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Editörden

Şu günlerde tüm dünya olarak zor günlerden geçiyoruz. 2019 yılının sonlarına doğru Çin'in Wuhan eyaletinde patlak veren ve şimdilerde tüm dünyanın ortak sorunu olan Covid-19 ile mücadele…

Bu mücadelenin önemli aktörlerinin en başında tüm sağlık çalışanları geliyor. Bulaş riskinin en yüksek olduğu diş hekimleri üstün bir gayret ile görevlerine devam ettiler ve hala devam ediyorlar. Hastalığın bulaş riskinin en yoğun olduğu dönemde bile toplum sağlığının aksamaması bilinci ile ara vermeksizin hasta tedavilerine devam ettiler. Tabii bu özveri sadece klinik anlamda olmadı, aynı zamanda akademik ortamda çalışmalarına devam etiler.

Bu dönemde bile dergimiz, yayın hayatına ara vermeden çalışmalarına devam etti ve programına uygun şekilde 2020'nin ilk sayısını Editör Kurulumuzun üstün gayreti ile tamamlama başarısını gösterdi. Bu sayı için de bizlere desteklerini veren yazar, hakem ve editör arkadaşlarımıza teşekkürü borç biliyoruz.

Uzun süren sessiz bir dönemden sonra dergimiz yenilenen editör kurulu ve yapısı ile 3. yılına girmiş bulunmakta. Yılda 2 sayı olarak planladığımız dergimizi 2020 yılından itibaren yılda 3 sayı olarak çıkarma kararımızı mutlulukla sizlerle paylaşmak isterim. Bu dönemde ki en büyük hedefimiz dergimizi ulusal ve uluslararası endekslere sokmaktır. Bu süreçte de sizlerin değerli desteklerinize ihtiyacımız vardır.

Bu süreci el birliği ile beraber atlatacağımıza inancımız tamdır.

Doç. Dr. Korkut Ulucan, Editör

From the Editor

We are going through difficult times as the whole world nowadays. Combating Covid-19, which broke out in Wuhan province of China towards the end of 2019 and is now a common problem of the world…

All health professionals are at the forefront of the important actors of this struggle. Dentists, who have the highest risk of transmission, have continued their duties with great effort and still continue. Even during the period when the transmission risk of the disease was most intense, they continued their treatment without interruption with the awareness that the public health would not be disrupted. Of course, this dedication was not only clinically, but also academically.

Even in this period, our journal continued to work without interrupting the publication life and succeeded in completing the first issue of 2020 in accordance with its program with the superior effort of our Editorial Board. We would like to thank our authors, reviewers and editors who supported us for this issue.

After a long quiet period of time without any volume and issue, our journal has entered its third year with its newly board and structure. I would like to happily share our decision to publish our journal, which was planned as 2 issues per year, to be 3 issues per year since 2020. Our biggest goal in this period is to put our journal into national and international indexes. We also need your valuable support in this process.

We firmly believe that we will survive this process together.

Assc. Prof. Dr. Korkut Ulucan, Editor-in-Chief

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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

Evaluation of the anterior meniscal displacement with reduction by High-Resolution Ultrasonography pulsed-wave Doppler mode (PWD). A pilot study

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Abstract

Objective: The temporomandibular joint disorder (TMD) refers to mandibular dysfunction caused by reduced function of the primary structures that compose the temporomandibular joint (TMJ) or other structures related to the TMJ or by the interaction of these structures with each other. Ultrasound imaging (USI) can demonstrate not only soft tissue alterations but also visualize hard tissue alterations. Pulsed-wave Doppler mode is a widely used technique in the study of movable structures, particularly the vascular system.

Material and Methods: 16 patients (32 TMJ) were included in this study, grouped in 10 women's and 6 men's). An extraoral and intraoral examination of the TMJ was realized to detect anterior disc displacement with reduction. Ultrasonography high-resolution examination was carried out by LOGIQ e Healthcare® with a 16 MHz high-frequency transducer. A musculoskeletal L8-18i wideband linear array was used for pulsed-wave doppler mode examination.

Results: Fourteen patients presented anterior disc displacement with reduction, and 2 patients presented normal disc position. When meniscal displacement is detected, PWD mode presents a distinct waveform on the timeline of the exploration.

Conclusion: Pulsed-wave Doppler mode provides an advantage in USI, helping to confirm the existence of anterior disc displacement or crepitation. USI is a noninvasive technique with no radiation exposure. It permits static and dynamic exploration of the TMJ with a short examination time, low cost, and no contraindications or special patient preparation.

Keywords: Temporomandibular joint, Ultrasonography, Articular disc, Disc displacement, pulsed wave, Doppler.

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Introduction

The human temporomandibular joint (TMJ) is distinct from other synovial joints in that it is formed by two separate mesenchymal tissues(1). The TMJ consists of the mandible condyle and glenoid fossa of the temporal bone. The articular disc consists of intermediate fibrocartilage fixed to the articular capsule and the lateral margins of the condyle. However, the disc divides the articular joint cavity into two compartments: upper and lower(2). A synovial membrane covers the inner surface of the capsule and disc, except for the articular surface(3). The TMJ has a crucial role in mastication and speech, making it an essential anatomical structure of interest for dentists, orthodontists, clinicians, and radiologists(4). The term "temporomandibular joint disorder" (TMD) refers to mandibular dysfunction caused by reduced function of the primary structures that constitute the TMJ or other structures related to TMJ or by the interaction of these structures with each other(5). Pringle (6) was the first to report and define TMD in 1918. TMD affects not only the TMJ but also the masticatory system and other structures of the stomatognathic system. Overall, 41% of people exhibit at least one symptom related to TMD, and 56% have at least one related sign, which indicates that 40-60% of the general population is affected by TMD(5). Disc displacement is the most common intraarticular cause of TMD and results from instability between the condyle, temporal bone, and articular disc components(7). TMJ disc displacements are frequently symptomatic. However, in some individuals, disc displacement could be present with no symptoms. TMD affects women more than men, which could be referred to as the hormonal theory, which indicates that female hormones play a significant role in the pathogenesis of TMDs(8–10). Several studies have discussed the use of various imaging techniques as

diagnostic methods for TMD(11,12). Magnetic resonance imaging (MRI) is considered the gold standard modality due to its efficacy in evaluating the soft and hard tissues of the TMJ(7). Computerized tomography (CT) enables the evaluation of the bony structures, but it is not helpful in the evaluation of soft tissue structures like the articular disc. Furthermore, CT radiation exposure limits its use as a screening method because of the large doses of ionising radiation (13).

The high demand for a non-invasive technique and allows real-time evaluation with no radiation exposure and low cost, lead a group of scientists to propose the Ultrasonography as an alternative imaging technique in 1990(7). In ultrasonography, high-frequency wave sounds (emitted by the transducer through the piezoelectric crystals) are transmitted into the human body through the transducer, the interfered echoes of the body tissues are detected and displayed on the screen(7). The main advantage of USI is the ability to perform static and dynamic studies; this feature allows the practitioner to detect the disc position more accurately than with a single static investigation. USI can demonstrate not only soft tissue alterations but also visualize hard tissue alterations(8). However, USI is not only used to detect disc position but also used for detection of joint effusion (an increase of articular space width) and condylar irregularities.

Moreover, USI has a significant advantage that has been introduced in the last generation of USI equipment, namely, the pulsed-wave Doppler (PWD) mode. This mode is widely used in the study of movable structures, particularly the vascular system. The equipment combines real-time B-mode USI with the pulsed Doppler technique, permitting the user to evaluate the differences in frequency and thereby calculate blood flow velocity in the selected vessel (14). Some studies of the TMJ have used Doppler sound analysis techniques and, recently, two-dimensional Doppler velocimetry techniques. The aim of this study was to evaluate the efficacy of PWD mode ultrasonography for the detection of ADDwr.

Materials and methods

This study evaluated 32 TMJs of 16 patients (10 women and 6 men) with age ranged between 12 to 48 years old. These patients came to our clinic between March 2019 and June 2019 with pain in the TMJ area who were suspected of presenting TMD symptoms; the patients were otherwise in good health. The exclusion criteria of this study included previous trauma to the head and face area, prior surgery on the TMJ, orthodontic treatment, and facial deformities. Ethical approval was obtained from the ethics committee of the Instituto Asturiano de Odontologia (IAO) **(Ref.IAO-16-060)**, and this study met the criteria of Helsinki 1975, 2008 revision and Spanish legalization. Extraoral and intraoral exploration and clinical assessments of the TMJ were conducted by the same practitioner (orthodontist) per the research diagnostic criteria for temporomandibular disorders (CDC/TMD) (15). The examination included evaluating the patient's history, assessing the presence of joint sound and pain, palpating the intraoral and extraoral masticatory muscles, and measuring the mouth opening range. A clinical examination was carried out for all patients, followed by the USI B-Mode examination. Ultrasonographic examinations were carried out with a LOGIQ e ultrasound apparatus (BT12-GE Healthcare[å]USA) with a 16 MHz high-frequency transducer. The transducer used in this study for musculoskeletal imaging purposes was an L8-18i wideband high-frequency linear array, which has a 6.7-18.0 MHz imaging frequency. PWD mode was applied with a frequency of 10.0 MHz, a sample volume (SV) of 2, Figure 1, a pulse repetition frequency (PRF) of 2.6 Hz, and a wave frequency (WF) of 78 Hz. The patient was imaged under appropriate lighting in a dental chair while in a supine position. The probe was positioned over the TMJ area perpendicular to the zygomatic arch in the transverse and longitudinal planes and tilted until the best visualization was achieved(16–19), figure 2. The images were captured in both the closed and maximally open positions. On the ultrasound images, the condylar surface and articular eminence appeared as hyperechogenic lines, while the articular disc was identified by a thin hypoechogenic band between the two lines. The relationship between the articular disc and the condyle was assessed. The disc position was classified as normal when the anterior border of the disc was located superior to the condyle and as anteriorly displaced when the anterior border of the disc was anterior to the condyle. Subsequently, a dynamic examination of the TMJ was realized using PWD mode, which allows the simultaneous display of USI and Doppler signals.

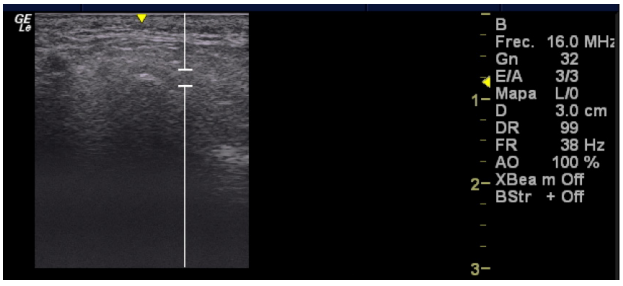

Figure 1. Sample volume of the mandibular condyle in PWD mode and analysis of condylar movement.

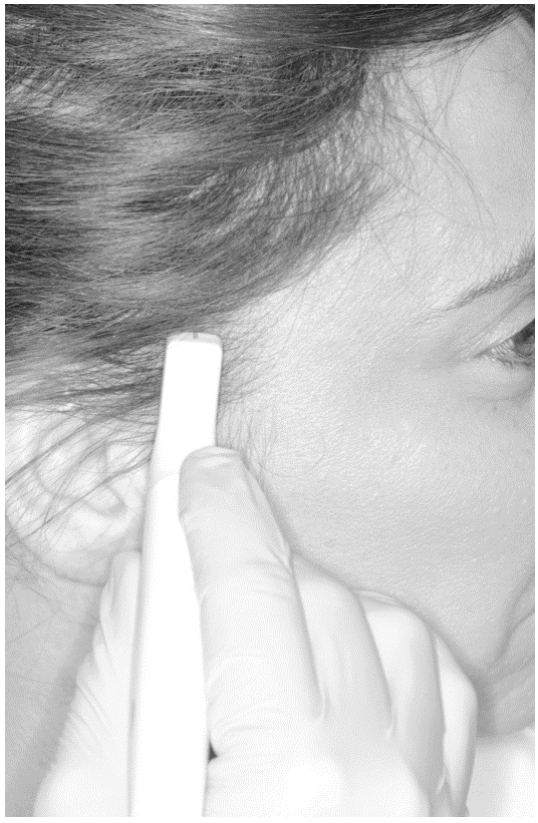

Figure 2. Patient and probe positioning in ultrasonography examination.

Results

A total of 14 patients presented ADDwr through the extraoral exploration of the TMJ. Ultrasound examination with PWD mode, confirm that fourteen patients had ADDwr, while two patients showed normal disc position.

PWD-mode USI confirmed the suspected presence of ADDwr by showing an elongated waveform on the timeline when the meniscal click occurred. In a normal patient included in this study, no alteration in the doppler spectrum was observed. Figure 3 shows a normal disc position diagnosed by PWD mode, where the examination timeline does not demonstrate any wave irregularities. While in a patient with dysfunction of the condylar-disc complex, irregular and elongated peaks were observed on examination timeline due to incorrect movement of the meniscus and condyle. However, Figures 4 from a different patient show an elongated waveform that indicates anterior disc displacement with reduction. However, Figure 5 presents a slight click of a girl with 12 years old. This click is presented on the timeline with a short and multiple waveforms. In the present work, crepitation was not detected through this study due to sample patients.

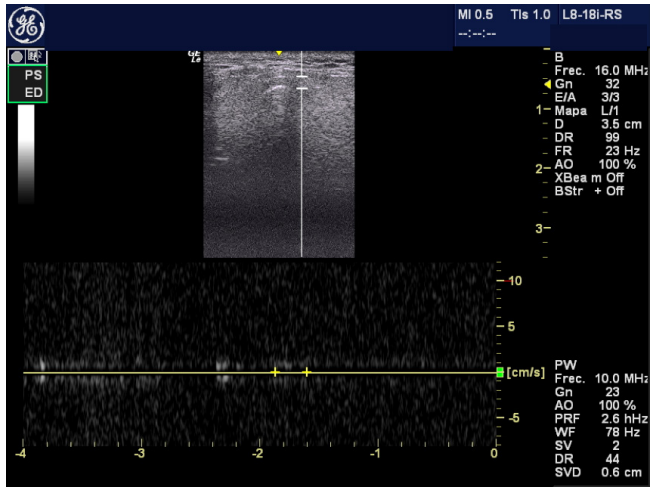

Figure 3. The patient did not present any wave irregularities on the timeline, which indicates that there was no disc displacement.

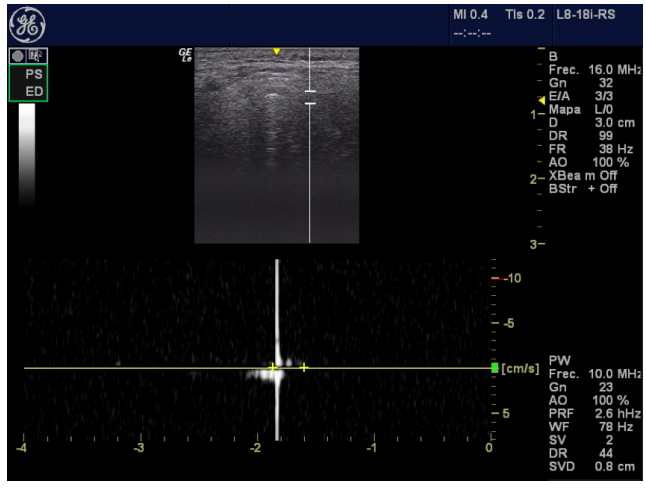

Figure 4. The patient presented anterior disc displacement with reduction. The PWD timeline shows an elongated wave at the time of the click.

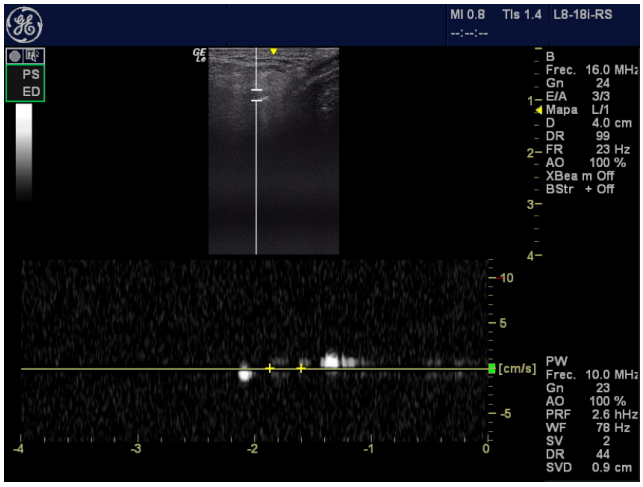

Figure 5. A 12-year-old girl presented a slight click when opening and closing her mouth. The first short wave on the left indicates the click during mouth opening, while the second short wave on the right indicate the click during mouth closing.

Discussion

The TMJ consists of the mandibular condyles, the mandibular fossa, and the articular disc. TMD is a common orofacial disorder that affects approximately 8-12% of the population, and a significant proportion of these patients seek treatment (20). TMD is divided into two groups: ID and musculoskeletal problems. ID is the most frequent type of TMD and is characterized by anterior disc displacement, joint effusion, condylar erosion, and osteoarthritis. The management of TMD starts with a clinical examination, which must be supported by the appropriate imaging modality to confirm the presence or absence of the suspected disorder, allowing the physician to make the correct treatment decision. In clinical practice, ordinary CT scans or cone-beam CT (CBCT) can help in the confirmatory diagnosis of hard tissue, while MRI can do the same for soft tissue. Many pathologies related to the head and neck, including structures such as the salivary glands, lymphatics, vascular structures, and nerves, are accessible to USI. However, reports have discussed the limitations of USI in the detection of TMD in clinical practice (20,21). On the other hand, several reports confirm that USI is a useful imaging modality for the diagnosis of TMD. A study by Hayashi et al. (22) with more than 23 patients and a 10 MHz transducer reported a Se of 63%, Sp of 100% and accuracy of 72% for detecting disc displacement, while Manfredini et al. (23) reported a Se and Sp of 57% and 74% for detecting disc displacement, respectively. Kaya et al. (24) stated that there were no significant differences between MRI and USI in visualizing ADD, ADDwr, ADDwor, and effusion, and the findings of the two methods agreed with each other in all assessments ($p>0.05$). Dong et al. (25) reported that patients who were suspected of having ADDwr were associated with an 89% probability of having a positive ADDwr result and a 21% chance of having a negative result after being evaluated by USI.

In comparison, the corresponding probabilities for ADDwor were 82% and 16%, respectively (25). Other authors reported that ultrasound is not an effective method to distinguish between anterior disc displacement with and without reduction (24,26). However, the new generation of ultrasonography equipment has a Doppler mode incorporated into it, permitting simultaneous B-mode and Doppler examination. In the dynamic exploration of the TMJ, PWD mode permits the examiner to hear and to visualize on the timeline any acoustic alteration that will produce an elongated waveform (with a distinct peak and trough), as in cases when a click caused by ADDwr occurs during the examination. This ability gives PWD an advantage in the detection of ADDwr or crepitation. It is essential to investigate sounds from the TMJ to understand TMJ dysfunction better. USI has advantages that make it superior to other imaging modalities, such as non-invasive techniques, a lack of radiation exposure, low cost, short examination time, and easily repeatable methods. Few studies have evaluated TMJ pathology through PWD mode. The recent paper about using PWD mode to study TMJ was in 2012 by A. Stagnitti et, al(14). However, the correct outcome of the examination seems to depend on operator experience as it is possible to generate many artifacts which are sometimes linked to minor methodological variations especially in the positioning and inclination of the transducer. Therefore, this study aimed to evaluate the efficacy of PWD-mode ultrasonography for the detection of ADDwr.

PWD mode uses the Doppler effect, i.e., moving objects change the characteristics of sound waves. By sending short, quick pulses of sound, it is possible to accurately measure the velocity of blood in a precise location and in real-time. In all cases, the Doppler ultrasound examination has shown the ability to differentiate between normal and pathological patients and has permitted the most significant aspects of dysfunctional to be identified (14). One must bear in mind, of course, that the examination outcome depends on operator experience, as it is possible to produce many

artifacts, especially in the positioning and inclination of the transducer (14). A study by Stagnitti et al. (14) mentioned that the PWD examination proved particularly useful in planning and follow-up because it allowed quantification of the kinetic moment of the pathological movement, including temporal and spatial relationships. Through this study, we found that PWD mode is a useful mode that helps the physician confirm the presence of ADDwr and/or crepitation of the mandibular articulation. This study has a small sample size; therefore, future studies of PWD mode must be conducted in large samples to confirm the effectiveness of this mode in detecting ADDwr. This work was realized because few studies were realized overusing pulsed wave mode as a diagnostic method for the detection of ADDwr. We suggest a prospective study with a more extensive patient's sample to confirm the usefulness of the PWD mode as a diagnostic method for the detection of TMD pathologies especially disc displacements and crepitation, which could allow ultrasound to take the place of MRI as the initial imaging modality for the diagnosis of TMD.

Conclusion

Ultrasonography is a useful diagnostic method for the detection of TMD. PWD mode gives ultrasound an advantage in confirming the existence of anterior disc displacement or crepitation. USI is a non-invasive technique with no radiation exposure and permits both static and dynamic exploration of the TMJ; this technique also has the advantages of short examination time, low cost, and no contraindications or special patient preparation required. A prospective study with a large patient sample is necessary to confirm the effectiveness of USI with PWD mode in diagnosing anterior disc displacement with reduction.

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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

Restoratif İşlemlerdeki Hasta Memnuniyetinin Belirlenmesi Üzerine Bir Pilot Çalışma

A Pilot Study on Determination of Patient Satisfaction in Restorative Procedures

Ü. Begüm GÜRAY EFES, Alican UZUNOĞLU, Burak Kaan BİRGÜL

Öz

Amaç: Hastaların, aldıkları diş hekimliği hizmetlerine yönelik beklentilerini belirlemek, tedavi hizmetlerinde diş hekimi ve sağlık çalışanlarının hastalar ile olan ilişkisini gözlemlemek, diş hekimliği tedavilerindeki memnuniyeti geliştirmeye yönelik hastalardan bilgi alımını sağlamak amaçlanmıştır. Diş hekimliği hizmeti veren bireylerin, tedavi sırasında hastaların uygulama etaplarındaki memnuniyetini etkileyen faktörleri belirleyerek bu veriler ışığında hekimlere ve diğer sağlık çalışanlarına, hizmet verdikleri bireylere yönelik veri elde edilmesi amaçlanmıştır.

Gereç ve Yöntem: İstanbul Üniversitesi Diş Hekimliği Fakültesi'nde restoratif diş tedavisi gören hastalara anket formları verilerek cevaplanması istenmiştir. Restoratif işlemin, İstanbul Üniversitesi Diş Hekimliği Fakültesi'nde eğitim gören diş hekimliği öğrencileri tarafından tamamlanmasının ardından 250 hastadan form doldurması istenmiştir. Anket sonucundaki kriterlerin karşılaştırılmasında Ki-Kare yöntemi ve SPSS programı kullanılmıştır.

Bulgular: Çalışmamızda yaptığımız anketlerin sonuçlarına göre tedavi sırasında hissedilen acı (p=0.005), hastanın tedavi sırasındaki oturma pozisyonu (p=0.047) ve tükürük emicinin kullanımı (p=0.014) kriterlerinin hasta memnuniyetini etkileyen faktörler arasında istatistiksel olarak anlamlı fark olduğu gözlenmiştir.

Sonuç: Restoratif tedavi sırasında kullanılan tükürük emicinin çevre yumuşak dokulara olan baskısı ve dentin hassasiyetine sebep olması, hasta pozisyonunun ideal ergonomik konumda ayarlanamaması, tedavi esnasında oluşan ağrı hissinin kontrol edilememesi hasta memnuniyetinin derecesinin düşük olmasına sebep olmaktadır. Bu da hastaların bir sonraki seanslara gelmemesine ve hekim ile ilişkilerini kesmelerine sebep olmaktadır. Bunun sonucu olarak basit tedavi prosedürleri ile çözülebilecek olan işlemler hastalığın ilerlemesine bağlı olarak komplike hale gelmekte ve bu da hem hastayı hem de ülke ekonomisini zarara uğratan bir süreç olarak karşımıza çıkmaktadır.

Anahtar Kelimeler: Dental restorasyonlar, diş hekimliği hizmetleri, hasta memnuniyeti

Abstract

Objective: The aim of this study is to determine the expectations of the patients for the dental services they receive, to observe the relationship between the dentists and health workers in the treatment services and to obtain information from the patients in order to improve the satisfaction of the dental treatments. The aim of this study was to determine the factors that affect the satisfaction of the patients who provide dental services during the application stages of the patients during the treatment and to obtain data for physicians and other health workers and the individuals they serve.

Materials and Methods: Questionnaires were given to the patients receiving restorative dental treatment at Istanbul University Faculty of Dentistry. After the restorative procedure was completed by dental students studying at the Faculty of Dentistry of Istanbul University, 250 patients were asked to fill in the form. Chi-square method and SPSS program were used to compare the criteria at the end of the survey.

Results: According to the results of the questionnaires we conducted in our study, it was observed that there were statistically significant differences between the factors that affected patient satisfaction during the treatment (p = 0.005), sitting position during treatment (p = 0.047) and use of saliva ejector (p = 0.014).

Conclusion: The saliva ejector used during restorative treatment causes pressure on the surrounding soft tissues and dentin sensitivity, the patient position cannot be adjusted to the ideal ergonomic position, and the feeling of pain cannot be controlled during the treatment leads to low patient satisfaction. This causes the patients not to come to the next sessions and to cut off their relations with the physician. As a result, the procedures that can be solved by simple treatment procedures become complicated depending on the progression of the disease and this is a process that harms both the patient and the national economy.

Keywords: Dental restorations, dental services, patient satisfaction

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GİRİŞ

Yirminci yüzyılda teknolojik gelişmelerle birlikte bilim, tüm çağlar boyu yaşadığı en hızlı değişimi gösterdi. Gelişen teknolojik gelişmelerle birlikte insanların yaşam kalitesi ve beklentileri de doğru orantılı olarak arttı (1). Zaman içerisinde hastalar, sadece tedaviye yönelik uygulamaların kalitesine değil aynı zamanda verilen hizmete yönelik kalite arayışına girmişlerdir (2-4). Bu da sağlık kuruluşlarının eski klasik yöntem anlayışlarını değiştirmelerine yol açmış, kaliteli bir hizmet verebilmek için hasta odaklı iletişim ve memnuniyet kavramlarının merkezde alındığı bir anlayış benimsenmiştir. Sağlık hizmetlerinin, hasta memnuniyeti dikkate alınmadan yüksek kalitede tedavi hizmeti verilemeyeceği yönünde ortak bir görüş geliştirilmiştir (5-6).

Hasta memnuniyeti, değişkene bağlı olan çok faktörlü bir kavram olarak karşımıza çıkmaktadır. Bu faktörler arasında hastanın eğitim geçmişi, yaşam tarzı, önceki tıbbi deneyim ve beklentileri vs. gibi birçok değişken bulunmaktadır (9,10). Yapılan çalışmaların sonucunda 'Hasta memnuniyeti, verilen hizmetin hastanın beklentilerini karşılaması ya da hastanın verilen hizmeti nasıl algıladığına dayanmaktadır.' şeklinde genel bir kabul bulunmaktadır (2, 9). Buradan hareketle literatürde hasta memnuniyetinin temelini hasta beklentileri ve geniş ölçüde hasta hekim birlikteliğinin oluşturduğu vurgulanmaktadır (10-12). Bir başka tanıma göre 'Hasta memnuniyeti, hastanın sağlık hizmeti alma kararından itibaren bu hizmeti araştırması, bulması, hizmete ulaşması ve kullanması vb. süreçlerde yaşadığı olaylar ve elde ettiği faydalar ile beklentilerinin karşılaştırılması sonucu ulaştığı tatmini düzeyidir (9,13).'

Memnuniyetin belirlenmesinde, anket formları önemli bir araç olarak karşımıza çıkmaktadır. Genel anlamda, araştırmalarda öne çıkan anketlere baktığımızda; Corah'ın Dental Visit Satisfaction Scale (DVSS) ve Dental Anxiety Scale (DAS) karşımıza çıkmaktadır. DVSS ve DAS, kişilerin normal günlük hayatlarında veya karşılaştıkları farklı durumlarda sahip oldukları anksiyetenin belirlenmesi amacıyla kullanılan sorgulama testleri olarak karşımıza çıkmaktadır (14,15). Başka bir anket çalışması olarak SERVQUAL anketi, tedavi hizmetlerinden hasta memnuniyetini değerlendiren ticari bir anket olarak kullanılmaktadır (13).

Son yıllarda ülkemizdeki sağlık sistemi, hizmetteki kalite ve hasta odaklı hale gelmiştir (3). Bu yapıda belirleyici bir unsur olarak hekimlerin hastalarla olan iletişim becerileri önem kazanmıştır. İletişim becerisi hekimlerin ve sağlık kuruluşlarının tercih edilebilirliğini etkileyen en önemli faktör olarak karşımıza çıkmaktadır (5). Hastaların beklentileri sağlık hizmetlerinin en önemli çıktılarından biri olarak, hizmet sürecinde ve kalite çalışmalarında üzerinde önemle durulan bir konudur (4,12,16).

Hastaların, diş hekimliği hizmetlerine yönelik memnuniyetini etkileyen faktörleri belirlemek ve diş hekimliği tedavilerindeki memnuniyeti geliştirmeye yönelik hastalardan bilgi alımını sağlamak amaçlanmıştır. Diş hekimliği hizmeti veren bireylerin; tedavi sırasında, hastaların uygulama etaplarından duydukları memnuniyet ve konfora yönelik veri elde etmek istenmiştir. Yapılan çalışma ile bu veriler ışığında hekimlere ve diğer sağlık çalışanlarına, hizmet verdikleri bireylere yönelik yapıcı davranış tarzını hatırlatmak ve bunun öneminin altını çizmek ile birlikte tedavi sırasındaki olumsuz faktörlerin belirlenip tedavinin sürdürülebilirliğine katkı sağlamak amaçlanmaktadır.

YÖNTEM

Çalışmaya katılacak bireyler İstanbul Üniversitesi Diş Hekimliği Fakültesi Diş Hastalıkları ve Tedavisi Anabilim Dalı'na çalışma için belirlenen iki aylık süreçte araştırma kriterlerine uygun olmak koşulu ile rastgele seçilmiştir. Katılımcıların: Dişlerinin birinde yada birden fazlasında pulpa dokusuna ulaşmayan çürük bulunması, on sekiz ile altmış beş yaş arasında olması, ciddi bir sistemik hastalığının bulunmaması, restorasyon bölgesinde yanıltıcı bir ağrının kaynağı olabilecek herhangi bir enfeksiyon odağı çürük yada gözlenebilen herhangi bir hastalığının olmaması istenmiştir.

Katılımcılar: Restorasyon öncesinde geçmeyen şiddetli ağrılar ve gece zonklama şeklinde oluşan ağrılarının var olması, hamilelik ya da emzirme sürecinde olması, beslenme bozuklukları olması, ciddi sistemik hastalıkların bulunması, aşırı bir diyet uygulaması ve şiddetli asitlere maruz kalması, üç ay içerisinde periodontal cerrahi operasyon geçirmiş olması durumunda araştırmaya dahil edilmemiştir.

Araştırma grubunun belirlenmesi işlemi öncesi hastalar, çalışma hakkında yazılı ve sözlü onayları alınmıştır. İstanbul Üniversitesi Diş Hekimliği Fakültesi'nde restoratif diş tedavisi gören hastalara anket formları verilerek cevaplanması istenmiştir.

Restoratif işlemin İstanbul Üniversitesi Diş Hekimliği Fakültesi'nde eğitim gören diş hekimliği öğrencileri

tarafından; tedavinin tamamlanmasının ardından hastaya, form doldurtulmuştur.

Hasta memnuniyetini belirlemek için sorulan 15 soruya verilen toplam puan 45'in altında olması durumunda memnuniyet derecesi düşük, üzerinde olması durumunda memnuniyet derecesi yüksek olarak kabul edilmiştir

Araştırma Kurgusu için Gerekli Minimum Denek Sayısının Saptanması

Çalışmada 'Restoratif İşlemlerdeki Hasta Memnuniyetinin Belirlenmesi' konulu çalışmada anket uygulanacağı denek sayısının çok değişkenli çözümlemelerde teorik olarak yeterliliği kabul edilen 1/10 oranı dikkate alındığında, toplam 25 soruluk anket için 250 denek kullanılması, yapılacak ileri analizler, çok değişkenli çözümlemeler ve diğer bivarite hesaplama kurguları için gerekli minimum denek sayısı olarak kabul edilmiştir.

Çalışmanın istatistiksel olarak çözümlemesinde, ele alınan primer ölçüte ait sıklıklar frekans ve yüzde değerleri ile tanımlanmıştır. Gruplar arası frekans ve yüzdelerin kıyaslanmasında Ki-kare kesin olasılık testi kullanılmıştır. Yorumlamalarda anlamlılık sınırı p=0.05 alınmıştır. Çalışmamızdaki istatistiksel analizlerde SPSS (Sürüm:22) paket programı kullanılmıştır.

BULGULAR

Hastalar, hekimin tedavi konusunda sunduğu seçeneklerden memnun olma konusunda 250 hastanın 240'ı olumlu bildirimde bulunmuştur [Tablo 1]. Hekimin tedavi sırasındaki hastaya karşı davranışları yönünden değerlendirilmesinde 250 hastanın 217'si olumlu bildirimde bulunmuştur [Tablo 2]. Hekimin, tedavi sırasında hastaya vermiş olduğu güven yönünden değerlendirilmesinde 250 hastanın 234'ü olumlu bildirimde bulunmuştur [Tablo 3]. Restoratif diş tedavisi kliniğinde diş çürüğü tedavisinde kullanılan malzemelerin kalitesine yönelik değerlendirmede 233 hasta olumlu bildirimde bulunmuştur [Tablo 4]. Hastalara yönelik koruyucu hekimliğin önemi konusunda 250 hastanın 201'i katıldığını bildirmiştir [Tablo 5]. 250 hastanın genel değerlendirme formu kapsamında 15 soruya verdikleri puanlara göre 196 hasta yapılan tedaviyle ilgili olumlu bildirimde bulunmuştur [Tablo 6]. % 21,6'lık kısımda bulunan hastaların memnuniyet derecesinin düşük olmasının nedeninin tespit edilebilmesi için tedavi sırasındaki faktörler değerlendirilmiştir. Bu sonuçlara göre tükürük emiciden rahatsız olan hasta sayısı 154 iken, 96 hasta etkilenmemiştir. Reflektör ışığından rahatsız olan hasta sayısı 46 iken, 204 hasta etkilenmemiştir. Kliniğin ortamından rahatsız olan hasta sayısı 24 iken, 226 hasta etkilenmemiştir. Kullanılan pamuktan rahatsız olan hasta sayısı 39 iken, 211 hasta etkilenmemiştir. Tedavi sırasındaki oturma pozisyonundan rahatsız olan hasta sayısı 108 iken, 142 hasta etkilenmemiştir. Kliniğin fiziki koşullarından rahatsız olan hasta sayısı 31 iken, 219 hasta etkilenmemiştir. Malzemelerin kalitesinden rahatsız olan hasta sayısı 13 iken, 237 hasta etkilenmemiştir. Materyallerin temizliğinden rahatsız olan hasta sayısı 18 iken, 232 hasta etkilenmemiştir. Acı hissetmesinden kaynaklı rahatsız olan hasta sayısı 176 iken, 74 hasta etkilenmemiştir [Tablo 7]. Tedavi aşamasındaki etkenler ile hasta memnuniyeti arasındaki ilişki istatistiksel olarak kıyaslandığında hastaya yöneltilen 10 tane faktörden tükürük emici (p=0.014), oturma pozisyonu (p=0.047), tedavi sırasındaki acı (p=0.005) memnuniyeti istatistiksel olarak anlamlı düzeyde etkileyen faktörler olarak ortaya çıkmıştır. Tedavi aşamasındaki etkenlerden hasta memnuniyetini etkileyen en önemli faktör olarak tedavi sırasında hissedilen acı, hastaların memnuniyetsizliğine % 70.4 oranında en çok sebep olan faktör olarak karşımıza çıkmıştır. Tedavi sırasında hissedilen acı faktörünü takiben, % 61.6 oranında tükürük emici ve % 43.2 oranında oturma pozisyonu, hasta memnuniyetinin derecesinin düşmesine sebep olan diğer faktörler olarak görülmektedir. Katılımcıların 182'si kadın hastalardan oluşurken, 68'i erkek hastadan oluşmaktadır. Katılımcıların % 26,4'ü 18-29 yaş; % 18,8'i 30-39 yaş; % 30'u 40-49 yaş; % 24,8'i 50-59 yaş arasındadır [Tablo 8].

Tablo 1: Hekimimin Diş Çürüğümün Tedavisi İçin Sunduğu Seçeneklerden Memnunum

TABLO 1	Sayı	Oran (%)
Tamamen Katılıyorum	231	92,4
Kısmen Katılıyorum	9	3,6
Kararsızım/Bilmiyorum	4	1,6
Çok Az Katılıyorum	5	2
Hiç Katılmıyorum	1	0,4
Toplam	250	100

Tablo 2: Hekimimin Titiz Davranışından ve Ciddiyetinden Memnunum

TABLO 2	Sayı	Oran(%)
Tamamen Katılıyorum	**193**	**77,2**
Kısmen Katılıyorum	**34**	**13,6**
Kararsızım/Bilmiyorum	**9**	**3,6**
Çok Az Katılıyorum	**6**	**2,4**
Hiç Katılmıyorum	**8**	**3,2**
Toplam	**250**	**100**

Tablo 3: Hekimimin Vermiş Olduğu Güvenden Memnunum

TABLO 3	**Sayı**	**Oran(%)**
Tamamen Katılıyorum	209	83,6
Kısmen Katılıyorum	25	10
Kararsızım/Bilmiyorum	8	3,2
Çok Az Katılıyorum	3	1,2
Hiç Katılmıyorum	5	2
Toplam	250	100

Tablo 4: Diş Çürüğü Tedavisinde Kullanılan Malzemelerin Kalitesinden Memnunum

TABLO 4	Sayı	Oran (%)
Tamamen Katılıyorum	**221**	**88,4**
Kısmen Katılıyorum	**12**	**4,8**
Kararsızım/Bilmiyorum	**4**	**1,6**
Çok Az Katılıyorum	**5**	**2**
Hiç Katılmıyorum	**8**	**3,2**
Toplam	**250**	**100**

Tablo 5: Koruyucu Hekimlik Uygulamalarının Tedavide Önemli Olduğuna İnanıyorum

TABLO 5	**Sayı**	**Oran(%)**
Tamamen Katılıyorum	128	51,2
Kısmen Katılıyorum	73	29,2
Kararsızım/Bilmiyorum	26	10,4
Çok Az Katılıyorum	14	5,6
Hiç Katılmıyorum	9	3,6
Toplam	250	100

Tablo 6: Yapılan Tedaviden Memnunum

TABLO 6	**MEMNUN**	**MEMNUN DEĞİL**	**TOPLAM**
	196	54	250
ORAN(%)	78,4	21,6	100

Tablo 7*:* Tedavi Aşamasında Hastaların Memnuniyetini Etkileyen Faktörlerin Dağılımı

TABLO 7	**Rahatsız etmedi**	**Rahatsız etti**	
Tükürük emicinin kullanımı	96	154	***P=0.014 ****
Reflektör ışığının kullanımı	204	46	*P=0.061*
Kliniğin ortamı	226	24	*P=0.073*
Tedavi sırasında kullanılan pamuk	211	39	*P=0.068*
Hastanın oturma pozisyonu	142	108	***P=0.047 ****
Kliniğin fiziki koşulları	219	31	*P=0.075*
Malzeme kalitesi	237	13	*P=0.059*
Materyallerin temizliği	232	18	*P=0.056*
Tedavi sırasında hissedilen acı	74	176	***P=0.005 ****

[Anlamlı fark oluşturma sınırı p<0.05 olarak Kabul edilmiştir.]

Tablo 8*:* Katılımcıların Yaş ve Cinsiyet Dağılımı

TABLO 8	**ERKEK**	**KADIN**	**YÜZDE**
18-29 YAŞ	15	51	26,4
30-39 YAŞ	13	34	18,8
40-49 YAŞ	23	52	30
50-59 YAŞ	17	45	24,8
TOPLAM	68	182	100

TARTIŞMA

Pearl Pei Liu ve ark. yaptıkları çalışmada, hastalardaki memnuniyet derecesinin az olmasına bağlı olarak hastaların tedaviyi sürdürmek istemediği bildirilmiştir (17). Yaptığımız çalışmada 250 hastanın 196'sının aldığı tedaviden memnun olduğu gözlemlenmiştir. Bu hasta grubunun % 98'inin yapılan işlem sonucunda tedaviyi sürdürmek istemesi bu konuda yapılan önceki çalışmaları desteklemektedir. Kalan % 2'lik grubun tedaviyi sürdürmek istememesindeki en önemli faktörün tedavi sırasında hissedilen acı olduğu gözlemlenmiştir.

Dr. Adnan Haşim'in "Diş Hekimliğinde Hipnoz" konulu yazısında; bilimsel ve yasal anlamda 1958 yılından beri tıbbi amaçlarla hipnozun resmen kabul edildiği Amerika Birleşik Devletleri'nde faal 5 tıp kuruluşunun 3 tanesinin diş hekimlerine ait kuruluşlar olduğu belirtilmektedir (18). Bu kapsamda diş hekimliğinde acı faktörü ve hastanın bu konudaki anksiyetesi tedavilerde çok önemli bir yer etmektedir (11,19,20). Bizim yaptığımız çalışmada da tedavi sırasında hissedilen acının, hasta memnuniyetini etkileyen faktörler arasında en yüksek oranda görüldüğü bulunmuştur. En belirgin memnuniyet etkenlerinden birinin tedavi sırasında hissedilen acı olarak belirlenmesinin sebebinin hastaların ağrısız tedavi beklentisi ve tedavi sırasında hissedilen acıdan kaynaklı oluşabilecek durumlar karşısında tedavi öncesinde önyargıları olduğu düşünülmüştür. Özellikle anestezi yaparken hekimin çevre yumuşak dokulara fazla baskı uygulamasının buna sebep olabileceği düşünülmüştür. Bir diğer faktör olarak tedavi sırasında dişteki dentin dokusunda yüksek hızlı döner aletlerin kullanılması, hassasiyet hissine bağlı hastada rahatsızlık hissine sebep olabilmektedir (21,22). Kullanılan frez takımının eskimesine bağlı olarak kesme fonksiyonlarının azalması ve dişlere gereğinden fazla basınç uygulanması da hastada rahatsızlık ve acı hissi olarak karşımıza çıkan faktörler olarak gözlemlenebilmektedir. Hekimin hastayla tedavi sırasında kurduğu iletişimin hastada hissedilen acının derecesini azaltmada etkili bir araç olduğu görülmüştür (23,24). Tedavi sırasında hasta ile

konuşmanın hasta üzerinde önemli derecede olumlu etki oluşturduğu gözlemlenmiştir.

Yapılan birçok çalışma kadın hastaların diş kliniğine daha çok başvurduklarını göstermiştir. Buna bir örnek olarak; Serpil Karaoğlanoğlu ve ark. yaptığı "Diş Fırçalama ve Sigara İçme Alışkanlığının DMFT Oranına Etkisinin Demografik Verilere Göre Değerlendirilmesi" konulu yaptıkları çalışmada Restoratif Diş Tedavisi Kliniği'ne başvuran 440 hastanın 251'inin kadın hasta olduğu tespit edilmiştir (25). Bizim yaptığımız çalışmada da 250 hastanın 182'si kadın hasta olduğu görülmüştür. Bu veriler bize, kadın hastaların erkek hastalara göre ağız sağlığına daha fazla dikkat ettiklerini ortaya çıkarmıştır. Bu bağlamda erkek hastalara ağız diş sağlığına yönelik bilinç düzeyinin arttırılmasına yönelik çalışmalar yapılabilir.

SONUÇ

Restoratif tedavi sırasında kullanılan tükürük emicinin çevre yumuşak dokulara olan baskısı ve dentin hassasiyetine sebep olması, hasta pozisyonunun ideal ergonomik konumda ayarlanamaması ve tedavi esnasında oluşan ağrı hissi hasta memnuniyetinin derecesinin düşük olmasına sebep olmaktadır. Bu da hastaların bir sonraki seanslara gelmemesine ve hekim ile ilişkilerini kesmelerine sebep olabilmektedir. Bunun sonucu olarak basit tedavi prosedürleri ile çözülebilecek olan işlemler hastalığın ilerlemesine bağlı olarak komplike hale gelmekte ve bu da hem hastayı hem de ülke ekonomisini zarara uğratmaktadır.

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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

Effects of Different Solvents on the Shear Bond Strength of A Nano Additive Composite

Farklı Çözücü İçerikli Adezivlerin Nano Doldurucu Katkılı Kompozitlerin Makaslama Bağlanma Değerleri Üzerine Etkisi

Gökhan DOKUMACIGİL, Pınar YILMAZ ATALI, Faik Bülent TOPBAŞI

Abstract

Aim: This study evaluated the effect of different solvents on shear bond strength (SBS) and how they were affected by the aging process after 10,000 thermocycling.

Materials and methods: Forty intact human molars were randomly divided into 4 groups of 10 teeth each. The teeth were embedded into self-curing acrylic resin and the occlusal enamel of teeth were cut with a low-speed diamond saw (Isomet 2000, USA). Two self-etching bonding agents containing different solvents, All-in-One (OptiBond, KavoKerr, USA), N-Bond (Tetric, Ivoclar Vivadent, Liechtenstein) were applied over the mid-dentin surface following the manufacturers' instructions. Subsequently, two-millimeter columns of Tetric N-Ceram (Ivoclar Vivadent, Liechtenstein) composite (Shade A2) were placed over the adhesives. Then the specimens were subjected to SBS test by using a universal shear testing machine. While two groups were tested after 24 h following the polymerization, the other groups were tested after 10,000 times thermal aging. The types of failure were evaluated under 25X magnification. The significance level $p<0.05$ was used for all hypothesis tests.

Result: The One-way ANOVA revealed no significant difference in SBS values between OptiBond All-in-one and Tetric N-bond in the different experimental conditions, immediately ($p=0,585$) and after 10,000 thermocycling ($p=0.266$). But all thermocycling groups showed lower bond strength than immediate groups ($p<0,05$). Besides, the types of failure were affected by thermal aging.

Conclusion: The SBS values were not affected by the solvent type. However, the thermal aging reduced the SBS values for both adhesive agents.

Keywords: Adhesive, Solvent, Composite, Shear Bond Strength

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Öz

Amaç: Bu çalışmanın amacı farklı çözücüler içeren dental adezivlerin immediyat ve 10.000 devir ısısal döngü uygulamasından sonra dentine olan makaslama bağlanma dayanımlarının karşılaştırılmasıdır.

Gereç ve Yöntem: Çürüksüz ve restorasyonsuz 40 adet insan azı dişi her grupta 10 tane diş olacak şekilde rastgele 4 gruba ayrılmıştır. Dişler soğuk akrilik içerisine gömüldükten sonra su soğutması altında kesme cihazıyla (Isomet 2000, ABD) oklüzal mine ortadan kaldırılmıştır. Farklı çözücüler içeren 2 adet kendinden asitli (*self-etch*) adeziv, All-in-one (Optibond, KavoKerr, ABD), N-Bond (Tetric, Ivoclar Vivadent, Lihtenştayn), üreticilerin talimataları doğrultusunda dentin yüzeyine uygulanmıştır. Daha sonra adezivlerin üzerine iki milimetre kalınlık ve 4 milimetre çapında A2 renk Tetric N-Ceram (Ivoclar Vivadent, Lihtenştayn) kompozit blokları oluşturulmuştur. Numuneler hazırlandıktan sonra universal test cihazı ile (Trapezum X, Shimadzu, Japonya) makaslama kuvvetine maruz bırakılmıştır. Oluşturulan 4 gruptan 2 tanesi polimerizasyon aşamasını takip eden 24 saat sonra test edilirken, diğer 2 grup 10.000 devir ısısal döngü uygulaması sonrası test edilmiştir. Kopma türleri 25X büyütme altında değerlendirilmiş ve tüm hipotez testlerinde istatistiksel anlamlılık değerleri $p<0.05$ olarak değerlendirilmiştir.

Sonuç: Tek yönlü varyans analizine (ANOVA) göre yapılan değerlendirmelerde Optibond All-in-one ve Tetric N-bond adezivin makaslama bağlanma değerleri arasında farklı ortam koşullarında, immediyat ($p=0,585$) ve 10.000 devir ısısal döngü uygulaması sonrasında ($p=0.266$), anlamlı bir fark bulunmamıştır. Fakat ısısal döngü uygulanan gruplar immediyat gruplara göre anlamlı derecede düşük bağlanma değerleri göstermiştir. ($p<0.05$) Ayrıca kopma tipleri ısısal döngüden etkilenmiştir.

Sonuç: Bu çalışmanın ışığında, makaslama bağlanma değerleri çözücü tiplerinden etkilenmezken, ısısal döngü uygulaması makaslama bağlanma değerlerini anlamlı derecede düşürmüştür.

Anahtar kelimeler: Adeziv, Çözücü, Kompozit, Makaslama bağlanma dayanımı

INTRODUCTION

Today, resin restorations are widely used in dentistry. One of the most critical steps of these restorations is adhesion that

ensures mechanical and physical forces between different materials by using various components. The adhesive interface consists of a substrate (adherent) and "adhesive", which placed on the substrate (2). The adhesive systems are used for bonding resins to enamel and dentin. The ultimate aim of bonding agents is to achieve maximum adaptation of the dental substrate with the restorative material.

Current developments in dentistry are based on reduced application time and simplification. Therefore, self-etch adhesive systems are widely used in dentistry. Because, these techniques do not require an additional acid-etch step and they are simultaneously dissolving the smear layer partially as they are infiltrating to dentin tubules (3). The first self-etch adhesives were consisting of two bottles, a bonding resin, and an acidic primer. Recently, many clinicians prefer to use one-step self-etch adhesives called as all-in-one (AIO) systems in which all the components have been combined into a single bottle. All-in-one systems require fewer steps for the bonding procedure, so they are easy to use because of reducing the application time.

Notwithstanding the dental bonding agents ensure the adhesion, shrinkage of the dentin matrix is another problem. To solve this problem, different solvents have been added into dental adhesives such as water, ethanol, and acetone. Water is one of the most essential solvents as it contributes to the ionization of acidic monomers (3). Also, it surrounds the residual collagens, which avoid hydrogen bonding. This preserves the inter-fibrillary spaces, thus resin materials could infiltrate to these spaces (4). Ethanol is a different solvent, which evaporates better than water because of higher vapor pressure. Generally, water is co-solvent of ethanol containing adhesives (5). The other important solvent is acetone and it has higher water removing capability than ethanol (6). Due to its high volatility, acetone-containing adhesives has a lower shelf life than the others (7). Consequently, the clinician must pay attention to storage conditions for this kind of bonding systems.

Having said that, durability of resin materials may decrease in time. The widely accepted method is thermocycling to simulate the aging in resin bonds (8). Especially, the restorations performed using self-etch systems may be affected more than the etch and rinse systems after thermocycling due to their hydrophilic ingredients.

This study evaluated the shear bond strength (SBS) values of 3 solvent containing adhesive by comparing ethanol/water-containing adhesive as immediate and after 10,000 thermocycling. The null hypothesis was that SBS to dentin is unaffected by solvent type, either immediately or after thermocycling.

MATERIALS AND METHODS

Marmara University Scientific Research Projects Commission (BAPKO) supported this study (Project no: SAG-C-DUP-120.917.0507). This study is approved by the ethical committee of Marmara University Faculty of Dentistry with the ethical number 2017-84 dated on 27.03.2017.

Study Design

Extracted human molar teeth within the previous 6 months were collected, residual tissue were removed, stored in 0.1% thymol solution, and finally they were embedded acrylic resin. The occlusal enamel of teeth was cut by low-speed diamond saw (Isomet 2000, Buehler, USA). To simulate the clinical dentin condition, surfaces were roughened by using mid-grain diamond burs (125 μm). The teeth were divided into 4 groups of 10 teeth (Group I (a, b), Group II (a, b). Two self-etching bonding agents, All-in-One (OptiBond, KavoKerr, USA) containing acetone/ethanol/water and N-Bond (Tetric, Ivoclar Vivadent, Liechtenstein) containing only ethanol/water, were applied for 40 and 10 s, respectively. Following the application of the bonding agents on the dentin surface, they were thinned with a gentle stream of air and cured for 10 s using a LED curing unit (VALO Cordless, Ultradent, USA) with an output of 1000mW/cm^2, as suggested by the manufacturer. The protocols for application and composition of the materials used in the study have been shown in Table 1. Two-millimeter columns of Tetric N-Ceram (Ivoclar Vivadent, Liechtenstein) composite with the shade A2 were placed over the mid-dentin surface by using silicone molds (2 mm thickness and 4 mm diameter) and a mylar strip to attain flat-ended surfaces, and cured for 10 s with the same visible light curing unit. Subsequently, during the control groups (Group Ia and Group IIa) were stored in 37 °C distilled water for 24 h, the test groups (Group Ib and Group IIb) were subjected to 10,000 thermocylcing between two water baths, a cold water bath at 5 °C and a warm water bath 55 °C.

Group I: Optibond All-in-one(AIO) + Tetric N-Ceram (TNC)

a) Immediately

b) After 10,000 thermal cycles

Group II: Tetric N-Bond Universal + Tetric N-ceram (TNC)

a) Immediately

b) After 10,000 thermal cycles

Afterwards, the samples were placed in a universal testing machine (Trapezium X, Shimadzu Corporation, Japan) and tested in shear to failure with a 0.5 mm/min crosshead speed. SBS values were calculated as MPa units.

Table 1. The protocols for application and composition of the materials

Brand	LOT	Composition	Procedures
Optibond All-in-one (KavoKerr, USA)	**33381E**	GPDM, mono and di-functional methacrylate monomers, nano-fillers including sodium hexafluorosilicate, water, acetone and ethyl alcohol, photoinitiators ph: 2.5	Two coats, Apply for 20 s, For each coat, dry gently, light cure for 10 s with 1000 mW/cm^2 power
Tetric N-Bond Universal (Ivoclar Vivadent, Liechtenstein)	**W86807**	Methacrylate, water, ethanol, silicon dioxide, photo stabilizers, stabilizers ph: 2.5 – 3.0	Scrub for 10 s, dry gently, light cure for 10 s with 1000 mW/cm^2 power
Tetric N-Ceram (Ivoclar Vivadent, Liechtenstein)	**W84900**	Barium glass, yitterbium triflouride, silicon dioxide **Matrix:** Bis-GMA, TEGDMA, ethoxylated Bis-EMA, UDMA	10 s. Light cure with 1000 mW/cm^2 power

Statistical analysis

The mean SBS to dentin was compared for 2 materials (Optibond All-in-one and Tetric N-bond) under 2 conditions; immediately and after thermocycling (10,000) using a one-way analysis of variance (ANOVA) and Tukey's tests at a significance level of 0.05. The statistical software package (NCSS, Utah, USA) was used to perform statistics.

Failure analysis

The types of failures were determined under 25X magnification (Leica, USA) and recorded as either "adhesive failure", "cohesive failure within dentin", "cohesive failure within composite" or "mixed failure".

RESULTS

The Mean SBS values and standard deviations (SD) for different groups are presented in Table 2. Bonding to dentin surface with Tetric N-bond resulted in higher bond strengths in both immediate (15.47±2.78 MPa) and thermocycled groups (11.06±2.67 MPa) than Optibond All-in-one (immediate: 14.56±4.3 MPa; thermocycled: 9.75±2.43 MPa). However, the One-way ANOVA revealed no significant difference in SBS values between OptiBond All-in-one and Tetric N-bond in the immediate (p=0.585) and thermocycled groups (p=0.266). The groups subjected to thermal aging showed lower SBS values compared to immediate groups (p=0.02 for OptiBond All-in-one; p=0.017 for Tetric N-bond) For all groups, most of the bonding failures were observed as either adhesive fracture or mixed fracture showing some attached materials or fractures on the dentin surface. However, there was no cohesive failure of the resin in any of the groups (Table 3). Thermocycling induced the morphological changes of failure type and increased the adhesive failure rate of the groups. Although the Optibond All-in-one group showed more adhesive failure and less cohesive failure within dentin after thermocycling compared to immediate rates, the failure types of Tetric N-bond has not been affected by thermocycling as much as AIO.

Table 2. Mean SBS values and Standard Deviations (SD)

Composite	Adhesive	Immediate SBS	SBS after Thermocycle	p
Tetric N-Ceram	**OptiBond AIO**	14.56 ± 4.37	9.75 ± 2.43	0.02
	Tetric N-Bond Universal	15.47 ± 2.78	11.06 ± 2.67	0.017
p<0.05				

Table 3. Failure modes

Testing Procedure	Composite	Adhesive	Cohesive Failure (Resin)	Cohesive Failure (Dentin)	Adhesive Failure	Mixed
Immediate	Tetric N-Ceram	Optibond AIO	-	3	2	5
		Tetric N-Bond Universal	-	1	3	6
10,000 Ther mocycle	Tetric N-Ceram	Optibond AIO	-	1	5	4
		Tetric N-Bond Universal	-	2	3	5

DISCUSSION

One of the most critical steps of the resin restoration technique is adhesion. Conversely to the former procedures which clinicians had to drill not only infected tooth tissue but also healthy tissues to enhance the mechanical retention (2), adhesive systems supply restoring teeth with minimally invasive procedures using various materials.

Etch and rinse systems increase the SBS, but self-etch adhesives have been improved and simplified while providing better durability and they were introduced as an alternative because of their reduced application time and sensitivity of the technique (9).

Faye et al. compared SBS of different self-etch adhesives by prior etching and non-etching. As a result, they found significantly higher SBS in prior etching groups (10).

Despite the limited research data, the available studies show that one-step AIO systems provide better long-term retention. Kubo et al. (11) evaluated the SBS of 2 different self-etch adhesives and found a retention rate of 98.1% in two-year follow-up. Apart from this, using the etch and rinse systems, extremely drying of dentin surface may lead to the structural collapse of the collagen matrix, which results in inadequate infiltration of monomers into the matrix. The prevention of the teeth from this collapse is made possible by providing adequate moisture within dentin structure (2). The organic solvents, such as acetone and ethanol, which improve monomer infiltration into the demineralized dentin matrix, play a crucial role to remove excessive water during evaporation and dissolve the resin monomers (12).

Up-to-date materials are introduced in restorative dentistry. Although there are several resin composites available in the market, the recently introduced resin composites have been produced by nano-filler technology which is one of the most important reasons of the improvement in the dental composites. Nayak et al. compared the SBS of 4 new nano-filled composites with the orthodontic light cure resin Transbond XT (3M ESPE, USA) and reported that Tetric N-ceram composite and the orthodontic resin showed higher SBS values (13).

Two of the important factors to attain a high quality hybrid layer are optimal monomer infiltration into the collagen fibrils of the demineralized dentin matrix and the removal of excessive water and organic solvents from the surface prior to curing (1). There is still controversy over which is the better solvent (acetone or ethanol). Acetone is widely used as a solvent, due to its efficiently water removal capability from the surfaces. However, acetone-containing adhesives has lower shelf life because of their high volatility. Ethanol is another material used as an organic solvent in the adhesives, but its vapor pressure is lower than acetone. In consequence of its more hydrogen bonding capacity, water has not chased by alcohol as effective as acetone (7). Conversely, ethanol can expand dried demineralized matrix more than acetone. Therefore, acetone-containing adhesives must be used and preferred only with the wet-bonding technique (14). Nevertheless, "dry-bonding" technique, namely gentle drying after rinsing is still providing effective adhesion for the water/ethanol-based adhesives (15).

In a study concerning the effect of solvent type on bond strength, ethanol-based adhesives resulted in higher bond strength values than acetone-based adhesives (16). The controversial results regarding the effect of solvent type on bond strength might be on the ground of both of the adhesives contain ethanol solvent.

In a study by Atash and Van den Abbeele, it has been suggested that the bond strength of adhesives depends on the pH value (17). The pH values of dentin adhesive systems used in our study were similar, and they were 2.5 for the OptiBond All-in-one system whilst between 2.5-3 for the Tetric N-Bond Universal system.

It was stated that adhesives including different solvents may show different bond strength values in superficial and deep dentin according to dentin bonding protocols (18). It is much more difficult to achieve adhesion in deep dentin than superficial dentin due to decreased intertubular dentin area in the deep dentin and the increased water content (19).

The SBS to the superficial dentin was regarded as higher independently from the adhesive system. In this study, the

mid-dentin surfaces of the teeth were used for the application of adhesive and resin composite (20).

Furthermore, there are lots of studies about SBS after 24-h storage, but some researchers have evaluated SBS values after thermocycling. The *in vitro* aging methods are often preferred as an alternative method to *in vivo* aging studies. It also has been reported that 10,000 thermal cycles have a similar effect with 1 year of aging in the mouth (21). The main factor that negatively affects the adhesive surface is the hydrolysis of resin-dentin bonding. Hot water may resolve poorly polymerized resin monomers and increase hydrolysis of collagen structure (1). In this study, both groups have been affected by thermocycling and this decreased the SBS values.

According to the literature, it was seen that the SBS tests were preferred more than the tensile bond strength tests (22) by reason of the fact that shear forces mimic the clinical conditions better than tensile forces (23). According to these results, the SBS comparison was chosen for this study.

Failure modes were subdivided as cohesive, adhesive, cohesive in dentin, and cohesive in resin. It has been reported that SBS plays an important role in failure types. Although adhesive failure occurs in the lower SBS values, cohesive failures occur in higher SBS values (24). The adhesive failures might have a couple of reasons such as inadequate wetting, excessive water or excessive air-drying (25). Although this study has given information about the effects of solvent type on SBS, this *in vitro* study does not fully reflect the real conditions of the oral cavity.

CONCLUSION

Under the limitations of this *in vitro* study, it can be concluded that;

1. There was no significant difference between the bond strength values of ethanol/water containing and acetone/ethanol/water containing adhesives.
2. The thermal aging has reduced the bond strength of all tested materials.

More information is needed about laboratory and clinical performance of the three-solvent containing adhesives.

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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

Evaluation of Dental Trauma Related Posts on Instagram

Instagram'daki Dental Travma ile İlişkili Paylaşımların İncelenmesi

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Abstract

Objective: The aim of the present study was to describe dental trauma related posts which are relation with the type of presentation, the distribution, etiology, treatment procedure and follow-up of the trauma on Instagram.

Materials and Methods: This was a descriptive study. The hashtags #dentaltrauma, #teethtrauma, #crownfracture, #toothfracture, #rootfracture, #avulsedtooth, and #dentaltraumatology were selected. All posts under these hashtags within a six month period (November 2018-April 2019) were analyzed. A total of 456 posts were included in this study. Data was collected, including details about the presentation of the case, etiology of trauma, type of trauma, follow-up period, treatment material, and informative advices for patients. SPSS (Version 21.0) was used for statistical analyses.

Results: A total of 645 traumatized teeth were shared, 96% of them were permanent teeth. It was found that the most common shared cases were trauma of the maxillary central incisors (86%). No etiological factor of trauma reported in 76% of posts. The most shared type of luxation injury was tooth avulsion (31.7%). More than half of the posts about crown and crown-root fractures (77.1%) were uncomplicated crown fractures. Follow-up time was unreported in more than half of shared posts (86.2%). 13% of the shared dental trauma posts included informative advices for the patients.

Conclusion: In this study, it is concluded that most of the Instagram posts which are related with dental trauma did not include essential elements for dental trauma management.

Keywords: dental trauma, endodontics, Instagram, pediatric dentistry, social media.

Öz

Amaç: Bu çalışmanın amacı; hekimler tarafından Instagram'da paylaşılan dental travma ile ilgili paylaşımların, Instagram'daki sunum şekli, dağılımı, etiyolojisi, tedavi ve takip prosedürünün incelenmesidir.

Materyal-Metot: Bu tanımlayıcı bir çalışmadır. Araştırma için #dentaltrauma, #teethtrauma, #crownfracture, #toothfracture, #rootfracture, #avulsedtooth, ve #dentaltraumatology etiketleri seçilmiştir. Bu etiketler ile etiketlenmiş son 6 ayda paylaşılan 456 paylaşım değerlendirilmiştir. Olgu sunumu, travma etiyolojisi, travma türü, takip süresi, tedavi materyali ve hastalar için bilgilendirici tavsiyelerin bahsedildiği paylaşımlar hakkındaki veriler toplanmıştır. İstatistiksel analizlerde SPSS (Versiyon 21.0) programı kullanılmıştır.

Bulgular: Toplam 645 adet travmaya uğramış diş paylaşılmış olup, bunların % 96'sının daimi dişler olduğu görülmüştür. En sık paylaşılan vakaların maksiller santral kesici dişleri ilgilendiren travma vakaları olduğu tespit edilmiştir (% 86). Paylaşımların %76'sında travmanın etiyolojik faktörü bildirilmemiştir. En sık karşılaşılan lüksasyon yaralanması tipi dental avulsiyon yaralanması olmuştur (% 31.7). Kron ve kron-kök kırıkları ile ilgili paylaşımların yarısından fazlası (% 77.1) komplike olmayan kron kırıkları olmuştur. Vakaların takip süresi paylaşımların yarısından fazlasında bildirilmemiştir (% 86.2). Dental travma paylaşımlarının %13'ünde hastalara yönelik bilgilendirici tavsiyelere yer verilmemiştir.

Sonuç: Bu çalışmada, Instagram'daki dental travma ile ilgili paylaşımların çoğunun dental travma yönetimi için gerekli unsurları içermediği sonucuna varılmıştır.

Anahtar Kelimeler: Çocuk diş hekimliği, dental travma, endodonti, Instagram, sosyal medya.

Introduction

One of the most important issues in dentistry is dental trauma, which is a common public health problem especially among children and adolescents (1). It has been reported in a meta-analysis study (1996-2016) that more than one billion people alive today have had dental trauma (2). The incidence and etiological factors of dental trauma vary across

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countries because of cultural, behavioral or environmental differences (3). Dental trauma can cause alterations in physical appearance, speech defects, emotional impacts and high treatment costs (4, 5).

Treatment of trauma is challenging for many physicians, both in terms of meeting the aesthetic and functional expectations of patients and of relieving their pain and it often requires multidisciplinary approach. For the management of dental trauma and to take precautions before it occurs, it is important to know the localization of the traumatized teeth, type of trauma and etiological factors (6). In addition, follow-up is very important to determine the prognosis of treatments in trauma cases. Guidelines of the International Association of Dental Traumatology (IADT) recommend appropriate follow-up, by clinical and radiographic monitoring between one to five years depending on the type of trauma (7).

Nowadays, social media is a propulsive force in the information sharing and is involved in every moment of life. It has been found that social media is an essential factor in shaping beliefs about health practices (8). Instagram is the most popular image and video sharing social media forum, which is reported to have one billion users as of June 2018 (9).

Instagram has attracted the attention of researchers because of its growing popularity and frequent user engagement, and accordingly it has been the subject of studies in various fields of medicine such as clinical dermatology (10), clinical infectious diseases (11), plastic surgery (12) and radiology (13). Dentistry is also a visually rich discipline; there have been a few dental studies that involve the use of social media (14-17), but only one study has been found to use Instagram, with a focus on fluoride (8).

Dental trauma is one of the issues of dentistry with high aesthetic and functional expectations, yet in accessible literature there is no study about posts on Instagram regarding dental trauma. The aim of the present study is to describe dental trauma related posts on Instagram. The type of presentation, the distribution, etiology, treatment procedure and follow-up of the trauma shared in the Instagram posts will be evaluated.

Materials and Methods

This was a descriptive, cross sectional study which has been described as a systematic approach for searching Instagram posts (8). A new Instagram account was created on November, 1, 2018, and the new account was used only for this study.

In a pilot study for the selection of hashtags, a single researcher examined posts shared with the '#dental trauma' hashtag. In these posts, the most common 50 hashtags accompanying '#dental trauma' hashtag which stated under the posts was noted. The posts under the 20 most frequently repeated hashtags were examined. Of the examined hashtags, those whose top 5 posts were not associated with dental trauma were excluded. Seven hashtags (#dentaltrauma, #teethtrauma, #crownfracture, #toothfracture, #rootfracture, #avulsedtooth, #dentaltraumatology) that meet the inclusion criteria were selected for the main study.

All posts under these hashtags within a six month period (November 2018-April 2019) were analyzed. The two researchers were trained and calibrated to perform the search, and Cohen's Kappa coefficient was used to examine inter-examiner agreement for the examination of the posts. The posts were grouped among themselves as dental trauma, non-dental trauma, veterinary dentistry and advertisement (congress presentation, clinical advertisement, informative brochure, etc.). The posts grouped under dental trauma and the written statements by the Instagram user, who shared the posts, were examined. The posts, which were in the form of video, were shared only as photographs without any statements, and those whose statement was not in English were excluded. In multiple photo sharings, all photographs were examined and included as a single post.

The main data collection was conducted in 10-day intervals three times per month. During that time, the top 20 posts were viewed on every hashtag. Posts were labeled with their respective data collection day for revisiting. Repeated posts were not included in each review. There were a total of 3870 posts in November, 3988 posts in December, 3460 posts in January, 3443 posts in February, 3887 posts in March, and 3925 posts in April. A total of 456 posts were included in this study (**Table 1**).

Table 1. The numbers of total and included Instagram posts for each hashtag in study period

	November	December	January	February	March	April
#dentaltrauma	2538/60	2658/58	2760/75	2825/56	2882/50	2902/30
#teethtrauma	45/3	46/0	48/0	53/0	57/1	59/0
#crownfracture	48/7	52/6	55/3	58/3	65/2	68/1
#toothfracture	497/12	505/8	526/12	560/10	588/10	651/8
#rootfracture	360/4	373/2	373/0	375/0	375/0	378/0
#avulsedtooth	102/6	110/3	119/2	119/0	120/0	122/0
#dentaltraumatology	280/17	290/5	290/0	293/0	295/1	304/1

Data was collected, including details about the origin country of the posts, specialty of dentists, presentation of the case (photography, radiograph, or both), etiology of trauma, type of trauma, follow-up time, treatment material and informative features for patients.

SPSS software (version 21.0; IBM, Chicago, IL, USA) was used for statistical analysis. The compatibility of observations performed by the investigators was assessed according to Cohen's Kappa coefficient. Inter-examiner reliability for grouping of posts was 0.95, for details of posts was 1. The demographic data of this study, in number and percentage, was tabularized. Categorical variables were described by frequencies (percentages) and were compared using the chi-square test. Significance was defined as having a P value <0.05.

Results

The hashtag #dentaltrauma generated 329 posts, #teethtrauma generated 4 posts, #crownfracture generated 22 posts, #toothfracture generated 60 posts, #rootfracture generated 6 posts, #avulsedtooth generated 11 posts, and #dentaltraumatology generated 24 posts.

When the shared posts were examined by country of origin, it was seen that most posts came from the American continent (32.5%), while the least number came from the African continent (0.4%). No statistically significant difference was found between the countries in regards to the information shared, such as the etiological factor, follow-up period, radiographic examination, treatment material or patient recommendations (p>0.05).

Of the dentists sharing the posts on Instagram used in this study, 237 (52%) were general practitioners. Among the specialists, endodontists shared more posts (33.6%) than pedodontists (28.8%) and restorative/aesthetic dentists (19%).

A total of 645 traumatized teeth of were shared, 96% of them are permanent teeth and 4% of them are primary teeth. For both primary and permanent dentitions, it was found that the most common shared cases were trauma of the maxillary central incisors (86%). The distribution of the teeth according to their localizations are given in the **Table 2**.

Table 2. Distribution of the localization of traumatised teeth

	Maxilla		Mandibula		TOTAL
	Permanent dentition	Primary dentition	Permanent dentition	Primary dentition	
Central incisors	505 (91%)	18 (3%)	33 (6%)	0 (0%)	556 (86%)
Lateral incisors	63 (83%)	6 (8%)	7 (9%)	0 (0%)	76 (12%)
Canines	7 (70%)	1 (10%)	2 (20%)	0 (0%)	10 (%1.5)
Premolars	3 (100%)	-	0 (0%)	-	3 (%0.5)
Molars	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
TOTAL	578 (90%)	25 (4%)	42 (6%)	0 (0%)	645 (100%)

Photographs were used in 356 (78%) posts, radiographs were used in 29 (6%) posts and both of them were used in 71 (15.5%) posts.

No etiological factor of trauma was reported in 347 (76%) of the posts. There were 49 (11%) traumas caused by falls, 43 (9%) by sports accidents, 7 (1.5%) by running over , 4 (0.8%) through physical aggression, 2 (0.4%) from crashing , 3 (0.6%) caused by car accidents and only 1 (0.2%) other reason .

The most shared type of luxation injury was tooth avulsion (31.7%), followed by lateral luxation (25.8%), concussion (14.2%), extrusive luxation (10.8%), intrusive luxation (10%), and subluxation (7.5%) (**Table 3**).

Table 3. Distribution of the types of luxation injuries

TYPE	NUMBER OF POSTS
Concussion	17 (14.2%)
Subluxation	9 (7.5%)
Lateral luxation	31 (25.8%)
Extrusive luxation	13 (10.8%)
Intrusive luxation	12 (10%)
Avulsion	38 (31.7%)

More than half of the posts shared that were a type of crown or crown-root fracture (77.1%, n = 283) were an uncomplicated crown fracture. This result was followed by complicated crown fracture (12.8%, n = 47), root fracture (3.8%, n = 14), complicated crown-root fracture (2.7%, n = 10), dentoalveolar fracture (2.2%, n = 8), and uncomplicated crown-root fracture (1.4%, n = 5) (**Table 4**).

Table 4. Distribution of the types of crown and crown-root fractures

TYPE	NUMBER OF POSTS
Uncomplicated crown fracture	283 (77.1%)
Complicated crown fracture	47 (12.8%)
Uncomplicated crown-root fracture	5 (1.4%)
Complicated crown-root fracture	10 (2.7%)
Root fracture	14 (3.8%)
Dentoalveolar fracture	8 (2.2%)

Follow-up time was not reported in more than half of the shared posts (n = 393, 86.2%; **Table 5**). There was a statistically significant relationship between the follow-up period and presentation of the case ($p<0.05$). It was observed that the dentists who stated the follow-up period shared only photographs.

Table 5. Follow-up time which stated on dental trauma posts

TIME	NUMBER OF POSTS
Unreported	393 (86.2%)
1 week	6 (1.3%)
2 weeks	5 (1.1%)
1 month	15 (3.3%)
6 months	6 (1.3%)
1 year	18 (3.9%)
+ 1 year	13 (2.9%)

Of the shared dental trauma posts, 59 (13%) were informative for the patients, while 397 posts (87%) were just case sharing. The material used to treat the trauma was stated in 251 (55%) posts.

Discussion

With over one billion monthly users, Instagram is an immensely popular social network worldwide, which is why we chose this platform for our study. Instagram is especially popular in the United States, having over 110 million users there (9). In accordance, most of the posts shared by dentist in this study were from America (32.5%). It can be also related with including only posts written in English.

The multiplicity of possible trauma cases and the wide range of treatment choices make it complicated for dentists to provide evidence-based treatment and recommend the best possible treatment option for the patient (18). The treatment of dental trauma cases often requires a multidisciplinary approach, which seems to be the reason for the different dental specialists in this study sharing dental trauma cases. Approximately half of the dentists were general practitioners (52%). Among the specialists, endodontists shared more posts (33.6%) than pedodontists (28.8%) and restorative/aesthetic dentists (19%).

In this study, 96% of the shared cases on Instagram were traumatic injuries to the permanent teeth. This is in agreement with epidemiological studies which state that the the frequency of traumatic injuries in the permanent teeth is considerably higher than that in the primary teeth (19, 20). The findings may be also related to studies which report that the most frequently applied treatment for traumatic dental injury to primary dentition was follow-up (21, 22). It is important to note that follow up as a treatment choice is less attractive to users of Instagram, so dentists may prefer not to share these cases.

For both primary and permanent dentitions, it was found that the most common shared cases were trauma of the maxillary central incisors (86%). This finding is in accordance with previous studies that found that dental trauma most often affects the maxillary anterior teeth because of their position (21, 23-26). It was found that 15% of global Instagram users were young women between the ages of 18 and 24 (9). According to this result, the sharing of anterior teeth cases on Instagram could be related to attracting the attention of young female patients with particularly aesthetic concerns.

In the current study, the majority of shared cases were uncomplicated crown fractures (77.1%). This is in accordance with previous studies reported that in permanent teeth, enamel/enamel-dentin fracture is more frequent than any other type of dental trauma (23, 24, 27, 28). The reason

for dentists choosing to share a case of uncomplicated crown fracture with a complete aesthetic restoration may be the appealing of such a case to patients is more than a bleeding, splinted or completely intrusive tooth.

The common etiological factors of dental trauma are falls, collisions, traffic accidents, sports activities and interpersonal violence. These factors may vary among countries because of cultural, behavioral, and environmental differences (3, 24, 25, 29, 30). The results of this study showed that the etiological factors of most of the shared trauma cases were not stated (76%). Among the cases in which the etiological factors were indicated, the main etiological factors of dental trauma were falls (11%) and sports accidents (9%). Etiological factors are sources of important information to other dentists who will see these shared cases, as they can use this information to educate patients about dental trauma prevention. It is also important for patients to know the etiological factors of dental trauma in order to take precautions such as mouth guards.

Radiographs are essential tool for both establishing the differential diagnosis of traumatic dental injuries and to determine the post-trauma complications, such as periapical pathology, root resorption, or the long-term sequelae of permanent teeth (31). In this study, it was observed that the radiographs of most cases (78%) were not shared on Instagram. In the trauma cases where radiographs are of significant importance, sharing only the photos of aesthetic treatments performed immediately after the trauma is incomplete and can mislead followers on the prognosis of these cases.

It has been reported that some post-trauma complications, such as crown discoloration, pulp obliteration, fistula, inflammatory root resorption, and pathologic bone loss, may occur after a few weeks, months, or even years (32-34). The guidelines of the International Association of Dental Traumatology recommend appropriate follow-up between 1-5 years, depending on the type of trauma. In cases of severe primary teeth injuries, clinical and radiographic monitoring is recommended each year until the eruption of the permanent successor (7, 35). A follow up of less than 6 months after the trauma was reported to be inadequate for assessing the treatment outcomes (34). But on Instagram, 86% of the dentists did not share the follow-up period of their cases. Only 7% of the cases shared included information on the follow-up for more than 6 months. It was also observed that the dentists who stated the follow-up period usually shared only photographs. Thus, most of the shared cases did not give any information about the long-term success or complications of the treatment. The success of treatments shared on Instagram can be misleading for followers.

Audiovisual methods are important for educating the public about dental trauma (36). In a study, it is stated that the Internet, healthcare professionals and television were the most preferred sources of information on the emergency management of dental trauma (37). Instagram was identified as a unique mechanism for reaching people, especially the younger populations, making it a valuable mechanism for health education (10). In order to successfully use trauma posts as an educational or informative tool for patients and other medical or non-medical professionals, the details of the case (etiology, treatment procedure, prognosis etc.) and the importance of prevention should be included in the comments on Instagram posts. Only 13% of the shared posts in this study included informative comments; this result may indicate that most of the current Instagram posts are insufficient to raise the awareness of the public about dental trauma. This finding is similar with another study that investigated dental trauma on Facebook and found that that platform also provided insufficiency information on dental trauma to the public (38).

The limitation of this study was the evaluation of only the posts written in English and posts which had open privacy settings and were available for everyone to see. Origin country of the posts, specialty of dentists included in the study are taken as stated in their profiles. Although Instagram is considered a popular platform for medical research studies (8, 10-12), it should be noted that the information provided can be misleading. Instagram has a vast user platform and for widespread generalizability, evaluating more cases, including those written in other languages, and including more hashtags will be useful in the future.

Conclusion

In this study, posts related to trauma on Instagram were generally advertising, self-promotional, or unrelated content. Most of the posts do not include essential elements for dental trauma management, such as the etiology, treatment procedure, prognosis, follow-up period, post-trauma recommendations, or trauma prevention methods. It is concluded that in their present form, posts on Instagram are neither informative for patients nor educational for other dentists. In order for Instagram use to play an educational

role for dental trauma management, shared cases should be presented more carefully, and incorrect or incomplete information should be avoided.

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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

Evaluation of Correlation Between Wear Resistance and Microhardness of Resin-based CAD/CAM Blocks

Kompozit İçerikli Cad/Cam Blokların Aşınma Direnci ile Mikrosertlik Arasındaki Korelasyonun Değerlendirilmesi

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Bilal YAŞA

Abstract

Aim: Evaluating the relation between wear resistance and microhardness of composite blocks, hybrid block, and resin composite to provide convenient argument for clinical application.

Methods: A conventional resin composite (IPS Empress Direct, Ivoclar Vivadent, Liechtenstein), a hybrid ceramic block (Enamic, Vita, Germany), and composite blocks (Lava Ultimate, 3M, USA; Hc block, Shofu, Japan; Brilliant Crios, Coltene, Switzerland; Cerasmart, GC Corp., Japan) were investigated. Specimens (n=12 for each) were loaded in a chewing simulator (Dent Ar-Ge, Analitik Medical, Turkey) for thermal cycling (49 N force, 240.000 cycles, 1.5 mm lateral movement, 1.7 Hz frequency) and worn sufaces were scanned with Las-20 (Laser scanner, SD-Mechatronic, Germany), and Vickers microhardness (VHN) values were determined (200 grf/10 sec). Statistical analysis was performed using Spearman Correlation Coefficient, Kolmogorov-Smirnov, Mann-Whitney U, Friedman and Kruskal-Wallis tests ($p<0.05$).

Results: Significant correlation was detected between microhardness and wear resistance for all composite Cad/Cam blocks ($p<0.001$), whereas no correlation was observed for hybrid block and resin composite material ($p\geq0.05$). Vita Enamic showed the highest VHN value and wear resistance among all the materials ($p<0.001$).

Conclusion: Within the limitations of this *in vitro* study, a significant correlation between microhardness and wear resistance was observed only for composite Cad/Cam blocks which varied among the brands used in this study.

Keywords: Cad/Cam Block, Chewing simulator, Microhardness, Resin Composite, Wear

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Öz

Amaç: Klinik uygulamalara rehberlik sağlamak amacıyla kompozit bloklar, hibrid blok ve rezin kompozit materyallerin aşınma direnci ve mikro sertlik arasındaki ilişkinin değerlendirilmesi.

Yöntem: Geleneksel rezin kompozit (IPS Empress Direct, Ivoclar Vivadent, Liechtenstein), hibrid seramik blok (Enamic, VITA, Almanya) ve kompozit bloklar (Lava Ultimate, 3M, ABD; Hc blok, Shofu, Japonya; Brilliant Crios, Coltene, İsviçre; Cerasmart, GC Corp., Japonya) araştırıldı. Örnekler (n=12) termal siklus özelliği olan çiğneme simülatöründe (Dent Ar-Ge, Analitik Medikal, Türkiye) yaşlandırıldı (49 N kuvvet, 240,000 siklus, 1,5 mm lateral hareket, 1,7 Hz frekans). Lazer tarayıcı kullanılarak aşınan yüzeyler tarandı (Las-20, SD Mechatronic, Almanya) ve Vickers mikrosertlik değerleri (VHN) ölçüldü (200 grf, 10s). İstatistiksel analiz spearman korelasyon katsayısı, Kolmogorov-Smirnov, Mann-Whitney U, Friedman ve Kruskal-Wallis testleri kullanılarak yapıldı ($p<0,05$).

Bulgular: Tüm kompozit blokları değerlendirildiğinde, aşınma direnci ve mikrosertlik arasında anlamlı korelasyon tespit edildi ($p<0.001$). Ancak hibrid blok ve rezin kompozit gruplarında aşınma direnci ve mikrosertlik arasında bir korelasyon bulunamadı ($p\geq0.05$). Tüm materyaller içerisinde Vita Enamic en yüksek VHN değeri ve aşınma direncini gösterdi ($p<0.001$).

Sonuç: Bu *in vitro* çalışmanın şartları altında, yalnızca kompozit Cad/Cam blokta aşınma direnci ve mikrosertlik arasında anlamlı korelasyon gözlemlenmiş olup korelasyon durumu çalışmada kullanılan materyallere göre değişiklik göstermiştir.

Anahtar kelimeler: Aşınma, Cad/Cam Blok, Çiğneme simülatörü, Mikrosertlik, Rezin Kompozit

Introduction

Prefabricated polymers provide higher mechanical properties compared to direct resin composites. Industrial conditions provide homogeneus internal structure owing to keep high temperature and pressure parameters (1).

CAD/CAM (Computer aided design/Computer aided manufacturing) has shown a major development in last years in clinical dentistry. Computer programs and milling

devices have been improved. CAD/CAM technology lead to the improvement of materials with polymeric matrix and use of polycrystalline ceramics (2). Various blocks having different physical properties are currently avaliable in the market (3). Resin nano ceramic (RNC) and a polymer infiltrated ceramic (PIC) materials can be used as alternatives to ceramics (4). RNC block has a polymer matrix reinforced with ceramic fillers. PIC materials consist of porous ceramic matrix infiltrated with polymers (4).

Direct resin composite restorations are popular options for clinical applications in daily practice (5,6). Composite resins may provide aesthetic outlook in a minimally invasive way (7). In order to succeed in resin composite restorations; correct adhesive protocol, proper selection of the resin-based material, and effective technique are required (8). The structure as well as the thermal expansion coefficient of components vary among the composite materials (9). As far as composite materials are affected by intraoral temperature and fluids, thermocycling was accepted as the universal aging method (10).

Clinical performance of restorative materials are determined by evaluating the materials mechanical properties, such as flexural strength, fracture toughness, diametral tensile strength, compressive strength, wear resistance, and surface hardness (11).

Intraoral tribology describes wear as the loss volume of tooth or restorative material, which occurs in consequence of the interaction between two surfaces (12). Intraoral wear is based on four fundamental mechanisms: corrosive wear, fatigue wear, two-body wear, and three-body wear. Two-body wear and three-body wear mechanisms were accepted as the basic mechanisms for composite restorative materials (13). Two-body wear mechanism was defined as the material loss when the surfaces are in contact without the existence of another object, while three-body wear was characterized with presence of a third body between two antagonistic surfaces (14). Clinical tests are necessary to define complicated oral wear circumstances, however these tests are time consuming and expensive and they don't permit examination of variable factors such as oral conditions or masticatory forces (15). Consequently *in vitro* chewing simulation has still been defined as a convenient resolution for evaluating the wear performance of dental restorative materials (16).

Microhardness test is one of the most common methods used for evaluating the surface hardness of resin composites due to the ease of application steps. There are four methods for microhardness evaluations: Brinell, Knoop, Rockwell and Vickers (17). Vickers hardness (VHN) test is the most frequently used method for resin composites among others. VHN method works by indenting the specimen with a diamond indenter, in the form of a pyramid with a square base of which opposing faces have a 136° angle. It has a test force between 1 gf to 100 kgf and the load is applied for 10-15 sec (18). The VHN number should be presented together with the dwell time and test force. Surface hardness is described as the resistance of the specimen to indentation. Surface hardness measurement is one of the markers of the degree of conversion, and as a result indicates the clinical performance of restorative materials (19).

Strength and rigidity of resin-based materials were considered to be influenced by surface characteristics. Surface hardness is one of the criteria to assess the wear resistance of the materials (20). The amount of wear was also reported to be related to the surface microhardness (21). Some researchers have found no correlation between hardness and wear resistance (18), whereas several researches have reported the presence of correlation between these mechanical properties (22,23).

The objective of this *in vitro* research was to determine the relation between abrasive wear resistance and surface microhardness of a resin-based composite (IPS Empress Direct, Ivoclar Vivadent, Liechtenstein), a hybrid ceramic block (Enamic, VITA, Germany), and three composite blocks (Brilliant Crios, Coltene, Switzerland; Hc Block, Shofu, Japan; Cerasmart, GC Corp., Japan; Lava Ultimate, 3M, US). The null (h_0) hypothesis stated that, there will be no correlation between microhardness and wear resistance of the materials tested.

Material and Method

Preparation of the specimens

IPS Empress Direct, Enamic, Brilliant Crios, Hc block, Cerasmart and Lava Ultimate groups (n=12 for each group) were investigated (Table 1). Resin composite specimens were placed in silicone molds under light cured (Valo, Ultradent Products, Switzerland) for 20 sec under finger pressure using mylar strips. The specimens were polished under running water using aluminum oxide (Al_2O_3) embedded discs (Sof-Lex, 3M, US) and the polishing speed was set at approximately 20.000 rpm. Coarse (100 μm abrasive particles), medium (40 μm abrasive particles), fine (24 μm abrasive particles), and super-fine (8 μm abrasive particles) discs were used, respectively.

The polishing process was performed by a single experienced operator following the manufacturer's instructions (under slight hand pressure, 20 seconds application per disc). For each specimen a new polishing disc was used. Composite and hybrid block specimens were cut into 3 mm thick slices using Isomed (Buehler Ltd., USA). For polishing, Minitech 233 (Presi, Grenoble, France) was used under running water (170 rev/min, 15 s).

Table 1. Materials tested in the study.

		Manufacturer	Monomer	Filler	
				Content	Mass (Volume %)
Composite block	HC Block	Shofu, Japan	.TEGDMA, UDMA	Zirconium silicate Silica-powder, micro fumed silica	61
	Cerasmart	GC, Japan	UDMA, Bis-MEEP, DMA	Barium glass and silica nanoparticles	71
	Lava Ultimate	3M, USA	UDMA, Bis-EMA TEGDMA, Bis-GMA,	Silica/zirconia nanoparticles	80
	Brilliant Crios	Coltene Switzerland	Bis-GMA, TEGDMA, BIS-EMA	Silica particles, barium glass	71
Hybrid block	Vita Enamic	Vita Zahnfabrik, Germany	UDMA, TEGDMA	PIC with feldspatic porcelain network material	86
Resin Composite	IPS Empress Direct	Ivoclar Vivadent, Liechtenstein	Dimethacrylate	Barium glass filler ytterbium trifluoride barium alumina	81,2

Aging procedure of the specimens

All specimens were embedded in holders using acrylic resin (Imicryl, Turkey). Using a chewing simulator (Dent Ar-Ge, Analitik Medical, Turkey) specimens were thermo-mechanically aged with a total of 240.000 chewing cycles against a stainless steel ball with a diameter of 3 mm. The chewing simulator was used in the present study had a thermal cycling feature. The force parameters were set at 49 N force, 1.5 mm lateral movement, 1.7 Hz frequency, and the thermocycle parameters were 5-55^{o}C hot / cold bath water temperature, 60 sec waiting time and approximately 1800 cycles.

Assessment of wear and microharness

Three dimensional surface analysis of worn surfaces of the specimens was captured using Las-20 (Laserscanner, SD Mechatronic, Germany) and the volumetric loss (µm) was calculated with three-point alignment method using a specific 3D processing software (Geomagic Control, 3D Systems Inc., Rock Hill, USA).

Following the thermomechanical aging, Vickers microhardness (VHN) was measured by using a microhardness tester (Wilson Wolpert Micro-Vickers 401MVD, Wilson Wolpert Instruments, Germany) with the parameters of 200 gram force (grf) and 10 sec dwell time. Three measurements from different areas were made on the surfaces of the specimens and their average was recorded as the final VHN value. The VHN was determined by evaluating the length of the indentations and using the specific formula: H=1.854 P/d2 (p: load, d: diagonal length).

Statistical Analysis

Normality of input dispersion was evaluated using Kolmogorov-Smirnov test. The evaluation of wear was performed with Mann-Whitney U and Kruskal-Wallis tests. Evaluation of microhardness was determined with Friedman and Kruskal-Wallis tests. Spearman Correlation Coefficient was used for assessing the correlation between wear resistance and microhardness vaules for the restorative materials tested ($p<0.05$).

Results

According to the wear data evaluations (Table 2), the highest amount of wear was observed for the composite resin group (0,7538) which was followed by composite Cad/Cam block (0,4111), and hybrid Cad/Cam block (0,1484) groups, respectively. Among the composite blocks, Cerasmart showed the highest amount of wear (0,7518) and followed by Brilliant Crios (0,5499), HC block (0,3578), and Lava Ultimate (0,1974), respectively.

Table 2. Mean values of wear (μm) and microhardness(VHN) measurements.

		Wear Amount (μm)	Microhardness (VHN)
Composite Cad/Cam block	HC block	0,3578	76,2
	Cerasmart	0,7518	71,3
	Lava Ultimate	0,1974	97,9833
	Brilliant Crios	0,5499	77,5167
	Total	0,4111	77,5
Hybrid Cad/ Cam block	Vita Enamic	0,1484	185,1667
Composite Resin	IPS Empress Direct	0,7538	58,93

Regarding the microhardness measurements (Table 2), hybrid Cad/Cam block group showed significantly the highest VHN value (185,1667; $p<0.001$) and followed by composite Cad/Cam block (mean value of 77,5), and composite resin (58,93) groups, respectively. Among the composite Cad/Cam blocks, Lava Ultimate showed the highest VHN value (97,9833) and followed by Brilliant Crios (77,5167), HC block (76,2), and Cerasmart (71,3), respectively.

A significant correlation was determined between microhardness and wear resistance for the overall composite Cad/Cam blocks ($p<0.001$), whereas no correlation was observed for each composite block individually ($p\geq0.05$). Also, no correlation was detected for hybrid Cad/Cam block and composite resin groups ($p\geq0.05$). However, for the overall tested materials a significant correlation was found between microhardness and wear resistance ($p<0.001$) (Table 3, Figure 1).

Table 3. Corralation between wear and microhardness of the materials used in this study.

		Correlation Coefficient (r)	P (sig)
Composite Cad/ Cam block	HC block	-0.135	0.677
	Cerasmart	-0.18	0.956
	Lava Ultimate	-0.277	0.383
	Brilliant Crios	-0.277	0.383
	Total	-0.709	**0.001***
Hybrid Cad/Cam block	Vita Enamic	0.389	0.212
Composite Resin	IPS Empress Direct	0.203	0.526
	Total	– 0.83	**0.001***

* Positive correlation was found between microhardness and wear resistance (spearman correlation coefficient)

Discussion

This study investigated the correlation between surface hardness and wear resistance of six different restorative materials. As no correlation was observed for all the tested restorative materials individually, the null hypothesis was accepted.

The real performance of dental restorations should be assessed with long-term clinical observations, however this can be time consuming, expensive and arise ethical concerns (24). *In vitro* testing devices and methods were improved to overcome the mentioned problems. The chewing simulator, which was also used in the present study, was produced to mimic the oral environment *in vitro*. This simulator can evaluate both lateral and two body movement resistance of restorative materials (25). For the purpose to determine the proper parameters, researches were performed and different testing protocols were suggested by different authors (26,27). The testing parameters of the chewing simulator are loading forces, loading frequency, number of cycles, thermocycling and dry fatigue. The results of the studies were reported to be varying among these parameters (28). Teeth are exposed to substantial temperature changes during their intraoral functions. The temperature of dental enamel changes between 16°C to 48°C during these cycles (29). The alterations in temperature may lead to thermal stress and various modifications to dental hard tissues as well as the restorative materials as a result of different thermal expansion coefficients. Nelsen (22) reported that thermal characteristics of restorative materials could be examined by using thermocycling test method.

The Vickers microhardness test was used in this study to reflect mechanical properties of the materials and it was also suggested as an accurate and reliable method to measure surface hardness of materials, previously (28). Degree of polymerization, hydrolytic degradation, water absorption, inter-particle spacing and type, size, shape of inorganic fillers were determined as influencive factors affecting the wear resistance for restorative materials (30). Stawarczyk *et al*. reported that increase in filler loading and decrease in filler particle size improved the wear resistance (1). Klapdohr *et al.* reported a relation between inorganic filler content and hardness in resin-based composites (31). *Elzoheiry et al*. determined that, surface hardness was effected by filler particles and the link between polymer matrix and filler particles. The degree of polymerisation was also found to be related with the surface hardness (32).

The relation between the resistance to abrasion and microhardness was assessed for dental restorative materials in previous studies (1,22,28). CAD/CAM composite blocks were reported to have different mechanical properties due to their diversity in structural characteristics and filler percentages (33,34). Stawarcyzk *et al*. used composite blocks (Hc Block, Lava Ultimate, Cerasmart), a hybrid block (Enamic), and lithium disilicate glass ceramic and leucite (Ips Empress Cad) materials in their study, and aged in chewing simulator (5-55°C, 1.200.000 cycles, 50 N), in which human teeth were used as antagonist (26). According to their results, Enamic showed higher wear resistance compared to Lava Ultimate, Hc Block and Cerasmart block. Cao *et al* investigated two packable (Surefil, 3MP60, Dentsply, USA) two microhybrid (Clearfil AP-X, 3MZ250, Kuraray, Japan), and a nano-hybrid (Charisma Diamond, Kulzer, Germany) resin-based composites. A custom-made brushing machine was used to test the specimens (1Hz, 3N loads, 6×105 cycles). No significant difference was detected regarding interactions between wear and surface hardness for the materials (28). Dayan and Mumcu reported weak correlation between wear and microhardness of the restorative materials tested: Paradigm MZ100, 3M Espe, USA; Lava Ultimate, 3M Espe, USA; Vita Enamic, Vita Zahnfabric, Germany; Cerasmart, GC Corp., Japan (22). In the present study, supporting the results of Cao *et al.,* (28) *Dayan and Mumcu* (22), no correlation was observed for composite block, hybrid block and resin composite groups ($p \geq 0.05$). Also supporting the results of Stawarcyzk *et al*. (26), the hybrid ceramic Enamic group showed significantly the highest wear resistance among all groups ($p < 0.001$). The filler volumes of tested materials were: Hc block: 61%, Cerasmart: 71%, Lava Ultimate: 80%, Brilliant Crios: 71%, Vita Enamic: 86%, IPS Empress Direct: 81,2%. The wear behavior of hybrid ceramic and composite materials might be associated with their different microstructures and filler contents. The ceramic or polymer content might have also affected the wear properites as well as mechanical and surface roughness, with regard to the fact that, decrease in surface hardness causes increase in the amount of wear (34).

Conclusion

Within the limitations of this study, the hybrid ceramic showed the highest wear resistance and microhardness, wheareas resin-based composite showed the lowest. According to our results, surface hardness may not be considered as a predictor for wear resistance of the restorative materials, however further studies should be undergone for more precise results.

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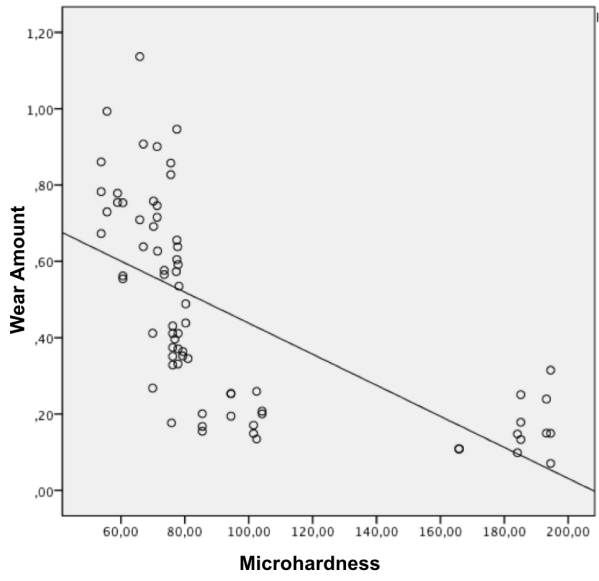

Figure 1. The relation between wear and microhardness

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CASE REPORT / OLGU SUNUMU

Treatment of Extraoral Sinus Tract with Endodontic Intervention: A Case Report

Ektraoral Fistülün Endodontik Müdahale İle Tedavisi: Olgu Sunumu

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Öz

Odontejenik fistüller çoğunlukla pulpa enflamasyonuna bağlı gelişen tedavisi için genellikle kanal tedavisi nadiren de cerrahi işlem gereken patolojik oluşumlardır. Pek çoğu intraoral olarak oluşmasına rağmen bazen ekstraoral olarak da gözlemlenebilmektedir. Ekstraoral fistül, ağız boşluğu ve cilt arasında patolojik bir yoldur. Hastaların genellikle dental semptomları olamaması sebebiyle pek çok diğer cilt lezyonu ile karışabilmekte ve etkisiz tedaviler uygulanabilmektedir. Bu sebeple bu vakaların ayırıcı tanısının yapılması oldukça önemlidir. Bu vaka sunumu, alt çene kesici dişlerden oluştuğu tespit edilen ve çene ucu bölgesinden drene ekstraoral fistül vakasının kök kanal tedavisi uygulamasının ardından 3 aylık takibini içermektedir.

Anahtar Kelimeler: Deri lezyonları, ekstraoral fistül, kök kanal tedavisi, odontojenik fistül, periapikal lezyon

Abstract

Odontogenic sinus tracts, mostly caused by pulp inflammation are pathologic formations which usually require root canal treatment and rarely surgical procedures. Although most of them occur intraorally, they may also occur extraorally. An extraoral sinus tract is a pathologic pathway between the oral cavity and the skin which can be confused with many other skin lesions and ineffective treatments may be applied because the patients usually do not have dental symptoms. Therefore, the differential diagnosis of these cases is very important. This case report describes the treatment and 3 month follow-up of an extraoral sinus tract which derives from lower incisors.

Keywords: Extraoral sinus tract, odontogenic fistula, periapical lesion, root canal treatment, skin lessions

Introduction

Odontogenic sinus tracts are pathological occurrences due to pulp necrosis that requires conventional or rarely surgical endodontic treatment to heal. They are mainly detected intraorally and in uncommon cases, they may exist extraoral, depending on the root location, bone thickness, muscle inserts, and localization of the perforation in the cortical bone.[1-5] Discharge of exudate which flows through tissues along the least resistant pathways is commonly associated with the periapical radiolucent lesion.[6]

Even if extraoral sinus tracts of dental origin are not rare, misdiagnosis and inappropriate treatment frequently occur. [7] Patients may not associate extraoral sinus tracts with teeth and often may not have symptoms of endodontic origin, so they frequently apply to the general practitioner rather than the dentist.[8, 9] The physician should keep in mind that the lesions seen in the face area may have an odontogenic origin and differential diagnosis should be made. Extraoral sinus tracts can often be confused with skin lesions, pyogenic granuloma, traumatic injury, carcinoma, osteomyelitis, congenital fistula, tuberculosis, and actinomycosis.[10-15]

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It is essential that interaction occurs between physicians and dentists to avoid exposing patients to insufficient treatment procedures.[5] It has been reported that half of the patients with extraoral fistula were exposed to unnecessary surgical interventions and long-term antibiotic treatments before the correct diagnosis.[16] Not identifying the endodontic origin commonly leads to unfavorable treatment which will not be therapeutic, for example, skin biopsies may lead to unnecessary scarring.[17, 18] Once the correct diagnosis is made, definitive treatment, through either tooth extraction or root canal therapy to eliminate the source of infection, is simple and effective.[19]

In this case report, the diagnosis and treatment of an odontogenic extraoral sinus tract are described.

Fig 1: First Session

Fig 2: Initial Radiograph

Fig 3: Post-op 1 week

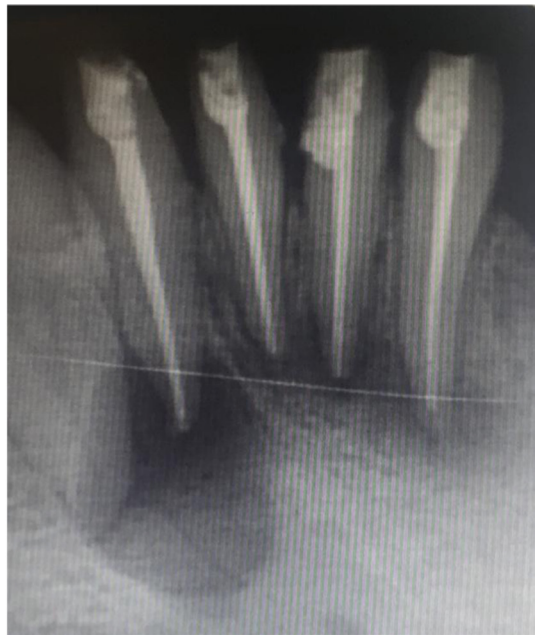

Fig 4: Post-op 1 month radiograph

Fig 5: Post-op 1 month

Fig 6: Post-op 2 month radiograph

Fig 7: Post-op 3 month

Case Report

A 50-year-old female patient with a noncontributing medical history was referred to our clinic with extraoral swelling and pain associated with the mandibular incisors. Extraoral examination showed an extraoral sinus tract 3 mm in width at the submental region which confirmed the diagnosis of the chronic apical abscess. Dental anamnesis showed that the patient had the sinus tract for 1 month. Clarithromycin was prescribed for the patient in emergency services by a physician before applying to our clinic. In the radiologic examination, there was a well defined periapical radiolucent region associated with mandibular incisors. Teeth were slightly sensitive to percussion and palpation. The involved incisors did not respond to electrical pulp tests. The diagnosis was established as chronic periapical abscess resulting from pulp necrosis due to prosthetic procedures. Lower right canine vitality test was positive so it was decided not do perform root canal treatment for this teeth After placing a rubber-dam, root canal treatment was initiated with gaining a proper access cavity and chemomechanical preparation of the root canals. Working length was measured with an electronic apex locator and confirmed with a periapical radiograph, in the root canals of all teeth. The root canals were prepared using the Protaper Next NiTi instrumentation system and irrigated with 5.25% NaOCl and %17 EDTA solutions. Excessive exudate in the root canals and also mild serous exudate from the sinus tract were detected during preparation. Calcium hydroxide paste was used as intracanal medication. Visits and calcium hydroxide replacements were replied until the drainage ceased. When the teeth became asymptomatic and there was no exudate, root canals were obturated with gutta-percha and AH Plus using the lateral condensation technique. After 1 week the sinus tract area started to shrink and in the following 3 months, it was even smaller. There were no symptoms observed at the control sessions except for a minimal palpation sensitivity. Follow-up was considered to be more appropriate than root canal retreatment because more time was required for complete recovery of the case.

Discussion

Intraoral or extraoral sinus tract drainage depends on the path that is less resistant to the progression of the exudate produced, the proximity of the apex to the external bone cortex, the length, and slope of the root involved, bacterial virulence, the patient's defense mechanism, low resistance of the tissues in the facial region and the relationship between the muscle attachment and the infected tooth and on the morphology of the affected jaw. If the apical section of the teeth is above the maxillary muscle connections or below the mandibular muscle connections, the infection may spread to the extraoral region.[20-25]

Gupta & Hasselgren reported the rate of sinus tract formation in teeth with periapical inflammation as 18%.

[2] Mortensen et al. also investigated teeth with periapical lesions; 9.0% teeth had sinus tracts. Teeth with periapical lesions smaller than 5 mm had sinus tracts in 5% of cases, whereas teeth with periapical lesions greater than or equal to 5 mm had sinus tracts in 19%.[26] Extraoral sinus tracts are occasionally seen.[27] Almost 80% of reported cases are associated with mandibular teeth and 20% with maxillary teeth.[28] The most frequent regions of involvement are the chin and submental regions.[24, 28] It should be considered that the lesions seen in the face area may have an endodontic origin and the differential diagnosis must be made.[14] After careful clinical and radiographic examination, teeth associated with the lesion can be identified. Thus, appropriate treatment is performed and unnecessary drug use and surgical interventions are avoided.[29] The clinical and radiological examination should be performed carefully in order to make the correct diagnosis. Vitalometric examination should be performed. If necessary, the gutta-percha or lacrimal probe can be placed outside the mouth to detect the source.[6, 16, 30-32] An essential diagnostic method is the determination of the nature of fluid draining (if any) from the cutaneous sinus tract, an attempt should be made during palpation to milk the sinus tract. Any discharge obtained should be examined to determine its nature (saliva, pus, or cystic fluid).[10, 33]

Treatment choice is nonsurgical endodontic therapy if the tooth is restorable. Extraction is indicated for nonrestorable teeth.[24, 28, 34] After 5 to 14 days following root canal treatment, the sinus tract is expected to close spontaneously.[8, 30, 35] This area usually heals with a slight pit and hyperpigmentation, decreasing over time.[35] Nonsurgical endodontic therapy, sometimes complemented by surgery, for extraoral sinus tracts of endodontic origin.[6] Hyperbaric oxygen therapy may also be used in cases that are massive and require surgery.[36, 37] The complete recovery of the extraoral sinus tracts reported as 5 months to 1 year in the literature.[29, 37-39] Therefore, it was decided to follow this case to fully recover the extraoral sinus tract.

Differential diagnosis should be made considering that skin lesions seen in the face and neck area may originate from endodontic infections. The accurate diagnosis based on the communication between the physician and the dentist ensures that the treatment should be made as soon as possible, protecting the patient from unnecessary waste of time, antibiotic use, and further infection.

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CASE REPORT / OLGU SUNUMU

Negative Pressure Pulmonary Edema After Orthognathic Surgery

Ortognatik Cerrahi Sonrası Negatif Basınçlı Pulmoner Ödem Gelişimi

Seçil ÇUBUK, Zeliha Aycan ÖZDEMİRKAN, Burak BAYRAM

Abstract

Negative-pressure pulmonary edema can arise in patients having upper airway obstruction following extubation. This report aims to present the case that had negative-pressure pulmonary edema after orthognathic surgery and to review the literature. Twenty-seven-year-old male patient underwent bimaxillary orthognathic surgery. At the postanesthesia care unit, the patient had marked respiratory distress and significant arterial oxygen desaturation. The patient was reintubated and transported to the Intensive Care Unit. Extubation was done after 6 hours and continuous positive airway pressure was applied for 2 days at the Intensive Care Unit. On the postoperative second and third day, vascular congestion resolved on the chest radiograpies. C-reactive protein, leukocyte, neutrophil counts, partial pressure of the arterial oxygen and carbon dioxide showed improvement during the treatment. Negative-pressure pulmonary edema is a life-threatening complication that can be seen after orthognathic surgery and can be managed with early diagnosis and accurate treatment protocol.

Keywords: Pulmonary Edema; Orthognathic Surgery; Oral Surgeries; General Anesthesia

Öz

Negatif basınçlı pulmoner ödem (NBPÖ) şiddetli negatif intratorasik basınç oluşturan spontan solunum eforu ve üst solunum yolu obstrüksiyonu bulunan hastalarda oluşmaktadır. Bu vaka raporu ve derlemenin amacı çift çene ortognatik cerrahi ameliyatı sonrasında NBPÖ gelişen bir vakanın takdimi ve bu konuyla ilgili literatür derlemesidir.

27 yaşında erkek hastaya çift çene ortognatik cerrahi ameliyatı uygulandı**.** Postanestezik bakım ünitesinde hastada belirgin bir solunum sıkıntısı ve arterial oksijen desaturasyonu gelişti. Hasta yeniden entube edilip invaziv mekanik ventilasyon ve takip için yoğun bakım ünitesine nakledildi. 48 saat sonra hasta yoğun bakım ünitesinden yataklı servise nakledildi. Postoperatif 2. gün ve 3. gün göğüs radyografilerinde vaskuler konjesyonda iyileşme görüldü. Yoğun bakım ünitesinde tedavi sürecinde C-reaktif protein, lökosit ve nötrofil değerleri normal seviyelerine döndü. Arteryal kan gazı analizinde parsiyel arteryal oksijen ve karbondioksit basıncında iyileşme olduğu belirlendi. Hasta postoperatif 4. günde taburcu oldu.

Negatif basınçlı pulmoner ödem ortognatik cerrahi sonrasında görülebilen hayati tehdit oluşturan bir tablodur. Postanestezik bakım ünitesinde hastanın dikkatli takibi, klinisyenlerin hastalığın klinik özellikleri hakkında yeterli bilgiye sahip olması ve tedavisinde deneyim sahibi olması NBPÖ'in başarıyla tedavisinde önemli rol oynayan hususlardır.

Anahtar kelimeler: Pulmoner Ödem; Ortognatik cerrahi; Oral Cerrahiler; Genel Anestezi

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Introduction

Negative-pressure pulmonary edema (NPPE) arises in patients having upper airway obstruction along with spontaneous respiratory effort, which generates extremely negative intrathoracic pressures. The overall incidence of NPPE is reported less than 0.1% in all surgeries performed under general anesthesia [1].

The pathogenesis of NPPE is highly complex. Inspiration against an obstructed upper airway and forceful diaphragmatic efforts cause high levels of negative pleural

pressure which raise the venous return to the right side of the heart. This may generate higher hydrostatic pressures in the pulmonary capillaries; induce alveolar flooding and pulmonary edema. This pathologic condition results in sudden respiratory system dysfunction and a decrease in O2 saturation [2].

There are several etiological factors other than post-extubation laryngospasms, such as upper airway tumors, obstructive sleep apnea, foreign bodies, hanging, strangulation, vocal cord palsy, and difficult intubation [3]. The most common risk factors for NPPE are reported as young age, male sex, and head and neck surgery [4].

There are very limited case reports which present NPPE associated with dental procedures and orofacial surgery in the literature [3,5-10]. This report aims to present the case that had NPPE after bimaxillary orthognathic surgeries and to review the reported data related to NPPE after oral procedures.

Case Report

Twenty-seven-year-old male patient referred to Başkent University Department of Orthodontics with a complaint of lower jaw prognathism. Bimaxillary surgeries were planned as he had also maxillary retrusion. Preoperative orthodontic treatment was completed in 9 months.

He had an only seasonal allergy as a systemic disease and used antihistaminic when allergic symptoms occurred. He had no other systemic diseases or drug usage. He was 169 cm tall and weighed 68 kg. The values at the complete blood count tests were in the normal ranges. The intubation difficulty was determined as Mallampati 2 at the preoperative examination.

The patient was transferred to the operating room for the planned surgical intervention. Anesthesia induction was done using fentanyl 50 mcg, propofol 200 mg, and esmeron 50 mg and it was maintained with O_2 and isoflurane.

The maxilla moved 5 mm forward using Le Fort 1 osteotomy and the mandible moved 4 mm backward using bilateral sagittal split osteotomy. (Fig 1) The planned surgical procedures were completed uneventfully within four hours and twenty-five minutes. The total blood loss amount was established as 890 mg. The fluid replacement was performed with 3500 ml physiologic multielectrolyte solution (Isolyte, Eczacıbaşı-Baxter, Turkey). He was responsive to verbal command, on adequate spontaneous ventilation, and was extubated with the standard procedures and transferred to the postanesthesia care unit (PACU). At the PACU the patient became unconscious, developed marked respiratory distress and significant arterial oxygen desaturation (65%). The patient was reintubated and O_2 supplementation was provided using a bag valve attachment to the endotracheal tube since paradoxical respiration did not improve despite the aid of mask ventilation. Discharge of foamy fluid from the oral cavity was observed, therefore initial diagnosis was considered as acute pulmonary edema. The patient was transported to the Intensive Care Unit (ICU) for invasive mechanical ventilation and follow-up.

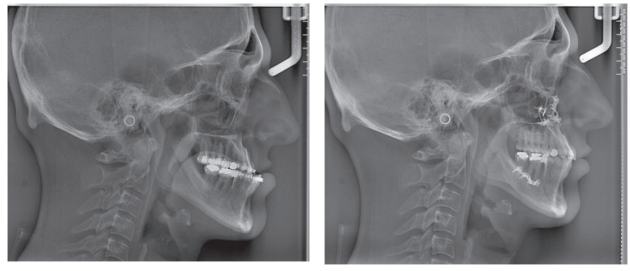


Fig 1.
A: Preoperative cephalometric radiography of the patient. **B:** Postoperative cephalometric radiography of the patient.

The patient was maintained with the hemodynamic stability in the ICU. Chest radiography showed pulmonary vascular congestion. (Fig 2-A) Twenty mg furosemide and 120 mg metilprednizolon were administered intravenously on the first postoperative day. Sixty mg metilprednizolan was given after 6 hours from the first administration. Extubation was made after 6 hours of invasive positive pressure ventilation and O_2 supplemantation was provided by nasal cannula. Additionally, noninvasive ventilation with oronasal facemask was applied for 15 minutes per hour on the first postoperative day. On the second day, its frequency was decreased to 15 minutes per 2 hours.

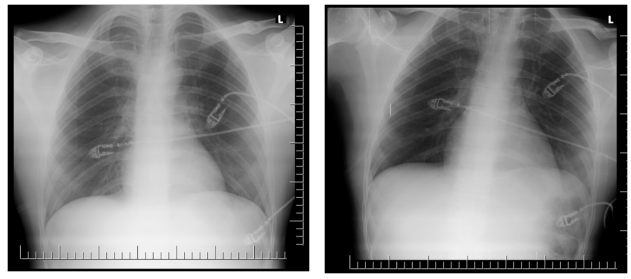
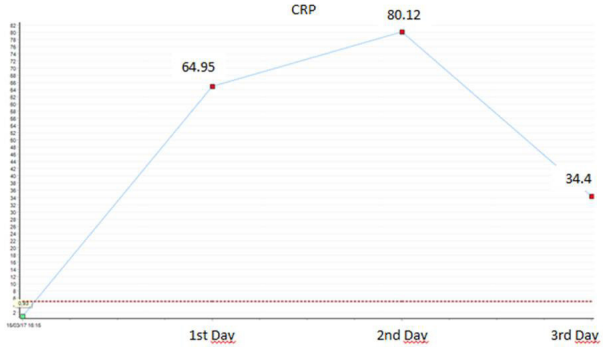


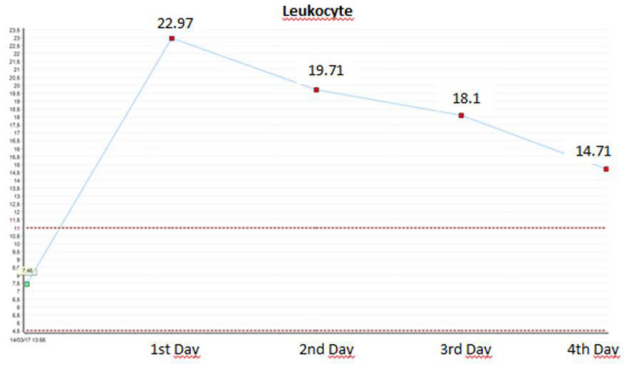
Fig 2.
A: Pleural effusion appears on the chest radiography on the 1st postoperative day. **B:** Slight pleural effusion was seen on the 3rd postoperative day.

CRP, leukocyte and neutrophil counts improved during the treatment at ICU (Fig 3). Arterial blood gas analysis revealed that the partial pressure of arterial oxygen and carbon dioxide showed improvement during the therapy (Table 1). The patient was transferred to the general ward from ICU on the second postoperative day. Vascular congestion resolved on the chest radiograpies on the postoperative second and third day (Fig 2-B). The patient was discharged from the hospital on the fourth postoperative day.

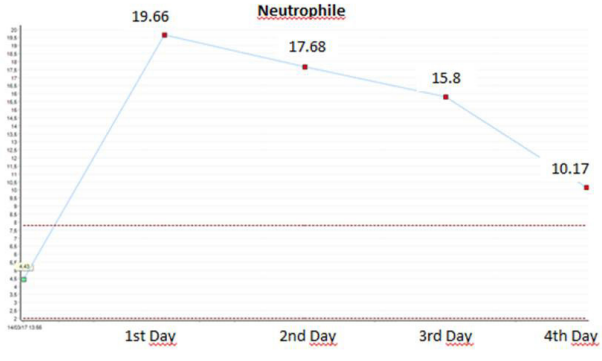
Fig 3.



A: CRP level decreased on the postoperative 3rd day.



B: The diagram showing the change of leukocyte count.



C: The diagram showing the change of neutrophil count.

	pO2	pCO2
On the 1st postoperative day	80 mmHg	50.9 mmHg
On the 3rd postoperative day	138 mmHg	45.4 mmHg

Table 1: Blood gas analysis revealed that pO_2 increased and pCO_2 decreased on the 3rd day postoperatively.

Discussion

A search of the reported medical data in the English language revealed 8 cases of NPPE following dental procedures and orofacial surgeries which were performed under general anesthesia [3,5-10] (Table 2). To the best of our knowledge, this article describes the fourth case of the development of NPPE following orthognathic surgery within the worldwide English literature. [9,10]. It was also reported that NPPE development after TMJ arthroscopy in one patient, impacted teeth extraction in one patient; impacted teeth extraction and plate removal in one patient. One of the major risk factors that lead to NPPE is known as oral surgeries, however 2 cases were reported to have pulmonary edema after dental procedures including filling and scaling [6]. Mitral valve stenosis was considered as a possible reason for ventricular failure leading to pulmonary edema in one of those patients [6] (Table 2).

Orthognathic surgeries are generally applied to young and healthy patients, however life-threatening complications such as bilateral pneumothorax, severe hemorrhage (up to 0.7%), upper airway obstruction, and NPPE associated with these surgeries were reported in the literature [11]. Ok Hong et al reported that patients undergo mandibular setback surgery have increased risk of airway obstruction and NPPE development because of reducing the size of upper airway [9].

It is reported that upper airway obstruction can be seen especially in the prolonged maxillofacial surgeries associated with excessive mucosal edema. However, the operation time showed variability between 30 minutes and 425 minutes in the reported cases so that irritation of the larynx by oral secretions and blood during the operation and following extubation are more likely reasons for laryngospasm and NPPE development in patients who undergo oral and maxillofacial surgeries.

The chest radiograph is the most useful method for the diagnosis of pulmonary edema. Additionally, arterial blood gas analysis should be done immediately after the development of NPPE and checked out at least once a day until entire progression of the respiratory function is

observed. Physical examination also may help evaluate the pulmonary function. Nevertheless, the differential diagnosis that includes aspiration pneumonitis, cardiogenic lung edema, and anaphylaxis should be done.

Table 2: Cases who developed NPPE following oral and maxillofacial procedures.

Pt No	Investigator	Year	Age	Sex	Type of Operation	Medical History	Duration of Operation	Blood Loss	Necessity of Reintubation
1	Hendler	1993	32	F	TMJ arthroscopy	No systemic diseases	90 min	Not available	Yes
2	Yanko Case 1	1996	26	F	Scaling Filling	Autistic, deaf	260 min	-	No
3	Yanko Case 2	1996	16	F	Scaling Filling	Heart murmur	120 min	-	No
4	Mamiya	2009	27	M	Plate removal, 3rd molar extraction	Depression	85 min	50 ml	Yes
5	Waheed	2011	28	M	Impacted molar extraction	No systemic diseases	30 min	Not available	No
6	Ok Hong	2014	26	M	Le Fort 1 BSSO	No systemic diseases	270 min	Not available	No
7	Asai	2018	18	M	Le Fort 1 IVRO	Osteogenesis Imperfecta	425 min	1689 mg	Yes
8	Present case	2018	27	M	Le Fort 1 BSSO	No systemic diseases	285 min	890 mg	Yes

Immediate intervention to treat NPPE is crucial to avoid fatal outcomes. Invasive airway maintenance may be required depending on the severity of respiratory distress. Out of 8 patients, 4 patients, including the presented case, were required to be reintubated according to the reported data [5,7,10]. In our case no invasive airway maintenance was needed after 6 hours, however, noninvasive ventilation using CPAP was applied for 2 days following extubation at ICU. Therefore we can conclude that NPPE can be successfully treated by an experienced team of anesthesiologists under ICU conditions.

Compliance with Ethical Standards

Funding: Başkent University, Ankara, Turkey

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical approval: Not required

Informed consent: Informed consent was obtained from the participant included in the study.

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CASE REPORT / OLGU SUNUMU

The Use of Angulated Screw Channel Abutment System for Anterior Single-Implant Restorations: A Clinical Report

Anterior Tek Diş İmplant Restorasyonlarında Açılı Vida Kanallı Abutmant Sisteminin Kullanımı

Bahar GURPINAR, Gül Merve YALÇIN ÜLKER, Önjen TAK

Öz

Bu olgu raporunun amacı; açılı vida kanallı ti-base abutmantlarla desteklenen hibrit abutmant kuronların kullanım amacı ve avantajlarını açıklamaktır. İmplant dişhekimliği'nde açılı vida kanallı abutmantlar, açılı implantlar üzerine uygulanan vidalı kuronlarda estetik bölgede vida kanalının gözükmesi problemine çözüm olarak üretilmişlerdir. Ayrıca, açılı vida kanallı ti-base abutmantlarla oluşturulan hibrit abutmant kuronlar, anterior tek diş implant restorasyonlarında estetik ve mekanik direnç avantajlarını birleştirilen bir yöntem olarak da düşünülebilir. Hibrit abutmant kuron dizaynında açılı vida kanalı sisteminin kullanımı, fazla açılı yerleştirilmiş implantların vidalı kuronlar ile restorasyonunda klinisyenlere optimal estetik ve dayanıklılık avantajlarını sunar.

Anahtar Kelimeler: Açılı vida kanalı, hibrit abutmant, hibrit abutmant kuron, ti-base, açılı implant.

Abstract

The purpose of this clinical report is to explain the use and advantages of hybrid abutment crowns supported by ti-base abutments with Angulated Screw Channel (ASC) for anterior single-implant restorations. ASC system abutments have recently released to market as a solution of visible screw access problem in the esthetic zone. Moreover, using hybrid abutment consists of ti-base abutment with ASC system and esthetic materials may be a new method to combine esthetic and mechanical strength advantages for anterior single implant restorations. The use of ASC system with hybrid abutment crown design may allow clinicians to obtain optimal esthetics and mechanical strength in the case of over-angulated implants.

Keywords: angulated screw channel, hybrid abutment, hybrid abutment crown, ti-base, over-angulated implants, visible screw access.

Introduction

Restoration of anterior single tooth deficiencies with implant therapy has been a common and valid option for decades. Nowadays, parallel with developments on implant dentistry area, implant-supported restorations should satisfy patient's all expectations about function and esthetic. The important esthetic parameters of implant supported restorations are peri-implant soft tissue contour and emergence profile of implant supported restoration that depends on implant position. However, because of anatomy of anterior maxilla and sometimes poor bone volume, it may not always be possible to place an implant with ideal angulation that allows a screw retained restoration. Because of esthetic concerns, screw retained restorations could be preferred when screw access hole could be located in a non-visible area. Common solution of this problem is preferring cemented restoration that have disadvantages as excess cement and lack of removability (1), (2), (3), (4), (5).

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Angulated screw channel (ASC) abutment systems were first introduced to market by Talladium International Implantology and the name of 'dynamic abutment' in 2004. Implant angulation could be corrected up to 28 degrees to make the angulation ideal for screw retention with no need to an additional component. After this, ASC abutment systems have been manufactured by other several companies. Straumann, Dentsply Astra Tech, Nobel Biocare (Branemark system, Replace, Standard and Multiunit abutments), Biomet 3i, BTI, Phibo TSA, Eckerman, Zimmer, Klockner, DIO, and Ankylos are implant companies that compatible with this abutment system that can adjust the implant angulation up to 25 degrees from original implant axis. Thus, a visible screw access channel can be avoided and a screw retained restoration can be used without esthetic concerns. Moreover, with ASC abutment system's angulated screw, it may not be necessary to widen the head of screw access hole for proper engagement of screw driver. Widening the head of screw hole leads to reduce thickness of ceramic material and thereby weaken it (2), (3), (5).

For anterior single implant restorations, abutment material and design are critical factors for mechanical strength and esthetic. Hybrid zirconia abutments with a titanium base (ti-base) is found stronger than monolithic zirconia abutments. At the same time using titanium abutments without an esthetic material can cause gray discoloration of peri-implant mucosa especially in patients with thin tissue (3), (6). Hybrid abutments are recommended with its similar esthetic characteristics with zirconia abutments and also similar mechanical properties with titanium abutments. Thanks to thicker ceramic layer, hybrid abutments show positive esthetic results (7).

There is a lack of information in the literature about clinical use of hybrid abutment crowns. In this clinical report, the use of hybrid abutment crown by ti-base with ASC system abutment is showed with a proper case.

Technique

A 30-year-old male and systemically healthy patient applied to Istanbul Okan University Dental Hospital for the treatment of tooth #21. After the clinical and radiographic evaluation, the extraction of the tooth and an early implant placement was determined (Fig 1). Following the tooth extraction, the edentulous space was restored with a fiber-supported Maryland bridge during the healing period. After bone healing, a Straumann Bone Level implant (3.3 x 10 mm), was placed and peri-implant bone defects were grafted with bone (Creos 1 g) and covered with collagen membrane (Creos 15x20 mm) (Fig 2). Because of inadequate insertion torque, implant couldn't be loaded immediately. After osseointegration, implant healing abutment was removed and a screw-retained provisional crown was fabricated for peri-implant soft tissue conditioning for about six weeks and thereafter a custom impression coping was prepared to transfer the emergence profile and final contour of soft tissues accurately to the impression (Fig 3,4,5). Polyether (Impregum, 3M Espe) was used as impression material with a standard closed tray. Because of the deep placement and labial inclination of the implant, a standard cement and/or screw-retained restoration couldn't be the proper solution for a long-term esthetic, biological and mechanical success. Thus, a special all-ceramic hybrid abutment crown supported by a ti-base abutment with a special angulated screw and ASC (Straumann Variobase for Crown AS) was used to modify the crown axis palatal to the implant axis up to 25° by avoiding a buccal screw access point. Hybrid abutment crown was consisted of a ti-base with ASC system, zirconia as mesostructure and esthetic veneer full ceramic layer (IPS e.max) prepared with cut-back technique. Transferring model to digital stage, designing and manufacturing of the crown, trying on the patient with intraoral and radiographic control and cementation stages were completed (fig 6,7,8,9,10). No biological, mechanical or esthetic complications were encountered during the 1-year follow-up period.

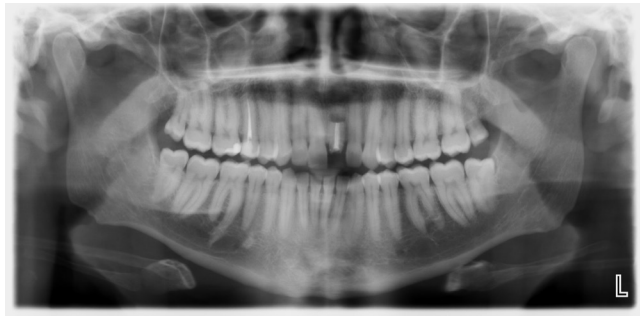


Figure 1: First panoramic radiography of patient

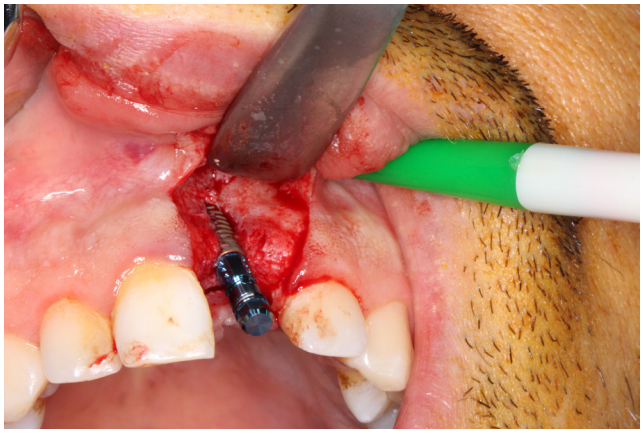
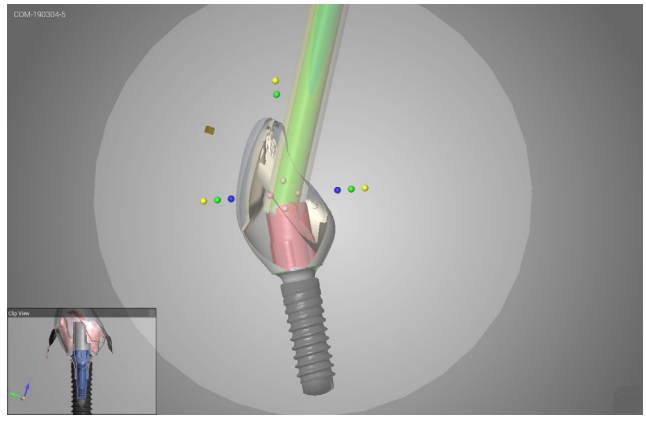


Figure 2: Implant placement during surgery

Figure 3: Screw-retained provisional crown

Figure 4: First placement of screw-retained provisional crown

Figure 5: Emergence profile and soft tissue contours after six weeks



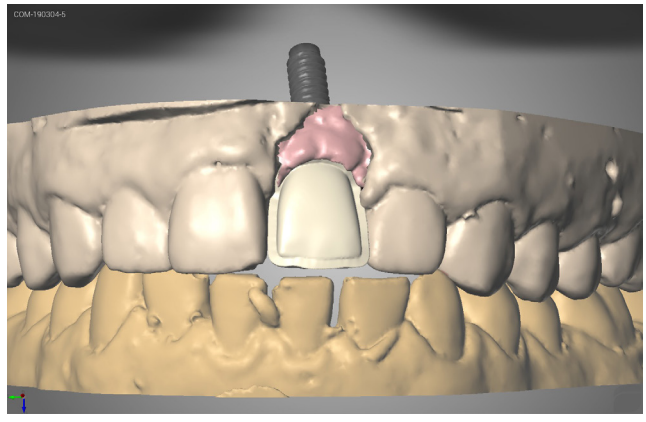


Figure 6,7: Designing stage of the permanent crown

Figure 8,9: Correction of over-angulation with ASC abutment

Figure 10: Final view of the hybrid-abutment crown

Discussion

The aim of this study is to make a literature review, collect actual data about angulated abutments and support these knowledges with a case. Main concerns about the usage of angulated abutments are possibility of causing more stress and bone loss around implants than straight abutments, thereby increase of prosthetic complications and decrease of implant survival. In a review study, Cavallaro and Greenstein have indicated that although finite element analysis and strain gauge studies presented more stress on prostheses and bone than straight abutments survival studies have not indicated decrease of prosthetic and implant survival. Moreover, no additional bone loss and screw loosening were detected for implants that supported with angled abutments (8).

In a prospective study in 2018, Friberg and Ahmadzai investigated outcomes of straight walled implant with conical connection (Nobel Parallel CC) and rate of need for ASC with reasons for anterior maxilla. In this study, 42 of 49 implants required abutments with ASC system. There were some reasons for this high rate. At first; anatomy of maxilla, form and direction of bone resorption after tooth loss often don't let an esthetically sufficient screw retained restoration. There may be bone concavities that affect implant site preparation and lead to increase on the need of more labial directions of implant to avoid buccal fenestrations. Another way to handle with this problem is using cemented restorations (2), (4).

In a prospective study conducted by Wilson in 2009; 39 patients received 42 single tooth implants in five years period. All 42 implants had symptoms of peri-implant disease at initial treatment. Excess cement was found at peri implant site in 34 of them (%81). These symptoms were eliminated with removing excess cement around implants (9).

Other goals of screw retained restorations are solving problems about implant restorations with ease of removal, reduced cost and chair time. All prosthodontists in the study conducted by Friberg and Ahmadzai in 2018 have no negative experience about ASC; no major complications were encountered in 5 years follow up period (2), (4).

In the point of choosing best material combination for hybrid abutment crowns, Tribst et al in 2018 have emphasized that although materials with high elastic modulus like zirconia can generate higher stress, it would not fracture before other materials and it shows less chance of catastrophic failure. Other interesting finding of this study is possibility of using materials with low elastic modulus like hybrid ceramics for hybrid abutment crowns. Hybrid abutment crowns manufactured with hybrid ceramic material have presented better stress distribution on cement line and looks like the best material choice.

Conclusion

The present case and current literature knowledge showed that, use of hybrid abutment crowns which consist of ti-base with ASC and esthetic materials for anterior single tooth implant restorations is a successful way that can tolerate implant angulation up to 25 degrees, simplifies screw access with its angulated screw and gives positive esthetic and mechanic results.

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