biomimetically modified mineral trioxide aggregate Acta Biomater. 2012;8(2):836–842.
26. Arends J, Ruben JL, Christoffersen J, Jongebloed WL, & Zuidgeest TG. Remineralization of human dentine in vitro. Caries Res. 1990;24(6):432–435.
27. Atmeh AR, Chong EZ, Richard G, Festy F, & Watson TF. Dentin-cement interfacial interaction: calcium silicates and polyalkenoates J Dent Res. 2012;91(5):454–459.

Uşak Üniversitesi
Diş Hekimliği Fakültesi Dergisi
Journal of Dentistry Faculty of Usak University
dergipark.org.tr/tr/pub/usakdhf
e-ISSN: 2980-3195

Vaka Raporu

[Düzeltme] Rotasyonlu Lateral Dişin Minimal İnvaziv Bir Yaklaşımla Estetik Rehabilitasyonu (Direkt Kompozit Lamina Restorasyon): Vaka Sunumu

Kübra MUMCU[1*], Hayriye Yasemin YAY KUŞÇU[2]

[1] Protetik Diş Tedavisi Ana Bilim Dalı, Diş Hekimliği Fakültesi, Harran Üniversitesi, Şanlıurfa, Türkiye, ORCID ID: 0000-0002-2597-312X
[2] Protetik Diş Tedavisi Ana Bilim Dalı, Diş Hekimliği Fakültesi, Harran Üniversitesi, Şanlıurfa, Türkiye, ORCID ID: 0000-0002-0805-1510

Makale Geçmişi
Alındı : 07.04.2023
Düzeltildi : 17.04.2023
Kabul Edildi: 26.04.2023

Anahtar Kelimeler
Estetik,
Direkt Kompozit Lamina,
Dental Restorasyon

Öz

Anterior dişlerin estetik restorasyonlarının planlaması, hastanın beklentisi, hekimin deneyimi ve teknik duyarlılığına bağlıdır. Anterior dişlerin tedavi teknikleri arasında metal-seramik restorasyonlar, tam seramik kronlar, porselen lamina veneerler ve kompozit lamina restorasyonlar yer alır. Direkt kompozit lamina restorasyonlar, anterior dişlerde estetik ve konservatif olmasının yanı sıra düşük maliyetli ve laboratuvar işlemleri gerektirmediği için tercih edilmektedir. Bu vaka raporunda rotasyonlu üst sol lateral dişinden memnun olmayan bir hastanın estetik beklentilerini karşılamak için minimal invaziv bir teknik olan direkt kompozit lamina restorasyonla tedavi edilmesi ve 3 aylık klinik takibi aşamalarıyla anlatılmıştır.

[Erratum] Aesthetic Rehabilitation of a Rotated Lateral Tooth with a Minimally Invasive Approach (Direct Composite Lamina Restoration): Case Report

Article History
Received : 07.04.2023
Revised : 17.04.2023
Accepted : 26.04.2023

Keywords
Aesthetics,
Direct Composite Lamina,
Dental Restoration

Abstract

The planning of aesthetic restorations of anterior teeth depends on the patient's expectation, the physician's experience and technical sensitivity. Treatment techniques for anterior teeth include metal-ceramic restorations, all-ceramic crowns, porcelain lamina veneers and composite lamina restorations. Direct composite lamina restorations are preferred because they are aesthetic and conservative in anterior teeth, as well as cost-effective and do not require laboratory procedures. In this case report, the treatment with direct composite lamina restoration, which is a minimally invasive technique, in order to meet the aesthetic expectations of a patient who is not satisfied with his rotated upper left lateral tooth, and its 3-month clinical follow-up are described.

*Sorumlu Yazar (dt.kubramumcu@harran.edu.tr)

Giriş

Dental tedavilerde hastaların beklentileri, sağlıklı ve fonksiyonel olarak yeterli çiğneme performansı sağlayabilecekleri ve estetik olarak da uyumlu dişlere sahip olmaktır. Dental tedavilerde dişlerin şeklini, boyutunu, rengini, simetrisini, konumunu ayarlamak gülümseme estetiğinin temel unsurlarındandır (1).

Anterior dişlerin estetiğinde hastaların yaygın şikayetleri arasında, çürük, malformasyon, anatomik değişiklik, renk değişikliği/lekelenme ve hipoplastik defektler yer almaktadır (2). Bu gibi şikayetleri olan hastalarda sıklıkla planlanan tedavi seçeneği dişlerin kronlanmasıdır. Ancak bu tedavi şeklinin mine ve dentini içeren geniş preparasyon gerektirmesi, dişeti ve çevre dokulara zarar verme riskinin olması gibi dezavantajları vardır (3). Bu nedenle kronlara alternatif olarak ve daha az sert doku preparasyonu gerektiren anterior dişlerde lamina restorasyonlar tercih edilmektedir. Lamina restorasyonları diastema varlığında, rotasyonlu, renklenmiş, palatal olarak konumlanmış dişlerde, konjenital ve edinilmiş malformasyonlarda, aşınmalarda dişin vestibül yüzeyine uygulanan minimal invaziv bir tekniktir (4,5). Lamina restorasyonlar direkt ve indirekt olmak üzere iki farklı şekilde uygulanabilir. Direkt lamina restorasyonlarda materyal olarak kompozit kullanılmaktadır. İndirekt yönteme göre maliyetinin daha düşük olması, ek bir adeziv simantasyon sistemine gerek olmaması, kolay şekilde uygulanabilmesi, ağız içinde düzeltme, tamir, polisaj işlemlerinin yapılabilmesi ve daha kısa sürede uygulanabilir olması gibi avantajları vardır (6). İndirekt lamina restorasyonlar ise direkt lamina restorasyonlara göre aşınmaya, kırılmalara ve renklenmelere karşı daha dirençlidir (5). Ancak ilave laboratuvar işlemleri gerektirmesi dezavantajıdır.

Bu vaka raporunda, rotasyonlu üst sol lateral dişinden memnun olmayan bir hastanın estetik beklentilerini karşılamak amacıyla hızlı, basit bir teknik olan direkt kompozit lamina restorasyon uygulaması ve 3 aylık klinik takibi aşamalarıyla anlatılmıştır.

Olgu Sunumu

17 yaşındaki kadın hasta, üst sol lateral dişinin rotasyonlu olması ve simetriği ile uyumsuz görünümünden şikayetçi olması sebebiyle Harran Üniversitesi Diş Hekimliği Fakültesi Protetik Diş Tedavisi Kliniği'ne başvurmuştur. Hastanın alınan anamnezinde sistemik olarak herhangi bir sağlık probleminin bulunmadığı öğrenildi. Hastanın intra-oral ve radyografik muayenesinde sol lateral dişinde rotasyondan kaynaklı malpozisyon olduğu belirlendi (Resim 1).

Resim 1. Tedavi öncesi intraoral görüntü

Periodontal tedavisi yapılarak ideal ağız hijyeni sağlandı. Hasta, tedavi seçenekleri hakkında bilgilendirildi. Hastanın da onayı alınarak sol üst lateral dişe direkt kompozit rezin restorasyon yapılmasına karar verildi. Öncelikle direkt kompozit lamina restorasyonun uygulanması için üst sol lateral dişin vestibül ve insizal yüzeylerinden minimal seviyede preperasyon yapıldı. Sonrasında diş eti oluğu sıvısını azaltmak ve marjinal adaptasyonu daha iyi sağlamak için retraksiyon ipi (Elite cord 00, Zhermack, Almanya) kullanıldı. Kompozitin mineye bağlanma oranını artırmak amacıyla bonding uygulaması öncesinde asitleme işlemi yapıldı. Asitleme için %37' lik ortofosforik asit jel (Etching Gel, Kerr, ABD) kullanıldı ve 15 saniye mine yüzeyinde uygulandı. Asitleme işlemi sonrası lateral diş, 20 saniye boyunca yıkandıktan sonra hava spreyi ile kurutuldu. Aşırı kurutulmadan kaçınarak dişe self-etching adezivin primer ve bondu (Clearfil SE Bond, Primer; Kuraray Co. Ltd.) uygulanarak 10 saniye süresince ışık kaynağıyla (Woodpecker LED-B Işık cihazı, Guilin Woodpecker Medikal Endüstri, Ltd, Guangxi, Çin) polimerizasyonu sağlandı. Restorasyonda kompozit rezin tüp A1 (X-s FIL, B&E Korea Co.Ltd.) kullanılarak inkremental teknikle dişe yerleştirildi. Sonrasında kompozit rezin 40 saniye süresince ışınlanarak (Woodpecker LED-B Işık cihazı, Guilin Woodpecker Medikal Endüstri, Ltd, Guangxi, Çin) polimerizasyonu sağlandı. Restorasyonun şekillendirilmesi, polisajı kompozit alev uçlu frezler ve kompozit parlatma lastik frezleri ile yapıldı (Resim 2). Tedavisi tamamlandıktan sonra hastaya oral hijyen hakkında bilgi verildi ve 3 aylık periyotlarla kontrole çağrıldı (Resim 3). Periyodik kontrollerde direkt kompozit lamina restorasyonda renk

konusunda memnun olan hastanın sadece tekrardan özel disklerle polisajı yapıldı. Ayrıca tüm kontrollerde hastanın estetik görünümünden son derece memnun olduğu gözlemlendi.

Resim 2. Tedavi sonrası intraoral görüntü

Tartışma

Günümüzde hastalar sağlıklı dişlere sahip olmanın yanında estetik açıdan da uyumlu dişlere sahip olmak istemektedir. Kompozit lamina restorasyonlar, artan estetik talebi karşılamakta ilk akla gelen tedavilerdendir (7). Bu vakamızda hastamızın şikayetçi olduğu rotasyonlu sol lateral dişi, basit ve tek seansta uygulanabilir olduğu için, sağ lateral dişine uyumlu olarak kompozit lamina ile restore edilmesi tercih edilmiştir. Ayrıca maliyetinin uygun olması ve diş yapısının korunmuş olması da bir diğer tercih sebebidir. Direkt kompozit lamina restorasyonları fonasyonu değiştirmez ve uygulama sırasında lokal anestezi uygulamasına ihtiyaç yoktur (8,9).

Özellikle noninvaziv veya minimal invaziv tedavi yaklaşımının endike olduğu klinik vakalarda direkt kompozit lamina restorasyonların uygulanması, indirekt lamina tekniklerine alternatiftir. Frese ve arkadaşlarının yaptığı bir çalışmada direkt kompozit lamina restorasyonlarının 5 yıllık takip sonrası başarı oranı %84,6'dır. Bu yüksek başarı oranının nedenlerinden biri de direkt kompozit lamina restorasyonların tamir edilebilirliğinin olmasındandır (10). Direkt kompozit lamina restorasyonun uzun dönem başarısızlığa neden olabilecek dezavantajı ise kompozitin renk değişikliğine uğraması ve porselen lamina restorasyonlara göre kırılma dirençlerinin az olmasıdır. Yine de porselen lamina restorasyonlardaki gibi karşıt dişlerde aşınmalara neden olmaz ve adeziv simantasyon için ilave işlem prosedürleri yoktur (8,9,11).

Direkt kompozit lamina restorasyonlarının başarısızlık nedenlerini değerlendirirken materyal, teknik ve hekim becerisi önemlidir. Klinik araştırmalarda, küçük renk kaybı, kısmi delaminasyon veya mikrosızıntı başarısızlık nedenlerindendir. Dişler ve uygulanacak restoratif materyaller arasındaki fiziksel farklılıklar (doldurucu içeriği, inorganik-organik matriks bileşeni) nedeniyle, diş/restorasyon arayüzünde debonding oluşur ve bu da estetik dental kompozit restorasyonlarında başarısızlığa neden olur (12).

Resim 3. 3 ay sonraki periyodik kontrolündeki intraoral görüntü

Gresnigt ve arkadaşlarının yaptığı bir çalışmada, direkt kompozit lamina restorasyonlarında farklı iki mikrohibrit kompozit kullanılmış ve genel sağkalım oranı bakımından önemli farklılıklar olmadığı bildirilmiştir. 3 yıldan fazla yapılan takiplerde restorasyonların %87,5'i klinik olarak başarılı bulunmuştur. Başarısız olarak değerlendirilen restorasyonlarda, debonding ve kırılma görülmüştür (13).

Gresnigt ve arkadaşlarının yaptığı başka bir çalışmada direkt ve indirekt kompozit lamina restorasyonlar karşılaştırılmış ve her iki kompozit lamina uygulaması, ortalama kırılma mukavemetleri göstermiştir. Ayrıca kırılma direncini artırmak için simantasyonda arayüze Eglass fiber kullanılmış fakat polimerik kırılma direncinde bir artış görülmemiştir (14). Bizim vakamızda da periyodik kontroller sırasında herhangi bir kırılma veya renk kaybı görülmedi.

Sonuç olarak, estetik yönden anterior dişlerinden memnun olmayan hastaların minimal diş preparasyonu uygulayarak direkt kompozit lamina restorasyonlarla tedavileri yapılabilir. Kolay uygulanabilir olması ve işlem basamaklarının basit olması sebebiyle hem hasta hem de hekim açısından tercih edilebilirliğini artırmaktadır.

Çıkar Çatışması Beyanı

Yazarlar, herhangi bir çıkar çatışmasının olmadığını beyan etmişlerdir.

Araştırmacı Katkı Beyanı

Tüm yazarlar çalışmanın tasarımı, yürütülmesi ve oluşturulmasına eşit derecede katkıda bulundu. Veri toplama, analiz ve yorumlama süreçleri işbirliği içinde yürütüldü. Makale, tüm yazarlar tarafından ortaklaşa yazıldı ve her biri önemli katkılarda bulundu. Tüm yazarlar, makaleyi eleştirel bir gözle gözden geçirip düzenleyerek entelektüel katkıların eşit olarak dağıtılmasını sağladı.

Kaynakça

1. Morita RK, Hayashida MF, Pupo YM, Berger G, Reggiani RD, Betiol EA. Minimally Invasive Laminate Veneers: Clinical Aspects in Treatment Planning and Cementation Procedures. Case Rep Dent. 2016;2016:1839793.
2. Gouveia THN, Theobaldo JD, Vieira-Junior WF, Lima DANL, Aguiar FHB. Esthetic smile rehabilitation of anterior teeth by treatment with biomimetic restorative materials: a case report. Clin Cosmet Investig Dent. 2017;9:27-31.
3. Güngör FS. Komplike Anormal Dişlerin Minimal Invaziv Bir Yaklaşımla Estetik Rehabilitasyonu: Bir Olgu Sunumu. Selcuk Dent J. 2018;5(1):86-90.
4. Khairuddin MNI, Iskanderdzulkarnein PMBUA, Halil MHM. Anterior teeth rehabilitation with direct resin composite veneer using multiple layering technique: A case report. IIUM J Orofac Health Sci. 2021;2(1):56-61.
5. Jain AR, Varma A, Hemakumar V. Evaluation of esthetic rehabilitation of teeth with severe fluorosis using direct and indirect laminate veneer: A case report. Biol Med (Aligarh). 2016; 8(7):1-3.
6. Kazak M. Eroziv Lezyonlarin Direkt Kompozit Lamina Venerler ile Minimal İnvaziv Restorasyonu: Olgu. Aydın Dent J. 2015;1(1):25-30.
7. Celik N, Yapar MI, Taşpınar N, Seven N. The Effect of Polymerization and Preparation Techniques on the Microleakage of Composite Laminate Veneers. Contemp Clin Dent. 2017;8(3):400-404.
8. Gresnigt MMM, Sugii MM, Johanns KBFW, van der Made SAM. Comparison of conventional ceramic laminate veneers, partial laminate veneers and direct composite resin restorations in fracture strength after aging. J Mech Behav Biomed Mater. 2021;114:104172.
9. Demirci F, Tanik A. Anterior Dişlerin Estetik Rehabilitasyonu (Direk Laminate Veneer Restorasyonlar): Vaka Raporu. Dicle Diş Hek Derg. 2015;16(1): 101-103.
10. Frese C, Schiller P, Staehle HJ, Wolff D. Recontouring teeth and closing diastemas with direct composite buildups: a 5-year follow-up. J Dent. 2013;41(11):979-85.
11. Alabdulwahhab BM, AlShethry MA, AlMoneef MA, AlManie MA, AlMaziad MM, AlOkla MS. The Effect of Dental Adhesive on Final Color Match of Direct Laminate Veneer (DLV): In Vitro Study. J Esthet Restor Dent. 2015;27(5):307-13.
12. Abdulrahman MS. Evaluation of the Sealing Ability of Direct versus Direct-Indirect Veneer Techniques: An In Vitro Study. Biomed Res Int. 2021 30;2021:1118728.
13. Gresnigt MM, Kalk W, Ozcan M. Randomized controlled split-mouth clinical trial of direct laminate veneers with two micro-hybrid resin composites. J Dent. 2012;40(9):766-75.
14. Gresnigt MM, Ozcan M. Fracture strength of direct versus indirect laminates with and without fiber application at the cementation interface. Dent Mater. 2007;23(8):927-33.