

Assessment of Treatment Phases of Class II Malocclusion Treatment

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Abstract: *The orthodontic treatment is usually consistent of one or several phases. Early treatments in mixed dentition are also called Phase I or interceptive treatment. Our research has shown that Class II is the most frequent malocclusion among the Bulgarian children population. The aim of this survey is to assess the treatment protocols for this malocclusion. The analyses are made based on treated patients in the Faculty of Dental Medicine Sofia. The survey analysis includes 661 patients. They are divided in two groups. We develop five treatment protocols for treatment of Class II malocclusion.*

Keywords: interceptive treatment, distal occlusion, rapid maxillary expansion, pendulum appliance, fixed appliance, removable appliance

1. Introduction

The early orthodontic interceptive treatment often is first phase of prolonged treatment associated with the growth processes of the human body. The transversal expansion, stabilization of first permanent molars' position during the tooth eruption in the middle segment and some tooth movements are possible during this period, because not all of the permanent teeth are already erupted. This treatment phase concerns patients in age between six and eight years. When there is a moderate or severe orthodontic deformation, the treatment is recommended to start during this period as a prevention of future orthodontic complications during patients' growth¹.

Using this stage successfully there are chances to decrease the use of maxillary facial surgery as well as the cases with severe orthopedic problems.

Treatments with removable appliances done in students group are just such as interceptive highly effective and cheap ones. In fact these treatments are the most appropriate for a certain period of time at the best price which concern big groups of patients.

The aim of Phase I treatment is to develop child's jaws, so that to create space for permanent tooth eruption, and the improvement of occlusion. If treatment of severe orthodontic deformations doesn't start in Phase I, this may lead to more complications in the future or even treatment including maxillary-facial surgery corrections².

The Phase II treatment starts when the permanent teeth are already erupted and its aim is to normalize the tooth position and arches and to harmonize the relations between the jaws^{3, 4, 5}. Usually this could be achieved with the fixed technic. This group of appliances may be divided to appliance for corrections of perimeter/ dimension of each tooth arch (appliance for maxillary transversal expansion, the appliance for tooth distalisation, extra-oral appliance, appliance with

protruding action and so on) and appliance for tooth and tooth - arch leveling. Consequently they could be used separately or in combination with the first appliances which correct occlusal relations.

Thanks to the achieved in Phase I, the Phase II treatment requires less patient cooperation (without extra-oral appliance, without inter-maxillary elastics) often it eliminates extractions of the permanent teeth and cut the time for treatment with fixed technique. This is very important for the teenage patients.

The most success rate of the orthodontic treatment from Phase I is observed in cases in which the patient is treated with fixed technique or with combination between fixed and removable appliances⁸.

According to our investigation⁹ we find out - the patients with which orthodontic deformation most often ask for the treatment in students group and in group of post-graduate students. There is a significant percent of patients with Class II occlusion 56.2% which are treated from post-graduate students. In students group, the patients with Class II occlusion are 54.1% or in Faculty of Dental Medicine in Sofia the average percent of treated patients with Class II is 55.2%. This statistic is demonstrative for the percent of this orthodontic deformation in Bulgarian population.

Class II malocclusion is a problem in sagittal dimension, in which lower jaw occludes distally compared to the upper jaw. This orthodontic deformation may be caused by the frontal skeletal maxillary position, frontal dento-alveolar maxillary position, posterior skeletal mandibular position and posterior dento-alveolar mandibular position¹⁰. According to a survey, made by Petrunov in Bulgaria, 32% from the children in population between 7 and 14 years are affected and in 62% of them the deformation is bilateral and in 38% the malocclusion is unilateral¹¹.

2. Aim

Our aim is to investigate what type of treatment protocols are used for treatment of patients with Class II occlusion in our institute, how many of these patients are treated with interceptive phase and what is the number of patients treated in permanent dentition.

3. Material and Methods

The existing principal methods for orthodontic correction of Class II occlusion depend on the patients skeletal age and include – orthodontic methods. Only orthodontic or camouflage treatment with tooth extraction and surgical - orthodontic ones (with facial maxillary surgery).

This survey includes only orthodontically treated patients.

In our investigation were included 661 patients, treated in Faculty of Dental Medicine in Sofia. The patients are divided in two groups - group one is from the patients treated by the post graduate students – 365 patients (149 male and 216 female) of average age 14.53 ± 6.70 years and group two – patients treated in student group – 296 patients (144 male and 152 female) on average age 8.82 ± 1.45 years.

Having in mind the specificity of education for post graduate students, the patients in this group are most often selected with permanent dentition (71% from all patients in this group). Only 1/3 from all patients in this group (29%) have been started the treatment when they were in mixed dentition, while 97% from all patients treated in students group are in phase of mixed dentition.

In students group the clinical work is only with removable appliances. Therefore almost all patients from group two are treated in interceptive phase during early development of dentition.

In two groups of patients (first- treated by post graduate students and second- treated in students' group) we divided five treatment protocols:

- Treatment in a single phase – with single appliance. This is possible in both groups.

- Treatment with two phases with removable appliance – this is possible in both groups.
- Treatment in two phases but with two fixed appliances – this is possible only in group one (post graduate group)
- Treatment in two phases with removable and fixed appliance – this is possible in group one (post graduate students). There are few cases in which the first phase with removable appliance were done in students group and afterthought the second phase with fixed appliance were finished from post graduate students.
- Treatment with more phases – this type of treatment includes interceptive phase and in second phase the orthodontic treatment includes more than one fixed appliance such as lingual arch and transpalatal arch for saving Leeway space during time of mixed dentition, and Pendulum appliance for distalisation of upper permanent molars and after that fixed appliance. This type of treatment is possible only in first group.

The SPSS version 13.0 specialized statistical suite was used to process survey data. The critical level of significance used is $\alpha = 0.05$. When we investigated the relationship between category data, we used a Fisher's test.

4. Results

The data received shows that the patients with Class II occlusion (56.2%), in post graduate students group are most often treated in only one phase (52.45%) tab.1. These are teenage age patients with formed permanent dentition treated with fixed technique.

The next most frequently used clinical protocol is with two phases, with two fixed appliances (25.98%). This trend is associated with non-cooperativeness of the teenage age patients. The alternative of this protocol is also two phase protocol, but with removable and fixed appliance (10.79%). It is obvious that is 2.5 less applied method in compared to previous one.

Two phase treatments, with removable appliances are not preferred at this age and their part is only 4.90% from all patients. The many phase treatment are also with a little part of all treatments – 5.88%.

Table 1: Patients treated in group of post graduate students divided by type of treatment protocol.

Deformation	Statistics	Number of phase of treatment					All
		One phase treatment	Two phase treatment with removable appliances	Two phase treatment With fixed appliances	Two phase treatment With removable and Fixed appliances	More than two phase treatment	
Class II occlusion	N	107	10	53	22	12	204
	%	52.45%	4.90%	25.98%	10.79%	5.88%	100%

The treatment in students group is possible only with removable appliances. Therefore there are two opportunities – treatment with a single phase or treatment in two phases with removable appliances. In 2/3 of clinical cases the

treatment is with one phase (67.92%) and in 1/3 of all clinical cases (30.19%) a treatment contains two phases with two appliances.

Table.2: Patients treated in students group divided according to treatment protocol.

Deformation	Statistics	Number of phase of treatment					All
		One phase treatment	Two phase treatment with removable	Two phase treatment with fixed appliances	Two phase treatment with removable and	More than two phase treatment	

			appliances		fixed appliances		
Class II occlusion	N	108	48	1	0	2	159
	%	67.92%	30.19%	0.63%	0%	1.26%	100%

In the next Tab. 3 is shown the percentage distribution of the frequency of used appliances for Class II correction. We will analyze the received results in group of post graduate students, because in these cases there are a lot of opportunities of treatment techniques and appliances.

As it is expected, the most cases are treated with fixed technique in this group (89.3%). The treatment has been started with segment treatment in 15.1% of cases and after distalisation of upper molars is finished only with fixed appliances.

There are tendency of usage of intraoral appliances for distalisation of upper molars (Pendulum) appliance – 17.0% compared to the extra-oral appliance used for same tooth movement – 6.6%. This is imposed by necessity of elimination of patients’ collaboration and responsibility factor and use of more comfortable and more effective appliances.

The trend predominantly is observed of myofunctional appliances (8.8%), compared to classical removable appliances (5.8%). Myofunctional appliances (trainers) are group of factory-made interceptive silicon appliances. They can correct tooth position (with guiding the tooth eruption), development of tooth arches and proper growth of jaws. It is used to change the incorrect functions, so that the bone structures can develop harmonically. The aim is to achieve etiological treatment, not symphonically one. Most frequently used functional appliance in our treatment is Twin Block. This allows us to make treatment in only one phase and make corrections in single tooth arch and occlusion in the same time.

Another modern tendency is also shown on tab 3.is the greater usage of lingual arches (L arch and TPA) and Limp bumper to preserve tooth perimeter dimension during mixed dentition phase (28.5%) compare to usage of lingual plate for correction of single tooth arch in mixed dentition (20.8%). This sustains the tendency of elimination of patients’ compliance as factor during treatment.

Table.3: Distribution of frequency of used appliances for Class II correction

Type of appliances	Group 1 – post graduate students Treated patients-365		Group 2 – students group Treated patients-296		All	
	N	%	N	%	N	%
Lingual plate	76	20,8	251	84,8	327	49,5
Functional appliance	21	5,8	67	22,6	88	13,3
Myotrainer	32	8,8	39	13,2	71	10,7
Fixed technique	326	89,3	1	0,3	327	49,5
Pendulum	62	17,0	0	0,0	62	9,4
EOA	24	6,6	5	1,7	29	4,4
L arch or Lip bumper	104	28,5	0	0,0	104	15,7
Segment arches	55	15,1	0	0,0	55	8,3
Rapid maxillary	34	9,3	0	0,0	34	5,1

expansion						
TPA	16	4,4	0	0,0	16	2,4

Which appliances are most frequently combined during treatment, according to our research is shown in tab.4. in one phase treatment the main appliance which can establish the results is fixed technique and functional appliances including Myotrainers. In treatments with two removable appliances, the combinations are between lingual plate and functional appliance in 54.2% from cases and with Myotrainer in 25.3% from the cases. The rest of the treatments include two functional appliances or combination with Myotrainer.

Table 4: Correlation between combining appliances in different phase of treatment

Type Appliance	Group 1 – Post graduate students Treated patients - 365		Group 2 – students group Treated patients - 296		All	
	N	%	N	%	N	%
Lingual plate	76	20,8	251	84,8	327	49,5
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Myotrainer	32	8,8	39	13,2	71	10,7
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EOA	24	6,6	5	1,7	29	4,4
L arch or Lip bumper	104	28,5	0	0,0	104	15,7
Segment arches	55	15,1	0	0,0	55	8,3
Rapid maxillary expansion	34	9,3	0	0,0	34	5,1
TPA	16	4,4	0	0,0	16	2,4

In treatments of two phases with two fixed appliance the higher percent is for treatment with Pendulum (53.8%) and fixed techniques. The treatment with Lingual arch and fixed technique are 47.3% and the treatments with RME and fixed technique are 20.9%.

In most cases, the Lingual arch is used in lower jaw to preserve the tooth perimeter and Pendulum appliance is used in upper jaw for correction of intermolar relations. That is the reason for their higher presents in the results.

In treatments with more than two appliances the most frequently sequence of appliances is: Myotrainer, Rapid maxillary expansion appliance during the period of mixed dentition for transversal corrections in maxillary arch, distalisation of upper molars with Pendulum appliances for increasing the tooth perimeter in distal area and the finishing of treatment is with fixed technique, through which the tooth are leveled, aligned and the occlusion is harmonized.

More than 50% of the patients, who needed orthodontic treatment, are appropriate for treatment that starts in mixed

dentition. They are successfully treated in students group and there is no need from Phase II orthodontic treatment. This is with financial benefit and with health benefit for patients.

5. Discussion

Whatever the treatment protocol includes one or two phases for correction of Class II malocclusion is chosen, the final treatment result is to achieve normal intermaxillary relations. The main benefit of interceptive treatment is that first phase decrease the percent of traumatic occlusion over lower incisors, also the psychological stress related with malocclusion is captured, which is important in childhood. The early orthodontic treatment has positive influence on self-confidence of the patients, despite they are not willing to cooperate.

This suggest that two phase treatment started before puberty, in phase of mixed dentition, is not more efficient than treatment with single phase which is started during pick of growth – during time that permanent dentition is not fully developed – before the eruption of second molars.

Otherwise early treatment didn't decrease the treatment duration with fixed technique in phase two and it is the same as in cases which need treatment with only one phase with fixed appliances. If the cases are with tooth-alveolar discrepancy, the early treatment phase can't compensate the need of tooth extractions or facial-maxillary surgery. Contrariwise the early treatment is easy and has better options for usage of growth potential of individuals.

6. Conclusion

The changes in skeletal indicators in treatment in Class II malocclusion are possible during the period of active growth which resembles with the period permanent dentition formation. Therefore the treatments made in post graduate students group are more effective. Remodeling of functions is possible in early age, which makes interceptive treatment in students group more effective. We can't forget the patients' factor, in which age the patient search the orthodontic treatment, in which period of skeletal development is patient, his cooperation and the finance ability. We can't say for sure which treatment model gives better results. Each treatment protocol was individually chosen and had a good outcome.

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Author Profile



ectopic and impacted teeth and working with 3D technology.

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