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Early Orthodontic Treatment

[1]Dr. Sweta Kaushik, Post Graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Rishiraj College of Dental Science and Research Centre, Opposite Raja Bhoj Airport, Bhopal Madhya Pradesh, India-462036

[2]Dr. Shuchi Singh, Associate Professor, Department of Orthodontics and Dentofacial Orthopaedics, Rishiraj College of Dental Science and Research Centre, Opposite Raja Bhoj Airport, Bhopal Madhya Pradesh, India-462036

[3]Dr. Neha Gupta, Post Graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Rishiraj College of Dental Science and Research Centre, Opposite Raja Bhoj Airport, Bhopal Madhya Pradesh, India-462036

[4]Dr. Sanchit Bhargava, Post Graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Rishiraj College of Dental Science and Research Centre, Opposite Raja Bhoj Airport, Bhopal Madhya Pradesh, India-462036

[5]Dr. Pranvi Sharma, Post Graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Rishiraj College of Dental Science and Research Centre, Opposite Raja Bhoj Airport, Bhopal Madhya Pradesh, India-462036

[6]Dr. Varad Vaidya, Post Graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Rishiraj College of Dental Science and Research Centre, Opposite Raja Bhoj Airport, Bhopal Madhya Pradesh, India-462036

Corresponding Author: Dr. Shuchi Singh, Associate Professor, Department of Orthodontics and Dentofacial Orthopaedics, Rishiraj College of Dental Science and Research Centre, Opposite Raja Bhoj Airport, Bhopal Madhya Pradesh, India – 462036.

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Abstract

Early orthodontic treatment focuses on correcting developing skeletal, dentoalveolar, and muscular imbalances to create a favorable environment for normal facial growth. Initiating treatment during childhood can reduce the need for complex procedures like tooth extraction or jaw surgery in adolescence. Increased awareness among parents and professionals has led to growing interest in early intervention. While not all early treatments are effective, when properly timed and planned, they can address habits (e.g., thumb sucking), guide tooth eruption, maintain space, and correct crossbites. Early correction of functional issues can prevent them from developing into skeletal problems. However, poorly planned treatment may lead to prolonged care, higher costs, and patient fatigue. A thorough understanding of craniofacial development is essential for clinicians to deliver effective, efficient early

interventions and reduce the severity of future orthodontic needs. Systematically planned interceptive treatment in the mixed dentition might contribute to a significant reduction in treatment need between the ages of 8 and 12 years. But in some instances early intervention does not change appreciably the environment for dentofacial development and permanent tooth eruption. In such instances, early treatment may serve only to increase time and cost and may result in patient burnout. So every effort must be made to time the treatment appropriately so as to maximize the treatment benefit in the shortest period of time.

Keywords: Early Treatment, Early Intervention, Growing Patients, Mixed Dentition Tooth, Maximize Treatment Benefit

Introduction

The goal of early orthodontic treatment is to correct existing or developing skeletal, dentoalveolar, and muscular imbalances to create a favorable environment for proper facial and dental development.[1] By initiating orthodontic and orthopedic therapy at a younger age, the need for complex treatments such as permanent tooth extractions or orthognathic surgery can often be minimized.[1-2] Over the last two decades, there has been growing interest in early intervention within the orthodontic community, driven by increased awareness of preventive care among both professionals and the general public. Parents are seeking earlier treatment for their children, influenced by a greater understanding of preventive dentistry and the desire to address issues before they worsen. Dental professionals, including generalists and specialists, are increasingly interested not just in correcting present problems but also in identifying and intercepting abnormal orofacial development early on.[2-3]

However, not all early orthodontic treatments result in favorable outcomes. In some cases, treatment begins without clearly defined goals, leading to unpredictable results, poor compliance, and dissatisfaction from parents, and treatment fatigue for both patients and clinicians.[3] Therefore, early treatment must be well-planned, with a deep understanding of craniofacial growth and dental arch development, to ensure that the most effective and efficient regimen is provided.[4] Early intervention is more widely accepted today as a way to gain better control over craniofacial form and function during growth. Many complex orthodontic issues originate in skeletal or functional disturbances that worsen with time if not addressed early.[4] While malocclusion is visible in the dentition, its underlying causes may lie in jaw structure or function. Delaying treatment may result in more severe skeletal problems that are harder to manage later.[5] Examples of early treatment include correcting thumb-sucking habits, guiding erupting permanent teeth into proper bite positions, gaining space for incoming teeth, using space maintainers after early loss of primary teeth, and correcting crossbites.[6-8] Addressing such issues early can prevent worsening malocclusions. The human skull consists of two separate jaws, and their size, shape, and position determine whether a patient will have a normal occlusion or a skeletal malocclusion. Jaw-related issues, though often overlooked compared to dental problems, are gaining attention in orthodontic research and practice.[8] Continued study and intervention in this area are expected to expand.[9] Early orthodontic treatment offers several benefits when properly applied. It can eliminate harmful habits and functional shifts that would otherwise disrupt normal growth and development. If these functional issues are not corrected in time, they may develop into skeletal problems requiring more

intensive treatment in adolescence.[8-9] Additionally, early treatment can prevent space loss, unwanted tooth movement, and misalignment of molars following premature loss of primary teeth. Timely intervention can ensure adequate arch space for permanent premolars and may reduce the complexity of future orthodontic procedures. In some cases, correcting protruding upper incisors early improves both aesthetics and self-confidence while reducing the risk of dental trauma.[10-12]

Rationale of Early Orthodontic Treatment

Robert E. Moyers and Michael L. Riolo emphasized that while some malocclusions can be prevented or intercepted, the terms "prevent" and "intercept" must be used carefully. Misuse of these terms can lead to unrealistic expectations about early orthodontic treatment.[13-19] Not all malocclusions are preventable, but research shows about 25% can be intercepted effectively. Early treatment can reduce the complexity of future orthodontic procedures.[20-31] Diphasic treatment—controlling skeletal growth early (Phase I) and aligning teeth later (Phase II)—is now seen as a more rational approach for some cases.[33-37] Early orthopedic interventions can harness natural growth and eliminate causes of malocclusion before the eruption of permanent teeth. Although some appliances may appear simple, guiding craniofacial development is complex and demands a deep understanding of growth biology.[38-39]

Early Intervention of Transverse Dimension

Crowding in adolescents can be managed through extraction, interproximal reduction, or expansion.[40] Early intervention during the mixed dentition period utilizes leeway space—about 4 mm in the maxilla and 5 mm in the mandible to minimize crowding, often aided by transpalatal or lingual arches.[41-43] Tooth-size arch length discrepancies are classified into extraction (>6 mm crowding), non-extraction (<3 mm), and borderline cases.[44] Rapid maxillary expansion (RME) is effective for correcting crossbites, increasing arch space, improving nasal airflow, and aiding maxillary canine eruption, although long-term stability is still under investigation. Crossbites, defined as malocclusion in the transverse plane, may be skeletal, dental, or functional. They are classified by location (anterior/posterior), nature, or malocclusion characteristics. Causes include retained deciduous teeth, narrow or collapsed arches, growth discrepancies, and habits like thumb sucking.[44-45]

Management varies by dentition stage

- **Primary dentition**: Anterior crossbite may require tooth extraction; posterior crossbite is managed by grinding or expansion.
- **Early mixed dentition**: Anterior crossbites may be corrected with removable appliances or space creation; posterior crossbites need over-expansion followed by passive retention.
- **Three main approaches** to posterior crossbite in children: equilibration, arch expansion, and repositioning teeth.

Historical appliances include the Coffin spring (1875), jack screw (1902), quad helix (1947), RPE (1960), and nickel-titanium expanders (1993). These devices vary in construction and application, commonly used to correct crossbites and associated habits.[46]

Early Intervention of Arch Length Deficiency

Moorrees observed that dental arch length decreases from childhood to adulthood, leading to natural crowding over time. Studies by Sinclair, Little, and Riedel confirmed this trend in both treated and untreated patients.[44] While Angle promoted arch preservation, clinicians like Tweed noted high relapse rates in non-extraction cases. Long-term studies showed that arch enlargement had poor stability and required lifetime retention.[45-46] Serial extraction aimed to guide natural alignment but offered

no significant long-term advantage over standard premolar extractions.[47] Nance introduced the concept of "leeway space," advocating its preservation using passive lingual arches rather than expansion. Dugoni's review found that preserving leeway space led to superior post-retention stability.[48] Therefore, minimal intervention during mixed dentition, combined with leeway space management and lifetime retention, offers the most predictable outcomes.[49]

Early Intervention of Class II Malocclusion

Treatment of Class II malocclusion depends on age, skeletal or dental components, clinician expertise, and patient preferences. It is not a disease but a variation in occlusion, so treatment approaches vary, with no universal protocol.[46-47] Initial evaluation should determine if the issue is maxillary or mandibular, skeletal or dentoalveolar. Maxillary protrusion is often managed with facebows—cervical, high-pull, or straight-pull—based on vertical growth patterns. Maxillary dentoalveolar issues may involve incisor correction or full-arch retraction using headgears or utility arches. Mandibular dentoalveolar issues like crowding are treated with lip bumpers, utility arches, or Schwarz appliances.[48] Skeletal mandibular retrusion, the most common issue, is addressed with functional appliances like the FR-2, bionator, Herbst, or twin block, selected based on facial height and severity. Timing, appliance choice, and patient compliance are crucial for long-term success and stability.[49]

Early Intervention of Class III Malocclusion

Treatment of Class III malocclusion in the permanent dentition is challenging due to its strong skeletal basis, but early intervention during the deciduous or mixed dentition phases can be more effective.[45-47] The FR-3 (Frankel appliance) is used for maxillary retrusion, while mandibular prognathism has traditionally been managed with orthopedic chin cups.[48] More recently, the orthopedic facial mask developed by Delaire and Petit has gained popularity, especially for addressing maxillary retrusion, mandibular excess, and reduced lower facial height. The facial mask includes a forehead-chin framework, bonded maxillary splint, and elastics that apply forward and downward traction to the maxilla, encouraging its growth and repositioning.[49-50] It is most effective when combined with rapid maxillary expansion and used before eruption of permanent molars. Chin cup therapy aims to limit mandibular growth by applying upward and backward force, which can alter mandibular development, especially during the first two years. However, discontinuation before growth completion may allow compensatory growth to reverse gains.[52] The occipital pull chin cup is most common, used in mild to moderate cases during early mixed dentition, particularly when edge-to-edge incisal contact is possible.[51-53] It restricts forward and downward mandibular growth and is helpful in short lower facial height cases.[54] The pull direction can influence mandibular rotation, and soft tissue pressure may tip mandibular incisors backward. Chin cup therapy requires close monitoring to avoid TMD, with baseline joint records essential. While effective in guiding growth and improving Class III malocclusion when applied early, long-term success depends on timing, compliance, and careful case selection.[55-56]

Early Intervention of Deep Bite

Deep dental overbite malocclusions are challenging to treat due to their high relapse potential, especially post-retention. Class II division 2 cases, with flatter mandibular planes and acute gonial angles, are particularly prone to relapse. Wasilewsky (1985) reported a 44.9% relapse over 10 years, emphasizing the need for stable long-term strategies. Morphologically, deep bites

often feature mandibular retrognathism, a short posterior ramus, a narrow mandibular base, and a downwardly tipped premaxilla. Retroclined incisors are common, but the issue is more skeletal than dental. Maxillary molar eruption initially helps correct the bite, but later intrusion and anterior shift of mandibular molars often lead to relapse. Stable outcomes are more likely when treatment enhances skeletal harmony—particularly forward mandibular positioning and vertical posterior development.[46-47] Growth in posterior dentoalveolar height supports better long-term results. In dual occlusal level cases, marked by reduced posterior height and anterior overeruption, it is vital to diagnose the cause accurately. Over closed mandibular posture and excessive freeway space signal a need to increase posterior vertical dimension. Erupting posterior teeth—rather than allowing anterior migration—restores balance and helps prevent relapse, making early, growth-guided treatment more effective.[53]

Early Intervention of Open Bite

Open bite malocclusion is often associated with supraerupted maxillary molars and incisors, which can retro position the mandible and increase lower anterior facial height. Early contributing factors include maxillary retrusion, counter clockwise rotation of the hard palate, mandibular clockwise rotation, and mandibular body bending at the antegonial notch. Functional habits like mouth breathing and thumb sucking promote molar over eruption by altering mandibular posture and increasing posterior vertical development.[46] These muscular influences, particularly during rest or repetitive actions like thumb sucking, contribute to skeletal changes and increased nasomaxillary height. Early intervention is crucial during periods of active vertical growth. Treatment should focus on preventing posterior tooth eruption using methods like bite blocks or promoting molar intrusion with high-pull headgear to reduce or control posterior facial height. The "closing the drawbridge" concept emphasizes retro clining maxillary and mandibular incisors to close the anterior open bite.[46-47]

High-pull headgear has been shown to effectively control vertical development of maxillary molars and prevent counter clockwise rotation of the palate. Simultaneous use of a mandibular lingual arch or bite block prevents lower molar eruption, allowing the mandible to rotate upward and forward for bite closure. Finally, open bites caused by posterior skeletal discrepancies differ from those due to tongue posture or size, where allowing anterior dentoalveolar development may be more appropriate.[54]

Indications of Early Orthodontic Treatment

Early orthodontic treatment in the **primary dentition** is primarily indicated to remove barriers to normal facial and dental development and to maintain or restore oral function. Conditions warranting treatment include anterior/posterior crossbites, premature tooth loss with space issues, retained primary incisors, malpositioned teeth, and habits that may hinder growth. Some distocclusions and open bites due to habits can also be addressed, but treatment is contraindicated when outcomes are unpredictable, better delayed, or if the child lacks social maturity.[50-53] During the transitional (mixed) dentition, treatment opportunities peak as malocclusions can be guided or intercepted efficiently. Indications include space loss due to premature tooth loss, tooth malpositions, supernumerary teeth, crossbites, deleterious habits, spacing or crowding, and various types of Class II malocclusions (functional, dental, or skeletal).[53] Class III malocclusions and cases needing serial extraction may also be treated at this stage. Space management is a critical concern, often involving the control of molar drift

and arch perimeter preservation.[54] Treatment tools include functional appliances, orthopedic devices (e.g., headgear, expanders), bracketed appliances, and muscle training. The rationale for early Class II treatment focuses on skeletal, dental, and neuromuscular corrections during active growth phases. While early intervention can be effective, overreliance on one-phase treatment has led to confusion between early and comprehensive treatment goals.[55-56]

Discussion

Early orthodontic treatment plays a vital role in guiding craniofacial development and addressing malocclusions before they progress into more complex skeletal and dental issues.[1-3] Initiating treatment during the primary or mixed dentition phases allows clinicians to intercept or minimize developing imbalances—skeletal, dentoalveolar, or muscular—thereby reducing the need for extractions or orthognathic surgery later. Growing awareness of preventive care has prompted both dental professionals and parents to embrace early intervention more widely, particularly for conditions like thumb-sucking habits, crossbites, arch length deficiencies, and space loss. When properly planned, early treatment can improve facial aesthetics, function, and even psychological well-being in children.[9-13] Management of Class II malocclusions often benefits from diphasic treatment: early orthopedic correction followed by detailed dental alignment. Similarly, timely intervention for Class III malocclusions—using appliances like the Frankel FR-3, facial mask, or chin cup—can redirect unfavorable growth and enhance skeletal harmony. For deep bites and open bites, early diagnosis of skeletal discrepancies is crucial.[46-54] Treatment tools such as bite blocks, headgear, and functional appliances not only correct dental positioning but also modify growth direction.[56] The preservation of leeway space using passive devices like lingual arches, rather than relying on arch expansion or extraction, has shown better long-term stability. In the transverse dimension, rapid maxillary expansion (RME) and other early-phase appliances have effectively corrected crossbites and facilitated space for erupting teeth. However, indiscriminate early treatment without defined goals or proper case selection can lead to poor outcomes, fatigue, and non-compliance.

Conclusion

Histologic studies from the 1950s, such as Baume (1959), indicated that early orthopedic treatment of micrognathia could stimulate condylar growth and reposition the glenoid fossa. However, later observations of spontaneous correction raised doubts about whether these changes were treatment-induced or part of natural growth. Functional appliances produce significant sagittal and facial changes, though attributing these solely to “condylar stimulation” oversimplifies the process. Multiple interacting factors—growth patterns, neuromuscular influences, appliance type, and patient compliance—contribute to treatment outcomes. While the exact mechanisms remain unclear, consistent sagittal improvements suggest real skeletal change. High-quality evidence, including Cochrane reviews, supports early orthodontic intervention for Class II and III cases, both for functional correction and psychological benefits. Timing should be based on the orthodontist’s clinical judgment in collaboration with the patient and parents.

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