Prevention, Early Diagnosis and Timing in Orthodontics

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Abstract

Aim To analyse the role of prevention, early diagnosis, and treatment timing in orthodontics, with a focus on preventive orthodontic treatment in the growing patient.

Materials and Methods A narrative literature review was performed, combined with clinical evidence. Diagnostic criteria in deciduous and mixed dentition, evaluation of occlusal indicators, oral habits, and radiographic and photographic records were analysed. Literature sources included PubMed, Scopus, and EJPD publications on prevention, early orthodontics, interceptive treatment, and treatment timing.

Results Early identification of malocclusion patterns such as cross-bites, increased overjet, and skeletal Class III discrepancies is essential for targeted interventions. Evidence demonstrates benefits in reducing traumatic risk, improving psychosocial outcomes, and simplifying future orthodontic treatment. Up to 15% of malocclusions can be completely corrected and nearly 50% improved with interceptive measures in mixed dentition. The correct timing of intervention represents a pivotal clinical variable: decisions must be based on growth status, risk evaluation, and evidence of effectiveness and predictability.

Conclusions Prevention, early diagnosis, and treatment timing are key factors in paediatric orthodontics. Timely preventive orthodontic treatment can correct skeletal and dental discrepancies, reduce trauma risk, and improve quality of life. Clinical decisions must be evidence-based and personalised, avoiding unnecessary overtreatment. Therapeutic methods must be effective and efficient in achieving the treatment goals and, above all, must not interfere with the health of growing patients.

KEYWORDS Preventive orthodontics, Interceptive treatment, Timing, Paediatric orthodontics, Early diagnosis.

Introduction

Orthodontics in paediatric patients is deeply rooted in prevention and early diagnosis. The ability to recognise malocclusion patterns at an early stage, often before the eruption of permanent dentition, is crucial for guiding growth and development. Prevention in orthodontics does not merely mean avoiding pathology but rather anticipating the development of malocclusions, identifying risk factors, and intervening with minimally invasive strategies [Thilander et al.,1984; Naoumova et al., 2011; Sinniah et al., 2020]. The clinical and ethical importance of prevention lies in protecting the child's health, self-esteem, and long-term oral function. This article reviews current evidence on prevention and early diagnosis in orthodontics, highlighting the diagnostic criteria, treatment indications, and clinical benefits of interceptive orthodontics [Araujo, 2025].

Materials and Methods

Early orthodontic diagnosis involves the integration of clinical, radiographic, and functional assessments. The primary evaluation begins in the deciduous dentition, where occlusal relationships, oral habits, and family history provide predictive markers. Key diagnostic tools include intraoral examination, assessment of occlusal traits (cross-bite, open bite, crowding, overjet), and evaluation of oral functions (swallowing, breathing, sucking habits). Radiographic records such as panoramic radiograph and lateral cephalogram allow the evaluation of skeletal structures, eruption paths, and craniofacial morphology. Photographs and study models complement the diagnostic dataset, supporting longitudinal follow-up. The literature reviewed includes systematic reviews, randomised clinical trials, and narrative contributions focusing on interceptive orthodontics. Special emphasis was placed on publications, and consensus guidelines for paediatric orthodontics.

Timing in preventive orthodontic treatment

Treatment timing represents a crucial variable in interceptive orthodontics. The decision of when to intervene must balance skeletal growth potential, risk factors such as trauma or tooth impaction, and psychosocial implications. Timing should be individualised, based on clinical evidence, craniofacial growth assessment, and the predictability of outcomes. Furthermore, in planning early treatment, it is essential to identify situations in which the intervention may constitute overtreatment that is a treatment that is unnecessary or disproportionate to the actual clinical benefit. The preventive evaluation of the therapeutic indication should therefore include a thorough risk–benefit analysis, considering the potential biological and psychological impact on the young patient. With preventive orthodontic treatment, clinicians are confronted not only with the variability of facial growth and its potential for modification, but also with the opportunity to perform, often in more cooperative patients, simple, short-term, and cost-effective treatments that may either definitively correct a malocclusion or minimise its severity in the permanent dentition. Clinical evidence supports early diagnosis and preventive orthodontic treatment in specific scenarios. Posterior cross-bites, particularly when unilateral, may self-correct but often persist and worsen without intervention. Anterior cross-bites due to skeletal Class III patterns [Quinzi et al., 2023] rarely improve spontaneously and benefit from early orthopaedic correction. Increased overjet exceeding 6 mm [Cobourne et al., 2022; Rosa et al., 2019; Tabellion et al., 2024] significantly raises the risk of traumatic dental injuries; early correction has been shown to reduce trauma incidence. Open bites linked to oral habits [Rosa et al., 2019; Fleming and Andrews, 2023] may resolve spontaneously if habits are eliminated early, underscoring the preventive role of habit control. The impaction of canines represents a significant orthodontic concern, as it may lead to serious complications; therefore, early diagnosis and timely

Condition / Indication	Recommended Early Intervention	Advantages
Anterior cross-bite (skeletal Class III)	Orthopedic treatment (facemask, hybrid expansion)	Improves skeletal relationships, reduces long-term complexity
Increased overjet (>6 mm)	Functional appliances, early Class II correction	Reduces risk of dental trauma, improves esthetics and self-esteem
Posterior cross-bite	Rapid/slow maxillary expansion	Corrects transverse discrepancy, improves occlusal function
Open bite linked to oral habits	Habit interception, myofunctional therapy	Spontaneous correction possible, prevents persistence into permanent dentition
Impacted canines (risk detected radiographically)	Space maintenance or creation, interceptive extraction of deciduous canine	Facilitates eruption, prevents impaction

TABLE 1 Main indications and advantages of early orthodontic treatment.

management are essential. Evidence from the literature indicates that early extraction of primary canines results in a spontaneous eruption of the permanent canines in approximately 87% of cases, confirming the effectiveness of interceptive management. Conversely, an unfavorable initial position, excessive angulation, or increased pericoronal follicular space have been associated with a higher risk of interceptive failure, underscoring the importance of early and accurate radiographic assessment to optimise clinical outcomes. In addition to the management of cross-bites and canine impactions, interceptive orthodontics may also involve the control of developing crowding. An accurate diagnosis of a dento–basal discrepancy, with or without transverse deficiency, may lead the clinician to consider serial extractions as an effective interceptive approach to prevent the progression or worsening of malocclusion. This strategy aims to maintain arch integrity, guide the eruption of permanent teeth, and reduce the complexity of future comprehensive orthodontic treatment. Epidemiological data demonstrate [Eskeli et al., 2016; Quinzi et al., 2018] that while the overall prevalence of malocclusion remains stable from deciduous to permanent dentition, early treatment can alter the severity and reduce the complexity of future treatment. Recent clinical trials also highlight that early orthodontic protocols should be carefully selected according to growth status and individual skeletal discrepancies (Table 1) [Philip-Alliez and Gall, 2025; Ceraulo et al., 2025].

Discussion

To better illustrate the divergence between theoretical schemes and daily clinical reality, it should be noted that numerous studies and theoretical models have been published on early orthodontic treatment, often proposing different timing strategies and treatment philosophies. However, the clinician must ultimately decide what is most appropriate for each individual patient. Scientific evidence provides valuable guidance, yet clinical experience, biological variability, and patient-specific factors often determine the true success of therapy — two perspectives that do not always coincide. Nowadays, owing to the growing awareness of oral health, children in the deciduous or mixed dentition stages are more frequently examined, enabling an early diagnosis of malocclusion. Parents play a fundamental role in treatment success, as they are responsible not only for understanding the malocclusion and the therapeutic plan, but also for supporting and continuously motivating their young patients throughout the treatment process. The following comparative frameworks summarise the main treatment indications for growing patients: Table 2 reports those derived from the scientific literature, whereas Table 3 integrates evidence from the literature with considerations from good daily clinical practice [Perillo et al., 2023]. A critical issue emerging from the literature concerns the philosophical and clinical approach to treatment timing. Several studies have reported that there is limited scientific evidence supporting the long-term benefits and stability of early orthodontic treatment. In contrast, our perspective is grounded in clinical evidence and individualised assessment: treatment timing should not be regarded as a rigid classification but rather as a scientific and clinical decision, based on craniofacial growth analysis, trauma risk evaluation, psychosocial implications, and the predictability of outcomes. This difference underscores the need to move from schematic categorisation toward evidence-based and patient-centered decision-making. Early orthodontic treatment generally involves the use of minimally invasive appliances that require limited

Suggested	Posterior Cross-bite
Suggested	Class III
Controversial	Class II, Increased OVJ
Controversial	Moderate crowding
Not indicated	Class I
Not indicated	Open bite
Not indicated	Deep bite
Not indicated	Scissor bite

TABLE 2 Indications for orthodontic treatment in growing patients, according to scientific literature.

Posterior Cross-bite	Posterior Cross-bite
Suggested	Class III
Suggested	Class I DT + Severe crowding
Suggested	Class II
Suggested	Class I Severe crowding
Suggested	Prevention of Inclusions
Suggested	Oral Habits
Suggested	Anterior Cross-bite
Controversial	Agenesis
Controversial	Transposition

TABLE 3 Indications for orthodontic treatment in growing patients, according to scientific literature and good daily clinical practice.

patient cooperation and act at the skeletal, dentoalveolar, or functional level. These devices aim to guide craniofacial growth, correct developing discrepancies, and restore physiological function while respecting the patient's natural development and psychological balance. Only Class III malocclusion, which requires the use of a facial mask, demands a certain degree of patient cooperation to achieve satisfactory results. However, compliance can often be improved by actively involving parents, for instance by allowing them to personalise or decorate the face mask, turning the appliance into a positive and motivating element of the treatment process. In recent years, clear aligners have also been proposed for interceptive orthodontics, with the intention of improving comfort and aesthetics in young patients. However, the current literature lacks high-quality evidence supporting their effectiveness and predictability in growing patients. Further well-designed clinical trials are therefore required before aligners can be considered a valid alternative to traditional interceptive appliances. The debate surrounding early orthodontic treatment remains active within the scientific community. Some authors advocate for targeted early interventions, particularly in skeletal discrepancies, while others warn against overtreatment. Current evidence suggests that, while not all malocclusions require immediate correction, selected cases, such as skeletal Class III, increased overjet, and impacted canines—benefit significantly from early intervention. From a psychosocial perspective [Seehra et al., 2011; Quinzi et al., 2019], children with severe malocclusions may suffer from reduced self-esteem, teasing, or bullying, further supporting the value of early corrective action. Growth considerations [Quinzi et al., 2019; Schneider-Moser et al., 2022; Mampieri et al., 2023] remain central to this discussion. Although craniofacial development follows predictable patterns, individual variability limits the accuracy of prognosis. Early treatment, while unable to fundamentally alter skeletal growth trajectories, can redirect growth and optimise dentoalveolar adaptation. Moreover, interceptive orthodontics often represents a conservative approach, taking advantage of deciduous teeth and preserving the integrity of the permanent dentition. International literature, including Cochrane reviews [Ackerman, 1980; Wong, 2004], emphasises that early treatment is most effective when it reduces risk (trauma, impaction, psychosocial harm) or simplifies subsequent therapy. Therefore, early orthodontics should not be applied universally but reserved for cases with clear, evidence-based indications.

Conclusions

In conclusion, interceptive orthodontics should focus on evidence-based approaches that respect the biology and developmental dynamics of the growing patient. Early orthodontic treatment must remain conservative, effective, and respectful of craniofacial growth and long-term oral health. Prevention and early diagnosis represent the cornerstones of orthodontics in the growing patient. Timely identification of malocclusions enables interceptive measures that reduce trauma risk, address psychosocial concerns, and simplify subsequent treatment. Moreover, interceptive orthodontics plays a fundamental role in guiding occlusal development and craniofacial growth, establishing a stable and harmonious foundation for future dental and skeletal maturation. An evidence-based and individualised approach is essential to maximise therapeutic benefits while avoiding unnecessary interventions. Finally, treatment timing must be regarded as both a scientific and clinical variable—not to be applied through rigid or schematic categories, but through a personalised, evidence-based evaluation that respects growth potential, biological limits, and the psychosocial needs of each young patient. In such patients, adherence to the principle of "less is more" is fundamental, guiding an orthodontic approach that remains effective, efficient, and ethical.

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