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THE CONCEPT OF MINIMALLY INVASIVE CARIOSOLOGY

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Abstact.
The idea of minimally invasive intervention—early caries treatment with maximum preservation of the anatomical and functional integrity of teeth—was developed as a result of the development of contemporary and efficient adhesive techniques and materials in dentistry.
Keywords: prevention, caries, and minimally invasive treatment.

Аннотация.
Идея минимально инвазивного вмешательства — раннего лечения кариеса с максимальным сохранением анатомической и функциональной целостности зубов — была разработана в результате развития современных и эффективных адгезивных методик и материалов в стоматологии.
Ключевые слова: профилактика, кариес и минимально инвазивное лечение

Annotatsiya.
Minimal invaziv aralashuv g'oyasi – ya'ni tishlarning anatomik va funksional yaxlitligini maksimal darajada saqlab qolgan holda kariesni erta davolash – stomatologiyada zamonaviy va samarali yopishqoq (adeziv) texnikalar hamda materiallarning rivojlanishi natijasida ishlab chiqilgan.
Kalit so'zlar: profilaktika, karies va minimal invaziv davolash.

Introduction: The idea of Minimal Intervention Dentistry (MID), which aims to treat cavities early while maintaining the teeth's anatomical and functional integrity to the greatest extent possible, was developed in the mid-1990s as a result of the development of contemporary and efficient adhesive materials and techniques [1, 3, 6]. At the start of the twenty-first century, the minimal intervention approach became widely used in dentistry. The preventive approach model (care based on health maintenance: early detection/monitoring and control of risk factors/minimum intervention) gradually replaced the surgical approach model (therapy based on the excision of damaged tissues) [5, 12]. The newest trend in dentistry is minimal intervention dentistry, which can be described as a professional treatment philosophy [4]. Early detection of carious disease, documentation of early alterations, and minimum surgical intervention into the tooth tissues—followed by filling with specific materials—are the cornerstones of minimal intervention. The result of treatment is greatly impacted by the management of carious disease risk factors and the routine assessment of restoration quality. Adhesive technologies are becoming more and more significant since they require less intervention, produce excellent functional and cosmetic outcomes, and offer an alternative to conventional prosthetics and preparation techniques.

The work's aim: is to talk about minimally invasive caries treatment methods. Dental caries is a pathological infectious process that is

brought on by a number of internal and external sources. It is initially characterized by the demineralization of enamel, which is followed by the destruction of dentin and enamel. According to Pitts (1991), caries is a multistage process that progresses progressively from microscopic and submicroscopic alterations to overt clinical signs and symptoms.

The following are included in the FDI guidelines for a minimally invasive treatment approach [9]: regulation and alteration of oral microbiota; encouraging patients and educating them about contemporary dental caries prevention techniques; active conservative treatment for dentin and enamel carious lesions that are not cavitated; application of adhesive materials and less invasive treatment techniques for cavitated dentin and enamel lesions; Instead of replacing all restorations, make corrections and repairs (if you can).

Material methods :

Contemporary Techniques for Diagnosing Caries

The identification of a carious cavity, followed by its preparation and filling, was the extent of caries diagnostics in the past. Early detection of early lesions and the use of categorization systems with the potential to register caries at the spot stage with code 0 are the cornerstones of the minimally invasive approach in cariology. The minimal invasion technique has been made possible by the advent and advancement of optical technology as well as the extensive use of caries diagnostic detectors, which help to identify pathology indicators more accurately through visual, magnified control. The "Diagnodent" gadget makes it possible to utilize a laser to identify subsurface, unseen carious lesions and enamel demineralization early on. The apparatus uses a photodiode in conjunction with a long-pass filter as the detector and a laser diode (wavelength 650 nm) as the activating light source. Through an optical fiber, which is a bundle of nine fibers, the activating light enters the tooth and helps identify the carious focus by concentrating around it. The long-wave fluorescent light is transmitted through the long-pass filter, which also absorbs the back-scattered excitation.

The technique of transillumination relies on the fact that various structures absorb light differently. This technique assesses the shadow patterns that emerge when a laser beam travels through the tooth. Although blue light from a standard photo-polymerization lamp can also be utilized for these purposes, orange light (DIAGNOPEN device) is the best option for transillumination.The QLF and QLF-D (Quantitative Light-induced Fluorescence) techniques. Light-emitting diodes that emit light with a wavelength of 405 microns are used to illuminate the tooth surfaces under examination. While healthy tooth tissue fluoresces green, the damaged portions glows in the red portion of the spectrum. Virtual images that show the impacted areas on the camera screen are produced using the proper algorithms. The image of the lighted tissues can be sent to a computer via an intraoral camera. Some writers claim that this method increases the quality of caries diagnosis by two times when assessing contact surfaces, three times when evaluating occlusal surfaces, and ten times when it comes to lingual and vestibular surface diagnosis clarification. The identification of risk factors for the carious process is just as crucial as the early detection of hard tissue lesions. This requires the use of clinical tests to measure the amount of Streptococcus mutans as well as the quantity and quality of saliva (stimulated and unstimulated, flow rate, viscosity, pH of unstimulated saliva, and buffer capacity). The registration of early lesions has been categorized and organized using a number of approaches since the late 1990s (Pitts & Fyffe, 1988; Ismail, 1992;

Ekstrand, Ricketts & Kidd, 1998; Fyffe et al., 2000; Nyvad, 2001) [7]. The G. Mount classification [10] is shown in Table 1 and considers both the size and location of the lesion (Table1). In order to document clinical work experience at the society and individual levels, the International Organization FDI [17] believes it is appropriate to continue developing and adopting caries lesion categories that will include the assessment of disease risk and its first manifestations. Adopting such classifications will serve as a foundation for the creation of suitable public health policies, planning decisions, and the proper and economical execution of prevention initiatives. The International Caries Detection and Assessment System (ICDAS) [13], which classifies lesions according to clinical symptoms (Table 2), is currently the established method for diagnosing carious disease. The system, which was created for research, teaching, and clinical practice, enables: identifying the lesion; evaluation of the injury; diagnosis;observing.Code legend (inferred from the context because the entire table is absent): A damage to the enamel Carious dentin shadow behind enamel The exposed dentin Severe tooth loss

Minimally Invasive Intervention in the Treatment of Caries

Treatment options for specific situations might be restricted to remineralizing therapy and preventative measures. Conservative preparation with restricted access is employed when hard tissue intervention is required [11]. The reduction in caries occurrence brought about by the widespread use of fluoride preparations and better dental hygiene is another argument in favor of conservative preparation.

Preparation aims to eradicate germs and remove the diseased substrate, or irreversibly changed tissues, from the afflicted location. Contemporary Preparation Concepts

Principle of Medical Expediency and Justification: This principle offers a unique way to select the cavity preparation and filling technique.

All therapeutic, diagnostic, and preventative manipulations should adhere to the principle of painlessness: sufficient anesthesia;utilizing effective, non-vibrating handpieces with high-speed modes and sharp burs;adequate water-air cooling;pharmacological, psychological, and psychotherapy patient preparation.The concepts of visual control, ergonomics, and work convenience:the patient's and dentist's ergonomic positions;"four-handed" work;adequate illumination of the workspace;proper orientation and placement of the unit's light;utilizing handpieces with integrated lighting and additional lighting of the workspace with specialized tools (such as dental microscopes or magnifying loupes to regulate the level of preparation); Mouth props, retractors, and a rubber dam (cofferdam) are used. Principle of Biomechanical Compliance: According to this principle, the cavity's design should take into account both the biomechanical traits of the tooth tissues around the prepared cavity and the physicomechanical qualities of the materials utilized.

The conservative treatment principle for tooth tissues refers to the selection of a therapeutic approach that maximizes the preservation of tissues unaffected by the carious process.

A modification of the traditional Black's rules of preparation, the features of minimally invasive caries treatment include the preservation of demineralized dentin, the removal of only destroyed hard tooth tissues, and the preservation of enamel without underlying dentin. This prevents the loss of healthy tooth tissue because a cavity of a particular geometric shape will not form.

Using tiny cutting tools (round and conical

burs) or other preparation methods (air abrasion, ultrasonic, laser) to prepare the tissues of hard teeth.

application of adhesive substances with adequate and sustained adherence to dental tissues. These materials include adhesive solutions and hybrid Glass Ionomer Cements (GICs), which are mixed with flowable composites and sealants. Use of specialized tools for filling mini-cavities, such as probes for difficult-to-reach places, sculptors, and tiny, narrow pluggers.

Methods of Treatment Depending on the Location of Caries

Location of Carious Lesions in the Fissure Region (Lesion 1.0-1.2). Plaque is challenging to remove, and the fissures' anatomy is intricate. It is recommended to seal fissures either invasively or non-invasively [16]. Non-invasive sealing is done when the following conditions are met: tissue condition, pronounced relief of the occlusal surface, tooth eruption timing (usually at 6–8 years and 12–14 years), and high caries risk (annual rise).

When there are severe cracks and just a little amount of dentin involvement, invasive sealing (enameloplasty, crucial biopsy of enamel) is done. The procedure entails sealing after 0.1–0.5 mm of enamel is removed. Pigmentation and plaque can be removed from the fissures using thin K-files, which are tiny spherical burs marked with red and yellow grit. Air abrasion using medium-sized aluminum oxide particles at moderate pressure is an alternate technique.

The Bat-cave, also known as the bottleneck, is a large space with a small opening. The dentist fills the carious cavity with flowable composite after doing minimum preparation of the cavity's entry.

Preventive fillings or restorations are advised when demineralized fissures involving dentin are present [15]. Similar to invasive sealing, the process involves prepping the primary lesion focus and then excising the surface layer of healthy or slightly damaged enamel in nearby pits and fissures.

lesion in the posterior tooth group's proximal regions (Lesion 2.0-2.2). The primary objectives are prompt detection (using bitewing radiography, orthodontic rubber separating rings, wedging, and imprints), process advancement prevention, and monitoring.

Slot preparation, which comes from the English "slot"—groove, channel, slit—can be done in specific situations (no neighboring teeth, wide interdental gaps, etc.). For tiny and medium carious lesions located below or at the level of the equator, this minimally invasive intervention technique is used on the contact surfaces of molars and premolars. According to Black, slot preparation is now regarded as a more acceptable approach to treating Class II defects than the more conventional way of preparing the marginal ridge to gain access to the carious lesion. Oral (lingual) and vestibular (buccal) slot preparation differ according to the access surface. Following a visual evaluation of the carious lesion, the type of access is identified. It will be better to prepare the vestibular slot if the defect is near the vestibular surface. The distal surfaces of first molars can typically be treated with this technique, but second molars and wisdom teeth can also be treated if access is adequate.

The tunnel preparation approach can be applied if the carious cavity is situated 2.5 mm below the marginal ridge [14, 18]. According to Black, tunnel preparation—which was initially explained in 1963 and subsequently replicated by Hunt and Knight in the 1980s—represents a more cautious strategy than the conventional shape of Class II cavities (G.M. Jinks, 1963; Knight, Hunt, 1984). The occlusal surface is used to gain access to the carious lesion. This procedure got its name because the

operating access bears the shape of an oval or rounded tunnel (P.R. Hunt, 1984). We refer to such a tunnel as occlusal-proximal.

preparation of the internal tube (Black's Class I). Enamel is maintained in the proximal area.

tunnel preparation in part. The demineralized enamel is somewhat retained.

Finalize the tunnel's preparation. On the proximal surface, all demineralized enamel is eliminated.

It is advised to use the "slit" preparation method if the lesion is located close to the marginal ridge. Only the afflicted tissues are extracted, with minimal effort. Preparation tools include enamel knives and tiny, diamond-coated conical burs. Small spherical burs are used to remove infected dentin slowly.

Another minimal intervention technique is proximal access, which is used when access is available from the proximal surface (no neighboring teeth, nearby cavities). The occlusal surface is not touched during preparation.

defects of the cervical region (Lesion 3.0-3.2). Remineralizing therapy eliminates carious areas. By removing traumatic variables (namely, normalizing occlusion through selective grinding of teeth), abfraction non-carious abnormalities can be stopped. Operative treatment methods are necessary for both carious and non-carious lesions (from abrasion to abfraction). Complicated preventative treatments (chlorhexidine, fluoride preparations, hygiene normalization) eradicate the first carious lesions of the root surface.

In conclusion

The benefit of the new technique for the patient is that it improves oral health; dentists can now treat caries more conservatively and provide patients with treatment alternatives that need little to no surgery. Additionally, there is a genuine chance of long-term teeth service following treatment, the patient feels less discomfort, and local anesthetic is no longer necessary.

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