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Editors
Oğuz YOLDAŞ
Hüda Melike BAYRAM

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Editors
Oğuz YOLDAŞ
ORCID iD:0000-0002-6887-1190
Hüda Melike BAYRAM
ORCID iD:0000-0002-3508-8458

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AUTHORS

Assist. Prof. Enes Mustafa AŞAR
Selcuk University Faculty of Dentistry
Department of Pediatric Dentistry

Dr. Lecturer Kübra BİLGE
Firat University, Faculty of Dentistry,
Department of Clinical Sciences, Restorative Dentistry

Assist. Prof. Büşra MUSLU DİNÇ
Selcuk University Faculty of Dentistry
Department of Pediatric Dentistry

Assist. Prof. Gözde ERİMLİ
Nuh Naci Yazgan University Faculty of Dentistry, Periodontics

Assist. Prof. Duygu KILIÇ
Erciyes University Faculty of Dentistry, Periodontics

Res. Asst. Özge DUMAN ÖZBİLGİ
Istanbul University, Faculty of Dentistry,
Department of Clinical Sciences, Department of Restorative Dentistry

Assist. Prof. Serkan ÖZTÜRK
Istanbul Atlas University, Faculty of Dentistry,
Department of Orthodontics

Assoc. Prof. Sanaz SADRY
Istanbul Atlas University, Faculty of Dentistry,
Department of Orthodontics

Assoc. Prof. Göksu TRAKYALI
Istanbul Atlas University, Faculty of Dentistry,
Department of Orthodontics

Assist. Prof. Zeynep Şeyda YAVŞAN
Tekirdag Namik Kemal University Faculty of Dentistry Department of Pediatric Dentistry

Chapter 1

CURRENT APPROACHES IN CLEAR ALIGNERS

Serkan ÖZTÜRK[1]
Göksu TRAKYALI[2]
Sanaz SADRY[3]

INTRODUCTION

Clear aligner treatment is a removable and nearly invisible orthodontic treatment method that has gained popularity recently, especially among patients with aesthetic concerns. Clear aligners use a series of specially designed clear plastic aligners to move teeth gradually. This treatment method offers an attractive alternative for patients who are uncomfortable with the visibility of conventional orthodontic appliances, such as braces (1).

The basic working principle of clear aligners is that each aligner applies gentle pressure to the teeth, guiding them into their planned positions. Patients wear one aligner for about two weeks and then move on to the next. This process continues until the teeth reach the desired alignment. Clear aligners date back to the 1940s, but a significant development occurred in the field with the introduction of Invisalign in 1998. The use of computer-aided design (CAD) and manufacturing (CAM) technologies has allowed clear aligners to be used in more complex cases and has made treatment planning more precise (1-7).

The main advantages offered by clear aligners are the following:

- • Aesthetics: Since clear aligners are almost invisible, they allow patients to receive treatment without affecting their social and professional lives (1, 8).
- • Removability: Patients can remove their aligners while eating, brushing their teeth, or for special occasions. This makes it easier to maintain oral hygiene and provides better periodontal health (1, 8, 9).

[1] Ass. Prof., Istanbul Atlas University, Faculty of Dentistry, Department of Orthodontics, serkan.ozturk@atlas.edu.tr, ORCID iD: 0000-0002-8458-8459

[2] Assoc. Prof., Istanbul Atlas University, Faculty of Dentistry, Department of Orthodontics, goksu.trakyali@atlas.edu.tr, ORCID iD: 0000-0001-7261-5504

[3] Assoc.Prof., Istanbul Atlas University, Faculty of Dentistry, Department of Orthodontics, sanaz.sadry@atlas.edu.tr, ORCID iD: 0000-0002-2160-0908

CONCLUSION

The history of clear aligners is full of continuous innovation and developments. The future of this technology looks set to continue to deliver even more effective, predictable, and patient-friendly treatments.

Clear aligner treatment can be an effective and aesthetic option, especially for mild and moderate orthodontic problems. However, the success of the treatment depends on patient compliance, correct case selection, and careful planning by an experienced orthodontist. Before considering clear aligner treatment, patients should carefully evaluate the advantages and disadvantages of this treatment and discuss their expectations with their orthodontist.

Clear aligners are a significant development in orthodontic treatment. The aesthetics, comfort, and patient-friendly features they offer make them an attractive option for many patients. With the continued advancement of technology, it is expected that the clinical applications of clear aligners will expand further and be used in more complex cases.

The future potential of clear aligners focuses on overcoming their limitations and appealing to a wider range of patients. Studies in this area could make clear aligners an indispensable tool in dentistry.

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Chapter 2

THE ROLE OF SYSTEMIC ANTIBIOTICS IN PERIODONTAL DISEASES

Gözde ERİMLİ[1]
Duygu KILIÇ[2]

THE RATIONALE FOR ANTIBIOTIC USE IN PERIODONTOLOGY

The use of antibiotics in the treatment of periodontal diseases began in the late 1970s. With the acceptance of the idea that certain bacteria are responsible for the development of specific disease types, antibiotics started to be used as an adjunct in periodontal treatment.(1)

It is known that many periodontal diseases have a bacterial origin. Culture studies have shown that dental plaque contains more than 500 different microbial species.(2) However, not all of these are associated with disease. The development of the disease is a complex process requiring multiple interactions and is related to factors such as environmental influences, the host's immune response, and a shift in the mass/qualitative composition of the plaque in favor of certain pathogenic bacterial species. Immediately after the teeth are cleaned, bacteria begin to adhere to the tooth surface, forming a biofilm layer. The supragingival plaque biofilm becomes more complex over time as pathogenic bacterial species colonize it and progresses apically, eventually becoming subgingival.(3) Bone destruction leads to the formation of a periodontal pocket, which houses a complex biofilm that cannot be accessed by regular oral hygiene, worsening the condition. If not eliminated, this biofilm can become resistant to both the immune response and antimicrobial agents.(4)

Since dental biofilm is the primary factor in the etiology of periodontal diseases, antibiotics have been considered for use in treatment. However, due to the highly limited permeability of the biofilm structure, the bacteria within it exhibit significant resistance to antibiotics, antiseptics, and host defense

[1] Assist. Prof., Nuh Naci Yazgan University Faculty of Dentistry, Periodontics, gozdek.0908@gmail.com, ORCID iD: 0000-0002-6054-7505

[2] Assist. Prof., Erciyes University Faculty of Dentistry, Periodontics, duygukilic4838@gmail.com, ORCID iD: 0000-0002-9396-1569

- Systemic antibiotics should always be combined with mechanical therapy to disrupt the biofilm and allow the antimicrobial agent to reach pathogenic bacteria, as monotherapy offers no benefit.
- Systemic antibiotics should be avoided if the patient has poor oral hygiene, misses follow-up appointments, or cannot comply with treatment conditions.
- Systemic antibiotics may be considered in cases of early-onset rapid progressive (Stage III, Grade C), persistent, aggressive, or recurrent periodontal disease.
- The evidence on the effectiveness of antibiotics for periodontitis treatment is not conclusive, but there is evidence suggesting that the combination of metronidazole/amoxicillin is beneficial.
- Despite extensive research, there are no specific guidelines on the most suitable antibiotic for a particular infection, the correct duration and dosage, or when it should be applied during treatment.

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Chapter 3

THE ROLE OF COLOSTRUM IN PEDIATRIC DENTISTRY

Büşra MUSLU DİNÇ[1]
Enes Mustafa AŞAR[2]
Zeynep Şeyda YAVŞAN[3]

INTRODUCTION

In pediatric dentistry, the importance of preventive measures and early intervention cannot be overstated. Among the various strategies employed to promote oral health in children, the role of colostrum, the first milk produced by mammals shortly after giving birth, is an area of growing interest and exploration. Colostrum, due to its rich nutritional composition and immunological properties, has garnered attention for its potential benefits in pediatric dentistry (1).

COLOSTRUM

Immediately after birth and for the first 24-48 hours, the milk secreted from the mother's mammary glands is called "colostrum." It is yellowish in color, has a salty taste, thick consistency, and its composition differs from regular milk. Colostrum is extremely beneficial for the health of the newborn, aiding in strengthening their immune system and providing essential nutrients. Research shows that newborn mammals require colostrum not only to establish their immune systems within the first 24 hours of life but also to support metabolic functions (2).

Although colostrum may seem to have emerged as a dietary supplement, its history of use as a natural healing substance dates back to ancient times. For instance, in America, colostrum was used before the advent of antibiotics due to its natural antibiotic properties (3). Albert Sabin, who discovered the polio vaccine,

1 Assist. Prof., Selcuk University Faculty of Dentistry Department of Pediatric Dentistry, dt.busramuslu@gmail.com, ORCID iD: 0000-0002-0230-5241

2 Assist. Prof., Selcuk University Faculty of Dentistry Department of Pediatric Dentistry, enesmustafasar@gmail.com, ORCID iD: 0000-0003-3432-8584

3 Assist. Prof., Tekirdag Namik Kemal University Faculty of Dentistry Department of Pediatric Dentistry, ylmzynpsyda@gmail.com, ORCID iD: 0000-0003-1275-0258

growth factors present in colostrum can expedite the healing process of oral wounds and promote tissue healing.

The results of research in these areas suggest that colostrum may have various applications in dentistry and could play an important role in oral health as a natural resource. However, further clinical studies and evidence are needed. Therefore, more research is crucial to gain further insights into the efficacy and reliability of colostrum in dentistry.

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Chapter 4

CONTEMPORARY RESTORATIVE MATERIALS

Kübra BİLGE[1]

Restorative dentistry is a branch of dentistry that aims to restore the form, function, and aesthetics of dental tissues damaged due to caries, trauma, wear, developmental disorders, or aesthetic concerns. This field focuses on preserving and, when necessary, restoring the natural structure and appearance of teeth. Restorative dentistry seeks to enhance individuals' oral and dental health both functionally and aesthetically, ultimately improving their quality of life.

Dental caries is a multifactorial disease that leads to the destruction of the hard dental tissues (enamel, dentin, and cement). It occurs when bacteria on the tooth surface ferment dietary carbohydrates, producing acids that demineralize dental tissues. With increasing life expectancy and the prolonged retention of teeth in the oral cavity, dental wear has become one of the most frequently observed oral pathologies following dental caries. Dental wear is defined as the loss of dental tissues without the presence of caries, trauma, or developmental disorders.

Developmental dental disorders, on the other hand, refer to anomalies occurring in the formation, structure, shape, size, number, or eruption process of teeth. These disorders may result from genetic, environmental, or systemic factors. The diagnosis and treatment of such pathologies fall within the scope of restorative dentistry, as they are highly prevalent and frequently encountered in the general population.

In the treatment of these conditions, the selection of materials is crucial, considering the patient's aesthetic expectations, the chewing forces exerted on different regions of the dentition, application techniques, and biocompatibility. Therefore, the materials used in restorative procedures must be continuously improved in terms of biocompatibility, physical and mechanical properties, and aesthetic characteristics, while treatment protocols should remain up to date.

When examining the materials and technologies used in restorative dentistry from past to present, various restorative options have been employed, including

1 Dr. Lecturer, Firat University, Faculty of Dentistry, Department of Clinical Sciences, Restorative Dentistry, kubratnyl@gmail.com, ORCID iD: 0000-0002-4323-9316

4.2.6. Additive and Subtractive Manufacturing Techniques

In CAD/CAM systems, two primary methods are used for manufacturing restorations: additive manufacturing and subtractive manufacturing. Additive manufacturing builds the material layer by layer, following a cross-sectional slicing process derived from the digital model. Each layer is stacked on top of the previous one, forming a three-dimensional structure. This method minimizes material waste, which is common in subtractive manufacturing techniques. Additive manufacturing allows for the rapid prototyping of restorations made from metal, ceramic, and polymer materials. Examples include:

- ***SLA (Stereolithography):*** Uses a laser to harden resin-based materials.
- ***DLP (Digital Light Processing):*** Cures photopolymer resins using a projector light source.
- ***SLS (Selective Laser Sintering):*** Uses a laser to fuse polymer or metal powders into a solid structure (42, 43).

Subtractive manufacturing, on the other hand, involves milling a pre-existing block or disk to create the desired shape. This method is commonly used in dental restorations because it allows for faster production compared to traditional techniques. However, a significant portion of the material is discarded, leading to higher material costs. Despite this drawback, subtractive manufacturing remains widely used due to its precision and efficiency in producing restorations.

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Chapter 5

MONOCHROMATIC COMPOSITE RESINS

Özge DUMAN ÖZBİLGİ[1]

COMPOSITE RESINS

Composite resins are commonly used direct restorative materials. One of their main advantages is their aesthetic appeal due to compatibility with the remaining tooth structure. Another key benefit is their adhesion to the tooth, which helps reinforce the remaining tooth structure (1).

Composite resins are primarily composed of three main components: the resin matrix, inorganic fillers, and silane bonding agents. In addition to these core components, polymerization initiators and accelerators, as well as inorganic oxide pigments in small amounts, may be added to achieve various shades (2)

The organic resin matrix phase consists of a mixture of monomers with varying molecular chain lengths, enabling chemical bonding to form a rigid material. Since the early 2000s, the development of specific methacrylates like Bis-GMA, TEGDMA, Bis-EMA, and UDMA has been the focus. Alternative monomers have been developed to reduce polymerization shrinkage and stress (3). Bis-GMA, the most commonly used component in dental materials, has a central phenyl ring core and two hydroxyl groups. The hydroxyl groups are responsible for Bis-GMA's main disadvantages: its extremely high viscosity and low mobility. Additionally, due to the hydroxyl groups, it has a high-water absorption rate (4). The polar bonds in the chain structure of the TEGDMA monomer are weak and flexible, which results in a much lower viscosity compared to Bis-GMA. TEGDMA is used to dilute composite materials. It also allows for a denser filler particle arrangement. However, the disadvantage of TEGDMA is that it increases water absorption, reduces color stability, and negatively affects the mechanical properties of the material. (5). Bis-EMA is created by replacing one of the hydroxyl groups in Bis-GMA with ethoxy groups through ethoxylation. Key benefits of Bis-EMA include its low viscosity, minimal water absorption, and reduced polymerization

[1] Res. Asst., Istanbul University, Faculty of Dentistry, Department of Clinical Sciences, Department of Restorative Dentistry, dtdumanozge@gmail.com , ORCID iD; 0000-0003-0521-4318

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