EOC
EUROASIAN
ONLINE
CONFERENCES

ENGLAND
CONFERENCE

INTERNATIONAL CONFERENCE ON MULTIDISCIPLINARY STUDIES AND EDUCATION



Google Scholar zenodo OpenAIRE doi digital object identifier

INTERNATIONAL CONFERENCE ON MULTIDISCIPLINARY STUDIES AND EDUCATION: a collection scientific works of the International scientific conference – London, England, 2025. Issue 5

Languages of publication: Uzbek, English, Russian, German, Italian, Spanish

The collection consists of scientific research of scientists, graduate students and students who took part in the International Scientific online conference **«INTERNATIONAL CONFERENCE ON MULTIDISCIPLINARY STUDIES AND EDUCATION»**. Which took place in London , 2025.

Conference proceedings are recommended for scientists and teachers in higher education establishments. They can be used in education, including the process of post - graduate teaching, preparation for obtain bachelors' and masters' degrees. The review of all articles was accomplished by experts, materials are according to authors copyright. The authors are responsible for content, researches results and errors.

UDC: 616.314-76:613.96

EVALUATION OF THE ANATOMICAL AND FUNCTIONAL CONDITION OF THE ORAL CAVITY IN INDIVIDUALS WHO USE FIXED DENTAL PROSTHESES LONG-TERM

Aliyeva Mavluda Tursunaliyevna qizi
Central Asian Medical University International Medical University Assistant, Burhoniddin Marg'inoniy Street-64, Phone: +998 95 485 00 70, Email: info@camuf.uz, Fergana, Uzbekistan
Email: aliyevamavluda@gmail.com
Orcid: https://orcid.org/0009-0005-7472-7741

Abstract: Orthodontic treatment, particularly with fixed appliances, creates a complex intraoral environment that significantly increases the risk of plaque accumulation, enamel decalcification, gingival inflammation, and long-term periodontal complications. Therefore, individualized oral hygiene strategies have become an essential component of modern orthodontic care. This theoretical review aims to analyze the development and effectiveness of individualized hygiene measures for patients undergoing orthodontic treatment, drawing on existing scientific literature, textbooks, and international clinical guidelines. The paper discusses the mechanisms through which orthodontic appliances modify the oral microenvironment, evaluates conventional and modern hygiene tools, and examines patient-centered behavioral approaches designed to improve compliance. Additionally, the review highlights digital innovations such as mobile-based reminders, smart toothbrush sensors, and AI-supported monitoring systems, which have shown promise in enhancing self-care behavior. Evidence from published studies consistently demonstrates that personalized hygiene programs—tailored according to age, appliance type, oral health status, and psychosocial factors—are significantly more effective than standardized instructions. The review concludes that a multidisciplinary approach combining mechanical cleaning, chemical antimicrobials, regular professional supervision, and patient-specific motivational strategies is crucial for achieving optimal oral health outcomes during orthodontic treatment.

Keywords: orthodontics, Individual hygiene, Fixed appliances, Plague control, Enamel decalcification, Gingival health, Compliance, Oral microenvironment, Preventive dentistry, Patient-centered care

Intradaction: Orthodontic therapy plays a crucial role in correcting malocclusions, improving facial esthetics, and restoring oral functionality. However, the process of tooth movement, particularly when fixed orthodontic appliances are used, introduces new challenges to maintaining adequate oral hygiene. Brackets, bands, archwires, ligatures, and auxiliary attachments create additional retention sites where dental plaque can accumulate more easily than on natural tooth surfaces. Over time, this accumulation can lead to

enamel decalcification, white spot lesions, gingivitis, halitosis, and even early periodontal breakdown if proper preventive measures are not implemented. For these reasons, oral hygiene management is considered an integral and indispensable component of orthodontic care.

The oral environment undergoes significant shifts once fixed appliances are placed. Numerous studies indicate that the insertion of brackets alters the biofilm ecology by promoting the growth of acidogenic and aciduric bacterial species, including Streptococcus mutans and Lactobacillus spp. The presence of archwires and elastomeric ligatures restricts natural cleansing mechanisms, such as saliva flow and tongue movement, thereby making mechanical plaque removal more difficult. In addition, patients often find brushing and interdental cleaning time-consuming and inconvenient due to the physical obstruction created by orthodontic components. Consequently, patient compliance with oral hygiene recommendations often declines shortly after treatment begins.

To address these challenges, individualized oral hygiene programs have become increasingly emphasized in modern dentistry. Unlike generalized instructions that offer uniform advice to all patients, individualized hygiene measures are tailored to a patient's specific risk level, appliance type, oral anatomy, behavior, and cultural or socioeconomic background. Such an approach recognizes that every patient presents unique challenges and requires customized interventions for optimal results. For example, adolescents undergoing fixed appliance therapy may need motivational strategies that differ significantly from those used with adults. Similarly, patients with pre-existing gingival inflammation may require more intensive chemical plaque control compared to individuals with healthy periodontal tissues.

Individualized strategies typically include a combination of mechanical and chemical plaque control, lifestyle counseling, professional prophylaxis, and behavioral interventions. Mechanical plaque control remains the cornerstone of oral hygiene, with orthodontic toothbrushes, electric brushes, interdental brushes, water flossers, and orthodontic wax all contributing to cleaner tooth surfaces and reduced inflammation. Chemical agents, such as fluoride toothpaste, fluoride varnishes, chlorhexidine mouth rinses, and antimicrobial gels, supplement mechanical cleaning by reducing bacterial load and enhancing enamel resistance to demineralization.

In recent years, digital technologies have transformed orthodontic hygiene education. Smartphone applications, artificial intelligence–based brushing guidance systems, and tele-orthodontic platforms have shown promise in supporting patient compliance by offering real-time feedback, reminders, and personalized instructions. These innovations have introduced a new

dimension to individualized hygiene programs that merges behavioral science with technological advancements.

Ultimately, the development and evaluation of individualized hygiene measures represent a key area of orthodontic research and clinical practice. An effective program not only prevents oral diseases during treatment but also promotes long-term oral health habits that patients can retain after appliance removal. The present review synthesizes current evidence on the effectiveness of individualized hygiene interventions and proposes a comprehensive framework for their implementation in orthodontic care.

Results and Discussion:

1. Changes in Oral Microenvironment During Orthodontic Treatment: The placement of fixed orthodontic appliances introduces substantial modifications to the oral ecosystem. The composition of dental biofilm changes rapidly within the first four weeks following appliance installation. Several studies have shown that microbial counts of Streptococcus mutans and Lactobacillus increase significantly during this period due to the creation of new stagnation areas. Unlike natural tooth surfaces, bracket wings, base pads, elastomerics, and ligature ties form niches in which biofilm adheres strongly and becomes more resistant to removal. Salivary buffering capacity decreases locally, and localized pH drops below the critical threshold of 5.5, predisposing enamel to demineralization. These microenvironmental changes justify the need for intensified and highly individualized hygiene measures for each patient.

2. Mechanical Hygiene Measures and Their Individualization: Mechanical plaque removal remains the foundation of all hygiene programs. However, its effectiveness depends heavily on patient technique, tool selection, and behavioral consistency. Therefore, individualized recommendations are necessary.

2.1 Manual vs. Electric Toothbrushes

Electric toothbrushes with oscillating-rotating or sonic action have been found to outperform manual brushes in removing plaque around brackets. Patients with limited motor skills, younger children, or individuals with poor brushing technique particularly benefit from power brushes. Conversely, highly motivated adults with good manual dexterity may achieve comparable results with manual orthodontic toothbrushes featuring V-shaped bristles. Tailoring brush selection to patient needs forms a core component of individualized programs.

2.2 Interdental Cleaning Tools: Traditional dental floss is often difficult to use with fixed appliances, leading to poor compliance. Interdental brushes allow easier access beneath archwires and between contacts. However, their ideal size varies; a brush too large may damage the papilla, while one too

small may fail to clean effectively. Clinicians must therefore select sizes according to each patient's interdental anatomy.

Water flossers represent another alternative that has shown effectiveness in reducing bleeding and plaque scores. Patients with periodontal risk factors, dexterity limitations, or tight schedules may particularly benefit from incorporating water flossers into their routine.

2.3 Orthodontic Wax and Accessory Tools: Soft tissue irritation from brackets and wires can reduce a patient's motivation to maintain hygiene due to discomfort. Orthodontic wax alleviates mucosal irritation and indirectly improves compliance. Proxabrushes, tip stimulators, and end-tuft brushes help reach difficult areas such as molar bands or palatal brackets. Selecting appropriate accessories for each patient enhances individualized care.

3. Chemical Agents for Enhanced Prevention:

Mechanical cleaning is insufficient alone for many orthodontic patients. Chemical plaque control supplements mechanical methods, especially for patients at high risk of caries or gingivitis.

3.1 Fluoride Therapy

Fluoride dentifrices (1,000–1,500 ppm) represent the baseline preventive measure for all orthodontic patients. However, individualized fluoride protocols may involve:

Fluoride mouth rinses for adolescents with poor compliance

High-fluoride 5,000 ppm toothpaste for high-risk individuals

Fluoride varnish applications every 3–6 months for patients prone to decalcification

Fluoride gels for nighttime remineralization therapy

Tailoring fluoride use prevents white spot lesions and enhances enamel resistance

3.2 Antimicrobial Agents

Chlorhexidine gluconate remains the gold standard for chemical plaque control. Short-term chlorhexidine regimens (0.12% or 0.2%) benefit patients with severe gingivitis or poor plaque control. However, due to side effects such as staining and taste alteration, chlorhexidine should be prescribed based on individual periodontal risk, not universally.

Herbal antimicrobials, essential oil rinses, and cetylpyridinium chloride solutions offer milder alternatives suitable for long-term use, particularly for patients sensitive to chlorhexidine.

4. Behavioral Approaches and Patient Compliance: Compliance represents the core determinant of success in individualized hygiene programs. Even the most advanced tools are ineffective if patients fail to use them consistently.

4.1 Motivational Interviewing

Motivational interviewing involves patient-centered communication designed to enhance intrinsic motivation rather than impose instructions. Adolescents

respond especially well to this approach, as it respects autonomy while guiding behavior change.

4.2 Self-Monitoring and Feedback:

Studies show that patients who visually track their plaque scores or gingival bleeding are more likely to improve hygiene. Plaque-disclosing agents allow patients to visually detect inadequately cleaned areas, reinforcing proper technique.

4.3 Educational Interventions

One-to-one education, instructional videos, interactive demonstrations, and visual aids significantly improve patient understanding. Tailoring the educational style by age, language, and cultural background enhances effectiveness.

5. Digital and Technological Innovations

Modern orthodontics increasingly incorporates digital tools to support individualized hygiene.

5.1 Smartphone Applications

Oral hygiene apps can send reminders, track brushing frequency, provide instructional videos, and generate personalized feedback. Studies have shown significant reductions in plaque scores among app users compared with traditional instruction.

5.2 Smart Toothbrush Technology

Smart toothbrushes equipped with pressure sensors, gyroscopic orientation detection, and AI-driven brushing maps can guide technique in real time. These devices create personalized brushing reports that help clinicians assess patient compliance.

5.3 Tele-orthodontics and Remote Monitoring

Digital platforms allow patients to upload photos of their teeth for professional evaluation. Remote monitoring ensures that hygiene issues are addressed before complications arise. Such systems increase accountability and reduce the incidence of decalcification and gingival inflammation.

6. Professional Prophylaxis and Clinical Supervision: Professional cleaning at intervals of 4–8 weeks is essential for most orthodontic patients. Individuals with rapidly accumulating calculus or inflamed gingiva may require more frequent visits. Clinicians can customize recall intervals based on plaque indices, gingival scores, and patient compliance levels. Fluoride varnish, sealant application, and high-viscosity glass ionomer barrier coatings can be selectively applied for patients with high demineralization risk. These preventive strategies should be adapted to each patient's specific needs.

7. Evaluating the Effectiveness of Individualized Hygiene Measures

Success can be evaluated through multiple indicators:

Plaque index reduction

Gingival bleeding scores

Decrease in white spot lesions
Improvement in patient compliance
Reduced halitosis
Long-term periodontal stability
Evidence consistently demonstrates that individualized programs outperform generic hygiene instructions. Tailored interventions address personal risk factors, behavioral challenges, and hygiene deficits more effectively.

Conclusion: Individualized hygiene measures represent a cornerstone of successful orthodontic treatment. Fixed appliances significantly increase plaque retention, modify the oral microenvironment, and elevate the risk of caries, white spot lesions, and gingival inflammation. Therefore, standardized hygiene instructions are insufficient for achieving optimal outcomes. Instead, individualized programs—targeted to age, risk level, appliance type, lifestyle, and compliance—offer superior protection and promote long-term oral health. This review demonstrates that a comprehensive individualized approach integrates mechanical cleaning tools, chemical antimicrobial therapies, fluoride protocols, digital technologies, behavioral strategies, and professional supervision. Evidence from scientific literature clearly supports the superiority of personalized methods over generic recommendations. Digital innovations, motivational interviewing, and remote monitoring further enhance adherence and have been shown to reduce plaque scores and gingival inflammation substantially. Ultimately, an individualized hygiene protocol not only preserves oral health during orthodontic treatment but also fosters lifelong preventive habits. As orthodontic technologies continue to evolve, the integration of personalized digital support systems, advanced preventive materials, and tailored behavioral interventions will further strengthen the effectiveness of oral hygiene strategies for patients undergoing orthodontic therapy.

References:

1. Boyd RL, Baumrind S. The effects of orthodontic treatment on periodontal status. Am J Orthod Dentofacial Orthop.
2. van der Weijden F, Slot DE. Oral hygiene in orthodontic patients: a systematic review. Am J Orthod Dentofacial Orthop.
3. Ergashev, B. (2025). Sirkon dioksid qoplamalari va materialining klinik laborator ahamiyati. Journal of Uzbekistan's Development and Research (JUDR), 1(1), 627–632.
4. Ergashev, B. (2025). Gingivitning bakteriologik etiologiyasi va profilaktikasi. In International Scientific Conference: Innovative Trends in Science, Practise and Education, 1(1), 122–128.
5. Richter, A. E., Arruda, A. O., Peters, M. C., & Sohn, W. (2011). Incidence of caries lesions among patients treated with comprehensive orthodontics.

American Journal of Orthodontics and Dentofacial Orthopedics, 139(5), 657–664.
6. Ergashev, B. (2025). Karies va paradont kasalliklari profilaktikasi. Modern Science and Research, 4(4), 732–741.
7. Ergashev, B. (2025). Psychological support for cancer patients. ИКРО журнал, 15(1), 164–167.
8. Zimmer, S., Bizhang, M., & Seemann, R. (2020). Role of powered toothbrushes in orthodontic oral hygiene management. International Journal of Dental Hygiene, 18(4), 442–448.
9. Farhadian, N., Miresmaeili, A., Eslami, B., & Mehrabi, S. (2017). Effect of chlorhexidine mouthwash on plaque accumulation and gingival inflammation in orthodontic patients. Journal of Dentistry, 14(1), 1–8.
10. Ergashev, B., & Raxmonov, Sh. (2025). Oral trichomoniasis: Epidemiology, pathogenesis, and clinical significance. Kazakh Journal of Ecosystem Restoration and Biodiversity, 1(1), 19–27.
11. Ergashev, B., & Raxmonov, Sh. (2025). Transmission dynamics of tuberculosis. Kazakh Journal of Ecosystem Restoration and Biodiversity, 1(1), 28–35.
12. Ergashev, B. J. (2025). Uch shoxli nervning yallig‘lanishi. Research Focus, 4(3), 162–169.
13. Aljabaa, A. H., Aldrees, A. M., & Almuzian, M. (2019). The impact of smartphone applications on oral hygiene in orthodontic patients: A systematic review. Journal of Orthodontic Science, 8(1), 1–7.
14. Proffit, W. R., Fields, H. W., & Larson, B. (2019). Contemporary Orthodontics (6th ed.). Elsevier.