

## Review

# Clinical Efficiency and Treatment Outcomes of Intermaxillary Elastics in Orthodontic Care

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### Abstract

Intermaxillary elastics remain an integral component of orthodontic biomechanics owing to their versatility, simplicity, and cost-effectiveness. Although contemporary orthodontic practice has increasingly incorporated skeletal anchorage systems and fixed functional appliances, elastics continue to be routinely prescribed for sagittal correction, vertical control, and occlusal finishing. This narrative review aims to provide a critical appraisal of intermaxillary elastics, with emphasis on their classification, biomechanical behavior, clinical applications, efficiency, and treatment outcomes.

An electronic search of the literature was conducted using PubMed and Google Scholar to identify English-language publications relevant to the orthodontic use of intermaxillary elastics. Elastics are discussed according to direction of force application, force magnitude, and material characteristics, with particular focus on Class II, Class III, vertical, and cross elastic configurations. The biomechanical effects on dentoalveolar structures, occlusal plane orientation, and facial vertical proportions are examined with reference to available clinical evidence.

The reviewed literature suggests that intermaxillary elastics can contribute effectively to sagittal dental correction and occlusal refinement when prescribed with appropriate biomechanical control. However, their clinical efficiency is closely linked to patient compliance and is frequently associated with undesirable dentoalveolar effects, including incisor inclination changes and posterior tooth extrusion. When used judiciously and with realistic treatment objectives, intermaxillary elastics remain a valuable adjunct in orthodontic therapy.

**Keywords:** intermaxillary elastics, orthodontics, biomechanics, dentoalveolar compensation, Class II, Class III

## Introduction

Intermaxillary elastics have been employed in orthodontic practice for many decades and continue to represent one of the most commonly used auxiliary appliances in daily clinical care (1, 2). Their persistent popularity can largely be attributed to their ease of application, low cost, and ability to deliver continuous forces capable of influencing dental relationships in the sagittal, vertical, and transverse planes (1, 2). Despite significant advances in orthodontic biomechanics, including the development of temporary anchorage devices and fixed functional appliances, intermaxillary elastics remain widely utilized throughout various stages of orthodontic treatment (3).

The effects produced by intermaxillary elastics are inherently complex and strongly influenced by patient compliance and biomechanical design. While elastics are effective in achieving dentoalveolar compensation, their use is frequently accompanied by unintended consequences such as incisor tipping, extrusion of posterior teeth, and alterations in facial vertical dimensions (4–6). If not adequately controlled, these effects may compromise esthetic outcomes, functional results, and long-term stability (6, 12).

A thorough understanding of elastic biomechanics is therefore essential for appropriate case selection and treatment planning. The purpose of this narrative review is to provide an in-depth evaluation of intermaxillary elastics, focusing on their classification, biomechanical characteristics, clinical indications, efficiency, and potential side effects, with emphasis on evidence-based clinical interpretation relevant to oral health care.

## Methods

The literature search for this review commenced on December 28, 2025, prompted by a need for critical appraisal of current orthodontic auxiliary protocols. Various electronic databases, including PubMed, Web of Science, and Cochrane, were utilized to conduct a comprehensive survey of literature. The search process involved employing a diverse range of medical terms and Boolean operators, focusing

on keywords such as "intermaxillary elastics," "Class II and Class III biomechanics," "orthodontic force degradation," and "dentoalveolar compensation." Additionally, manual searches on Google Scholar were conducted to identify landmark studies and relevant clinical terminology.

The primary objective of this search centered on identifying the biomechanical behavior of various elastic configurations, their clinical efficiency in malocclusion correction, and the management of associated side effects. Selection criteria for the included literature prioritized peer-reviewed clinical trials, systematic reviews, and biomechanical analyses to ensure a thorough and rigorous review process.

### *Types of Intermaxillary Elastics*

#### *Classification According to Direction*

Class II elastics are commonly attached from mandibular posterior teeth to maxillary anterior teeth and are frequently prescribed in the management of Class II malocclusions (1, 6). Their primary effects are dentoalveolar in nature and include mesial movement of mandibular dentition and distal movement of maxillary teeth (4, 6).

Class III elastics are typically worn from maxillary posterior teeth to mandibular anterior teeth and are mainly indicated for Class III camouflage treatment (5, 9). These elastics tend to promote forward movement of the maxillary dentition while contributing to retraction of mandibular anterior teeth (5).

Vertical elastics, including box and triangular configurations, are most often used during the finishing phase of orthodontic treatment. Their primary role is to enhance intercuspation and facilitate occlusal settling rather than produce substantial sagittal correction (1, 14).

Cross elastics are prescribed to address transverse discrepancies, particularly posterior crossbites, by applying buccolingual corrective forces between opposing dental arches (2, 7).

***Classification According to Force Magnitude***

Intermaxillary elastics are manufactured in a range of force levels commonly described as light, medium, or heavy. From a biological perspective, light continuous forces are generally preferred, as they are associated with a more favorable tissue response and a reduced risk of adverse effects on dentoalveolar structures (2, 7).

***Classification According to Material***

Latex elastics remain the most frequently used due to their favorable elastic properties and relatively consistent force delivery (14, 15). Non-latex elastics are recommended for patients with latex hypersensitivity; however, they are typically characterized by more rapid force degradation during intraoral use, which may necessitate more frequent replacement (15).

***Biomechanics of Intermaxillary Elastics***

The force system generated by intermaxillary elastics consists of both horizontal and vertical components, the relative contribution of which depends on the points of attachment and the direction of elastic wear (2, 7). In Class II elastic mechanics, the horizontal component contributes to sagittal dental correction, whereas the vertical component often results in extrusion of mandibular posterior teeth and maxillary anterior teeth (4, 8). This vertical effect may induce clockwise rotation of the mandible, particularly in patients with a hyperdivergent skeletal pattern (8).

Similarly, the use of Class III elastics may result in extrusion of maxillary molars and mandibular incisors, potentially contributing to counterclockwise mandibular rotation (5, 9). The clinical expression of these biomechanical effects is influenced by elastic force magnitude, duration of wear, anchorage control, and individual growth patterns (2, 7).

***Clinical Applications***

In routine clinical practice, intermaxillary elastics are used in a variety of situations, including camouflage treatment of mild to moderate sagittal discrepancies, reduction of excessive overjet or

overbite, midline correction, and occlusal settling during the finishing stage of orthodontic treatment (1, 6). They may also be employed as an adjunct in orthognathic surgery cases to guide postoperative occlusal relationships (3).

***Intermaxillary Elastics in Clear Aligner Therapy***

With the increasing adoption of clear aligner therapy, intermaxillary elastics have been integrated into aligner-based treatment protocols through the use of precision cuts or bonded attachments (17). In this context, elastics are commonly prescribed to assist in sagittal correction and occlusal settling. However, due to the inherent flexibility of aligner materials, elastic forces may result in localized dentoalveolar tipping rather than bodily tooth movement when compared with fixed appliances (17).

Recent advances in digital orthodontic platforms have facilitated improved monitoring of elastic wear and patient compliance, addressing a longstanding limitation of elastic therapy (17). Although early clinical reports suggest that elastics used in conjunction with clear aligners may improve treatment efficiency in selected cases, further controlled clinical studies are required to evaluate their biomechanical predictability and long-term stability.

***Efficiency of Intermaxillary Elastics***

The efficiency of intermaxillary elastics should be interpreted with consideration of their predominantly dentoalveolar mode of action. Numerous clinical investigations indicate that improvements in sagittal relationships achieved with elastics are largely attributable to changes in incisor inclination rather than true skeletal modification, particularly in non-growing patients (6, 10, 11). Systematic reviews consistently report limited skeletal effects when elastics are used as the primary modality for sagittal correction (10, 12).

When compared with fixed functional appliances and skeletal anchorage systems, intermaxillary elastics demonstrate lower predictability but greater clinical flexibility and reduced invasiveness (3, 11). Their effectiveness is closely dependent on patient

cooperation, and inconsistent wear has been associated with prolonged treatment duration and an increased incidence of adverse dentoalveolar effects (6, 13).

### ***Treatment Outcomes and Side Effects***

Favorable treatment outcomes associated with intermaxillary elastics include improvement in sagittal dental relationships and enhanced occlusal interdigitation, particularly during the finishing phase of treatment (1, 14). However, their use is also associated with several potential adverse effects, including proclination or retroclination of incisors, extrusion of posterior teeth, increases in lower anterior facial height, and changes in occlusal plane inclination (4, 8, 15).

The magnitude and clinical relevance of these effects are influenced by elastic force magnitude, duration of wear, and patient-specific skeletal characteristics (2, 7). Prolonged use of heavy elastics has been linked to an increased risk of relapse and compromised periodontal support (6, 15).

### ***Patient Compliance***

Patient compliance remains the principal limitation of intermaxillary elastic therapy. Objective assessments have demonstrated that patient-reported wear times frequently exceeds actual usage, introducing variability into treatment outcomes (13, 16). Reduced compliance has been consistently associated with prolonged treatment duration and diminished treatment efficiency (6, 16).

Measures aimed at improving compliance include patient education, simplified elastic wear protocols, and the use of reminder systems (16). Emerging digital monitoring technologies may offer additional support; however, their long-term clinical benefit in orthodontic care remains insufficiently documented (17).

### **Discussion**

The continued use of intermaxillary elastics in contemporary orthodontics reflects their balance of simplicity, adaptability, and clinical effectiveness

(1–3). Although modern anchorage systems offer superior biomechanical control in selected cases, elastics remain particularly valuable in camouflage treatment and occlusal finishing (6, 10).

At the same time, their reliance on patient compliance and tendency to produce dentoalveolar rather than skeletal effects limit their applicability in cases requiring substantial orthopedic correction (10–12). Variability in study design, force protocols, and outcome assessment across the literature further complicate definitive conclusions regarding long-term effectiveness and stability.

### **Conclusion**

Intermaxillary elastics remain an important adjunct in orthodontic treatment when applied with appropriate biomechanical planning and careful patient selection. While effective for dentoalveolar correction and occlusal refinement, their dependence on patient compliance and potential for adverse effects necessitate close clinical monitoring. Continued research is required to further refine their evidence-based application and to clarify long-term treatment outcomes.

### **Disclosure**

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#### ***Data availability***

All data is available within the manuscript.

#### ***Author contribution***

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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