

TITLE: INTERCEPTIVE ORTHODONTICS – A REVIEW

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ABSTRACT:

Any treatment procedure that eliminates or reduces the severity of the developing malocclusion is referred as interceptive orthodontic treatment. By initiating orthodontic and orthopaedic treatment at a younger age the need for complex orthodontic treatment involving multiple extractions and orthognathic surgery is presumably reduced. The goals of early treatment involve correction of skeletal, dental and muscular abnormalities to correct the oral environment before completion of growth and development. Prompt interventions are advised for predisposing conditions that may potentially develop a malocclusion. This review highlights various clinical situations and its effective interceptive management modalities.

Keywords: Early treatment; interceptive management ; mixed dentition.

1. INTRODUCTION:

The American Association of Orthodontists (1969) defined interceptive orthodontics as that phase of science and art of orthodontics employed to recognize and eliminate the potential irregularities and mal positions in the developing dentofacial complex. Proffit and Ackermann (1980) defined interceptive orthodontics as the elimination of existing interferences with the key factors involved in the development of the dentition..14%-49% of children are reported to benefit from interceptive management.^{1,2} For the development of normal adult occlusion, transition phase from primary to permanent dentition should be thoroughly monitored and intervened when necessary. Planned intervention at mixed dentition eliminates future treatment complexities and further treatment needs can be categorized as elective. The conditions requiring interceptive management and various interceptive treatment modalities are described in this article. King et al³ in 2010 concluded that interceptive orthodontics is effective in reducing the malocclusion even though it does not produce finished quality results. 57% of children are present with an anomaly during the transition phase from deciduous to mixed dentition. In view of the greater number of malalignments in the deciduous and mixed dentition there is an increased need for preventive and interceptive orthodontic therapy ⁴

2. DISCUSSION:

Early intervention mainly aims at the elimination of the primary etiologic factors. The commonly seen conditions are sagittal dysplasias, occlusal discrepancies, unilateral or bilateral posterior crossbite, anterior crossbite or open bite, habits associated malocclusions. Bishara et al in 1988 ⁵ conducted a longitudinal study in 5 year old children. On following the subjects for over a period of eight years the study concluded that the distal step present in the primary dentition eventually developed into a class II malocclusion in

100% of cases. Tulloch in 1997⁶ stated that spontaneous relief of lower anterior crowding is unlikely once the mandibular lateral incisors erupt. Managing arch length discrepancies to resolve crowding and future extraction indicates the need for early orthodontic treatment.

3. DEVELOPING CROSS BITES:

Anterior cross bites can either be skeletal, dental or functional. Guiding the mandible in centric relation helps in differentiating the skeletal cross bite with functional cross bites. Skeletal cross bites require maxillary protraction devices or chin cup therapy and continuous abnormal growth pattern of jaws can lead to relapse. Dental anterior cross bites can be corrected by fixed or removable mandibular acrylic inclined bite plane, Reversed stainless steel crowns, Tongue blade (deliver heavy intermittent forces), Removable appliance with auxiliary springs, Removable plate with screw, Maxillary lingual arch and fixed light arch wire (deliver light continuous forces)⁷.

Early treatment of **posterior cross bites**^{8,9} during the mixed dentition is essential for stable results. If the transverse problem is skeletal, treatment is indicated as soon as the permanent first molar erupts. For a dento-alveolar correction, treatment might be delayed until the eruption of permanent teeth, but only while the patients are in growth phase. The dental compensations must be considered prior to expansion as buccal version of the dentition might cause gingival resorption of posteriors and canine. Additionally, if dental alveolar compensations are present expansion will result in scissor bite. Quad helix or removable appliances with slow expansion screw may be used to correct the dento-alveolar cross-bites. Rapid maxillary expansion is the preferred choice for skeletal cross bites. If the transverse alteration is accompanied by a vertical or anterior-posterior malocclusion, the transverse alteration is treated first. After correcting the transverse malocclusion at an early age, the results must be stabilised with retainers until all the permanent teeth have replaced the deciduous teeth. When a transverse discrepancy is observed a potential maxillary canine impaction may accompany it.¹⁰

TRANSVERSE ANOMALIES	
UNILATERAL CROSSBITES (UCB)	UCB with normal maxilla and constricted dentoalveolar process
	UCB with normal maxilla and asymmetrically-constricted dentoalveolar process
	UCB with constricted maxilla
BILATERAL CROSSBITES (BCB)	BCB with constricted maxilla
	BCB with constricted maxilla and buccal version of dentoalveolar processes
	BCB with constricted maxilla and mandibular excess

(Adopted) CLASSIFICATION OF POSTERIOR CROSS BITES (LORENTE, 2002)

4. ARCH LENGTH DISCREPANCIES

The leeway space (E-space) provides adequate space to resolve crowding that is present in the mixed dentition. Early loss of deciduous teeth, interproximal caries are some factors that adversely influence arch length resulting in crowding. Arch-length tooth material discrepancies are more common in such cases. There are various space maintainers available among which the common appliances used to maintain leeway space is lingual arch and lip bumper. In a case of premature loss of primary canine, lingual arch can be used. The opposing deciduous canine can be extracted for the purpose of symmetry. The appliance prevents the lingual movement of lower incisors and maintains the arch length. A recommended strategy is to maintain arch length until the first premolars erupt. One exception is presence of dehiscence in mandibular anteriors as lingual movement of the incisors might be favourable in this case. A second exception is when erupting teeth are forced to erupt in an area of non-keratinized gingiva.¹¹ Lip bumper with a relatively thick labial shield can enhance the length and width in the dental arch.¹¹ The desirable

timing for insertion of lip bumper is after the eruption of first premolars. Treatment decision can be made based the space requirements. For arch deficiency no more than 2mm ,lip bumper is preferred; for greater arch discrepancies serial extraction can be recommended considering other factors.¹¹ Gianelly in 2002 suggested that appropriate timing to correct crowding is during late mixed dentition stage¹². During the transition stage, when arch space is already utilized by migration of the adjacent teeth space regainers can be chosen. Serial extraction is most effective in class 1 malocclusions and bimaxillary dentoalveolar protrusions. Indicated when there is a marked irregularity in anterior teeth, premature loss of one deciduous canine, midline deviation, displaced lateral incisors, gingival recession and alveolar destruction in the labial surface of the anterior teeth. Several extraction sequences have been advocated with the most common ones being that of Dewel and Tweed. Absence of space in the primary dentition indicates 70% chance of crowding of the permanent teeth, if there is less than 3mm spacing there is 50% chance of crowding.¹³

5. ECTOPIC ERUPTION

Young stated that ectopic eruption was approximately present 3% of the time with greater male predilection and added that two-thirds of the ectopically erupting first permanent molars erupted into position without any corrective treatment.¹⁴ Ectopic eruption of molars can either be reversible or irreversible. Reversible pattern occurs in approximately 66% of ectopically erupting permanent maxillary first molars. In the irreversible form, the permanent first molar remains in a locked position until active treatment is provided or premature exfoliation of a primary second molar occurs.¹⁵ Brass wire or a polyurethane module can be wedged inter proximally^{15,16}. Humphrey¹⁷ banded the second primary molar and soldered a S-shaped Elgiloy loop to the band with the distal end placed at the central pit of ectopically erupting molar. Kennedy¹⁸ suggested a modification of the Halterman appliance where a reverse band and loop appliance with a bonded button on the permanent molar and chain elastic can be used for disimpaction. For ectopically erupting maxillary canines, extraction of deciduous canines is preferred treatment of choice and this resolves permanent canine impaction in 62% of cases and remaining 17% showed favourable canine positions. Other factors which influence canine eruption are degree of impaction and age at which the condition is diagnosed¹⁹.

6. HABITS

The detrimental effects of habits persist as malocclusion even after its cessation. Dental arch perimeters and occlusal characteristics are adversely affected. Thumb sucking, tongue thrusting, mouth breathing, pacifier, nail biting, lip chewing, bruxism are some of the habits in children. Early intervention is necessary to prevent the adverse effects. If the child continues the thumb sucking habit even after the age of 5 years at the time of eruption of permanent teeth the child is motivated, given rewards and reminder therapy is followed. The orthodontic appliance is enforced as the final stage of intervention.²⁰ Nail biting adversely causes malocclusion and root resorption of the anterior teeth, intestinal parasitic infections, change of oral carriage of Enterobacteriaceae, bacterial infection and alveolar destruction. Children with nail biting should be evaluated for emotional problems²¹. Bruxism is one of the common problems encountered and the common clinical side effects include grinding or impacting sounds of teeth; erosion of the teeth occlusal surfaces and breakdown of repairs; hypertrophy of masticatory muscles; hypersensitivity of teeth to cold air; joint sounds. There is no special recommended regimen, but increasing awareness of the patient, intra oral appliances, behavioural treatment and drugs like diazepam and clonazepam have been reported to be effective.²²

7. INTERCEPTIVE FUNCTIONAL THERAPY

Functional shifts caused by premature contacts, and unilateral posterior crossbites can be eliminated by minimal occlusal adjustments/expansion. Functional jaw orthopaedics is one of the vital treatment modality in orthodontics involving growth modification of the jaw base. For a class III orthopaedic correction, once the etiology is analysed appropriate treatment is rendered using Rapid palatal expanders, Facemask, or Chin cup along with orthodontic therapy if required. Class II skeletal pattern with mandibular deficiency is effectively treated by various functional appliances with twin-block gaining more popularity because of its ease of use and effective results. Late mixed dentition or early permanent

dentition is considered the ideal treatment time for twin-block therapy.²³ Treatment can be considered at a much early age if there are procumbent incisors predisposing to traumatic injury or any other psychosocial problems.²⁴

8. DENTAL FACTORS

Various other factors such as scissor bite of first molars, retained primary teeth, midline diastema, abnormal labial frenum might contribute to malocclusion. Supernumerary teeth might be one of the causes for delayed eruption of permanent teeth. All these factors raise the need for intervention to enable normal development of the mixed dentition. Sanin et al²⁵ developed a method to assess if the space between the central incisors would close spontaneously during dentition development.

He estimated that if the diastema is greater than 1.85 mm in the early mixed dentition stage, the possibility of spontaneous space closure reduces to 50%. For a 2.7 mm space the possibility of closure without treatment is only 1%. The measurements are made after the eruption of lateral incisors. Abnormal frenal attachment, oral habits, traumatic deep bite resulting in adverse proclination of the incisors, pathologic migration of teeth, Tooth size arch size discrepancy, angulation of teeth, odontomas occurring in the maxillary midline, developmental cysts in the orofacial midline, and flaccid lips are other proposed etiological factors leading to midline diastema. Hence, proper diagnosis of the etiology of diastema and appropriate effective intervention has to be carried out. The retained primary teeth or supernumerary teeth should be extracted to allow spontaneous alignment.

9. CONCLUSION:

Prompt recognition and elimination of malalignment and malposition is facilitated through interceptive orthodontics as they reduce or eliminate the severity of developing malocclusion. This review has discussed the common clinical problems and its management presenting during the mixed dentition. More awareness among parents and children are necessary for treatment and prevention of malocclusion at an early stage.

10. REFERENCES:

- [1] Popovich F, Thompson G. W. Evaluation of preventive and interceptive orthodontic treatment between 3 and 18 years of age (In: Cook J. T. Ed.) Transactions of the Third
- [2] International Orthodontic Congress London, Crosby Lockwood Staples. 1975. 26-33p. 6. Al Nimri K. and Richardson A. "The applicability of interceptive orthodontics in the community" British Journal of Orthodontics 1997. 24. 223- 228p
- [3] King GJ, Brudvik P. Effectiveness of interceptive orthodontic treatment in reducing malocclusions. American journal of orthodontics and dentofacial orthopedics. 2010 Jan 1;137(1):18-25.
- [4] Stahl F, Grabowski R. Orthodontic findings in the deciduous and early mixed dentition— inferences for a preventive strategy. Journal of Orofacial Orthopedics/Fortschritte der Kieferorthopädie. 2003 Jun 1;64(6):401-16.
- [5] Bishara SE, Hoppens BJ, Jakobsen JR, et al. Changes in the molar relationship between the deciduous and permanent dentitions: A longitudinal study. Am J Orthod Dentofacial Orthop 1988;93:19–28.
- [6] Tulloch JFC, Prof@t WR, Phillips C. In^uences on outcome of early treatment for
 - a. Class II malocclusion. Am J Orthod Dentofacial Orthop 1997;111:533-42
- [7] **Vadiakas G, Viazis AD.** Anterior crossbite correction in the early deciduous dentition. Am Orthod Dentofac Orthop 1992;102:160-2.
- [8] Lorente P. Clasificación y tratamiento de las maloclusiones transversales Mordidas cruzadas completas (MCC). Rev Esp Ortod 2002;42:21123.
- [9] Castañer-Peiro A. Interceptive orthodontics: The need for early diagnosis and treatment of posterior crossbites. Med Oral Patol Oral Cir Bucal 2006;11:E210-4.

- [10] Schindel RH, Duffy SL. Maxillary transverse discrepancies and potentially impacted maxillary canines in mixed-dentition patients. *The Angle Orthodontist*. 2007 May;77(3):430-5.
- [11] Gianelly AA. Leeway space and the resolution of crowding in the mixed dentition. In *Seminars in orthodontics* 1995 Sep 1 (Vol. 1, No. 3, pp. 188-194). WB Saunders.
- [12] Gianelly AA. Treatment of crowding in the mixed dentition. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2002 Jun 1;121(6):569-71.
- [13] Leighton B. C. "The early signs of malocclusion" *Transactions European Orthodontic Society* 1969. 353-368p.
- [14] Young DH. Ectopic eruption of permanent first molar. *J Dent Child*. 1957;24:153-62.
- [15] Sharma PS, Rypel TS. Ectopic eruption of permanent molars and their management. *Quint Int*. 1978;9:47-52.
- [16] Glenn RW. Ectopic eruption of permanent first molar - A simple interceptive method of treatment. *J Nebr Dent Assoc*. 1978;55:11-4.
- [17] Humphrey WP. A simple technique for correcting an ectopically erupting first permanent molar. *J Dent Child*. 1962;29:176-8.
- [18] Kennedy DB. Clinical tips for Halterman appliance. *Pediatr Dent*. 2007;29:327-9.
- [19] Power S. M. and Short M. B. "An investigation into the response of palatally displaced canines to the removal of deciduous canines and an assessment of factors contributing to favourable eruption" *British Journal of Orthodontics* 1993. 20. 217-223p.
- [20] Warren J. J. and Bishara S. E. "Duration of nutritive and nonnutritive sucking behaviours and their effects on the dental arches in the primary dentition" *American Journal of Orthodontics and Dentofacial Orthopedics* 2002. 121. 347-356p.
- [21] Maguire JA (2000). The evaluation and treatment of pediatric oral habits. *Dental Clin. North Am.*, 44(3): 659-669
- [22] Pierce CJ, Gale EN (1988). A comparison of different treatments for nocturnal bruxism. *J. Dent. Res.*, 67: 597-601.
- [23] Baccetti T, Franchi L, Toth LR, McNamara Jr JA. Treatment timing for Twin-block therapy. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2000 Aug 1;118(2):159-70.
- [24] Thiruvengkatachari B, Harrison J, Worthington H, O'Brien K. Early orthodontic treatment for Class II malocclusion reduces the chance of incisal trauma: Results of a Cochrane systematic review. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2015 Jul 1;148(1):47-59.
- [25] Sanin C, Sekiguchi T, Savara BS. A clinical method for the prediction of closure of the central diastema. *ASDC J Dent Child* 1969; 36: 415-418