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MODERN TREATMENT APPROACHES FOR PATHOLOGICAL TOOTH WEAR

Teshayeva Nozigul Khamidullaevna
Asia International University
nozigulteshayeva@gmail.com

Abstract: Pathological tooth wear is a progressive dental condition characterized by the excessive loss of hard tooth tissues beyond normal physiological aging. The condition may result from mechanical, chemical, or multifactorial processes, including attrition, abrasion, and erosion. If left untreated, pathological tooth wear can lead to dentin exposure, tooth sensitivity, functional impairment, aesthetic concerns, and reduced quality of life. Advances in preventive, restorative, and digital dentistry have significantly improved the management of this condition. This article discusses the etiology, diagnosis, and contemporary treatment methods used in the management of pathological tooth wear.

Keywords: pathological tooth wear, dental erosion, attrition, abrasion, restorative dentistry, digital dentistry, minimally invasive treatment.

Introduction

Pathological tooth wear refers to the irreversible loss of dental hard tissues caused by factors other than dental caries or trauma. While a certain degree of tooth wear is considered a natural consequence of aging, pathological wear occurs when tissue loss exceeds normal physiological limits and compromises oral function or aesthetics.

The prevalence of pathological tooth wear has increased globally due to changing dietary habits, longer life expectancy, increased consumption of acidic beverages, and higher rates of parafunctional activities such as bruxism. Modern dentistry emphasizes early diagnosis, prevention, and minimally invasive intervention to preserve natural tooth structure.

Etiology of Pathological Tooth Wear

Pathological tooth wear is generally classified into three major categories:

Attrition

Attrition results from direct tooth-to-tooth contact during mastication or parafunctional habits such as bruxism. It commonly affects occlusal and incisal surfaces.

Abrasion

Abrasion occurs due to mechanical factors external to the teeth, including:

- Aggressive tooth brushing
- Improper brushing techniques
- Use of abrasive toothpaste
- Habits involving foreign objects

Erosion

Dental erosion is caused by chemical dissolution of tooth structure by acids not produced by oral bacteria. Common sources include:

- Carbonated beverages
- Citrus fruits
- Sports drinks
- Gastroesophageal reflux disease (GERD)
- Eating disorders associated with recurrent vomiting

Many patients present with a combination of these mechanisms, making diagnosis and treatment more complex.

Modern Diagnostic Methods

Clinical Examination

A comprehensive clinical assessment remains the foundation of diagnosis. Dentists evaluate:

- Severity of tissue loss
- Occlusal changes
- Tooth sensitivity
- Functional disturbances
- Aesthetic concerns

Digital Intraoral Scanning

Modern intraoral scanners allow accurate three-dimensional documentation of tooth wear. Digital records facilitate monitoring of disease progression and treatment planning.

Photographic Documentation

High-resolution dental photography provides valuable information for comparison over time and improves patient communication.

Occlusal Analysis

Computerized occlusal analysis systems help identify abnormal bite forces and parafunctional habits contributing to tooth wear.

Salivary Assessment

Evaluation of salivary flow and buffering capacity assists in identifying patients at increased risk of erosion.

Preventive Management

Prevention is the most important component of treatment because lost enamel cannot regenerate naturally.

Dietary Modification

Patients should be advised to:

- Reduce consumption of acidic beverages
- Limit frequent snacking
- Use a straw when consuming acidic drinks
- Rinse with water after acidic exposure

Fluoride Therapy

Topical fluoride applications strengthen enamel and reduce susceptibility to erosion and sensitivity.

Common methods include:

- Fluoride varnishes
- Fluoride gels
- High-fluoride toothpaste
- Fluoride mouth rinses

Remineralization Agents

Products containing calcium phosphate compounds and bioactive minerals promote enamel remineralization and provide additional protection against acid attack.

Contemporary Restorative Treatment

Direct Composite Restorations

Modern resin composite materials have become a preferred treatment option for mild to moderate tooth wear.

Advantages include:

- Conservative tooth preparation
- Excellent aesthetics
- Lower cost
- Easy repair and maintenance

Advances in adhesive technology have significantly improved the longevity of composite restorations.

Ceramic Veneers

For patients with anterior tooth wear and aesthetic concerns, ceramic veneers provide a durable and highly aesthetic solution.

Benefits include:

- Natural appearance
- Color stability
- High wear resistance
- Minimal tooth preparation

Full-Coverage Crowns

Severely damaged teeth may require complete coverage restorations.

Modern crown materials include:

- Zirconia
- Lithium disilicate ceramics
- Porcelain-fused-to-metal restorations

These materials offer excellent strength and aesthetics while restoring function

Digital Dentistry in Tooth Wear Rehabilitation

The integration of digital technologies has transformed restorative treatment.

Computer-Aided Design and Manufacturing (CAD/CAM)

CAD/CAM systems enable precise fabrication of restorations with improved accuracy and reduced treatment time.

Advantages include:

- Enhanced precision
- Faster production
- Improved patient comfort
- Better long-term outcomes

Digital Smile Design

Digital smile design software assists clinicians in visualizing treatment outcomes and improving communication with patients.

Three-Dimensional Printing

3D printing technologies are increasingly used for diagnostic models, surgical guides, and provisional restorations.

Management of Bruxism

Bruxism is one of the most significant contributors to pathological tooth wear.

Occlusal Splints

Custom-made night guards help protect teeth from excessive grinding forces during sleep.

Benefits include:

- Reduced tooth wear progression

- Protection of restorations
- Decreased muscle fatigue

Behavioral Therapy

Stress management and behavioral modification techniques may reduce parafunctional habits in susceptible individuals.

Botulinum Toxin Therapy

Recent studies suggest that botulinum toxin injections into masticatory muscles can reduce excessive bite force in severe bruxism cases, although this approach requires careful patient selection.

Management of Dental Erosion

Treatment of Underlying Medical Conditions

Successful management often requires addressing systemic factors such as:

- Gastroesophageal reflux disease
- Eating disorders
- Chronic vomiting
- Xerostomia

Collaboration between dentists and medical specialists is frequently necessary.

Saliva Enhancement

Saliva plays a crucial role in protecting teeth from acid damage.

Modern approaches include:

- Salivary stimulants
- Sugar-free chewing gum
- Saliva substitutes
- Adequate hydration

Minimally Invasive Dentistry

Contemporary treatment philosophy emphasizes preservation of healthy tooth structure.

Principles include:

- Early intervention
- Conservative restorations
- Adhesive techniques
- Continuous monitoring
- Personalized treatment planning

This approach improves long-term outcomes while minimizing unnecessary tissue removal.

Future Perspectives

Emerging technologies may further improve the management of pathological tooth wear.

Promising developments include:

- Biomimetic restorative materials
- Regenerative dental therapies
- Artificial intelligence-assisted diagnosis
- Advanced enamel repair technologies
- Personalized preventive strategies based on genetic risk assessment

These innovations have the potential to revolutionize the prevention and treatment of tooth wear in the coming decades.

Conclusion

Pathological tooth wear represents a significant clinical challenge that can negatively affect oral health, function, and aesthetics. Modern treatment approaches combine preventive strategies,

minimally invasive restorative techniques, digital technologies, and management of underlying etiological factors. Early diagnosis and individualized treatment planning remain essential for successful outcomes. Continued advancements in dental materials, digital workflows, and regenerative medicine are expected to further enhance the effectiveness of treatment and improve patient quality of life.

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