

EARLY ORTHODONTIC TREATMENT

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ABSTRACT:

The goal of orthodontic treatment is to achieve the achievable normal occlusion which is esthetically pleasing and functionally stable. The factors which influence orthodontic goals are not only the type of malocclusion, mechanotherapy or the type and duration of retention but equally important is the timing of treatment. As facial and dental development continues throughout childhood and adolescence the long-term impact of early treatment may not be predicted. Yet early intervention may help develop a normal occlusion and facial harmony which enables the complete or partial correction of many incipient discrepancies or, at least, a reduction in their capacity to grow worse. 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. So purpose of this article is to give an overview and consensus of the literature to the clinician regarding the various studies related to the debate on early orthodontic interventions.

Keywords: malocclusion, interceptive, early intervention

INTRODUCTION:

Orthodontists have made remarkable progress in their understanding of physiology, growth, tissue response, increasingly sophisticated diagnostic techniques, available materials, and information; but still, with all these advances, many practitioners still find themselves at a total loss when confronted with that eternal dilemma as to intervene or not to intervene before the eruption of the complete permanent dentition.^[1] The goal of orthodontic treatment is to achieve “the achievable normal occlusion which is esthetically pleasing and functionally stable.” Factors which influence orthodontic

goal are not only the type of malocclusion, mechanotherapy or the type and duration of retention but equally important is the timing of treatment.^[2]

The “proper age” to begin orthodontic treatment has been discussed since the first international orthodontic congress held in New York in 1926.^[3] and up till now many articles have been published discussing the adequate timing of intervention. McNamara.^[4] defined early treatments in orthodontics as therapeutic procedures undertaken on deciduous or mixed dentition for the purpose of preventing, intercepting or correcting a specific orthodontic problem. There has been an

ongoing discussion among orthodontists about the optimal time to initiate orthodontic treatment under various clinical conditions. Since the objectives of orthodontic care include the minimal amount of treatment that achieves the maximum benefit for each patient, the timing of the commencement of treatment becomes of paramount importance. Each patient should expect and receive only that amount of orthodontic treatment that minimizes both the biologic and financial cost to them and yet obtain the optimal outcome.^[5]

As facial and dental development continues throughout childhood and adolescence the long-term impact of early treatment may not be predicted. Yet early intervention may help develop a normal occlusion and facial harmony.^[6] Beginning orthodontic treatment early seems eminently logical because it enables the complete or partial correction of many incipient discrepancies or, at least, a reduction in their capacity to grow worse. Its objective is eliminating or minimizing dentoalveolar and skeletal disorders that interfere with growth, function, esthetics, and the psychological well being of children.^[1] Initiating early treatment allows partial or even total correction of an evolving orthodontic anomaly in a growing child. Such early therapy is often brief, uses simple means, elicits little cooperation from patients and their parents and prevents the anomaly from worsening.^[7] In defence of this approach GUGINO.^[8] (1998) pointed out

that the earlier the treatment was applied, the better the face adapted to it, whereas the longer it was deferred, the more it would have to adapt to the face. Early treatment not only reduce the time and complexity of comprehensive fixed appliance therapy but also eliminate or reduce the damage to the dentition and supporting structures that can result from tooth irregularity at a later age. In short, early intervention of skeletal and dental malocclusions during the primary and mixed dentition stages can enable the greatest possible control over growth changes and occlusal development, improving the function, esthetics, and psychological well-being of children.^[9]

RATIONALE FOR EARLY TREATMENT

The rationale for doing early orthodontic treatment lies in the fact that a few malocclusions can truly be prevented, for example; arch length-tooth size discrepancy due to loss of arch length can be prevented by timely restoration of proximal carious lesions. Early orthopedic control of skeletal morphology is easier in some cases than later correction of the craniofacial skeleton, and often easier than positioning teeth to camouflage skeletal dysplasia because growth can only be redirected while it is happening. The earlier the treatment is started, the more total growth one can effect. When growth has largely ceased, treatment options are limited to moving teeth or orthognathic surgery.^[10] When the patient is young, one may be able to remove etiologic factors, enlist natural

growth forces, provide differential growth responses, and obtain a balanced profile prior to eruption of most permanent teeth. It has been suggested by many authors.^[11,12] that almost all types of malocclusion could be benefited from early treatment. The effectiveness of the intervention depends on malocclusion. The main reason for the controversy seems to be our present knowledge about the timing of treatment; which is largely based on clinical experience with various clinical approaches and traditions of orthodontic practice. Scientific evidence is limited and only few studies have specifically targeted questions about the effects of early treatment. The following section deals with the rationale behind early intervention in various malocclusions.

Rationale for Early Correction of Posterior Crossbite With A Functional Shift

Evidences have suggested that a lateral shift of the mandible into unilateral crossbite occlusion may promote adaptive remodeling of the temporomandibular joint and asymmetric mandibular growth. Favorable improvement of mandibular asymmetry associated with a mandibular shift is seen in patients who are treated in the early mixed dentition.^[13] The fact that most unilateral crossbites do not spontaneously correct and that functional shifts are rarely detected in adults with unilateral crossbite, suggests that adaptive remodeling of the temporomandibular joint occurs and that children with unilateral crossbite and functional shift develop an

asymmetry of the mandible.^[14] Some studies suggested that for patients in the mixed dentition stage, adaptive remodeling in the temporomandibular joints may have already occurred.^[15] However, there is still adequate time for growth modification in the early mixed dentition. A recent study has shown that favorable improvement of a mandibular asymmetry associated with a mandibular shift is seen in patients treated in the early mixed dentition. That is, if the crossbite and functional shift are treated in a timely manner (early mixed dentition), the asymmetry can be largely eliminated.^[16]

Additional benefits of early treatment have been reported as: preventing adverse growth and re-establishing proper muscle balance before deteriorating effects become well established, improving maxillary lip posture and facial appearance and providing space for eruption of canines.^[17] Tsanidis et al (2016).^[18] in their systematic review concluded that the abnormal masticatory cycle associated with functional posterior unilateral cross-bite tends to normalise following early cross-bite treatment. Masticatory muscle activity shows an increase after early functional unilateral posterior cross-bite treatment, and this activity approaches normal levels. The presence of a unilateral posterior cross-bite pre-exists the functional asymmetry, and treating the cross-bite can also normalise asymmetric functional aberrations. Therefore it can be concluded that early treatment in such cases offer a greater advantage.

Rationale for early treatment of tooth size arch length deficiency

Severe crowding caused by tooth size arch length deficiency (TSALD) may be treated at an early stage with serial tooth extractions in the early mixed dentition (first transitory period) or with late extraction of the premolars in the permanent dentition. Serial extraction procedure is based on the fact that whenever there is an excess of tooth material as compared to the arch length, a selective extraction of some teeth is done so that rest of teeth can be guided to normal occlusion. Since human dentition show a physiological tendency to move towards an extraction space. Thus, some teeth which are in the process of eruption are guided by the natural forces into extraction spaces. It may be debated as why to allow an unfavorable dental, skeletal, or soft tissue relationship to exist for a number of years if it can be corrected, or practically corrected, early, with a minimum of appliance treatment time.^[19] Therefore, the serial extraction procedure seems logical. However, it must be remembered that, once teeth have been extracted, they cannot be replaced if an error in judgement must be made, it is more expedient to error in a conservative manner without extraction, for the teeth can always be extracted at a later date, its subsequent development remains unsatisfactory. This of course, might mean delaying all treatment until the permanent dentition conversely, no one has devised suitable treatment procedures when growth

exceeds expectations following an improper extraction programme.^[20]

A recent review by Filho et al.^[21] on early vs late orthodontic treatment of tooth crowding by first premolar extraction showed that early and late treatment presented similar primary outcomes for relief of crowding however, there was less relapse and reduced active treatment times (treatment with appliances) in early treatment, but the levels of evidence were not sufficiently strong to assert the best indication. So serial extraction can be considered as a double edged sword and requires a compact diagnosis before its implementation. Even if we do an exact prediction of growth by using precise diagnostic tools, it is still questionable and various limitation of this procedure has stood up. Injudicious extractions lead to drastic results and worsen the facial profile and balance. The effectiveness and efficacy of the procedure before planning treatment should be kept in mind. If the procedure is followed by a proper case selection and a sound diagnosis, it will give best results.^[22] So, serial extraction has its advantages and limitations, literatures are not still sufficient to substantiate its benefits and defects.

Rationale for early correction of Class II

The primary goal of early Class II skeletal treatment is to achieve a more favorable skeletal morphology prior to the complete eruption of the permanent dentition. Early therapy aims at restraining midface growth, promotion of mandibular growth, widening

of the maxilla, control of dentoalveolar adaptation, or planned combinations of these strategies. As a rule, the more severe the skeletal dysplasia, the more advantageous is early treatment. The vertical skeletal aspects of Class II, difficult to compensate for with tooth movements alone in adolescence, are improved in earlier years by controlling the basal skeletal growth and by differential management of the alveolar processes and occlusal plane.^[5,7]

Early treatment of the neuromuscular aspects of Class II malocclusion is undertaken to establish a normal neuromuscular environment that will aid function and growth and neither aggravate nor distort the unfolding skeletal pattern. Such therapy often consists of control of deleterious habits and treatment of the skeletal and dental features in order that normal neuromuscular function can obtain. Sometimes, in the primary dentition, the neuromuscular pattern is the dominant Class II theme, for example, nasorespiratory or airway problems, faulty posture, or deleterious sucking habits. The establishment of normal muscular function at the earliest possible age is one of the most important steps in treatment of Class II malocclusions.

Various studies.^[23,24] have shown that the greatest amount of dentoskeletal correction of Class II malocclusion occurred in patients treated during the pubertal growth spurt. Other studies.^[25-27] suggest that for children with moderate to severe Class II problems,

early treatment followed by later comprehensive treatment on average does not produce major differences in jaw relationship or dental occlusion, compared with later one-stage treatment. As reported by them, Class II treatment seems to be just as effective in late childhood as it is at an earlier age.

The landmark multicentric randomized control trials by O'Brien et al.^[28-30] on early twin block treatment of Class II malocclusion gave conclusive evidence that there was no differences between those who received early Twin-block treatment and those who had 1 course of treatment in adolescence with respect to skeletal pattern, extraction rate, and self-esteem. It was concluded that Twin-block treatment when a child is 8 to 9 years old has no advantages over treatment started at an average age of 12.4 years. However, the cost of early treatment to the patient in terms of attendances and length of appliance wear is increased.

The Cochrane review.^[31] published in 2013 concluded that early treatment of Class II malocclusion resulted in limited advantage when compared to providing treatment in one stage during adolescence. In 2015 Thiruvengkatachari et al.^[32] in their systematic review provided evidence that orthodontic treatment for young children, followed by a later phase of treatment when the child is in early adolescence, appears to reduce the incidence of new incisal trauma significantly compared with treatment that is provided in 1 phase when

the child is in early adolescence. But there are no other advantages in providing 2-phase treatment compared with 1 phase in early adolescence. All these evidence based studies indicate that class II treatment should be undertaken after complete eruption of all permanent teeth as early treatment do not provide much advantage. However, these results should be interpreted with caution.

Rationale for early treatment of class III malocclusions.^[7,33]

The objective of early orthodontic treatment is to create an environment in which a more favorable dentofacial development can occur. The early therapy aims to prevent progressive irreversible soft tissue or bony changes, improve skeletal discrepancies and provide a more favorable environment for future growth, improve occlusal function by eliminating centric occlusion/centric relation (CO/ CR) discrepancies and avoid adverse growth potential. simplify phase II comprehensive treatment, provide more pleasing facial esthetics, thus improving the psychosocial development of a child. Early treatment of Class III malocclusion has been attempted with varying success. The main advantage of early Class III malocclusion treatment is to avoid surgical intervention and thus reduce the morbidity of the surgery. The timing of early treatment is crucial for a successful outcome. Some studies have reported that treatment should be carried out in patients less than 10 years of age to enhance the orthopedic effect.^[34-37] In

contrast, other studies have found that patient age had little influence on treatment response and outcome.^[38,39] Hence, there is no strong evidence to support that early treatment would be beneficial. Woon and Thiruvengkatachari.^[40] (2017) in their meta analysis found a moderate evidence to show that early treatment with a facemask resulted in positive improvements in both skeletal and dental changes in the short term. However, there is a lack of evidence for the long-term benefits. Also the chin cup appliance showed greater skeletal changes when compared with the untreated control group, due to high heterogeneity and high risk of bias, the results should be interpreted with caution. Further long-term, high-quality studies are needed to determine the long-term effects of orthopedic treatment for Class III patients.

Rationale for early intervention in open bite cases

Early intervention in open bite cases is at the time when vertical jaw and alveolar growth are strongly active that treatment should be initiated to mechanically prevent the expression of full vertical development in the posterior region of the occlusion. By doing so, mandibular posture can be prevented from opening excessively in the anterior dentoalveolar region while continued expression of vertical development in that region may maintain an acceptable overbite. The ounce of prevention that the orthodontist must exert is to either prevent eruption of the molars

or, if possible, to facilitate depression of these teeth. Orthodontic therapy must be directed towards preventing counterclockwise rotation of the nasomaxillary complex and maxillary dentition while augmenting the counterclockwise rotation of the mandible and its dentition. An early treatment of dentoskeletal open bite (9–11 years of age) is able to intercept the malocclusion to reduce the need of treatment at an adolescent age. This is particularly true in the cases of open bite caused by an altered function, such as oral habits. The control of the skeletal vertical dimension is considered the most important factor in successfully treated individuals.^[7,41] Several authors.^[42-44] have emphasized that a skeletal open bite should be treated in the mixed dentition in order to take advantage of the active growth producing faster and more stable results and to reduce the burden of treatment in the permanent dentition. A recent review by Pisani et al.^[45] also showed the effectiveness of early treatment of open bite, but more studies are still necessary to provide conclusive evidence.

Rationale of early treatment in cleft lip & palate patients

A cleft lip is not only a disfiguration affecting the appearance of the face but also a disruption of the musculature of the upper lip affecting its function thus the position of teeth. Additionally, the cleft lip and palate entity has representation of every type of malocclusion known to affect the non cleft individuals including class III,

class II malocclusions, vertical problems such as deep and open bites, cross bites of all types, malaligned and drastically rotated as well as malpositioned teeth.^[7,41] Therefore, early intervention in cleft lip and palate patients can be justified as it encourages a more normal growth and development of jaws with a resulting improvement in soft tissue relationship. It also provide provision of a more harmonious intraoral environment for the development of highly complex speech patterns. If the orthodontic intervention is done early enough the abnormal situation may be converted to the normal with a minimum of a trauma and less time. Also early orthodontic care removes considerable amount of the orofacial stigmata that these children have to bear. According to Kazanjian, if every child had the benefit of early orthodontic treatment, many of the late deformities can be eliminated or atleast minimized.^[46]

Burstone, Subtelny and Mc Neil.^[47,48] were among the few researchers who advocated early treatment in cleft patients stating that marked improvement in facial and dental esthetics, improved masticatory efficiency and speech development were seen using an early treatment approach. Ross and Jhonson.^[49] in their study found that early correction in bilateral cleft lip and palate results in marked improvement in facial skeletal harmony, but in unilateral cleft lip and palate, orthodontic treatment prior to the permanent dentition had no

appreciable effect on the facial growth pattern.

CONCLUSION:

Early treatment orthodontic procedures are relatively simple and inexpensive treatment approaches that target developing malocclusions during the mixed or deciduous dentition. Orthodontists perceive these as useful ways to reduce the severity of malocclusions, improve a patient's self image, eliminate destructive habits, facilitate normal tooth eruption, and improve some growth patterns. Early treatments in orthodontics do not produce finished orthodontic results without a second phase of treatment in the permanent dentition, but 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, often producing results so that further need can be categorized as elective. The selection of specific protocols and when to use them should be based on evidence derived from rigorous prospective and retrospective clinical studies. By initiating treatment in the mixed dentition, many of the skeletal and dentoalveolar problems associated with malocclusion often are eliminated or reduced substantially, thus lessening the need for prolonged fixed appliance therapy in the adolescent years.

It must be stressed that early intervention is not always necessary or appropriate. In some instances, early treatment does not

change appreciably the environment of dentofacial development and permanent tooth eruption. In such instances, early treatment may serve only to increase treatment time and cost and may result in a lack of patient cooperation in later years. If every effort is made, however, to time the treatment appropriately so as to maximize the treatment benefit in the shortest period of time, and if the implemented treatment protocol has a reasonably predictable duration and outcome, orthodontic and orthopedic intervention can be provided successfully.

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