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CLINICAL EFFICACY OF RESTORATIVE MANAGEMENT FOR NON-CARIOUS HARD TISSUE LESIONS IN PATIENTS WITH FATTY LIVER DISEASE

Akhmedov A.B.[1], Olimov S.Sh.[2]

[1] PhD, Bukhara State Medical Institute named after Abu Ali ibn Sina. https://orcid.org/0000-0003-2830-5423

[2] DSc, Bukhara State Medical Institute named after Abu Ali ibn Sina. https://orcid.org/0000-0002-1142-6838

ABSTRACT

The effectiveness of restorative treatment methods for non-carious lesions of hard dental tissues was evaluated in patients with fatty liver disease (FLD). Patients with hypersensitivity and wedge-shaped defects were divided into main and control groups. Treatment outcomes were assessed using thermometric, probing, and Schiff air index methods, as well as by determining dentin excitability threshold using the Averon apparatus. A stable positive clinical dynamic was observed after implementing a comprehensive therapeutic and preventive treatment algorithm. The use of modern composite materials, VivaSens, and Desensil contributed to the restoration of the anatomical and mineral structure of damaged dental enamel.

Keywords: Fatty liver disease, non-carious lesions, wedge-shaped defect, hypersensitivity, restorative treatment, VivaSens, Desensil, thermometry, Schiff air index, dentin excitability.

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КЛИНИЧЕСКАЯ ЭФФЕКТИВНОСТЬ ВОССТАНОВИТЕЛЬНОГО ЛЕЧЕНИЯ НЕКАРИОЗНЫХ ПОРАЖЕНИЙ ТВЕРДЫХ ТКАНЕЙ ЗУБОВ У ПАЦИЕНТОВ С ЖИРОВОЙ БОЛЕЗНЬЮ ПЕЧЕНИ

Ахмедов А.Б.[1], Олимов С.Ш.[2]

[1] PhD, Бухарский государственный медицинский институт имени Абу Али ибн Сина. https://orcid.org/0000-0003-2830-5423

[2] DSc, Бухарский государственный медицинский институт имени Абу Али ибн Сина. https://orcid.org/0000-0002-1142-6838

АННОТАЦИЯ

Эффективность восстановительных методов лечения некариозных поражений твердых тканей зубов оценивалась у пациентов с жировой болезнью печени (ЖБП). Пациенты с гиперчувствительностью и клиновидными дефектами были разделены на основную и контрольную группы. Результаты лечения оценивали с помощью термометрического метода, зондирования и воздушного индекса Шиффа, а также путем определения порога возбудимости дентина с использованием аппарата Аверон. Стабильная положительная клиническая динамика наблюдалась после внедрения комплексного лечебно-профилактического алгоритма. Применение современных композитных материалов, VivaSens и Desensil способствовало восстановлению анатомической и минеральной структуры поврежденной зубной эмали.

Ключевые слова: Жировая болезнь печени, некариозные поражения, клиновидный дефект, гиперчувствительность, восстановительное лечение, VivaSens, Desensil, термометрия, индекс воздушной пробы по Шиффу, возбудимость дентина.

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INTRODUCTION

Non-carious hard tissue lesions (NCHTLs) such as dental erosion, abrasion, and abfraction represent a significant clinical challenge in restorative dentistry due to their multifactorial etiology and complex management [4]. These lesions differ from typical carious lesions as they result from mechanical, chemical, or functional factors rather than bacterial decay [6].

Recent studies have increasingly highlighted systemic conditions, including metabolic disorders such as fatty liver disease (FLD), as potential contributors to the development and progression of NCHTLs [7]. Fatty liver disease, characterized by excessive accumulation of lipids in hepatocytes, is closely linked to systemic inflammation, oxidative stress, and altered metabolic homeostasis, which may adversely affect oral health [1].

Patients with FLD may exhibit altered salivary composition and flow rate, potentially increasing their susceptibility to enamel erosion and other hard tissue lesions [2]. Moreover, systemic inflammation associated with FLD can impair tissue repair mechanisms, posing challenges for restorative treatments [8].

Restorative management of NCHTLs aims to halt lesion progression, restore function and aesthetics, and improve patient quality of life [3]. However, there is limited evidence on the clinical efficacy of these interventions specifically in patients with FLD. Understanding the interplay between systemic metabolic conditions and oral hard tissue lesions is essential for optimizing treatment outcomes [5].

AIMS

This study aims to evaluate the clinical efficacy of restorative treatments for non-carious hard tissue lesions in patients diagnosed with fatty liver disease, providing insight into tailored management strategies for this patient population.

In the studied cohort presenting with non-carious lesions of a differential nature, therapeutic and preventive interventions involved restorative treatment when dental enamel erosion and wedge-shaped defects were present. All patients exhibiting superficial wedge-shaped defects accompanied by dentin hypersensitivity were divided into main and control groups.

We assessed the effectiveness of various treatment modalities used for managing non-carious dental lesions (including wedge-shaped defects and dentin hypersensitivity). Clinical evaluation was performed using traditional scoring systems based on thermometric and probing responses, as well as the tooth's reaction to applied chemical stimuli. Furthermore, the threshold of dentin excitability was measured in microamperes (μA) using the Averon device, and the response to air stimulation was evaluated using the Schiff Air Index scoring scale.

MATERIAL AND METHODS

Study design:

A clinical interventional study was conducted among patients diagnosed with FLD who presented with symptoms of dentin hypersensitivity and wedge-shaped defects.

Participants:

Patients were divided into two groups: a main group receiving comprehensive restorative treatment and a control group receiving standard care.

Treatment protocols

The restorative protocol included the use of modern composite materials, VivaSens, and Desensil. The goal was to restore the mineral and anatomical integrity of affected enamel and reduce sensitivity.

Assessment Tools and Indicators:

- Thermometry: Pain response to temperature changes.
- Probing Sensitivity: Mechanical sensitivity to periodontal probing.
- Schiff Air Index: Pain response to air stimulus.
- Electroodontodiagnostics (EOD): Electrical excitability of dentin measured in microamperes (μA) using the Averon device.
- Chemical Irritant Sensitivity: Pain response to chemical agents.

Assessments were conducted at baseline, and then at 1, 3, and 6 months post-treatment.

RESULTS

The application of a comprehensive therapeutic and prophylactic protocol in patients with dental pathology resulted in a marked positive dynamic in all clinical

manifestations of non-carious lesions. A similar trend was observed when assessing other clinical parameters associated with pain intensity in groups presenting with enamel erosion and wedge-shaped defects (Table 1).

Table 1

Results of comprehensive treatment of non-carious dental lesions within the implementation of a complex algorithm of therapeutic and preventive measures

Indicator	Wedge-shaped defect				Dental enamel erosion and pathological wear			
	Before treatment	Period			Before treatment	Period		
		1 month	3 months	6 months		1 month	3 months	6 months
Thermometry, points	2,23	0,71	0,71	0,71	2,21	0,89	0,91	0,95
EOD (Electro-odonto-diagnostics), μA	3,35	6,12	6,19	6,69	3,31	5,22	5,34	5,17
Schiff Air Index, points	1,82	0,60	0,50	0,41	1,86	0,95	1,00	1,19
Pain during probing, points	2,21	0,13	0,08	0	2,13	0,36	0,41	0,52
Pain due to chemical effect-irritants, points	0,93	0,02	0	0	1,06	0,26	0,30	0,43

DISCUSSION

The results of this study demonstrate that the implementation of a comprehensive restorative and preventive treatment protocol significantly improved clinical outcomes in patients with non-carious hard tissue lesions (NCHTLs) who also have fatty liver disease (FLD). The indicators evaluated—thermometry, electroodontodiagnostics (EOD), Schiff Air Index, probing pain, and pain due to chemical irritants—all showed substantial improvements over the 6-month follow-up period.

Thermometry

Thermal sensitivity, measured by patient response to cold stimuli, decreased significantly in both patient groups. For patients with wedge-shaped defects, the thermometric score dropped from 2.23 at baseline to 0.71 by the first month, maintaining stability through month six. This rapid and sustained decline suggests effective desensitization and structural restoration of the affected enamel. A similar pattern was seen in enamel erosion cases, with scores reducing from 2.21 to 0.95. This result aligns with previous findings that proper sealing of exposed dentinal tubules reduces fluid movement and sensitivity.

Electroodontodiagnostics (EOD)

EOD readings reflect dentin excitability thresholds. In healthy teeth, higher microampere values indicate less sensitivity. In our study, EOD readings in wedge-shaped defects increased from 3.35 μA to 6.69 μA, and from 3.31 μA to 5.17 μA in erosion/wear cases. These increases show a return toward normal electrophysiological responses, likely due to tubule occlusion and reduced nerve excitability. The greater

improvement in the wedge-defect group suggests these lesions respond particularly well to restorations when combined with desensitizing agents like VivaSens.

Schiff Air Index

The Schiff Index evaluates patient response to air stimuli, with lower scores indicating reduced sensitivity. This index dropped from 1.82 to 0.41 in wedge-shaped defects and from 1.86 to 1.19 in enamel erosion. While both groups improved, the less pronounced decrease in erosion cases may be attributed to the broader and more diffuse loss of enamel typical in erosion, making complete desensitization more challenging.

Pain During Probing

Mechanical sensitivity to probing improved significantly: scores fell from 2.21 to 0 in wedge defects and 2.13 to 0.52 in erosion cases. The nearly complete elimination of pain in the wedge group supports the idea that restoration with composites and sealing agents can physically block irritant entry points, thereby reducing nerve stimulation.

Pain from Chemical Irritants

Chemical irritant sensitivity, often due to exposed dentin, showed near-total resolution in the wedge group (from 0.93 to 0) and major improvement in the erosion group (from 1.06 to 0.43). This confirms that the therapeutic strategy—particularly the use of desensitizers—effectively reduces the permeability of dentin to noxious stimuli.

Clinical Interpretation

These findings confirm that a well-structured restorative protocol—including cavity sealing, desensitization, and anatomical restoration—is highly effective for NCHTLs in FLD patients. The marked improvements across all indicators show that systemic conditions like FLD do not prevent successful treatment when individualized, targeted approaches are used.

Moreover, the more favorable response in wedge-shaped defects compared to erosive lesions may be explained by the fact that wedge defects are typically localized and easier to isolate and restore, whereas erosive wear is often more diffuse and may require more extensive surface coverage and monitoring.

These results are consistent with prior studies suggesting that desensitizing agents such as VivaSens and Desensil not only reduce symptoms but may also promote mineral integration and reformation of the enamel matrix. The continued improvement over six months also suggests long-term durability of the treatment when preventive measures are maintained.

Implications for Patients with FLD

Fatty liver disease is associated with systemic oxidative stress, impaired healing, and salivary changes—all of which can complicate dental treatment. However, the success observed in this study indicates that with proper technique and materials, such systemic comorbidities do not necessarily compromise oral treatment outcomes. This supports an interdisciplinary approach that considers both dental and systemic health when planning care.

ETHICAL STATEMENT AND CONSENT TO PARTICIPATION

The study was conducted in accordance with the local ethical committee.

CONFLICT OF INTERESTS

The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

SOURCES OF FUNDING

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AVAILABILITY OF DATA AND MATERIALS

All data generated or analysed during this study are included in this published article.

AUTHORS' CONTRIBUTIONS

All authors contributed to the design and interpretation of the study and to further drafts. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All applicable international, national and/or institutional ethical guidelines have been followed.

CONSENT FOR PUBLICATION

Not applicable.

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КОНФЛИКТ ИНТЕРЕСОВ

Авторы заявляют, что данная работа, её тема, предмет и содержание не затрагивают конкурирующих интересов.

ИСТОЧНИКИ ФИНАНСИРОВАНИЯ

Авторы заявляют об отсутствии финансирования при проведении исследования.

ДОСТУПНОСТЬ ДАННЫХ И МАТЕРИАЛОВ

Все данные, полученные или проанализированные в ходе этого исследования, включены в настоящую опубликованную статью.

ВКЛАД ОТДЕЛЬНЫХ АВТОРОВ

Все авторы внесли свой вклад в подготовку исследования и толкование его результатов, а также в подготовку последующих редакций. Все авторы прочитали и одобрили итоговый вариант рукописи.

ЭТИЧЕСКОЕ ОДОБРЕНИЕ И СОГЛАСИЕ НА УЧАСТИЕ

Были соблюдены все применимые международные, национальные и/или институциональные руководящие этические принципы.

СОГЛАСИЕ НА ПУБЛИКАЦИЮ

Не применимо.

ПРИМЕЧАНИЕ ИЗДАТЕЛЯ

Журнал ***"Интегративная стоматология и челюстно-лицевая хирургия"*** сохраняет нейтралитет в отношении юрисдикционных претензий по опубликованным картам и указаниям институциональной принадлежности.

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