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The Assessment of Complex Treatment of Children with Class II Malocclusion and the Vertical Incisal Disocclusion in Early Changing Bite

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Abstract: Results of complex treatment of patients with combined form of class II malocclusion and the vertical incisal disocclusion caused violation of function of muscles and syndrome of complicated nasal breath are presented. The complex of orthodontic actions with an application myogymnastics and respiratory exercise machine was reasonable. A new date about using of the breathing trainer in the complex of orthodontics treatment of vertical anomaly of malocclusion was presented.

Key words: Class II malocclusion · Vertical incisal disocclusion · Harmful habits · Orthodontic treatment

INTRODUCTION

Treatment of patients with distal occlusion as one of the most prevalent recurrent malocclusion is a complex and urgent problem in orthodontics. According to various authors, in early changing bite distal occlusion occurs in 12,5-31,7 percent of the population [1].

Frequently occlusal disturbances in lateral parts are combined with anomalies in the front area of tooth rows. One of the most important occlusive markers of a combined form of distal and the vertical incisal disocclusion of tooth rows is the presence of a combination of the sagittal and vertical slits in the front area [2, 3].

This occlusive symptom is mainly formed if a child has harmful habits, such as the sucking of a tongue, fingers, objects, the biting of a lower lip, a caudal position of the tongue in the mouth, the influence of obstructed nasal breathing, which is especially true for children at the age of early changing bite [4, 5, 6].

It is known that one of the important factors determining the formation of dentoalveolar apparatus is the functioning of muscles of the maxillofacial region. Achieving a myodynamic balance between the muscles antagonists and synergists creates conditions for the normal development of the dentoalveolar apparatus [7, 8, 9].

Muscle dystonias, leading to failure of muscle function, are often the reason that cause incorrect posture and the pathology of the maxillofacial region [3]. Currently the efficiency of application of therapy of muscles in orthodontics as a method of prevention of anomalies of the maxillofacial region and as a stage of orthodontic treatment has been proved [5]. As a clinical method, myotherapy of muscles promotes the normalization and the development of facial expressions, chewing function and articulation [10]. Usually exercises for muscles are performed using additional devices and simulators. There are different designs with a functional and mechanical action for this purpose. The best time to use these devices is a period of early changing bite, during the growth of the maxillofacial area.

The target of this study is to evaluate the effectiveness of an integrated approach to orthodontic treatment of combined anomalies distal occlusion and vertical incisal disocclusion of tooth rows of children in early changing bite.

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MATERIALS AND METHODS

We carried out the clinical study and treatment of 36 patients aged from 6 up to 9, the complex of main (anamnesis, an objective status) and additional (an anthropometric research method, orthopantomography) orthodontic diagnostic and treatment activities were carried out for them at the Department of Children Dentistry and Orthodontics at the Perm state medical academy named after Academician Eugenie Anatoljevich Vagner (the head of the Department- Doctor of Medical Sciences, Professor M.A.Danilova) and the Dental Clinic "Resto", Izhevsk (the head physician- Candidate of Medical Sciences A.P. Reshetnikov). Inclusion criteria of patients in to Study were early changing bite, which corresponded to the age of 6-9 years, intact tooth rows, closing of molars as II / II class Engle, a combination of a vertical and sagittal slit in the anterior area, the quantity of which ranged from 2 to 6 mm. Exclusion criteria were skeletal Class I or III, normal occlusion or deep bite in the front area, incisal reverse occlusion/ disocclusion, secondary deformations, a period of baby-teeth and period of the late change and of permanent bite. Duration of monitoring of patients was 12 months.

Correction of occlusion was performed by using of apparatus of combined action type (Regulator of Freckle's functions, IV type) and standard elastic positioners.

The apparatus was one size larger for the expansion of tooth arches and the change of an inclination of teeth in the front area on a maxilla.

All the children were divided into two groups according to the proposed plan of treatment of a combined form of distal occlusion and vertical incisal disocclusion. For the patients in group one (n = 17) such hardware and no-hardware methods as exercises for training circular muscle of the mouth and muscles, putting forward a lower jaw were used:

- Water-salt massage that improves of intramuscles the tonus. It is recommended to make a weak salt solution (1/2 teaspoon of salt in a glass of warm water), to take it into the mouth and to massage the upper and lower lip. The exercise should be repeated 1-2 times a day for 5 times;
- The exercise with a wooden stick. A child is offered to install a wooden stick on the chewing group of teeth and bite with a force 10 times. The exercise is performed 3-4 times a day until light fatigue;
- Inflating a balloon daily
- The exercises for tongue muscles (recounting of a palatal surface of frontal group of teeth of the upper and lower jaw, clatter, clicking, stroking of firm and partially soft palate, etc.);
- The exercise with resistance. A child puts his pinkies into the corners of the mouth and slightly stretches them, compresses his lips and makes sure that they do not turn out.
- It is recommended to whistle or blow on the easily moving things by the game "Hit the gate" (a child to blows on a light bulb, trying to put it in to a little toy gate).

For patients in group 2 (n = 19) in addition to hardware and no-hardware methods of treatment of malocclusion the complex of respiratory static exercises with using of " The respiratory simulator for trainer muscular frame of a nasopharynx for patients with vertical anomalies of occlusion of dental rows " (the priority certificate for a useful model under number 2013142634 from 18.09.2013 year) was recommended (Fig. 1).

The device is recommended from 6 years in the period of change and early permanent bite. Duration and frequency of training is necessary to enlarge in the process of accustoming of a child to the exercise machine and adaptation to the respiratory load. In the first week of training ten breaths for every 2 minutes three times a day are recommended, further it is necessary to add 2 inhalations every week.

The assessment of efficiency of orthodontic treatment of anomaly of an occlusion of dental rows was carried out by means of monitoring of the objective occlusal status of patients. The control of sagittal and vertical compliance in the front area was carried out by means of a stomatological line LM ErgoMax.

Statistical processing of the material was carried out by using the software package StatPlus Professional 2009 (Analyst Soft Inc.).

a b

Fig. 1: "The breathing trainer ..." a - a top view of the apparatus, b – the use of the device

In describing of the quantitative traits using the average value (M) and standard error of the mean (m) were used.

The comparison of the relative frequency with populational was conducted by means of tables of conjugacy 2x2 with the computation of χ^2. To compare two dependent groups on a quantitative trait Wilcoxon test was used.

RESULTS AND DISCUSSION

At the stage of the diagnosis of the anomaly of occlusion we paid particular attention to the children included to the study who had with harmful habits. It was found that the fixed stereotype of mouth breathing for the reason of adenoid growths (II - III severity), allergic rhinitis, accompanied by swelling of the mucous membrane of the nasal passages and unwillingness of a child to breathe through the nose because of psychosomatic personal features prevailed in the 1st (14 people) and the 2nd (15 people) groups. Orthodontic treatment was started strictly after the recovery of children's nasal breathing together with the corresponding experts. The presence of such harmful habits as a systematic sucking of a tongue, biting of a lower lip, rear position of the tongue in the mouth was noted.

As a result of the clinical examination of children with combined form of distal and the vertical incisal disocclusion of tooth rows the following features of an occlusal picture were identified: patients in the 1st group had the size of a of sagittal slit in the front area was 4,3 ± 0,42 mm, a vertical slit - 3,3 ± 0,39 mm, patients in the 2nd group had the size of a sagittal slit was 4,5 ± 0.45 mm, a vertical slit - 3,4 ± 0,49 mm. From the total number of examinees, 17 (47.2%) children had crowding teeth position in the front area of a mandible, 9 (25.0%) patients had crowding in the front area of maxilla. All children had an anomalic form of the tooth rows in upper and lower jaws.

After 12 months of active orthodontic treatment the structure of occurrence of harmful habits changed of patients in the 1st group (Table 1).

- The harmful habit of 5 patients of sucking a tongue in 5 patients leveled (χ^2 = 5,86, p<0,05);
- Habitual caudal position of the tongue in the mouth of 7 children became more physiological (χ^2 = 6,58, p<0,05);
- 6 patients got rid of the habit of thumb sucking (χ^2 = 5,88, p=0,02).

The picture of implication of harmful habits of patients of the 2nd group in the course of orthodontic treatment looked as follows (Table 1):

- The stereotype of nasal respiration of 15 children fixed, that makes 78,9% of total number of the patients, who was entered into the 2nd group of the research (χ^2 =24,78, p<0,001);
- 8 patients got rid of the habit of thumb sucking (χ^2 =7,79, p<0,05).

During observation of patients of the 1st and 2nd group of research we defined an appreciable reduction of sagittal and vertical disharmony in the front area. However, we noted more intensive leveling of a vertical incisal slit at the children who were treated by hardware and no-hardware methods of treatment with daily respiratory gymnastics (before treatment - 3,4±0,49, after 12 months of observation - 1,4±0,32, p<0,01) (Table 2). Systematic short-term emergence of pressure in a nasal cavity as a result of exercise of a complex of respiratory exercises with application "The respiratory simulator for training muscular frame nasopharynx in patients with vertical anomalies occlusion dental rows " the effect on formation of a front area of a palatal plate. On the surface, facing the nasal resorption processes begin to prevail, whereas, on the surface facing towards the oral cavity processes of apposition prevail. They to flattening of the palatal arch and the predominance of the growth of the frontal portion of the upper jaw downward and anteriorly (Fig. 2). Intensification of growth of the midface is expressed in the accelerated leveling of a vertical component of combined anomalies of occlusion.

From the total number surveyed 9 (25,0%) persons kept acervuline position of teeth in the front area of a lower jaw (before treatment at 17, χ^2 =3,85, p<0,05), 3 (8,33%) children had a close locating of teeth in the front area of the upper jaw (before treatment at 9, 9, χ^2 =3,60, p<0,05). Most effectively we managed to eliminate the crowding position of the incisors of children who used the standard elastic positioners as orthodontic apparatus. After 12 months of active orthodontic treatment 95.0% of patients from the total number of children included in the study need to continue the chosen way of correction of occlusion anomalies because of the presence of residual sagittal and vertical discrepancy in the front area.

Table 1: Assessment of manifestations of patients' harmful habits with combined form of distal and the vertical incisal disocclusion during the orthodontic treatment

	1st group (n=17)			2nd group (n=19)		
Harmful habits	Before treatment (person)	After 12 months (person)	χ^2	Before treatment (person)	After 12 months (person)	χ^2
Mouth breath	14	8	3,35	19	4	24,78*
Sucking of tongue	5	0	5,86*	5	2	1,57
Rear position of the tongue	9	2	6,58*	8	3	3,19
Biting the lower lip	6	2	2,61	-	-	-
Thumb sucking	7	1	5,88*	10	2	7,79

* Note: * - difference of indicators statistically reliable, p=0,05

Table 2: Terms of leveling of sagittal and vertical discrepancies in the front area of oral cavity in the observation groups depending on the conductivity of orthodontic treatment

	1st group (n=17)		2nd group (n=19)	
Observation period	Sagittal slit, mm.	Vertical slit, mm.	Sagittal slit, mm.	Vertical slit, mm.
Starting of treatment	4,3±0,42	3,3±0,39	4,5±0,45	3,4±0,49
3 months	4,1±0,36	3,0±0,45	4,3±0,37	3,1±0,38*
6 months	3,7±0,40*	2,7±0,72	3,6±0,52**	2,6±0,40*
9 months	3,0±0,47**	1,9±0,66**	2,9±0,55**	1,4±0,32**
12 months	2,5±0,62*	1,5±0,61*	2,3±0,48*	0,7±0,57**

Note: * - difference of indicators statistically reliable, p=0,05

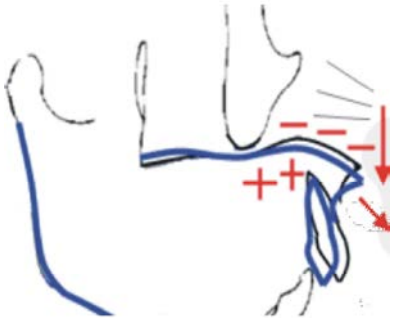

Fig. 2: Growth modification of the front area of the upper jaw

CONCLUSION

Thus, the combination of hardware and no-hardware (a complex of exercises for muscles) treatment methods in the period of an early changing bite allows to achieve effective impact on functional and morphological components of dentoalveolar system of patients.

Focusing on prevention and treatment of myofunctional disorders, increasing the volume of the pathogenic effects of patients with the syndrome of nasal breathing difficulty, improvement functional marks of children with combined form of distal and the vertical incisal disocclusion of tooth rows will allow to achieve positive and long-term results of orthodontic treatment in the reduced terms.

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