INTERNATIONAL MULTI DISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
eISSN 2394-6334 Impact factor: 8.854 Volume 13, issue 04 (2026)

MECHANISM OF THE HERBST APPLIANCE IN CLASS II MALOCCLUSION TREATMENT

Ravshanov Jasur Jurabekovich

Asia International University

doctorravshanov@gmail.com

Abstract

The Herbst appliance is a fixed functional orthopedic device widely used for the correction of Class II malocclusion, particularly in patients with mandibular retrognathia. Its mechanism is based on continuous mandibular advancement, resulting in a combination of skeletal, dentoalveolar, and neuromuscular adaptations. This article reviews the biological and biomechanical mechanisms underlying its clinical effectiveness.

Keywords

Herbst appliance, Class II malocclusion, mandibular advancement, functional appliance, orthodontics.

Introduction

Class II malocclusion is one of the most common orthodontic problems, often associated with a retruded mandible. Fixed functional appliances such as the Herbst appliance are designed to eliminate patient compliance issues and provide continuous mandibular advancement.

The Herbst appliance was reintroduced by Hans Pancherz in 1979 and has since become a standard treatment modality in orthodontics.

Appliance Design and Function

The Herbst appliance consists of a bilateral telescopic mechanism connecting the maxillary and mandibular arches. This rigid system maintains the mandible in a forward position regardless of jaw movement.

- Fixed (non-removable) appliance
- Telescopic rod-and-tube mechanism
- Anchored to molars or splints
- Works continuously (24 hours/day)

It keeps the mandible in a protruded position by mechanically preventing retrusion.

Mechanism of Action

1. Mandibular Advancement

The primary mechanism is **bite-jumping**, where the mandible is held in a forward position continuously.

- Leads to immediate correction of sagittal discrepancy
- Produces Class I occlusion during treatment

Studies show that this forward positioning is a key factor in treatment success.

2. Skeletal Effects

The appliance induces orthopedic changes, especially in growing patients:

- Increased mandibular length (condylar growth stimulation)
- Slight restriction of maxillary forward growth
- Improvement in skeletal jaw relationship

Forward positioning causes the condyle to relocate anteriorly and inferiorly within the joint, stimulating adaptive growth.

3. Dentoalveolar Effects

A significant part of Class II correction is dental:

- Proclination of lower incisors
- Retroclination of upper incisors
- Mesial movement of mandibular molars
- Distal movement of maxillary molars

Research shows that correction results from both skeletal and dental changes, often in nearly equal proportions.

However, some studies report **greater dentoalveolar contribution (≈66%)** compared to skeletal effects.

4. Neuromuscular Adaptation

Continuous mandibular advancement alters muscle function:

- Changes in activity of masticatory muscles
- Functional reprogramming of neuromuscular system
- Stabilization of new mandibular position over time

This adaptation is essential for long-term stability.

5. Temporomandibular Joint Remodeling

The temporomandibular joint undergoes adaptive remodeling:

- Condylar growth and reshaping
- Glenoid fossa adaptation
- Improved joint positioning

Although remodeling occurs, the extent of permanent structural change remains debated in literature.

Biomechanical Characteristics

- **Force type:** Continuous, low-intensity
- **Direction:** Anterior positioning of mandible
- **Anchorage:** Dental (molars, splints)
- **Mechanics:** Fixed functional, compliance-free

The rigid design ensures uninterrupted force application, distinguishing it from removable appliances.

Clinical Considerations

- Most effective during **growth peak or post-pubertal phase**
- Can be used in adults, but skeletal effects are limited
- Often followed by fixed orthodontic treatment

Advantages:

- No patient compliance required
- Rapid Class II correction
- Predictable results

Disadvantages:

- Dental side effects (incisor proclination)
- Appliance breakage risk
- Cost and technical complexity

Conclusion

The Herbst appliance corrects Class II malocclusion through a **multifactorial mechanism** involving mandibular advancement, skeletal adaptation, dentoalveolar changes, neuromuscular reprogramming, and TMJ remodeling. While both skeletal and dental effects contribute, current evidence suggests that dentoalveolar changes often predominate, especially in non-growing patients.

Its ability to provide continuous, compliance-free mandibular advancement makes it one of the most effective fixed functional appliances in modern orthodontics.

References:

1. Kuzieva, M., Akhmedova, M., & Khalilova, L. (2025). MODERN ASPECTS OF CHOICE OF MATERIAL FOR ORTHOPEDIC TREATMENT OF PATIENTS IN NEED OF DENTALPROSTHETICS. Modern Science and Research, 4(1), 322-333.

2. Kuzieva, M., Akhmedova, M., & Khalilova, L. (2025). GALVANOSIS AND ITS DIAGNOSTIC METHODS IN THE CLINIC OF ORTHOPEDIC DENTISTRY. Modern Science and Research, 4(2), 203-212.

3. Kuzieva, M. A. (2023). Clinical and Morphological Criteria of Oral Cavity Organs in the Use of Fixed Orthopedic Structures. Research Journal of Trauma and Disability Studies, 2(12), 318 324. 458 ResearchBib IF- 11.01, ISSN: 3030-3753, Volume 2 Issue 3

4. Abdusalimovna, K. M. (2024). THE USE OF CERAMIC MATERIALS IN ORTHOPEDIC DENTISTRY. (Literature review). TADQIQOTLAR, 31(3), 75-85. 5. Abdusalimovna, K. M. (2024). CLINICAL AND MORPHOLOGICAL FEATURES OF THE USE OF METAL-FREE CERAMICSTRUCTURES.TA'LIM VAINNOVATSION TADQIQOTLAR,13,45-48.

5. Abdusalimovna, K. M. (2024). THE ADVANTAGE OF USING ALL-CERAMIC STRUCTURES. TA'LIM VA INNOVATSION TADQIQOTLAR, 13, 49-53. 1286 ResearchBib IF- 11.01, ISSN: 3030-3753, Volume 2 Issue 6

6. Abdusalimovna, K. M. (2024). Clinical and Morphological Features of the Use of Non Removable Orthopedic Structures. JOURNAL OF HEALTHCARE AND LIFE SCIENCE RESEARCH, 3(5), 73-78. 800 ResearchBib IF- 11.01, ISSN: 3030-3753, Volume 2 Issue 4 1285 ResearchBib IF- 11.01, ISSN: 3030-3753, Volume 2 Issue 5

7. Kuzieva, M. A. (2024). CARIOUS INFLAMMATION IN ADOLESCENTS: CAUSES, FEATURES AND PREVENTION. European Journal of Modern Medicine and Practice, 4(11), 564-570.

8. ISSN NUMBER:2751-4390 IMPACT FACTOR:9,08 Kuzieva, M. A. (2024). Malocclusion Modern Views, Types and Treatment. American Journal of Bioscience and Clinical Integrity, 1(10), 103-109.

9. KUZIEVA, M. A. (2024). MODERN ASPECTS OF MORPHO-FUNCTIONAL DATA AND TREATMENT OF AGE-RELATED CHANGES IN THE MAXILLOFACIAL REGION. Valeology: International Journal of Medical Anthropology and Bioethics, 2(09), 126-131.