THE INFLUENCE OF INTERCEPTIVE ORTHODONTIC TREATMENT IN REDUCING DENTAL CROWDING

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ABSTRACT

Aim of study: The interceptive orthodontic treatment is defined as any treatment procedure that eliminates or reduces the severity of a developing malocclusion. Interceptive orthodontics is a good solution in early mixed dentition for improving malocclusion even if it does not solve it completely. **Material and methods**: In this paper are presented clinical cases of child patients with malocclusions treated in the early period of mixed dentition with functional aplliances and removable appliances, which determinated the stimulation of alveolar development and reduced the severity of dental crowding in the permanent dentition.**Results**: Through the presented cases we can advocate that the interceptive orthodontic treatment during the mixed dentition is effective and improve the occlusal relashionship which can help the normal growth of the facial skeleton.**Conclusions**: The interceptive orthodontics is a part of orthodontic treatment used for a recognize and eliminate potential irregularities and malpositions in development of dento-facial apparatus.

Keywords: interceptive orthodontic treatment, early mixed dentition

All authors have the same contribution.

INTRODUCTION

Orthodontics aims to study and treat not only dental malpositions, but also certain changes that occur in development of facial skeleton[1,2]. Orthodontic treatment aims to achieve a morpho-functional balance of the dento-maxillary apparatus in direct relation with the constitutional type and the particularities of growth and development of each individual[3,4].

In relation to the moment when it intervenes, the orthodontic treatment can be[5-14, 15-27]

- preventive — represents all therapeutic acts aimed at removing or counteracting the factors that could cause dento-maxillary abnormalities, the optimal age being considered up to 6 years.

- interceptive— consists in detecting anomalies at the first signs of onset or interrupting their evolution, usually intervening on the cause The role of interceptive treatment is therefore that of timely and targeted intervention to allow the dento-maxillary apparatus, spontaneously or directed, to resume normal development, the optimal age being considered between 7-13 years, in mixed dentition.

- Curative - instituted when the dento-maxillary abnormality is already present and can be:

- early - in early stages of the abnormality and at a young age of the patient. It is placed between 7-13 years. During this period, the organism is in full growth and the

prepubertal phase is of maximum importance for the therapeutic response[10,11].

● late - in obvious stages of the malocclusion and at the patient's old age. It addresses the periods of reduced growth potential after 13-14 years in which the initiation of a treatment requires the use of the entire therapeutic arsenal, depending on the severity of the dento-maxillary abnormality. For this, fixed appliances, numerical reduction, orthodontic surgery and gnathological surgery are frequently indicated.

Regardless of the age at which the intervention is performed, any orthodontic treatment must follow and respect the following objectives[28-32, 33-41:

a) Occlusal objectives: ensure optimal occlusal function (maximum intercuspation)

b) Aesthetic objectives: seeking harmony of the face, a pleasant alignment of the teeth and satisfactory proportions between the facial tissues and teeth.

c) Short and long term sustainability: stability and long-term longevity

d) Avoid iatrogenic injuries.

The main proceeding taken in interceptive orthodontic treatment are[12-17,41-50]:

- Space management following early loss of teeth with space maintainer
- Regaining space for dental eruption and alignment
- Control and correction of dental crowding
- Correction of developing crossbite occlusion
- Screening for palatally ectopic upper canines
- Removing the blocking contacts, which limit the movements of the mandible, through selective grinding, especially on the temporary canines; these grindings become necessary when, at the age of 4 - 5 years, with diastemization already appearing, the canines retain an unabrasive cusp that can lead to incorrect occlusal relationships such as scissor bite occlusions ;
- Extraction of persistent temporary teeth that unfavorably deviate the axis of eruption of permanent teeth;
- Muscle exercises for the perioral muscles
- Control and combating vicious habits
- Removal of soft tissue or bone barrier to a allows teeth to erupt
- Screening for palatally ectopic upper canines
- Treatment of local factors: ex. unerupted teeth, supernumerary teeth, retained primary teeth
- Interception of skeletal malrelation (class II or class III)
- Monitoring the evolution of wisdom teeth to prevent the appearance of frontal dental crowding through their evolution.

MATERIAL AND METHODS

To exemplify the importance of orthodontic interceptive treatment in early mixed dentition, we have selected for presentation three cases of child patients who presented clinical and radiological signs of bimaxillary dental crowding.

Clinical case 1

Patient C.S.A., girl, 8 years old, from the rural environment, was brought by her mother for orthodontic treatment, being worried about the eruption and buccal position of 11, due to the persistence of the milky incisor, which was extracted after the eruption of the homologous central incisor.

During the intraoral clinical examination it was found:

- mixed dentition, with multiple untreated carious lesions in deciduous teeth, complicated with destruction of dental crowns;
- lack of space for the eruption and alignment of the incisors, bimaxillary, the lack of physiological abrasion at the lower milky canines, which determined the anterior positioning of the mandible in habitual occlusion.
- neutral relations in the sagittal and transversal planes at the molars, class 1 Angle malocclusion, with overjet and deviation of the median line towards right (figure 1).

Figure 1. Girl, C.S.A., 8 years old, images of dental arches (a) and static occlusion (b,c).

On the orthopantomogram (figures 2) can be observed: pathological root resorbtion at 54.64, (due to the odontal lesion complicated with periapical inflammatory phenomena) and a tendency towards early eruption of 14 and 24, with obvious root immaturity; limited space for the eruption of the upper lateral incisors; the arrangement "in a bouquet" of the buds of the upper canines and premolars, which denotes an insufficient maxillary alveolar development, with the probability of the appearance of a dento-alveolar incongruity with crowding.

Figure 2. The orthopantomogram of girl C.S.A., at 8 years old

Considering the clinical and radiological signs revealing a dento-alveolar incongruity with crowding (due to insufficient bimaxillary alveolar development), it was decided to initiate interceptive and curative orthodontic treatment, gradually:

- in the first phase, was applied a functional orthodontic appliance (activator) with an

expansion screw, activated weekly, through which the stimulation of bimaxillary transverse development was followed (the appliance was worn 16-18 hours a day);

- in the second phase, were applied bimaxillary removable orthodontic appliances, with transverse expansion orthodontic screws, which aimed to stimulate the development of the jaws and leading the eruption of permanent teeth (the appliances were worn permanently) (figure 3);

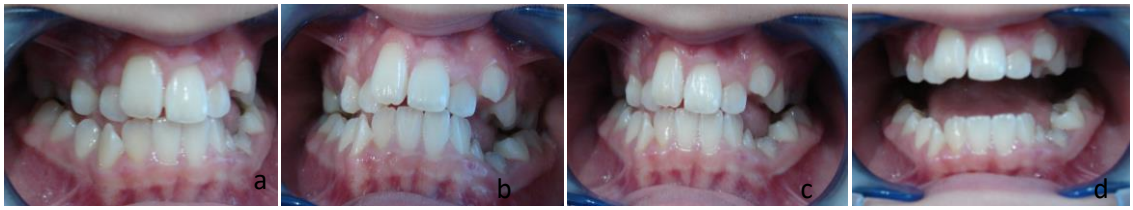

Figure 3. Girl, C.S.A., 10 years old. Images of dental arches (d) and static occlusion (a,b,c).

On the orthopantomogram performed at 10 years old, can be observed the physiological root resorbtion of 55, 74, 75, the dental crowding at the maxillary canine level, as well as the beginning of the mineralization of the crowns of the wisdom molars (figures 4)

Figure 4. The orthopantomogram of girl C.S:S., at 10 years old

- in the third phase (after the eruption of all permanent teeth), were applied fixed orthodontic appliances (straight wire technique, 022 MBT prescription), through which the leveling and alignment of the bimaxillary dental arches it was followed, without dental extractions, although 12 moved to the oral position, without space, after the eruption of 13 (figures 5 and 6);

Figure 5. Girl, C.S.A., at 14 years old. Images of dental arches (a) and static occlusion (b,c,d).

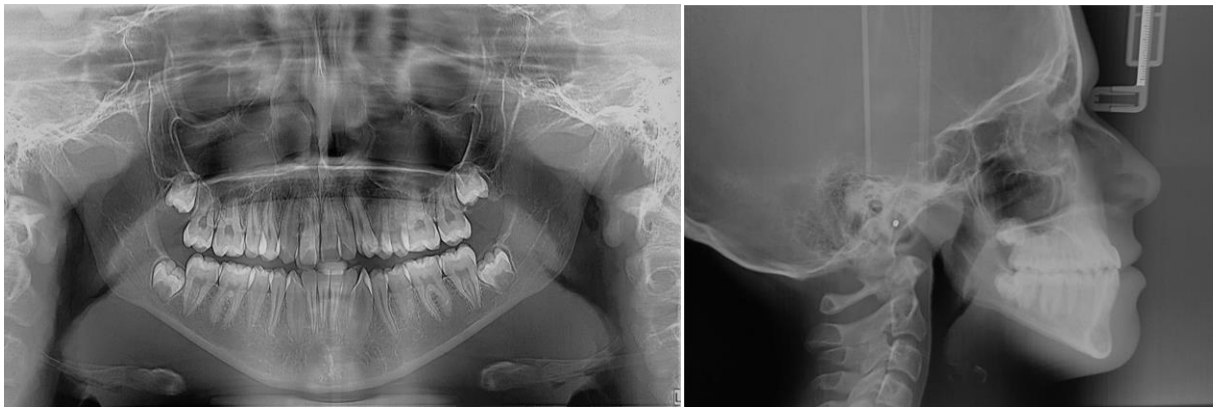

Figure 6. The orthopantomogram and lateral ceph of patient C.S.A., at 14 years old, before starting the orthodontic treatment with fixed orthodontic appliances

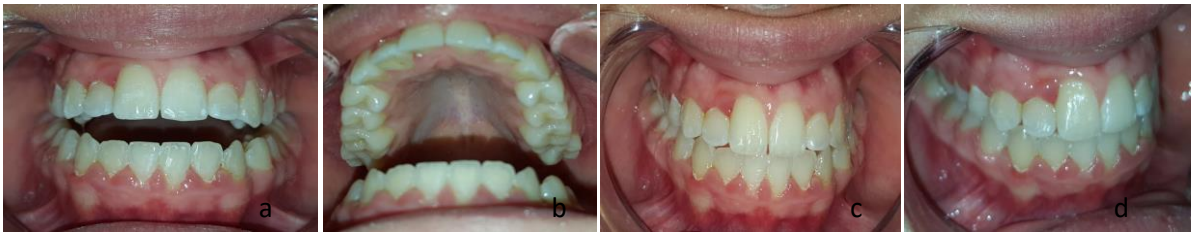

Figure 7. Girl, C.S.A., 16 years old. Images of dental arches (a,b) and static occlusion (c,d).

- after 24 months, the fixed orthodontic appliances were removed and retention appliances were applied, the patient being monitored for the eruption of the wisdom teeth, with the indication of their extraction (figure 7).

Clinical case 2

Patient O.A., girl, 8 years old, from the rural environment, was sent by the dentist to solve the frontal scissor bite between 21 and 31, which caused traumatic periodontal recession at 31. Clinically, the patient presented mixed dentition, with malpositions of the permanent central incisors, limited space at 2-4 mm for the eruption and alignment of the lateral permanent incisors, mandibular propulsion and canine movements blocked due to the scissor bite between 21 and 31 (figures 8).

Figure 8. Girl, O.A., 8 years. The images of oclussion (frontal -a, lateral-b left and right-c).

It was applied an activator with orthodontic screw to stimulate bimaxillary transverse development, correction the anterior scissor bite and gaining the space for the lateral incisors. The device was worn 16-18 hours a day, until the maximum activation of the orthodontic screw, the patient being clinically monitored during the period of replacement of deciduous teeth with permanent ones, up to 13 years.

The patient returned at 16 years age (figure 9), when the clinical examination revealed dental malpositions, with unbalanced occlusion and blocking of the left lateral canine movements (with scissor bite between 23 and 33) and right laterality movements (with scissor bite between 16 and 46). The clinical and radiological examination (figures 10) outlined the diagnosis of Angle class I malocclusion, with bimaxillary dental crowding and skeletal class I (normodivergent), with the presence of wisdom teeth, with lack of space for eruption

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Figure 9. Girl, O.A., 16 years. The images of oclussion (frontal-a, lateral right-b and left-c).

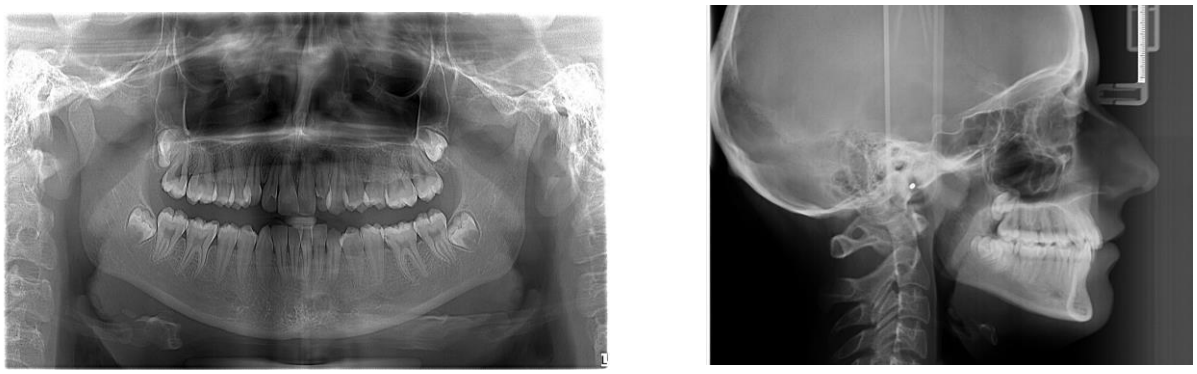

Figure 10. The orthopantomogram and lateral cephalography of patient O.A., at 16 years old, before starting orthodontic treatment with fixed orthodontic appliances

The orthodontic treatment objectives were: dental alignment, frontal and lateral overjet and overbite correction, obtaining neutral sagittal and transversal relationships at the canines and molars, with maximum dental intercuspation, which was achieved after 26 months of orthodontic treatment with fixed appliances (figures 11).

Figure 11. Girl, O.A., 18 years age. The images of dental arches (a) and static occlusion (b,c,d) after removal of fixed orthodontic appliances

Clinical case 3

Patient F.V., boy, 8 years old, from the urban environment, was brought by his parents for an orthodontic examination, his older sister being in orthodontic treatment to solving bimaxillary dental crowding.

The clinical examination showed mixed dentition, with the mandibular central incisors and permanent first molars in eruption, delay in the eruption of maxillary incisors, with the presence of milky incisors, with physiological mobility and cross bite on the right side (figures 12).

Figure 12. Boy, F.V., 8 years old. Frontal view of the dental arches and the panoramic X-ray at the beginning of the orthodontic treatment

The orthopantomogram showed the physiological root resorbtion of the milky incisors, lack of space for the eruption of the permanent ones, the arrangement "in a bouquet" of the buds of the canines and upper premolars, which denotes an insufficient maxillary alveolar development, with the probability of the appearance of a dento-alveolar incongruity with crowding.

Considering the clinical and radiological signs (insufficient bimaxillary alveolar development), the orthodontic treatment aimed in the first stage at stimulating the transverse development of the dentoalveolar

arches, with an activator with screw activated once a week, for 12 months.

Figure 13. Boy, F.V., 10 years, the images of dental arches (a) and static occlusion (b,c)

At 10 years, the orthodontic treatment continued with removable orthodontic appliances, to stimulate the development of the dento-alveolar arches, considering the delayed eruption of the maxillary lateral incisors and mandibular canines and premolars (figures 13).

The patient was followed during the eruption of the permanent teeth, and at 14 years old he returned for the orthodontic treatment with fixed appliances, presenting the permanent dentition, with the erupting second molars and upper cuspides (figures 14), scissor bite between 12 and 42, 43, with blocking of the movements of mandibular propulsion.

Figure 14. Boy, F.V., 14 years. The images of dental arches (a) and oclussion (frontal-a, lateral right-b and left-c).

The clinical and radiological examination (figure 15) outlined the diagnosis: Angle class I malocclusion, with bimaxillary dental crowding and skeletal class I (normodivergent), with the the second permanent molars with the roots in development and the absence of wisdom teeth.

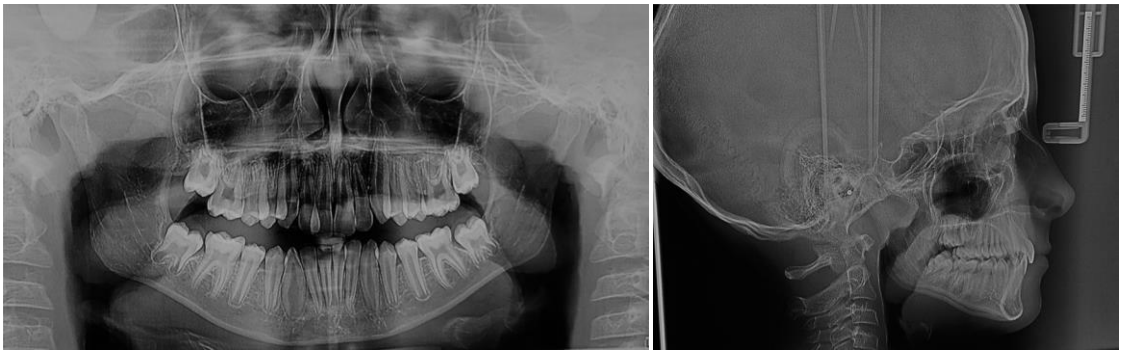

Figure 15 . The orthopantomogram and lateral ceph of patient F.V., at 14 years old, before starting the orthodontic treatment with fixed bimaxillary appliance

The orthodontic treatment continued with the fixed bimaxillary orthodontic appliances, aiming at getting space for dental alignment, correcting the scissor frontal bite, obtaining the correct dental intercuspation, with overjet and overbite within normal limits.

After 24 months, the therapeutic objectives were achieved, the fixed device was removed and the contention splints were applied (figures 16).

Figure 16. Boy, F.V., 16 years. The images of dental arches (a) and oclussion (frontal-a, lateral right-b and left-c), at the end of orthodontic treatment

Clinical case 4

Patient D.A.M, girl, 8 years old, from the urban environment, was sent by the dentist to solve the incisal crowding and the anterior crossbite which caused traumatic periodontal recession at 31.

Clinically, the patient presented mixed dentition, with bimaxillary malpositions of the permanent incisors, mandibular propulsion and canine movements blocked due to the anterior scissor bite and the milky canines with unabrasive cusp (figure 17).

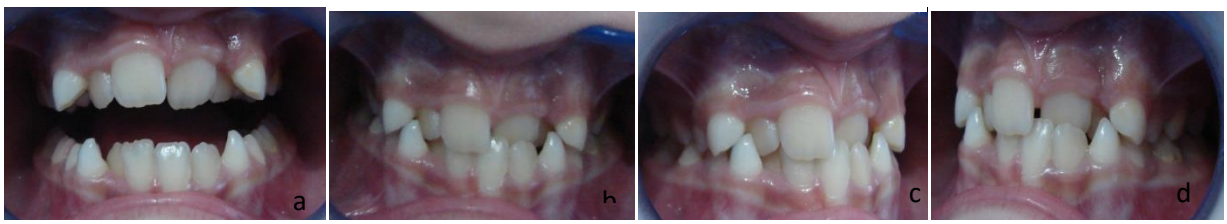

Figure 17. Girl, D.A.M., 8 years old. Images of dental arches (a) and static occlusion (b,c,d).

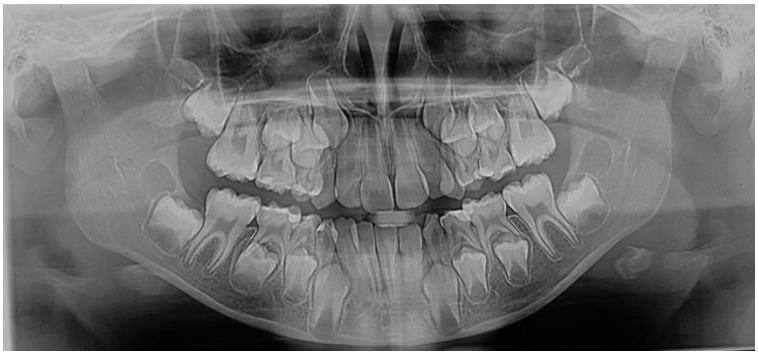

Figure 18. The orthopantomogram of girl D.A.M, at 8 years old

Considering the clinical and radiological signs (figure 18) (insufficient bimaxillary alveolar development, with anterior crowding and lack of space for upper permanent cuspids), the orthodontic treatment aimed in the first stage at stimulating the transverse development of the dentoalveolar arches and resolving anterior crossbite occlusion with removable upper and lower aplliances.

The patient was followed during the eruption of the permanent teeth, and at 11 years old she returned for the orthodontic treatment with fixed appliances, presenting the permanent dentition, with the erupting second molars and upper canines (figure 19), scissor bite between 22 and 34, and lack of space for alignment of 23 with infrabuccal position.

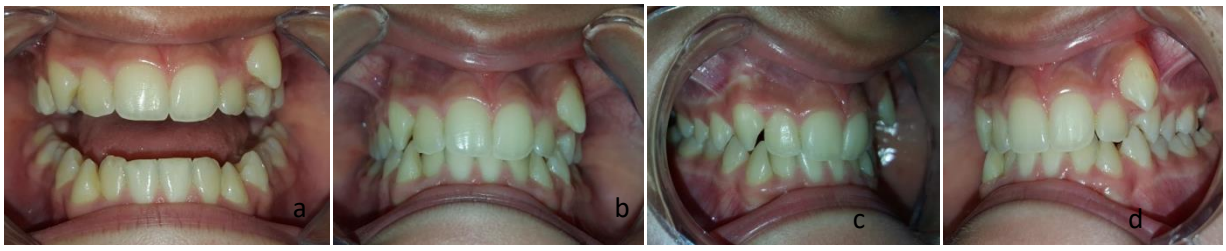

Figure 19. Girl, D.A.M., 11 years. The images of dental arches (a) and oclussion (frontal-b, lateral right-c and left-d).

The clinical and radiological examination (figure 20) outlined the diagnosis: Angle class I malocclusion, with bimaxillary dental crowding and skeletal class I (normodivergent), with the the third permanent molars with the roots in development.

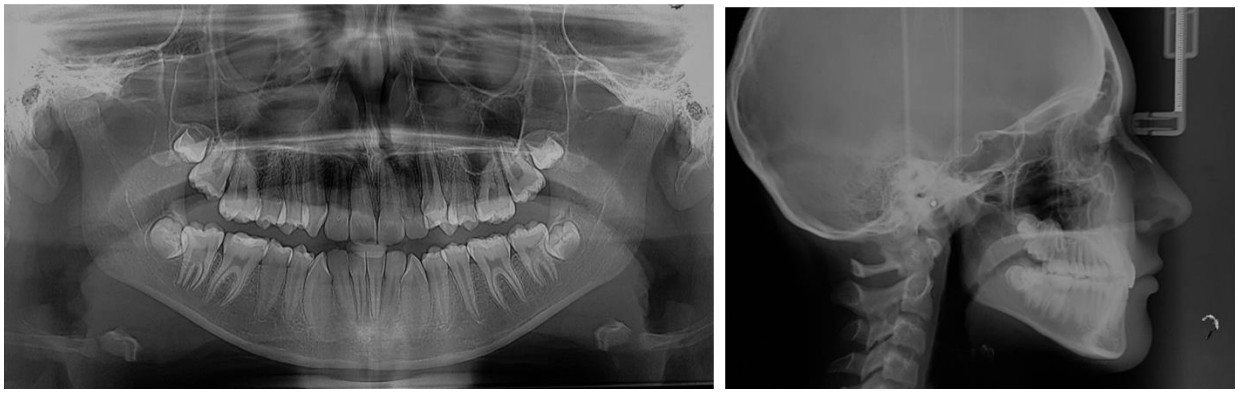

Figure 20. The orthopantomogram and lateral ceph of girl., at 11 years old, before starting the orthodontic treatment with fixed bimaxillary appliance

The orthodontic treatment objectives were: dental alignment, gaining space for 23, frontal and lateral overjet and overbite correction, obtaining neutral sagittal and transversal relationships at the canines and molars, with maximum dental intercuspation, which was achieved after 25 months of orthodontic treatment with fixed appliances (figures 21).

Figure 21. Girl, D.A.M., 13 years. The images of dental arches (a) and oclussion (frontal-b, lateral right-c and left-d), at the end of orthodontic treatment

DISCUSSIONS

Through the presented cases we wanted to emphasize that the dental crowding in early mixed dentition, anterior crossbite, lack of space for eruption and alignment of permanent teeth are a common problem experienced by many children and teens; they require orthodontic treatment because that determine health problems or self-esteem issues[9,18].

Dental crowding can be corrected in temporary and mixed dentition by prophylactic and interceptive treatment, especially if the causes are vicious habits, heredity, certain local factors or eating habits[5,7, 51-57].

Misaligned teeth may affect the ability to chew, causing pain every time at eating, may cause periodontal disease, excess wear and tear on the teeth, gums and jaw muscles, with temporomandibular joint disorders and chronic headaches, speech difficulties and lack of self-esteem and social avoidance[19,20].

CONCLUSIONS

Interceptive orthodontics is beneficial as it reduces the severity of a developing malocclusion, simplifies future orthodontic management and may reduces the complexity and cost of treatment.

Interceptive and preventive orthodontic procedures are relatively simple treatment approaches and target developing malocclusions during the mixed dentition, reducing the severity of malocclusions, eliminating vicious habits, facilitating normal tooth eruption and improving some growth patterns[2,8].

, but can help raise a young child's self-esteem[19].

When deciding on an interceptive treatment for young children with newly erupted crooked teeth, an orthodontist must decide what technical protocol should be suggested to the concerned parents of a young child, must evaluate the timing of orthodontic treatment and must take into account that by age 8, children's criteria for attractiveness are the same as those of adults, and the appearance of the smile is considered to be an important criterion when judging facial attractiveness[5,6].

Thus, we can sustain the importance of interceptive treatment, because, often, it corrects not only the jaw deformities and dental malposition

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