

EFFECT OF MYOBRACE APPLIANCES IN MALOCCLUSION CLASS II DIVISION 1 PATIENTS – CASE REPORT

ЕФЕКТИ НА МΥΟΒRACE АПАРАТИ КАЈ ПАЦИЕНТИ СО МАЛОКЛУЗИЈА КЛАСА II ОДДЕЛЕНИЕ 1 – ПРИКАЗ НА СЛУЧАЈ

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Abstract

Aim: The aim of this study is to show the effect of the myofunctional appliance in the treatment of Class II division 1 malocclusion. **Material and Method:** Eight-year-old twin boys S.G. and J.G. with Class II division 1 malocclusion came to our Department of Orthodontics, and clinical, functional, radiographic, and gnatometric examinations were performed. Impressions were taken for studio casts to perform a gnatometric analysis, before and after treatment with myofunctional devices. The patients were treated with Myobrace K1 step 1 medium and K2 step 2 medium myofunctional appliance. **Results:** After the treatment, the gnathometric analysis showed correction of the crowding, a reduction of the overbite and overjet, significant correction of irregular functions of swallowing and breathing, and improvement of the facial profile. **Conclusion:** The use of myofunctional appliances Myobrace K1 and K2 in early mixed dentition greatly contributes to the timely correction of the dentoalveolar anomaly. **Keywords:** Class II division 1 malocclusion, early mixed dentition, myobrace.

Апстракт

Цел: Целта на овој труд е да се прикаже ефектот од примената на миофункционалните апарати во третман на малоклузија Класа II/1. **Материјал и Метод:** На клиниката за Ортодонција извршено е клиничко, функционално, рентгенграфско и гнатометриско испитување на пациенти С.Г. и Ј.Г., близнаци, 8 годишни момчиња со малоклузија Класа II одделение 1. Земени се отпечатоци за студиомодели за гнатометриска анализа пред и после третманот со миофункционални апарати. Пациентите се третирани со миофункционален апарат Myobrace K1 step 1 medium и K2 step 2 medium. **Резултати:** По спроведениот третман гнатометриската анализа покажа значителна корекција на збиеноста, намалување на вертикалниот инцизивен преклоп и хоризонталната инцизална стапалка и корекција на неправилните функции на голтање и дишење и подобрување на лицевитот профил. **Заклучок:** Употребата на миофункционалните апарати во рана мешовита дентичија во голема мера допринесуваат во навремено коригирање на дентоалвеоларната аномалија. **Клучни зборови:** Малоклузија Класа II/1, рана мешовита дентичија, myobrace.

Introduction

The great challenge for orthodontics is the treatment of Class II malocclusions in children. Developing class II malocclusion is one of the biggest problems in the mixed dentition stage. Early detection and treatment lead to decreasing the severity of the malocclusion and the time and complexity of the orthodontic treatment¹.

The main component of Class II division 1 malocclusion is mandibular retrusion, resulting in excessive overjet, protruded upper incisors, and a shorter upper lip. The main cause of the development were parafunctional habits such as thumb/lip sucking and tongue thrusting². Class II

dentoskeletal disharmony cannot correct itself with growth if not treated and can even worsen with time³. The aim of the treatment of skeletal Class II division 1 is to correct the dental arch relationship and improve the facial profile by promoting favorable mandibular growth⁴.

Part of the orthodontics treatment is the use of functional appliances. They are the first-order choice for early treatment of Class II Division 1 malocclusion for many orthodontists. Functional/myofunctional appliances use muscle action to adjust skeletal and dentoalveolar growth to normal occlusion. In pediatric dentistry, Oral Myofunctional Therapy (OMT) is used to treat malocclusion. Its structure has components built to positively stim-

ulate the masticatory and tongue muscles activity, changing the posture of the mandible to a forward position, correcting orofacial habits (chewing and swallowing), and improving nasal breathing^{5,6,7}.

One of the functional appliances that is used to correct malocclusions and bad habits in children is the Myobrace appliance. It is an intraoral appliance system used in interceptive orthodontics, and its design is adjusted to treat malocclusions in the mixed dentition stage (8-12 years). Adult patients can also use Myobrace but the indication is limited only for non-extractive cases and mild or moderate malocclusions. The usage of this appliance tends to correct the balance of the facial muscles and the chewing. It can also improve tongue posture⁸. To sum up, the main goals of the treatment using Myobrace are 1) restoring nasal breathing from mouth breathing, 2) correcting tongue posture, 3) correcting swallowing, 4) aligning the teeth and jaw to correct position, and 5) unhindered craniofacial development^{9,10,11}.

The Myobrace appliance can be classified into six groups: Myobrace for juniors (aged 3-6), for children (aged 6-10), for teens (aged 10-15), for adults (Aged >15), and the Myobrace Interceptive Class III, and permanent dentition Class III.

Myobrace for children (aged 6-10) is a three-stage appliance system designed to correct poor oral habits while treating upper and lower jaw development problems. The peak effect can be reached after the child's permanent front teeth have come through and before all the permanent teeth have erupted. It is available in three sizes (K1-K3)^{5,12,13,14}.

The K1 is made of soft and flexible silicone, which offers easy adaptation to any dental arch form and malocclusion. It has small breathing holes to establish continuous nasal breathing and myofunctional features to promote correct habits. Because of the manufacturing material used, this appliance can be used at night and induces great retention. Patients can move to the K2 when the K1 is staying in overnight and nasal breathing has been established.

The K2 provides dental arch development and continuing habit correction and it is ideal for kids aged between 5 and 10. It features a revolutionary *Dynamicore*TM with Frankel grid ideal for jaw enlargement and development and further improvement of habit correction. Patients can move to the K3 when the K2 has corrected the arch form, breathing and myofunctional habits.

The K3 focuses on the final alignment of the teeth while retaining the dental arch form, breathing, and myofunctional habits. It is the firmest appliance in the series, made of polyurethane, and designed to provide the best retention of dental arch form and bad habits. By this stage of treatment, patients' teeth will be mostly aligned

and, therefore, the K3 can be used to finalize any remaining mild malocclusion. Patients can move to the Myobrace® for Teens series if further treatment or retention is required in the developing permanent dentition^{15,16}.

In order to achieve the best results, the appliance must be worn regularly for 1-2 hours daily and overnight while sleeping. If it is not used every day, it is not going to work. Patients need instruction how to swallow correctly and to position the tongue in the correct place in the mouth. It is also of great significance to keep their mouth closed when not speaking or eating¹⁷.

Myobrace myofunctional devices are advantageous because of greater patient cooperation. Due to the two-material technology, once it is removed, the tongue and lips can align due to the unique reeducation features¹⁸ of Myobrace. Any disadvantages of using this appliance have not been documented in the literature¹⁹.

Case Report

Eight-year-old boys S.G. and J.G., twins, came to our Department of Orthodontics complaining of protruding upper incisors and crowding.



Figure 1. Pretreatment facial photography, S.G.: A) Front; B) Profile

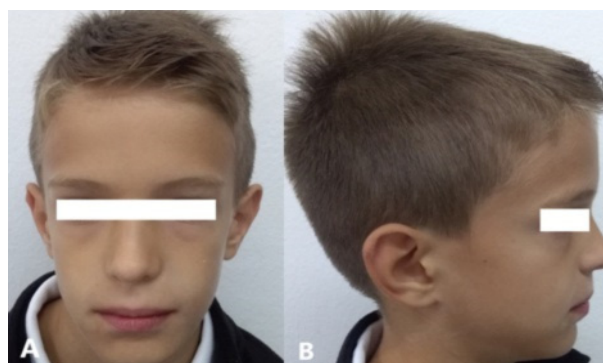


Figure 2. Pretreatment facial photography, J.G.: A) Front; B) Profile

Extraoral clinical examination showed that they both had leptoprosopic and symmetrical faces, convex profiles with a protrusive maxilla, retrusive mandible, an increased lower anterior facial height, and deep labio-mental fold. The lips were incompetent and protrusive (figure 1 and figure 2).

Intraoral clinical examination showed that:

S.G. had Angle's class II molar relationship bilaterally and class II canine relationship bilaterally. Protrusion in the maxillary frontal teeth, crowding in the mandibular dental arch, irregular swallowing, and oronasal breathing were found. Increased overjet up to 5mm and overbite of 3 mm were present (Figure 3).



Figure 3. Pretreatment intraoral photography S.G.

J.G. had Angle's class II molar and canine relationship bilaterally with a protrusion in the maxillary frontal teeth and crowding in the mandibular dental arch. Irregular swallowing and oronasal type of breathing were found. Increased overjet up to 7 mm and overbite of 5mm were present (Figure 4).



Figure 4. Pretreatment intraoral photography J.G.

The panoramic radiograph showed that they both had the presence of all permanent teeth and no pathology.

Treatment Plan

Our treatment plan was based on the patient's symptoms, extraoral and intraoral examination, and roentgenographic and gnatometric analysis, and it included two phases:

1. The patients were instructed to wear the Myobrace K1 appliance for 2 hours each day and overnight while sleeping for a period of 6 months. The K1 contributed to initial myofunctional improvement. It focuses on establishing nasal breathing and the initial correction of myofunctional disorders in the mixed dentition.

2. After Stage K1, we moved to Stage K2, when the patients were instructed to wear the Myobrace K2 appliance for 2 hours each day, plus overnight while sleeping. The design features of the K2 are suited to promote arch development while correcting breathing and myofunctional habits in the mixed dentition.

Results and Discussion

The Schwarz model analysis after 12 months of therapy showed that:

1. S.G. had an increase in anterior and posterior widths (anterior upper width from 32 to 38 anterior lower width from 32 to 39 mm; posterior upper width from 40 to 48 mm, posterior lower width from 41 to 47 mm) (table 1).

Table 1. Dental cast measurements before, during treatment, and after treatment, according to Shwartz (patient S.G.)

Maxillary arch S.I=7+9+9+7=32mm			
	Anterior width	Posterior width	Dental arch height
Before treatment	32mm	40mm	21mm
During treatment	35mm	45mm	22mm
End of treatment	38mm	48mm	20mm
Mandibular arch S.I=7+9+9+7=32mm			
	Anterior width	Posterior width	Dental arch height
Before treatment	32mm	41mm	19mm
During treatment	39mm	44mm	21mm
End of treatment	39mm	47mm	19mm

- J.G. had an increase in anterior and posterior width (table 2), (anterior upper width from 34 to 43mm, anterior lower width from 35 to 42mm; posterior upper width from 44 to 52mm, posterior lower width from 44 to 53mm).

Table 2. Dental cast measurements before, during treatment, and after treatment, according to Shwartz (patient J.G.)

Maxillary arch S.I=8+10+10+8=36mm			
	Anterior width	Posterior width	Dental arch height
Before treatment	34 mm	44 mm	23 mm
During treatment	36 mm	48 mm	21mm
End of treatment	43 mm	52 mm	22 mm
Mandibular arch S.I=8+10+10+8=36mm			
Before treatment	35 mm	44 mm	18 mm
During treatment	38 mm	48 mm	21mm
End of treatment	42 mm	53 mm	20 mm

After stage K2, both had correction in occlusion (figure 5 and figure 6), (canine and molar relationship) and reduction in overjet (S.G. from 5 to 3mm, J.G. from 7 to 3) and overbite (S.G. from 3 to 1mm, J.G. from. 5 to 2mm).



Picture 5. After treatment intraoral photography A) S.G.



Picture 6. After treatment intraoral photography B) J.G.

Table 3. Dental cast measurements according to Moyers.

Patient S.G. (8 years old)				
DSI=7+6+6+7=26 mm				
	Leeway space	Leeway space	Leeway space	Leeway space
	Maxillary arch right	Maxillary arch left	Mandibular arch right	Mandibular arch left
Measuredspace 3+4+5	22 mm	23 mm	23 mm	21 mm
3+4+5	24.3 mm	24.3 mm	24 mm	24 mm
Difference	-2.3 mm	-1.3 mm	-1 mm	-3 mm
Patient J.G. (8 years old)				
DSI=6+6+6+6=24mm				
	Leeway space	Leeway space	Leeway space	Leeway space
	Maxillary arch right	Maxillary arch left	Mandibular arch right	Mandibular arch left
Measuredspace 3+4+5	22 mm	22 mm	20 mm	23 mm
3+4+5	23.1 mm	23.1 mm	22.8 mm	22.8 mm
Difference	-1.1 mm	-1.1 mm	-2.8 mm	-1.8 mm

Table 4. Dental cast measurements according to Lundstrom at the end of the treatment.

Patient S.G. (8 years old)												
Maxillary dental arch												
Tooth	16	15	14	13	12	11	21	22	23	24	25	26
Width (mm)	11	7	8	9	7.5	9.5	10	7.5	9.5	7.5	7	10
Segment	S1		S2		S3		S4		S5		S6	
Required space (mm)	17		17		17		17.5		17		17	
Available space (mm)	17.5		17		17		17		16.5		17	
Difference (mm)	-0.5		0		0		+0.5		+0.5		0	
Mandibular dental arch												
Tooth	36	35	34	33	32	31	41	42	43	44	45	46
Width (mm)	12	8	8	8	7	5.5	6	7	8	8	8	11
Segment	S1		S2		S3		S4		S5		S6	
Required space (mm)	20		16		12.5		13		16		19	
Available space (mm)	19		16		12		12.5		16		19	
Difference (mm)	+1		0		+0.5		+0.5		0		0	
Patient S.G. (8 years old)												
Maxillary dental arch												
Tooth	16	15	14	13	12	11	21	22	23	24	25	26
Width (mm)	11	7.5	9	8	8	9.5	10	7.5	8.5	8	8	11.5
Segment	S1		S2		S3		S4		S5		S6	
Required space (mm)	18.5		17		17.5		17.5		16.5		19.5	
Available space (mm)	18		16		18		18		16		19	
Difference (mm)	+0.5		+1		-0.5		-0.5		+0.5		+0.5	
Mandibular dental arch												
Tooth	36	35	34	33	32	31	41	42	43	44	45	46
Width (mm)	11	8.5	8.5	8	7	5.5	6	7	8	8.5	8	11
Segment	S1		S2		S3		S4		S5		S6	
Required space (mm)	19.5		16.5		12.5		13		16.5		19	
Available space (mm)	19.5		16		13		13		16		20	
Difference (mm)	0		+0.5		-0.5		0		+0.5		-1	

Results from Moyer's analysis in mixed dentition at the start of the treatment (tab.3) show that the upper maxillary arch and lower mandibular arch have moderate crowding (<8), which means that there is not enough space for placing the permanent teeth in the dental arch.



Picture 7. Dental cast before treatment S.G.



Picture 8. Dental cast before treatment J.G.

A Lundstrom analysis at the end of the treatment (tab.4) shows that by wearing K1 and K2 appliances in each segment, we provided enough space (positive value) for placing the teeth.

According to the results from this case report, there is an indication that myofunctional devices, when used in growing patients with mixed dentition and mild-to-moderate sagittal issues, can improve partial or complete resolution of Class II division 1 malocclusion. We have also reviewed other articles where myofunctional devices have been used and have shown positive results when treating growing patients.

In our case, with the use of two Class II correction appliances, K1 and K2, significant differences were documented. The upper anterior teeth were retroclined, and the overjet was reduced. The overbite was slightly reduced. There was a slight increase in the width of both dental arches, suggesting that myofunctional treatment played a role in promoting the transversal development of the dental arches.



Picture 9. S.G. dental cast at end of the treatment



Picture 10. J.G. dental cast at end of the treatment

In a study from Rongo et al. (2019) has been reported efficient results from the use of myofunctional treatment for correcting Class II malocclusion. In this study, the cephalometric analysis showed larger maxillary dimensions for the contemporary group (CG) than the historical group (HG), while no differences were shown between the growth rate and direction of the two groups²⁰.

Antonorakis et al. (2019) analyzed fifteen growing children with Class II division 1 malocclusion. Results have been obtained using dynamic 3D recordings of facial expressions prior to and 12 months after using myofunctional devices. It was concluded that myofunctional appliance treatment has improved the condition of kids with Class II malocclusion by reducing the overjet²¹.

The incorrect myofunctional habits such as mouth breathing, tongue thrusting, reverse swallowing, and thumb sucking are the real causes of malocclusion according to a study of Sander FG et al. (2001). Considering the results from the last 20 years, myofunctional research has developed orthodontic appliances to improve the dental and facial development of children from 5 to 15, with the usage of myofunctional orthodontic techniques instead of traditional orthodontics. This technique straightens teeth and also treats the incorrect jaw development¹⁷.

Habashy et al. (2020) compared the dentoalveolar effects of the myofunctional trainer T4KTM versus twin

block in children with class II division I malocclusion. The overjet showed a higher significant decrease in the twin block group compared to T4K ($p = 0.03$). The mean values of the overbite were significantly decreased in twin block than in T4K ($p < 0.0001$). Both groups showed significant dentoalveolar improvements toward class I occlusion. However, the twin block showed significantly better results than the T4K appliance²².

Conclusions

The use of myofunctional appliances, such as myobrace K1 and K2, in early mixed dentition greatly contributes to the timely correction of the dentoalveolar anomaly by establishing correct orofacial functions of breathing, swallowing, and mastication, as well as improving the facial profile of the patients. Widening of the upper and lower anterior and posterior width of the arches results with relief of crowding. Moyers' analysis at the start of treatment (table 3 and figure 7 and 8) and Lundstrom's analysis at the end of treatment (table 4 and figure 9 and 10) showed that treatment with Myobrace K1 and K2 appliances helped in correcting crowding and provided space for all teeth in the dental arch.

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