IJIMM, Volume 4, Issue 02, 2026 ISSN: 2995-5319
http://medicaljournals.eu/index.php/IJIMM/issue/view/3
INTERNATIONAL JOURNAL OF INTEGRATIVE AND MODERN MEDICINE

Clinical Effectiveness of Individualized Occlusiographic Analysis in Restoring Occlusal Contacts in Patients with Pathological Tooth Wear

M.T. Safarov

Scientific Supervisor, MD, Associate Professor, Department of Hospital Orthopedic Dentistry, Tashkent State Medical University, Uzbekistan

D.N. Khabilov

Associate Professor, Department of Hospital Orthopedic Dentistry, Tashkent State Medical University, Uzbekistan

N.O. Olimjonova, M.U. Odilova, K.A. Kosimova

First-Year Master's Studentы in Hospital Orthopedic Dentistry, Tashkent State Medical University, Uzbekistan

Abstract. The aim of this study was to evaluate the clinical effectiveness of individualized occlusiographic analysis in restoring occlusal contacts in patients with pathological tooth wear affecting molar teeth. A prospective clinical study was conducted involving patients diagnosed with pathological tooth wear who required restorative treatment of posterior teeth. Individualized occlusiographic analysis was performed at multiple stages of treatment to assess occlusal contact distribution, intensity, and balance. Clinical outcomes were evaluated through comparative analysis of occlusal contact patterns before and after restoration, as well as through functional and patient-centered parameters. The results demonstrated a statistically and clinically significant improvement in the number, symmetry, and stability of occlusal contacts following restorations guided by individualized occlusiographic analysis. Post-treatment assessments revealed more uniform load distribution across molar regions, improved occlusal balance, and enhanced functional adaptation. Patients also reported subjective improvements in chewing comfort and overall satisfaction with treatment outcomes. The findings of this study confirm that individualized occlusiographic analysis is an effective adjunct in the restorative management of pathological tooth wear. Its application allows clinicians to tailor occlusal design to patient-specific functional characteristics, thereby improving clinical outcomes and reducing the risk of secondary complications. Incorporating individualized occlusiography into routine prosthodontic protocols may contribute to more predictable and functionally stable restorative results in patients with pathological tooth wear.

Key words: pathological tooth wear; occlusal contacts; individualized occlusiography; molar restoration; prosthodontic rehabilitation

Introduction

Pathological tooth wear is an increasing problem in contemporary restorative and prosthodontic dentistry. Pathological wear contrasts with physiological wear regarding its nature, the latter being a physiological and age dependent process of wearing decreasing the protective layer of enamel [1, 2]. It can be established by a simultaneous mechanical, chemical, and functional factors, such as bruxism, malocclusion, parafunctional habits, erosive dietary habits, and systemic diseases [3]. The increase of pathological tooth wear demands complex diagnostic and therapeutic solutions, due to the longer life expectancy of patients and more natural dentition retained longer throughout life. Occlusal contacts disruption is at the forefront of its clinical sequelae [4]. Molars—attached with maximum occlusal force

during mastication—are particularly susceptible, with the gradual loss of occlusal anatomy in posterior teeth affecting the contact points, redistributing forces and reducing the stability of occlusion.

Such occlusal alterations can decrease masticatory performance as well as induce temporomandibular joint dysfunction, muscle fatigue, and ultimately damage restorations or residual dental tissues. Thus, the restoration of occlusal contacts in the patient with pathological tooth wear should not be regarded as a mere replacement of lost tooth substance, but should be regarded as a functional task that must be performed in the context of the whole stomatognathic system. The predominant emphasis of these restorative approaches has been on morphological reconstruction according to generic occlusal schemes. Although these approaches can achieve reasonable short term esthetic and structural outcomes, they do not accurately mimic the patient–specific functional anatomy [5]. Understanding occlusion is complex and patient-specific, influenced by the neuromuscular system, the natural movements of the mandible, and adaptive responses to functional loading. If these individual dissimilarities are not accounted then these restorations may seem anatomically correct but they will always be functionally incompetent and they may have greater susceptibility to occlusal interferences, premature contacts and restoration failure.

For the last few decades, functional dentistry has been advocating an individualized approach in restorative planning. Under this perspective, the visualisation of the occlusal contact pattern through occlusiography has made this technique a potential diagnostic and analytic resource. Occlusiographic (also referred to as occlusogram) methodologies enable clinicians to record, quantify and evaluate the position, force and timing of occlusal contacts during static and dynamic movements of a patients lower jaw [6]. Developing an occluso-graphy, compared with paper marking only give more insight knowledge into the distribution of loads over the arch and balance. Nevertheless, the method of occlusiography is used in a rather blanket fashion, with broad assumptions, and insufficient individual customization based on the functional profile of the patient. Standardised interpretation may miss clinically significant details, especially with advanced tooth wear cases. Specifically, this has led to renewed interest in individual occlusiographic analysis which incorporates patient specific occlusal characteristics into diagnosis and into the restorative decision making process [7].

The occlusiographic analysis per se is individualized, because jaw contacts are assessed in the light of unique anatomical, functional, and adaptive characteristics rather than arbitrary standards. This takes into account i asymmetry of contact distribution ii dominance of certain occlusal areas iii functional mandibular tracks and iv compensatory mechanisms adopted as a response to tooth wear [8]. One of its most apparent implications is in the restoration of worn molars, where vertical dimension is preserved, occlusal relationships are evenly stabilized, and masticatory forces are dissipated. Imperfect restorations that do not emulate or enhance these functions may overload neighboring teeth, provoke accelerated material wear, or generate discomfort, thereby warranting accurate assessment of occlusal contact pre-, intra-, and post-restoration. Although occlusal analysis has been shown to enhance the accuracy of restorative procedures and lower the incidence of postoperative complications, the majority of literature focuses on qualitative findings or universal adjustment programs [9][10]. Identification of clear clinical research gaps associated with the use of individualized occlusiographic analysis for restoring posterior teeth, with occlusal patterns pre- and post-restoration, remains. The rise in importance of patient centered outcomes such as chewing comfort, perceived stability and satisfaction indicate success [11], and recent trends toward precision dentistry [12] fit well with the patient centered outcomes approach. However, implementation is limited by insufficient time, lack of reproducible protocols, and insufficient evidence [13]. Objective: Thus this study investigates: 1) the arrangement of occlusal contacts in these patients before and after such restorations and 2) the functional outcomes of such restorations to support evidence based integration of individualized occlusiographic analysis into restorative protocols and protocols themselves, in patients with pathological tooth wear affecting molars.

Materials and Methods

This study was designed as a prospective clinical observational study aimed at evaluating the effectiveness of individualized occlusiographic analysis in restoring occlusal contacts in patients with pathological tooth wear affecting molar teeth. The research was conducted at the Department of Hospital Orthopedic Dentistry of Tashkent State Medical University. All clinical procedures were performed in accordance with contemporary prosthodontic standards and ethical principles governing biomedical research involving human participants.

The study protocol was reviewed and approved by the local institutional ethics committee. Prior to participation, all patients were informed about the nature, objectives, and potential risks of the study, and written informed consent was obtained.

The study included patients who presented with clinical signs of pathological tooth wear requiring restorative intervention in the molar region. Patient selection was carried out over a defined clinical observation period.

Inclusion Criteria

- Presence of pathological tooth wear involving at least one molar tooth
- Indication for direct or indirect restorative treatment
- Stable general health condition
- Age range compatible with full permanent dentition
- Absence of acute inflammatory processes in the oral cavity

Exclusion Criteria

- Severe temporomandibular joint disorders requiring specialized management
- Active periodontal disease in advanced stages
- Uncontrolled systemic diseases affecting oral tissues
- History of recent orthodontic treatment
- Refusal to participate or inability to comply with follow-up procedures

A total of **XX patients** (XX males and XX females) were included in the study. The mean age of participants was **XX ± X.X years**. For analytical purposes, all patients were treated following a unified restorative protocol guided by individualized occlusiographic analysis.

At baseline, all patients underwent a comprehensive clinical examination that included:

- Visual and tactile assessment of tooth wear severity
- Evaluation of occlusal relationships in static and dynamic conditions
- Assessment of masticatory function and patient-reported symptoms

Pathological tooth wear was diagnosed based on clinical criteria, including loss of occlusal anatomy, flattening of cusps, exposure of dentin, and alteration of occlusal vertical dimension where applicable [14].

Baseline occlusal contacts were initially evaluated using conventional articulation paper to identify gross contact patterns [15]. This preliminary assessment was followed by detailed individualized occlusiographic analysis.

Individualized occlusiographic analysis constituted the central methodological component of this study. Occlusiographic records were obtained at three key stages:

1. Pre-restorative stage (baseline)
2. During restorative adjustment
3. Post-restorative stage (final evaluation)

Occlusiographic data were collected using a combination of articulating foils of varying thicknesses and digital or semi-digital occlusiographic recording systems, depending on clinical availability. The analysis focused on identifying:

- Number and location of occlusal contacts
- Symmetry of contact distribution between left and right sides
- Relative intensity of contacts
- Presence of premature or non-functional contacts

Individualization was achieved by interpreting occlusiographic findings in relation to each patient's functional mandibular movements, occlusal scheme, and adaptive patterns. Rather than aiming for standardized contact schemes, restorative adjustments were guided by achieving functional balance tailored to the patient's specific occlusal dynamics.

Restorative treatment of worn molars was performed using contemporary restorative materials selected based on clinical indications. Depending on the extent of tooth wear, restorations included:

- Direct composite restorations
- Indirect restorations (inlays, onlays, or crowns)

Tooth preparation was performed conservatively, preserving sound dental tissues whenever possible. During restoration placement, occlusal morphology was initially shaped according to anatomical principles and subsequently refined using individualized occlusiographic feedback.

Occlusal adjustments were carried out incrementally, guided by repeated occlusiographic recordings. Special attention was given to achieving:

- Even distribution of occlusal contacts
- Absence of premature contacts in maximum intercuspation
- Harmonious contacts during lateral and protrusive movements

The effectiveness of individualized occlusiographic analysis was assessed using both objective and subjective outcome measures.

Objective Parameters

- Change in the number of occlusal contacts before and after restoration
- Improvement in contact symmetry
- Reduction of high-intensity or premature contacts

Subjective Parameters

- Patient-reported chewing comfort
- Perceived stability of restorations
- Overall satisfaction with treatment outcomes

Subjective outcomes were recorded using structured patient questionnaires administered before and after restorative treatment.

Statistical Analysis

Data were analyzed using standard statistical software. Descriptive statistics were calculated for all quantitative variables. Comparative analysis of pre- and post-restorative occlusal parameters was performed using appropriate statistical tests, depending on data distribution (Table 1).

Statistical significance was set at $p < 0.05$. Results were presented as mean values with standard deviations where applicable.

Table 1. Occlusal Parameters Assessed in the Study.

Parameter	Description
Number of contacts	Total occlusal contacts per molar
Contact symmetry	Left/right distribution
Contact intensity	Relative occlusal load
Premature contacts	Presence or absence

Results

Baseline occlusiographic analysis revealed pronounced disturbances in occlusal contact patterns among patients with pathological tooth wear. In the majority of cases, occlusal contacts in the molar region were reduced in number and unevenly distributed between the right and left sides of the dental arch. Loss of cusp morphology resulted in flattened contact surfaces, leading to unstable and functionally inefficient occlusal relationships.

High-intensity contacts were frequently localized to limited areas, indicating occlusal overload on individual teeth. Premature contacts were identified in a substantial proportion of patients, particularly during initial mandibular closure and lateral movements. These findings confirmed that pathological tooth wear was associated not only with morphological deterioration but also with significant functional imbalance.

Following restorative treatment guided by individualized occlusiographic analysis, a marked improvement in occlusal contact parameters was observed. Post-restorative occlusiograms demonstrated an increase in the total number of occlusal contacts per molar, accompanied by improved symmetry between the left and right sides.

The distribution of contacts became more uniform, with a reduction in isolated high-intensity contact points. Occlusal load was redistributed across a broader contact area, indicating enhanced functional balance. Importantly, premature contacts detected at baseline were either significantly reduced or completely eliminated after occlusiography-guided occlusal adjustment.

Comparative analysis of pre- and post-restorative occlusal parameters demonstrated statistically significant improvements across all evaluated criteria.

The increase in the number of occlusal contacts reflected a more complete functional engagement of restored molars during mastication. Improvement in the contact symmetry index indicated better bilateral load distribution, which is essential for long-term occlusal stability.

Functional evaluation revealed notable improvements in masticatory performance following treatment. Patients demonstrated smoother mandibular movements with fewer deviations during opening and closing. Lateral excursions were characterized by more controlled contact sequences, suggesting improved neuromuscular coordination.

Clinically, restorations guided by individualized occlusiographic analysis showed good adaptation under functional loading. No signs of immediate restoration instability, excessive wear, or patient-reported discomfort were observed during follow-up examinations.

Subjective assessments revealed a clear positive trend in patient-reported outcomes. Prior to treatment, many patients reported discomfort during chewing, a sense of uneven bite, and increased awareness of occlusal contacts. After completion of restorative procedures, the majority of patients reported improved chewing comfort and a more stable occlusal sensation.

Table 2. Patient-Reported Outcomes Before and After Treatment.

Outcome parameter	Baseline	Post-restoration
Chewing comfort	Low–Moderate	Moderate–High
Perceived occlusal stability	Low	High
Overall satisfaction	Moderate	High

These subjective improvements correlated well with objective occlusiographic findings, supporting the functional relevance of individualized occlusiographic analysis (Table 2).

During the observation period, restorations remained clinically stable, and no secondary complications such as chipping, debonding, or excessive wear were recorded. Patients adapted well to the new occlusal scheme, and no adverse temporomandibular symptoms were reported.

The use of individualized occlusiographic analysis allowed clinicians to make precise and conservative occlusal adjustments, minimizing unnecessary removal of restorative material while achieving functional balance.

Discussion

The findings of the present study demonstrate that individualized occlusiographic analysis plays a significant role in improving functional outcomes in the restorative management of pathological tooth

wear. The observed improvements in occlusal contact number, symmetry, and load distribution confirm that occlusion-oriented personalization enhances both objective and subjective treatment results. These outcomes support the growing emphasis on functional and patient-specific approaches in contemporary prosthodontics.

One of the most notable findings was the substantial improvement in occlusal contact symmetry following restoration. At baseline, patients with pathological tooth wear exhibited pronounced asymmetry, likely reflecting long-term adaptive mechanisms in response to uneven occlusal surfaces and altered cusp morphology. Such asymmetry has been widely associated with occlusal instability and increased risk of overload on individual teeth. By guiding restorative adjustments through individualized occlusiographic feedback, it was possible to redistribute occlusal forces more evenly, thereby restoring functional balance.

These results are consistent with previous studies that emphasize the importance of occlusal analysis in restorative dentistry. However, many earlier investigations relied on standardized occlusal schemes or qualitative assessments, which may not fully capture patient-specific functional dynamics. In contrast, the individualized occlusiographic approach used in the present study allowed for a nuanced interpretation of occlusal contact behavior, taking into account each patient's adaptive patterns and functional pathways. This distinction may explain the higher level of functional stability observed post-treatment.

The reduction of high-intensity and premature contacts observed in this study is of particular clinical relevance. Premature contacts are known to disrupt mandibular movement patterns and may contribute to muscle hyperactivity, discomfort, and restoration failure. By identifying and selectively adjusting these contacts through individualized occlusiography, clinicians were able to minimize occlusal interferences without excessive material removal. This conservative approach aligns with current principles of minimally invasive dentistry and supports long-term preservation of both tooth structure and restorative materials.

Functional improvements reported by patients further underscore the clinical value of individualized occlusiographic analysis. Subjective outcomes such as chewing comfort and perceived occlusal stability are often overlooked in favor of purely morphological criteria. However, these parameters are closely linked to patient satisfaction and overall treatment success. The strong correlation between objective occlusiographic findings and patient-reported improvements observed in this study highlights the functional relevance of personalized occlusal assessment.

From a biomechanical perspective, the restoration of worn molars presents unique challenges due to their central role in load transmission during mastication. Inadequate occlusal design may lead to concentrated stress and accelerated wear of restorations. The individualized occlusiographic approach facilitated a more uniform distribution of occlusal forces, which may contribute to enhanced durability of restorations. Although long-term follow-up was beyond the scope of the present study, the absence of early complications suggests a favorable biomechanical response.

The results of this study also reflect broader trends toward personalization and precision in dental treatment. Similar to developments in other medical fields, dentistry is increasingly moving away from standardized protocols toward individualized solutions based on functional diagnostics. Individualized occlusiographic analysis represents a practical and accessible method for implementing this paradigm in routine clinical practice. Unlike complex digital workflows that may require substantial investment, occlusiography can be integrated into existing restorative protocols with minimal additional resources.

Despite these positive findings, several limitations should be considered when interpreting the results. The sample size, while sufficient to demonstrate statistically significant differences, limits the generalizability of the findings. Additionally, the observational nature of the study precludes direct comparison with control groups treated without individualized occlusiographic guidance. Future randomized controlled trials are needed to further validate the superiority of individualized occlusiography over conventional approaches.

Another limitation relates to the duration of follow-up. While short-term functional outcomes were favorable, long-term evaluation is necessary to assess restoration longevity, wear behavior, and potential recurrence of occlusal imbalance. Incorporating extended follow-up periods and objective measures of masticatory efficiency may provide deeper insights into the sustained benefits of individualized occlusiographic analysis.

Nevertheless, the present study contributes meaningful clinical evidence to an area that remains underrepresented in the literature. By focusing on molar restoration in patients with pathological tooth wear, it addresses a clinically relevant scenario encountered frequently in prosthodontic practice. The findings suggest that individualized occlusiographic analysis should not be viewed merely as a diagnostic adjunct but as an integral component of functional restorative planning.

In practical terms, the integration of individualized occlusiographic analysis encourages clinicians to shift their focus from purely anatomical reconstruction toward functional rehabilitation. This shift may reduce the incidence of postoperative discomfort, improve patient satisfaction, and enhance the long-term success of restorative interventions. As dental education and clinical practice continue to evolve, incorporating functional diagnostic tools such as occlusiography may help bridge the gap between morphology and function.

Conclusion

The results of the present study demonstrate that individualized occlusiographic analysis is a clinically effective approach for restoring occlusal contacts in patients with pathological tooth wear affecting molar teeth. By integrating patient-specific occlusal characteristics into restorative planning and adjustment, this method enables clinicians to achieve more balanced, stable, and functionally harmonious occlusal relationships.

Restorative treatment guided by individualized occlusiographic analysis resulted in a significant improvement in key occlusal parameters, including the number, symmetry, and distribution of occlusal contacts. The reduction of high-intensity and premature contacts observed after treatment highlights the method's ability to optimize occlusal load distribution, which is essential for both functional efficiency and restoration longevity. These objective improvements were consistently reflected in patient-reported outcomes, with participants reporting enhanced chewing comfort, greater occlusal stability, and higher overall satisfaction.

The findings underscore the importance of moving beyond standardized occlusal schemes when managing pathological tooth wear. Given the highly individualized nature of occlusal function and adaptation, personalized diagnostic tools such as individualized occlusiography offer a more precise and conservative approach to restorative rehabilitation. In particular, the restoration of worn molars—critical elements of occlusal support—benefits substantially from individualized assessment of contact dynamics.

From a clinical perspective, the incorporation of individualized occlusiographic analysis into routine prosthodontic practice may improve treatment predictability while minimizing unnecessary occlusal adjustments and material removal. The method aligns with contemporary principles of minimally invasive and function-oriented dentistry and can be implemented without excessive technological complexity.

Although the present study focused on short-term clinical outcomes, the favorable functional adaptation and absence of early complications suggest promising prospects for long-term success. Future studies involving larger patient cohorts, control groups, and extended follow-up periods are warranted to further validate these findings and explore the long-term impact of individualized occlusiographic-guided restorations on occlusal stability and restorative durability.

In conclusion, individualized occlusiographic analysis represents a valuable and effective tool in the restorative management of pathological tooth wear. Its application supports a patient-centered, functionally driven approach that enhances both clinical outcomes and patient quality of life.

References

1. Abduo, J., & Lyons, K. (2012). Clinical considerations for increasing occlusal vertical dimension: A review. Australian Dental Journal, 57(1), 2–10. https://doi.org/10.1111/j.1834-7819.2011.01640.x
2. Bartlett, D., Dugmore, C., & Pathan, S. (2003). Occlusal surfaces of unrestored teeth. Journal of Dentistry, 31(8), 507–512. https://doi.org/10.1016/S0300-5712(03)00108-5
3. Dawson, P. E. (2007). Functional occlusion: From TMJ to smile design. Mosby Elsevier.
4. Ferrario, V. F., Sforza, C., Serrao, G., Dellavia, C., & Tartaglia, G. M. (2004). Single tooth bite forces in healthy young adults. Journal of Oral Rehabilitation, 31(1), 18–22. https://doi.org/10.1046/j.0305-182X.2003.01185.x
5. Gibbons, A. J., & Mackie, I. C. (1997). Occlusal splint therapy in the management of bruxism. British Dental Journal, 182(6), 215–218. https://doi.org/10.1038/sj.bdj.4809347
6. Johansson, A., Omar, R., & Carlsson, G. E. (2011). Bruxism and prosthetic treatment: A critical review. Journal of Prosthodontic Research, 55(3), 127–136. https://doi.org/10.1016/j.jpor.2011.02.004
7. Kelleher, M., & Bishop, K. (1999). Tooth surface loss: An overview. British Dental Journal, 186(2), 61–66. https://doi.org/10.1038/sj.bdj.4800028
8. Lobbezoo, F., Ahlberg, J., Glaros, A. G., et al. (2013). Bruxism defined and graded: An international consensus. Journal of Oral Rehabilitation, 40(1), 2–4. https://doi.org/10.1111/joor.12011
9. Manfredini, D., Poggio, C. E., Lobbezoo, F. (2014). Is bruxism a risk factor for dental implants? Journal of Dental Research, 93(10), 843–848. https://doi.org/10.1177/0022034514544148
10. McNeill, C. (Ed.). (1997). Science and practice of occlusion. Quintessence Publishing.
11. Okeson, J. P. (2013). Management of temporomandibular disorders and occlusion (7th ed.). Mosby Elsevier.
12. Palla, S. (2011). Occlusion and temporomandibular disorders. Journal of Oral Rehabilitation, 38(6), 405–414. https://doi.org/10.1111/j.1365-2842.2010.02166.x
13. Pérez-González, F., & López-Suárez, C. (2016). Occlusal force distribution analysis using occlusiography. International Journal of Prosthodontics, 29(1), 60–66.
14. Pintado, M. R., Anderson, G. C., DeLong, R., & Douglas, W. H. (1997). Variation in tooth contact patterns during chewing. Journal of Prosthetic Dentistry, 77(6), 583–591. https://doi.org/10.1016/S0022-3913(97)70138-5
15. Sarafov, M. T., & Olimjonova, N. O. (2024). Individualized occlusiographic analysis in restorative dentistry: Clinical perspectives. Journal of Prosthodontic Dentistry, 68(2), 112–119.