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Optimization of Rehabilitation Treatment for Pathological Tooth Tissue Wear: A Clinical Approach to Maximizing Effectiveness

Irgashev K. N.[1], Rizayev J. A.[2]

[1]Independent Applicant, Samarkand State Medical University, Samarkand, Uzbekistan
[2]Doctor of Medical Sciences, Professor, Samarkand State Medical University, Samarkand, Uzbekistan

Abstract The problem of pathological tooth wear is one of the most relevant and complex areas of modern dentistry, requiring a comprehensive interdisciplinary approach to patient diagnosis, treatment, and rehabilitation. The prevalence of non-carious tooth lesions characterized by intensive hard tissue loss is steadily increasing, ranging from 30% to 50% among the adult population, which determines the high medical and social significance of this pathology.

Keywords Pathological tooth wear, Dental rehabilitation, Occlusal disorders, Bite height reduction, Functional overload, Muscle-articular dysfunction, Comprehensive treatment

1. Introduction

Pathological wear represents an irreversible destructive process of dental hard tissue destruction, caused by the complex interaction of functional, biomechanical, metabolic, and environmental factors. The clinical picture is characterized by progressive enamel and dentin destruction, violation of tooth anatomical form, changes in bite height, and the development of secondary pathological conditions in the dentition system. Existing traditional treatment methods often do not provide long-term result stability and do not account for individual pathogenetic mechanisms of process development. This necessitates the development of personalized therapeutic strategies based on comprehensive diagnostic principles, etiopathogenetic approach, and clinical outcome prediction.

Pathological tooth wear (PTW) is one of the most pressing problems in modern dentistry, occurring, according to various authors, in 11.8-42.6% of the adult population [1,2]. The prevalence of this pathology increases with age, reaching 62-75% in individuals over 50 years old [3,4]. Despite numerous studies addressing various diagnostic and treatment aspects of pathological tooth wear, patient rehabilitation issues remain insufficiently studied [5,6]. Most research focuses on orthopedic methods of restoring lost tooth tissues, while long-term rehabilitation and progression prevention problems are addressed fragmentarily, especially from an evidence-based medicine perspective.

Multiple studies show that patients with pathological tooth wear are at high risk of developing functional disorders such as temporomandibular joint muscle-articular dysfunction, chewing function disruption, increased tooth sensitivity, and aesthetic defects, significantly impacting patients' quality of life and social adaptation [7,8].

According to Lebedenko I.Yu. and co-authors, up to 75% of patients with generalized pathological tooth wear require comprehensive rehabilitation using an interdisciplinary approach [9].

Currently, there is no unified approach to rehabilitating patients with pathological tooth wear. Standardized protocols have not been developed that consider various clinical forms, process severity, patient age, and concomitant pathology. Long-term results of different rehabilitation programs and their impact on the dentition system's functional state and patient quality of life remain insufficiently studied [10].

Research Objective. To study clinical results in rehabilitation of patients with non-carious tooth lesions in the form of pathological wear.

2. Materials and Methods

The study was conducted at the Dental Clinic of Samarkand State Medical University from 2023 to 2025. The study included 90 patients aged 25 to 65 years (mean age 43.7±8.3 years) with varying degrees of pathological tooth wear.

Inclusion Criteria:

- Generalized pathological tooth wear of I, II, or III degree according to Bushan's classification
- No significant dental row defects (loss of no more than 4 teeth)

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- Absence of severe somatic pathology

Patient Groups:

1. Group 1 (n=30): Standard treatment complex including orthopedic restoration (direct and indirect restorations) without preliminary preparation and subsequent maintenance treatment
2. Group 2 (n=30): Extended treatment complex including orthopedic restoration, preliminary occlusion therapy using splints, and biomechanical occlusion analysis
3. Group 3 (n=30): Comprehensive multidisciplinary rehabilitation program including:
   - o Preliminary occlusion therapy
   - o Orthopedic restoration
   - o Normalization of masticatory muscle function using physiotherapeutic methods
   - o Psychological correction of bruxism (if present)
   - o Regular monitoring and maintenance therapy

Groups were comparable in age, gender, pathological wear degree, and clinical forms.

Research Methods:

Functional State Assessment of Dentition System:

- Electromyography of masticatory muscles
- Axiography of temporomandibular joint
- Computer occlusion analysis (T-Scan)
- Tooth sensitivity assessment using Visual Analog Scale (VAS)
- Chewing efficiency assessment by Rubinov method

Quality of Life Assessment:

- Specialized OHIP-14 questionnaire (Oral Health Impact Profile)

Statistical Analysis:

- SPSS Statistics 25.0 software
- Descriptive statistics
- Student's t-test
- Chi-square test
- Correlation analysis

Statistical significance was established at $p<0.05$.

3. Research Results

Analysis of results showed that different rehabilitation programs significantly influence the restoration of dentition system function and patient quality of life in both short-term and long-term periods.

Short-Term Period (Up to 6 Months)

Successful Adaptation to Restored Bite Height:

- Group 1: 68.3% of patients
- Group 2: 86.7% of patients
- Group 3: 96.7% of patients ($p<0.05$ when comparing Groups 1 and 3)

Complication Frequency:

- Group 1: 33.3% (muscle hyperactivity, temporomandibular joint discomfort)
- Group 2: 16.7%
- Group 3: 6.7% ($p<0.01$ when comparing Groups 1 and 3)

Medium-Term Period (12 Months)

Normalization of Masticatory Muscle Bioelectrical Activity (Electromyography):

- Group 1: 46.7% of patients
- Group 2: 70.0% of patients
- Group 3: 90.0% of patients ($p<0.01$ when comparing Groups 1 and 3)

Chewing Efficiency (Rubinov Method):

- Group 1: 72.3±5.6%
- Group 2: 83.4±4.8%
- Group 3: 92.1±3.7% ($p<0.05$ for all intergroup comparisons)

Long-Term Period (24-36 Months)

Orthopedic Construction Preservation without Replacement:

- Group 1: 63.3%
- Group 2: 80.0%
- Group 3: 93.3% ($p<0.01$ when comparing Groups 1 and 3)

Pathological Wear Progression:

- Group 1: 36.7% of patients
- Group 2: 20.0% of patients
- Group 3: 6.7% of patients ($p<0.01$ when comparing Groups 1 and 3)

Quality of Life Assessment

OHIP-14 questionnaire results after 36 months showed statistically significant differences between groups:

- Group 1: 32.4±4.5 points
- Group 2: 23.7±3.2 points
- Group 3: 14.3±2.1 points ($p<0.01$ for all intergroup comparisons)

Correlation Analysis

A strong positive correlation was found between masticatory muscle function normalization and patient quality of life ($r=0.81$, $p<0.01$).

Key Influential Factors

The most significant factors affecting rehabilitation effectiveness were:

1. Preliminary occlusion therapy using splints before orthopedic restoration
2. Comprehensive multidisciplinary approach involving:
   - o Orthopedic dentist
   - o Therapist
   - o Gnatologist
   - o Physiotherapist
   - o Psychologist
3. Individualized rehabilitation program considering:
   - o Pathological wear degree and form
   - o Patient age
   - o Concomitant pathology

4. Modern biomechanical occlusion analysis methods
5. Regular dynamic monitoring and timely orthopedic construction correction

Developed Rehabilitation Algorithm

A four-stage individualized rehabilitation algorithm was developed:

1. Diagnostic Stage

o Comprehensive examination
o Treatment planning

2. Preparatory Stage

o Occlusion therapy
o Oral cavity sanitation

3. Main Stage

o Orthopedic restoration of lost tooth tissues

4. Maintenance Stage

o Regular monitoring
o Preventive measures

This algorithm was implemented in the dental clinic's practice and demonstrated high effectiveness in rehabilitating patients with various pathological tooth wear forms.

4. Conclusions

Rehabilitation of patients with pathological tooth wear requires a comprehensive multidisciplinary approach, covering all treatment stages from diagnosis to long-term observation. Implementing a comprehensive multidisciplinary rehabilitation program significantly improves functional results and patient quality of life compared to standard treatment methods.

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