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Bölüm 1

KOMPOZİT REZİNLERİN YÜZEY ÖZELLİKLERİ:BİLEŞENLERDEN POLİSAJ MATERYALLERİNE İDEAL MATERYAL ARAYIŞI

Sultan Gizem ÜLKÜ[1]

Günümüzde hastaların estetik beklentileriyle birlikte diş hekimliği hakkında farkındalıklarının artması, daha konservatif ve estetik olan kompozit rezinlerin hastalar tarafından en fazla tercih edilen restoratif materyal olmasının başlıca nedenleridir. Ayrıca bitim işlemleri dahil tek seansta uygulanabilme, hekime uygulama kolaylığı sağlaması gibi avantajları sayesinde kompozit rezinler, restoratif diş hekimliği pratiğinde yaygın olarak kullanılır hale gelmiştir.

En az 2 ayrı fazdan oluşacak şekilde farklı yapı ve özellikteki materyallerin 3 boyutlu fiziksel karışımı "kompozit" olarak tanımlanmaktadır. Diş hekimliğinde kullanılan kompozit rezinler, 1962 yılında Bowen tarafından silika partikülleriyle güçlendirilmiş polimerik restoratif materyal şeklinde geliştirilmiştir (1). Diş hekimliğinde kullanılan kompozit rezinler; organik rezin matriks, inorganik doldurucular ve bağlayıcı ajan olmak üzere üç temel içerik ile renk pigmentleri, renk sabitleyiciler, polimerizasyon başlatıcılar ve kompozit rezinin kendi kendine polimerize olmasını engelleyen inhibitörler gibi bileşenlerden oluşmaktadır (2).

Kompozit rezinlerdeki rezin matrisin polimerizasyon işlemi esnasında büzülmeye uğraması kompozit rezinlerin başlıca dezavantajıdır (3). Geliştirilen yeni monomerlerle kompozit rezinlerin polimerizasyon büzülmesine bağlı oluşan dezavantajlarının giderilmesi amaçlanmıştır. İlave edilen çapraz bağlı monomerler sayesinde ise kompozit rezinler, mine veya dentine kendiliğinden adezyon göstermektedir (4). Günümüzde "kompozit rezinlerin yoğunlaştırıcıları" olarak tanımlanan nanopartiküllerin kullanımıyla birlikte; kompozit rezinlerin polimerizasyon büzülmesi azalmış, aşınma direnci arttırılmış, aynı zamanda estetik nitelikte kompozit rezinler geliştirilmiştir.

Geliştirilen kompozit rezinlerin dayanıklılık, aşınma direnci, yüzey sertliği ve elastisite modülü gibi mekanik özellikleri ile polisajlanabilirlik, translusensi, renk

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mikrosızıntıyı birlikte değerlendirdiklerinde bitim ve polisaj sistemleri arasında fark görmediklerini bildirmişlerdir (100).

Mevcut verilere dayanarak, ideal kompozit rezin restorasyon elde edilmesi amacı doğrultusunda kullanılan materyallere bağlı çeşitli sonuçlar elde edildiği tespit edilmiştir. Bu alandaki gelişmelere paralel ideal materyal geliştirmeye yönelik çalışmalar umut verici olmakla birlikte, klinik pratiğinde ideal kompozit rezin ve polisaj sistemini tespit etmeye yönelik uzun dönem klinik takip çalışmalarının yapılmasına ihtiyaç vardır.

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Bölüm 2

RESTORATİF MATERYALLERDE YÜZEY PÜRÜZLÜLÜĞÜ İLE MİKROBİYAL ADEZYON İLİŞKİSİ: BİR LİTERATÜR DERLEMESİ

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GİRİŞ

Günümüz diş hekimliğinde tercih edilen materyallerin yüzey özellikleri, adezyon gösteren mikrobiyal topluluk miktarını büyük ölçüde etkileyebilmekte, bununla ilişkili olarak restorasyonlarda plak birikimi, renklenme ve sekonder çürükler ile periodontal enflamasyonlar meydana gelebilmektedir(1). Burada bahsi geçen mikrobiyal topluluk kavramını açmak gerekirse, farklı tür bakterilerin birbirleri ile iletişim kurup haberleşebildikleri, kendi oluşturdukları polisakkarit matriks tarafından çevrelenen ve yüzeylere tutunabilme becerileri gelişmiş, kompleks yapıdaki biyofilmden söz edilmektedir(2). Biyofilm miktarını etkileyen başlıca parametrelerden biri olan yüzey pürüzlülüğü; bir materyalin elde edilme şekli veya özelliklerine bağlı olarak meydana gelen yüzey tekstüründeki düzensizlikler olarak tanımlanabilmektedir(3). Sürtünme katsayısının arttığı yüksek yüzey pürüzlülüğü olan materyaller, uzun dönemde deformasyona yatkın olurken(4), pürüzlülük değerleri fazla olan materyallerin artan yüzey enerjilerinin de, yüzeyleri mikrobiyal tutuluma daha elverişli hale getirdiği söylenebilir(5-7). Restoratif materyallerin yüzey pürüzlülüğünün azaltılmasının, yukarıda belirtilen problemlerin önüne geçilebilmesini sağlayarak, hasta memnuniyetini arttırdığı belirtilmektedir(8).

Dental materyallerde yüzey pürüzlülüğünün ölçülebilmesi amacıyla yüzey profili analizi (profilometre) gibi nicel veya taramalı elektron mikroskobu (SEM) gibi nitel yöntemler tercih edilebilir. Son dönemlerde ise yeni bir teknik olan atomik kuvvet mikroskobu da (AFM) yüzey pürüzlülüğünün değerlendirilmesinde

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Bölüm 3

DİŞ BEYAZLATMA AJANLARINDAKİ GÜNCEL GELİŞMELER

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1.GİRİŞ

Günümüzde estetik standardların gelişmesiyle birlikte insanlar, daha beyaz bir gülümsemeyle görünümlerini iyileştirmek istemektedir. Diş beyazlatma tedavileri ise bu amaçla uygulanan tedaviler arasında en sık yapılan estetik diş hekimliği prosedürlerinden biri haline gelmiştir (1,2).

Renklenmiş dişlerin beyazlatılması için ideal ajan arayışı 1800'lü yıllarda başlamıştır (3). Karbamid peroksitin dişlerin renginin açılmasına neden olduğu gözlemi, 1960'lı yılların sonlarında, diş eti iltihabının tedavisinde kullanılmak üzere %10 karbamid peroksit içeren bir antiseptik reçete eden bir ortodontist tarafından yapılmıştır. Bundan yaklaşık 20 yıl sonra diş rengini açmak için %10 karbamid peroksit içeren gece koruyuculu plak kullanımını açıklayan yöntem yayınlanmıştır (4). 1991 yılında ışıkla aktive edilen %30 hidrojen peroksit jellerinin kullanıma sunulmasından bu yana diş beyazlatma ajanları sürekli gelişmektedir (5).

Diş beyazlatma ajanlarının etkisini anlayabilmek için öncelikle dişlerdeki renk kavramını oluşturan unsurları bilmek gerekir. Dişlerin rengi esas olarak dentin tarafından belirlenir ancak minenin kalınlığından, yarı saydamlığından ve değişen derecelerde kalsifikasyonundan etkilenmektedir (5). Dişlerin insizal kenarı minenin o bölgede kalın olması nedeni ile gri-mavimsi görünürken, servikal bölgede ince olan minenin altındaki dentin rengini yansıtması nedeni ile daha sarımsı görünmektedir. Tipik olarak, kanin dişleri, santral ve yan kesici

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jeli ve diş pulpasının sıcaklığı üzerindeki etkisini değerlendirmek istemişlerdir (48). Çalışmanın sonucuna göre, kırmızı LED, beyazlatma tedavisinin etkinliğini artırma kapasitesine sahip olmuş ve pulpa sıcaklığını pulpaya zararlı seviyelere yükseltmemiştir (48).

6. SONUÇLAR

Beyazlatma ajanlarının pulpada hassasiyet, minenin demineralizasyonu, rezorbsiyon gibi yan etkilerinin varlığı; araştırmacıları bunlara alternatif ajanların üretilmesine ve varolanların geliştirilmesine teşvik etmiştir. Bunun için çeşitli çalışmalar yapılmış ve bu çalışmalarda nanopartiküller, bitkisel ekstratlar, ozon ve flor gibi çeşitli materyallerden faydalanılmış; peroksitsiz ajanların, piezokatalizin ve ışığın beyazlatma üzerindeki etkinlikleri değerlendirilmiştir. Ancak, pH, sıcaklık, beyazlatma ajanlarının konsantrasyonu ve diş renklenmelerinin derecesi gibi değişken parametrelerin varlığı, bu materyallerin hassas bir şekilde karşılaştırılmasına engel oluşturmaktadır. Buna rağmen bugüne kadar elde edilen veriler, geleneksel beyazlatma ajanlarının istenmeyen etkilerini azaltmada ve ajanların geliştirilmesinde umut vadetmektedir. Ancak daha fazla çalışmaya ihtiyaç vardır.

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Bölüm 4

DİŞ HEKİMLİĞİNDE PROBİYOTİKLERİN YERİ VE ÖNEMİ

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PROBİYOTİKLER

‘Pro’ ve ‘biotos’ kelimerinden türeyen probiyotik terimi ‘yaşam için’ anlamına gelmektedir. Fermente süt ürünlerinin yararlı etkileri MÖ 3000 yıllarında antik Mısırlılardan beri bilinmektedir [1]. Fermente ürünlerden biri olan yoğurdu ilk keşfedenlerin MS 800 yıllarında eski Türkler olduğu düşünülmektedir [2]. Probiyotiklerin içeriği ve fonksiyonları tam olarak bilinmeden yüzyıllarca fermente ürünlerle birlikte kullanılmıştır. Probiyotiklerin içeriğininin ve fonksiyonlarının tam olarak anlaşılabilmesi için öncelikle mikropların keşfedilmesi gerekmekteydi. 1880-1990 yılları arasında kısa ama daha uzun bir geçmişi olan çalışmalar mikrobun keşfine öncülük etmiştir. Yapılan çalışmalar sonucunda mikroorganizmaların hepsinin hastalığa neden olmadığı, bazı türlerin sağlığa faydalı olabileceği sonucuna varıldı. Probiyotik özelliği olan mikroorganizmaların insan sağlığı üzerindeki faydalı etkileri ilk olarak Pasteur Enstitüsü’nde yaptığı çalışmalarla Nobel ödülünü alan bakteriyolog Elie Metchnikof tarafından ortaya atılmıştır. Bulgar toplumunun uzun yaşam süresini çok fazla fermente süt tüketmeleriyle ilişkilendirmiştir. Tükettikleri yoğurttaki canlı bakterilere Lactobasillus Bulgaris adını vermiştir [3]. Pasteur ve Joubert 1877’de şarbon basilinin, flora basilleri ile kültüre edildiğinde üremesinin baskılandığını ve bu durumun tedavide ümit verici olduğunu bildirmişlerdir [4]. Henry Tissier, anne sütü ile beslenen bebeklerin dışkılarından aldıkları örneklerde Lactobasillus’a benzeyen bakteriler izole etmiştir. Basillus bifudus adını verdiği bu bakterilerin sağlıklı çocuklarda çok sayıda bulunduğunu ve hasta çocuklarda sağlıklı bir bağırsak florası oluşturabilmek için kullanılabileceğini bildirmiştir [5].

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araştırılmıştır. Probiyotik diş macunu kullanımının plak indeksi, gingival indeks ve sondalamada kanamayı önemli oranda azalttığı rapor edilmiştir [65].

Sonuç olarak, probiyotiklerin diş hekimliğinde diş çürüklerini önlemede, diş beyazlatmada ve periodontal hastalıkların tedavisinde etkili olduğunu gösteren çalışmalar bulunmaktadır. Ancak, probiyotiklerin hangi durumlarda hangi tür ve miktar olarak kullanılması gerektiği tam olarak bilinmemektedir. Ayrıca probiyotiklerin güvenilirliği hakkında hala bazı endişeler vardır. Bütün bu soruların aydınlatılabilmesi ve probiyotiklerin diş hekimliğinde rutinde kullanılabilmesi için daha fazla *in vivo* ve *in vitro* çalışmalara gereksinim vardır.

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Bölüm 5

ÇEŞİTLİ DENTAL TEDAVİ PROSEDÜRLERİNİN PULPADA OLUŞTURDUĞU TERMAL ETKİLER

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Meltem TEKBAŞ ATAY[2]

GİRİŞ

Farklı diş tedavileri esnasında açığa çıkan ısı artışının dentin pulpa kompleksine yönelik olası termal tehlikelerinin diş hekimliği profesyonelleri tarafından gözetilmesi ve pulpa içi sıcaklık artışının en aza indirilmesi için gerekli önlemlerin alınması önemli bir husustur. Pek çok restoratif ve estetik tedavi prosedürleri kapsamında yer alan kavite preparasyonu yöntemleri, rezin esaslı restoratif materyallerin polimerizasyonu, cilalama ve beyazlatma gibi dental işlemler ile kullanılan materyallere ilişkin özellikler pulpa içi sıcaklık artışına neden olabilir (1-5). Bu noktada hangi dental prosedürün ısı artışına sebebiyet vereceği ve bu işlemler sırasında oluşan sıcaklık artışının dokularda enflamasyon ve/veya nekroz gibi hasarlara yol açmayacak düzeydeki güvenli aralığı hakkında bilgi sahibi olunmalıdır. Ayrıca güvenli olarak tanımlanabilecek aralığın üzerindeki ısı artışlarının pulpada ve dişe destek diğer dokularda oluşturabileceği zararları azaltmak için hava-su soğutmasının kullanılması, sıcaklık değişikliklerinin izlenmesi ve tedavi parametrelerinin buna göre ayarlanması gibi çeşitli önlemler önerilmiştir (6, 7). Bu önlemler sayesinde diş hekimleri pulpanın termal hasarını önlemek için tedavi süresince oluşabilecek sıcaklık artışını kabul edilebilir sınırlar içinde tutabilir. Özetle hastaların güvenli yönetimini sağlamak için klinik yönergelere uyulması gerekmektedir.

Bu kitap bölümünün amacı pulpa içi ısı artışına sebep olabilecek restoratif ve estetik işlemlerin, tekniklerin ve materyale bağlı koşulların tanımlanarak oluşabilecek hasarlara ve alınabilecek önlemlere ilişkin bilgi vermektir.

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Dental prosedürler kapsamında dikkate alınması gereken diğer bir konu ise ağrının kontrol edilmesi amacıyla sıklıkla uygulanan lokal anesteziklerdir. Diğer oral dokulara oranla kan akışının en fazla olduğu doku olan diş pulpası yüksek vaskülarizasyonu sayesinde ısı dağılımı açısından dentin pulpa kompleksinde regülatör görevini üstlenmektedir (44). Ancak vazokonstriktör madde içeriği olan anestezik solüsyonlar pulpal sirkülasyonun azalmasına yol açtığından (78) pulpal dokulardaki sıcaklık artışının lokal anestezi uygulanan dişlerde daha da yükselmesi kaçınılmazdır. Bu noktadan hareketle lokal anestezi ile yapılan tedavilerde soğutma önlemlerine maksimum düzeyde önem verilmesi gerekmektedir.

SONUÇ

Literatürdeki in vivo ve in vitro çalışma sonuçları çeşitli dental prosedürlerin pulpa ve destek dokularda sıcaklık artışına neden olacağı yönündedir. Hasta ağzındaki bir dişin pulpası ve çevre dokularındaki sıcaklık artışının pulpa, periodontal ve osseöz dolaşım yoluyla dağılımının etkisi göz önüne alındığında pulpa içi sıcaklık artışının in vitro araştırmaların önerdiğinden daha düşük olabileceği öngörülmektedir. Üretilen ısı miktarı pek çok faktöre bağlı olarak değişkenlik göstermektedir. Klinik koşullarda işlem sonrası komplikasyonlara yol açan sebepler içinde termal hasarların etkisini net bir şekilde tespit etmek mümkün olmadığından klinisyenlerin rutin klinik prosedürlerden kaynaklanabilecek pulpa ve destek dokuya yönelik potansiyel termal tehlikenin farkında olmaları ve önleme yollarına ilişkin kılavuz bilgileri takip etmeleri gerekmektedir. Belli başlı hususları özetlemek gerekirse, diş preparasyonlarında yeterli su soğutması yapılması ve eğer kuru kesim yapılacaksa döner aletlerin tek seferde 20 sn'den az temas süresi gözetilerek hafif basınçla ve düşük hızda kullanılması, ışıkla polimerizasyon işleminde arta kalan dentin kalınlığı 0,5 mm ise 1-2 mm kalınlığında izolasyon kapasitesi yüksek bir kaide materyali kullanılması ve soft-start ışık uygulaması önerilmektedir.

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Bölüm 6

DİŞ HEKİMLİĞİNDE İMMEDİYAT DENTİN ÖRTÜLEME TEKNİĞİ (IDS) UYGULAMASI

Hacer BALKAYA[1]
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1.GİRİŞ

1.1. İMMEDİYAT DENTİN ÖRTÜLEME TEKNİĞİ (IDS) UYGULAMASI NEDİR?

İndirekt restorasyonlarda (inley/onlay/veneer/kuron) diş preparasyonu sonrası kesilmiş dentinin preparasyon sonrası adeziv materyallerle örtülenmesidir (1). Diş preparasyonu sonrası açığa çıkan fazla miktarda dentin alanını düşük viskoziteli rezinler kullanılarak örtüleyerek temelde dentin kanallarının kontaminasyonunu ve hassasiyet oluşumunun önlenmesi amaçlanmaktadır (1). İlk olarak 1982 yılında "rezin örtme tekniği" adıyla kullanılmaya başlanmıştır. İlerleyen zamanlarda bu işlem "dentin sealing" veya "dual bonding" olarak isimlendirilmeye başlandı (2,3).

2. IDS UYGULAMASI NASIL YAPILIR?

Başarılı bir IDS uygulaması için gerekli 10 ana basamak vardır (4).

1. Dişe eğer endodontik tedavi uygulanmış ise primer içindeki çözücülerle endodontik örtücünün çözülüp kontaminantları oluşturmaması için CİS yerleştirilir.
2. Preparasyon sırasında kullanılan frezler dişte smear tabakası ve pürüzler oluşturmaktadır. Özellikle self-etch sistemlerde kalın smear tabakası varlığında adezyon olumsuz etkilenmektedir bu nedenle asit uygulaması ile smear tabakası uzaklaştırılır (5).
3. Üreticinin talimatları doğrultusunda adeziv materyaller uygulanır. Rezin kalınlığını sabitleyebilmek için IDS'de hava ile tabakanın inceltilmesi

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Bölüm 7

RESTORATİF DİŞ HEKİMLİĞİNDE ÜÇ BOYUTLU YAZICIYLA İNDİREKT İNLEY RESTORASYON ÜRETİMİ

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GİRİŞ

Restoratif diş hekimliğinin temel amacı; sağlıklı diş dokularının korunması ve kaybedilen dental yapıların tekrar kazandırılarak fonksiyon, fonasyon ve estetiğin sağlanmasıdır (1). Günümüzde adeziv ve restoratif malzemelerin gelişmesiyle beraber, dental restorasyonların yapımı esnasında daha fazla madde kaybı önlenerek konservatif yaklaşıma olanak sağlanmaktadır (2). Restoratif diş hekimliğinde sıklıkla kullanılan direkt restorasyon malzemeleri dental amalgamlar ve kompozit rezinlerdir. Diş hekimliğinde kullanılan ilk restoratif malzemelerden olan dental amalgamın estetik olmayan görüntüsü ile cıva salınımı sonucunda vücutta yan etki oluşturma ihtimali istenmeyen bir durumdur (3, 4). Hastaların estetik taleplerinin artması, kompozit rezinlerin mekanik ve estetik özelliklerinin gelişmesi ile birlikte kompozit rezinler amalgamlara alternatif olarak tercih edilmektedirler (5).

Günümüzde posterior bölge estetik restorasyonlar için estetiğin yanı sıra kalan diş dokusunun da güçlendirilmesi önem arz etmektedir. Posterior bölgede yapılacak restorasyona karar verirken, hastanın yaşı, ağız hijyeni, motivasyonu, çürük insidansı, diyet alışkanlıkları, finansal durumu gibi genel parametrelere dikkat edilmelidir. Bununla birlikte kavite geometrisi, sağlam diş duvar kalınlıkları, çatlak varlığı, dişin pozisyonu, pulpal ve periodontal problem olup olmadığı gibi lokal parametrelere de bakılmaktadır (6).

Özellikle posterior dişlerin kompozit rezin ile restorasyonunda okluzal morfoloji ile proksimal kontur ve kontak oluşturmada sıkıntılarla karşılaşılmaktadır.

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Tablo 3.1 3B yazıcılarla dijital iş akışı şeması
İnley Restorasyon Üretiminde Dijital Akış Şeması
1. İnley kavite preparasyonu İdealize edilmiş bir inley kavitesi tasarlanarak preparasyonun yapılması
2.Üç boyutlu dijital veri eldesi (direkt tarama, indirekt tarama) Restore edilmek istenen yapıların ölçüsünün ağız içi ya da laboratuvar tipi tarayıcılar kullanılarak ölçüsünün alınması
3.Tasarım Elde edilen dijital verilerin (stl., ply., obj.) CAD yazılımı aracılığıyla tasarım işlemlerinin yapılması
4.Baskı öncesi hazırlık Yazıcı arayüz programı ile baskı parametrelerinin ayarlanması, destek yapıların oluşturulması ve katmanlar halinde kaydedilmesi
5.Üç boyutlu baskı Verilerin yazıcıya aktarılması ve üretimin yapılması
6.Bitirme işlemleri Destek yapıların uzaklaştırılması, alkolle yıkama ve kürleme işlemlerinin yapılması

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Bölüm 8

DİŞ SERT DOKUSU REMİNERALİZASYONUNDA SON GELİŞMELER

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Giriş: Diş çürüğü, fermente olabilen karbonhidratlar, tükürük ve kariyojenik oral flora varlığında minenin demineralizasyon ve remineralizasyon dengesinin bozulması sonucu oluşan karmaşık bir hastalıktır. Karbonhidrat varlığında, oral mikroorganizmalar plağın pH'ını düşüren organik asitler üretebilir. Diş çürüğü, daha derin tabakalara ulaşmadan önce mine yüzeyinde meydana gelen bu demineralizasyon ve remineralizasyon fazlarından geçer.(1)

Diş minesi, %96 inorganik materyal (hidroksiapatit nanokristaller), %3 su ve %1 organik bileşenden (2,3) oluşan hücreli, sert, avasküler bir dokudur.

Minenin yüzey tabakası, mine prizmasını oluşturan hidroksiapatit (HA) kristallerinden oluşur. HA, kemiklerin ve dişlerin mineral yapısını oluşturan kristal bir kalsiyum (CA++), hidroksil (OH) ve fosfat iyonları (PO_4^{3-}) şeklidir. Yüzey tabakasının sertliği öncelikle yüksek konsantrasyonda fosfat iyonları, flor, kalsiyum ve klorun sonucudur. Mine-dentin bileşimindeki mine, yüksek magnezyum, sodyum ve potasyum iyon içeriği (1,4) nedeniyle daha yumuşaktır.

Demineralizasyon-remineralizasyon prosesi mine, dentin ve sement dokularında benzer bir şekildedir. Ancak bu dokuların her birinin mineral ve organik doku içeriğinin farklı yapıları ve nispi miktarı, çürük lezyonun doğasında ve ilerlemesinde önemli farklılıklara neden olmaktadır.(5)

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bütünüyle demineralize olmuş kollajen lifleri içinde apatit kristalleri oluşturma yeteneğine sahip daha yeni biyomimetik remineralizasyon ürünlerini başarıyla tanıttılar. Bu alandaki daha fazla deneyim, optimal yanıtlar ve sonuçlarla klinik uygulama için daha iyi ürünler ve teknolojiler ortaya çıkarması beklenmektedir.

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Bölüm 9

DENTAL UYGULAMALARDA YAPAY ZEKA

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Giriş: İnsan vücudunun büyüleyici kısımlarından olan beyin, uzun zamandır bilim insanlarının ilgisini çekmiştir (1) ve bununla birlikte "yapay zekayı" (YZ) ilerletmek için çalışmalar yapmaktadırlar.(2) John McCarthy, 1956'da YZ olarak bilinen uygulamalı bilgisayar bilimi alanını tanıttı.(3) YZ "dördüncü sanayi devrimi" olarak bilinen , insanlarınkine benzer eleştirel düşünme, karar verme ve akıllı davranışları taklit etmek için teknolojiyi kullanır.(3)

İnsanın bilişsel yeteneklerini taklit eden YZ, insan beyni gibi tasarlanmış, aynı zamanda insan düşüncesini simüle eder. Nöronlar, belirli bir konuyu ele almak için veri işleme sistemi olarak işlev gören beyin düzenini oluşturur. YZ, daha az postoperatif komplikasyon, daha yüksek yaşam kalitesi, daha iyi karar verme ve çok daha az gereksiz prosedür dahil olmak üzere sağlık hizmetleri için avantajlara işaret etmektedir.(4)

YZ, diş hekimliği de dahil olmak üzere çeşitli sektörlerde varlığını ve önemini giderek artırdı. Konvolüsyonel sinir ağları veya yapay sinir ağları gibi YZ modelleri, kök kanal sisteminin anatomisini incelemek, diş çürüğü teşhisi, kök kırıklarını, periapikal lezyonları belirlemek ve tedavi prosedürlerinin başarısını tahmin etmek gibi endodontide çeşitli uygulamalarda kullanım alanı bulmuştur. Bu teknolojiler, sağlık alanında hasta randevularını yönetme, kişiselleştirilmiş bakım sağlama, ilaç etkileşimlerini analiz etme, hastalık risklerini tahmin etme ve robotik cerrahiyi geliştirme gibi çeşitli uygulama alanlarına sahiptir

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hekimlerinin bilgi birikimi, deneyimlerinin artmasına yardımcı olabilirken tecrübeli klinisyenlerin hassas karar verme sürecini birebir sağlayamaz.

Hasta güvenliğini sağlamak ve hassas bilgilerin korunmasını garanti altına almak için veri erişim, şeffaflık ve gizlilik konularında titizlikle çalışılmalıdır. Bu bağlamda, standartlaştırılmış protokoller ve birleşik yönergeler büyük önem taşır. Gelecek araştırmalar, yapay zeka algoritmalarında karşılaşılan veri yetersizliği ve sınıf dengesizliği gibi sorunlara odaklanmalı, bu sorunların üstesinden gelmek için yenilikçi yöntemler geliştirilmelidir. Bu, hem hasta verilerinin güvenliğini sağlamak hem de algoritmaların doğruluğunu artırmak açısından kritik bir adımdır.

Bu modaliteler diş hekimliğinde sıkça kullanılsa da, mevcut tanı yöntemlerinin yalnızca bir bölümünü kapsar. Diğer görüntüleme teknikleri, klinik muayene sonuçları, histopatolojik bulgular ve genetik belirteçler göz ardı edildiğinde, tanı bulgularının genellenebilirliği kısıtlanabilir ve diş hekimliğinde daha geniş bir tanısal perspektifi yansıtmakta yetersiz kalınabilir.

Çağdaş yapay zeka, yapılandırılmış bilgiyi kullanma ve büyük miktarda veriden bilgi toplama konusunda öne çıkıyor. Ancak insan beyni gibi çağrışımlar oluşturamamakta ve klinik durumlarda karmaşık kararlar verebilme konusunda başarısı nispeten düşüktür. Özellikle diş hekimlerinin deneyimine dayanan daha üst düzey kavrama, fizik muayene yapmak, tıbbi öyküyü dahil etmek, estetik sonuçları değerlendirmek ve konuşmayı teşvik etmede tam olarak yeterli değildir. İyi bir hasta-diş hekimi iletişiminin, hastanın umutlarını, kaygılarını ve beklentilerini anlamayı gerektirdiğini vurgulamak önemlidir. Ayrıca, duygusal robotların yapay duyguları ifade etme yeteneği ve bu sistemlerde empatinin nasıl entegre edilebileceği üzerine tartışmalar da sürmektedir.

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Bölüm 10

DİŞ HEKİMLİĞİNDE FLORESAN DESTEKLİ TANIMLAMA TEKNİĞİ (FIT) VE UYGULAMA ALANLARI

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GİRİŞ

Estetiğin ön plana çıktığı her alanda olduğu gibi diş hekimliği alanında da diş rengiyle uyumlu olan kompozit restorasyonların kullanımı her geçen gün artış göstermektedir. Dişin doğal renk ve translusensliğini elde etmek için kompozit rezinler tabakalama tekniği ile uygulanarak doğal diş en iyi şekilde taklit edilebilmektedir(1,2). Renk uyumu yüksek olan kompozit rezinler, daha sonrasında diş ile ayrımı zor olabilmektedir. Bu durum kompozit rezinin değiştirilmesi gereken durumlarda yanlış teşhislere ve operatif zorluklara yol açabilmektedir(3). Loop sistemleri ile büyütme, ışık ile aydınlatma, dişi kurulamayla bile diş hekimleri yapılan restorasyonları ayırt etmede zorlanabilirler(4). Kompozit restorasyonun dişten ayırt edilememesi diş dokusunun fazla uzaklaştırılmasına veya bu ayrımın zorluğu sebebiyle kompozit artıkları bırakılabilir(3,5). Fazla bırakılan kompozit artıkları yeni yapılacak olan restorasyonun diş ile olan bağlantı kalitesini düşürür(3).

Kompozit rezinler klinik performanslarının ve estetik özelliklerinin iyi olması sebebiyle direkt posterior restorasyonlarda tercih edilirler(6,7). Restorasyon ağızda kalım süresince sınırlı bir ömürleri vardır. Buna başlıca neden olan en yaygın sekonder çürük ve kırıklardır(7). Bu sebeple kusurlu restorasyonların değiştirilmesi diş hekimlerince uygulanan yaygın bir prosedürdür(6). Kompozit rezinin komşu diş dokusuna zarar vermeden çıkarılması zordur(3). Bundan dolayı her çıkarma işleminde kavite sürekli boyut olarak artma eğiliminde olup dişin uzun vadeli prognozunda olumsuz yönde etkiye sahiptir(8–11). Ayrıca diş

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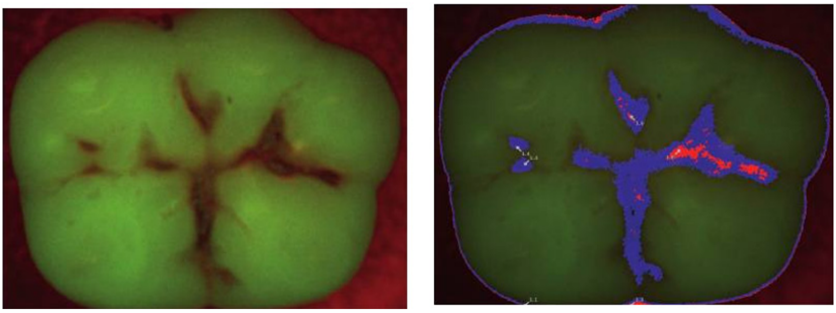

Şekil 4; Çürük alanlarının Vistacam ıX Hd Smart cihazındaki görünümü

SONUÇ

Çeşitli FIT cihazlarının kompozit restorasyonların mevcut diş ile olan ayrımının tespiti hâlâ belirsizdir. Diş hekimleri, farklı FIT cihazlarının kullanımına yönelik klinik uygulamalarda kullanım sağlayarak bu cihazların klinikte hasta başında muayene süresini azaltarak teşhis ve tedavide yardımcı olmasını ve bu cihazların kullanımının yaygınlaşmasını artırabilir.

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Bölüm 11

DİŞ HEKİMLİĞİNDE EKLEMELİ ÜRETİM KALİTESİNİ ETKİLEYEN FAKTÖRLER

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GİRİŞ

Eklemeli imalat, hızlı prototipleme (HP) ve 3 boyutlu baskı sistemi olarak da bilinir. Eklemeli üretim, CAD tasarımının STL (Standart Mozaikleme Dili) formatına dönüştürülerek, her biri 16-300 mikronluk küçük katmanlara ayrılması ve katmanların üst üste yazdırılarak fiziksel nesnenin oluşturulmasıdır (1). Prototipleme, üretilmeden önce ürünün ön şeklinin oluşturulmasıdır. Bu ön şekil bu ürünün prototipidir. Prototipin kısa sürede jenerik teknoloji ile üretilmesine hızlı prototipleme (RP) denmektedir. Hızlı prototipleme yerine genellikle 3B baskı (3D printing) ifadesi kullanılmaktadır (2).

3B baskı kavramı ilk olarak 1970'lerin başında, Pierre AL Ciraud'un toz halindeki materyali katmanlar halinde katılaştırmak için yüksek enerjili ışını kullanmayı önermesiyle ortaya çıkmıştır (3). 1984 yılında Chuck Hull, kürleme işlemi için ilk kez ultraviole ışığı (UV) kullanmıştır. Chuck Hull, 1986 yılında ''3D Systems" şirketinin kurucu ortağı olarak "Stereolithography (SLA)" adlı ilk hızlı prototipleme makinesini tanıtmıştır (4,5).

3B yazıcılar ile objenin x, y ve z olmak üzere üç eksende üretimi yapılmaktadır. Bu eksenlerden x ve y eksenleri yatay düzlemde iki boyutlu görüntüyü, z ekseni ise dikey yönü belirtmektedir. Bir başka ifade ile z ekseni, x ve y eksenlerinin üst üste eklenmesi ile oluşmaktadır. Böylece z ekseni görüntüyü üçüncü boyuta taşımaktadır (6). Nesneleri oluşturmak için gereken süre yazdırılan modellerin sayısından ziyade yazdırılan katmanların sayısına (modelin dikey yüksekliğine- z eksenine) bağlıdır Dilimleme işlemi ile dosyadaki komutların yazıcıda okunabilmesi için STL dosya formatı, G CODE adı verilen formata

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Bölüm 12

RESTORATİF DİŞ HEKİMLİĞİNDE RENK SİSTEMLERİ VE KOMPOZİT REZİNLERİN RENK UYUM POTANSİYELİ

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GİRİŞ

Kompozit rezin restorasyonlar ile doğal diş arasındaki renk uyumu ideal estetiği yakalamak için önemli bir unsurdur. Translusens, opaklık, ışık kırılması, parlaklık ve insan gözü ve beyni gibi faktörler, dişin renk algısını etkilemektedir. Bu faktörler göz önüne alındığında estetik bir restorasyon için ideal rengi yakalamak diş hekimleri için zor olmaktadır. Restorasyonların rengini belirlemek için klinik olarak çeşitli yöntemler geliştirilmiştir.(1)

Renk Belirleme Sistemleri

Uluslararası Aydınlatma Komisyonu (Commision Internationale de l'Eclairage) CIE l*a*b renk sistemi ve Munsell Renk Sistemi diş hekimliği renk analizinde kullanılmaktadır.

Munsell Renk Sistemi

Diş hekimliğinde en çok kullanılan sistemdir. Munsell renk sistemine göre rengin üç boyutu ; value (Parlaklık), croma (Doygunluk) ve hue (Ton) olarak tanımlanmıştır. Bu sistemle renk value, chroma ve hue sıralamasıyla belirlenmektedir. (2)

Munsell'a göre value açıklık veya parlaklık olarak belirtilmiştir. Value silindirik dikey eksende siyahtan beyaza grinin tonlarını ifade eder. Düşük value değerine sahip nesnelerde daha fazla gri bulunur ve daha koyu görünürler, ancak parlak (yüksek value) nesnelerde daha az gri tonu bulunur.(1, 2)

Chorama rengin yoğunluğunu, gücünü ve doygunluğunu ifade etmektedir. Bir bardak suya herhangi bir boya eklediğinizde, boyanın yoğunluğu artar, ancak renk tonu değişmez. Boyanın eklenmesi karışımı daha koyu hale getirir. Chromadaki artış value değerini ters orantılı olarak etkiler. Munssel silindirinde

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ortadan kaldıran tek renkli kompozit rezinlerin renk uyum potansiyeli, estetik restorasyonların başarısını artırmak için geliştirilen teknolojiler arasında önemli bir yer tutmaktadır. Geliştirilen bu kompozitlerin optik ve fiziksel özellikleri, restoratif diş hekimliğinde yeni yaklaşımlara olanak sağlamakla birlikte, uzun dönem klinik performansları üzerine daha fazla çalışmaya ihtiyaç vardır.

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