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## Case Report

# A Case Report on Pre-orthodontic Trainer in 9-year-old child with 12 month follow up.

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**ABSTRACT**

**BACKGROUND:** Pre-fabricated myofunctional appliances for early orthodontic therapy have been designed specifically for the care of children at the time of mixed dentition in growing adolescents with class II division 1 malocclusions. Sophisticated prefabricated removable functional appliances known as pre-orthodontic trainers have been shown to train the orofacial musculature, thus correcting malocclusions.

**CASE DESCRIPTION:** This is a case report of 9-year-old boy diagnosed as Class II division 1 malocclusion with protruded upper anterior teeth, constricted upper arch, space loss in lower arch and Class 2 molar relation on side. Functional treatment approach was decided using pre orthodontic T4K trainer for 12 months. At the end of this phase of treatment, improvements have been evaluated with lateral cephalograms superimposition between T1 and T2.

**DISCUSSION:** Class II orthopaedic treatment along with the use of functional appliances by early interception assist in addressing the concerns with soft tissues, muscles, mouth respiration, and bruxism. The pre orthodontic trainer allowed a good dento-skeletal result as it had a major effect on the masticatory muscles after 18 months application which helped in obtaining a good esthetic outcome for the patient.

**CONCLUSIONS:** The use of prefabricated functional appliance in children can be an advantageous method for early treatment of class II malocclusions with functional patterns as these devices influences masticatory muscle which help in molding the facial tissues and a viable alternative to braces for treating malocclusions in children because it stimulates the development of the dental arches transversely to stop the progression of the malocclusion. Therefore, when a lack of transverse development is discovered at a young age, this appliance is an invaluable tool for enhancing dental arch development, interceptive management of malocclusion, and oral habits.

***Keywords:*** *pre orthodontic trainer, class II malocclusion, interceptive orthodontics.*

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## INTRODUCTION

The most commonly seen issue in class II division 1 malocclusions growing patients is skeletal problem usually mandibular retrognathia associated with functional disorders. Functional appliances have been known to alter the skeleton and dentoalveolar structure since ancient times.[1,2,3] To overcome functional, mechanical, and psychological barriers to mandibular growth, several alternative techniques and devices have been developed.[4] Mandibular growth is modified and associated functional abnormalities can be corrected using prefabricated orthodontic trainers.[5] It is known that these devices produce neuromuscular changes that affect the morphology of the craniofacial complex..[6,7,8] At the same time, it is also known in orthodontics that patients are more comfortable and get a better outcome using these orthodontic appliances as they don't hurt the child when the appliance is worn so it would have a better outcome intercepting the malocclusion using these devices. When teeth are the only thing being moved throughout treatment, just a portion of the issue is being addressed, and relapse is likely.[9] The correction of orofacial dysfunctions must be a part of the treatment plan for these malocclusions. Therefore, a malocclusion treatment plan must incorporate appliances that reduce soft tissue dysfunction affecting the cheek, lip, and tongue muscles while also realigning the teeth and jaws.[10] Particular benefits of this type of appliance above other functional appliances, as demonstrated by clinical experience: Impressions are not required. Due of the challenge of persuading uncooperative kids at this age, complex appliance placement is not necessary. This appliance has a high acceptance rate among children and is unbreakable and comfortable, which are the main disadvantages of other types of functional appliances. The System of Trainer's appliances seems to be reasonably priced and reliable (Ramirez et al., 2008). The impact of a trainer on end-on-molar relation in mixed dentition has not yet been documented in the literature. Pre-orthodontic trainers are available in various sizes for kids between the ages of 4 and 12 (mixed dentition stage), and they are shaped to fit the upper and lower incisors in an edge-to-edge relationship. The Trainer for Kids (T4K, Myofunctional Research Co, Australia) is a prefabricated functional appliance which is used to correct malocclusions at an early age by acting on muscular dysfunction and repositioning the mandible in forward direction and it stimulates the transverse development as well.[11] This paper's goal is to describe a genuine instance of a kid who had class II malocclusion, functional issues, a habit of mouth breathing, and a space discrepancy in the lower arch which had been successfully treated during mixed dentition by a pre-orthodontic trainer with a long-term follow-up. Post treatments effects were evaluated with superimposition of T1 and T2 Cephalograms.

## CASE DESCRIPTION

**DIAGNOSIS:** A 9-year-old boy was referred to Department of Pedodontics, KVG Dental College & Hospital, Sullia, DK, Karnataka from a dental camp at Puttur, Sullia conducted by KVG Dental College & Hospital with primary issue being that the lower teeth are crowded as well as the upper teeth are placed forward. Mouth breathing habit was noted. Parental history revealed mother was over protective and the maternal attitude towards dentistry was positive. No findings were noted in the medical history. Behaviour history revealed the boy was a shy introvert child with cooperative behaviour was noted. On the clinical examination, he was moderately built and nourished with normal gait was present; extraoral examination revealed mesocephalic head form, leptoprosopic facial form, apparently symmetrical face with normal skin. No deviation or clicking sound was noted in TMJ examination. Lips were potentially incompetent, deep mentolabial sulcus and hyper mentalis activity was noted. Facial pattern was convex (Figure 1a,b&c) and anterior divergent face was noted. Intra-orally, he presented with a end on molar relation on both sides and a mixed dentition with retained primary 64 with ectopically erupting 14 with a "V" maxillary arch form and missing lower primary canine and space loss with respect to 73 (Figure 2a&b & 3a&b). Furthermore, he presented class II molars relationship, an increased over jet (+8 mm) and a deep overbite (+3 mm). Tanaka Johnson mixed dentition analysis revealed a space deficiency of 8mm in the lower arch. Cephalometrically, steiner's analysis inferred as retrognathic mandible and proclined rmaxilla on a class II skeletal base, proclined upper & lower incisors with horizontal growth pattern and McNamara analysis inferred as mild retrognathic mandible with average maxilla(class 2 skeletal base) and proclined upper incisors with horizontal growth pattern.(Table1 & 2). Correlating all the findings it was diagnosed as a class II malocclusion with mouth breathing habit with horizontal growth pattern and tooth size arch length discrepancy with respect to lower arch.

**Figure 1a, b & c shows the frontal, lateral and anterior view**

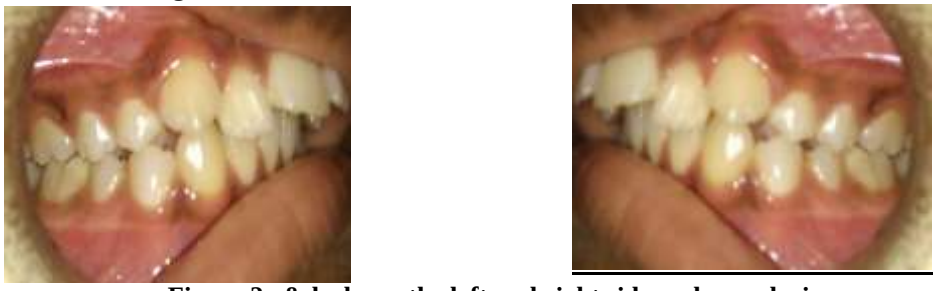

**Figure 2a & b shows the left and right side molar occlusion**

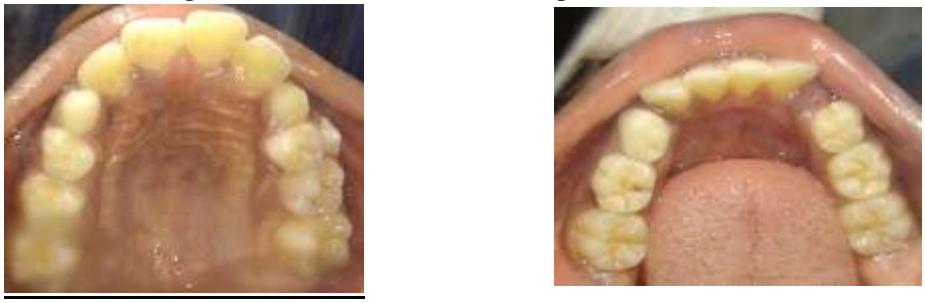

**Figure 3a & b shows upper arch and lower arch picture**

| STEINER'S ANALYSIS | | | |
|---|---|---|---|
| **MEASUREMENTS** | **MEAN** | **PRE TREATMENT** | **POST TREATMENT** |
| **SNA** | **82±2** | **86** | **82.5** |
| **SNB** | **80±2** | **78.5** | **80** |
| **ANB** | **2** | **6.5** | **4.5** |
| **Go Gn to SN** | **32** | **25.5** | **25.5** |
| **Occl. To S-N angle** | **14** | **$18^0$** | **$19^0$** |
| **1 to N-A-mm** | **4** | **6.5mm** | **4.5mm** |
| **1 to N-A-angle** | **22** | **$30^0$** | **$26^0$** |
| **1 to N-B mm** | **4** | **5.5mm** | **4.5mm** |
| **1 to N-B angle** | **25** | **$36^0$** | **$25^0$** |
| **I to I angle** | **131** | **$110.5^0$** | **$110.5^0$** |

**Table1**

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| Mc NAMARA ANALYSIS | | | |
|---|---|---|---|
| | **Measurements** | **Pre Treatment** | **Post Treatment** |
| | **Nasolabial angle** | **$111^0$** | **110** |
| **Maxilla to mandible** | **Co-point A(Max length)** | **90 mm** | **92** |
| | **Co- gnathion(Mand length)** | **103 mm** | **112** |
| | **Maxillomandibular differential** | **13mm** | **20mm** |
| **Vertical** | **Lower ant face height (ANS-Mn)** | **58mm** | **62** |
| | **Mand.plane angle(Go-Mn to FH)** | **$21^0$** | **$22^0$** |
| | **Facial axis angle** | **$-5.5^0$** | **$0^0$** |
| **Mandible to cranial base** | **Pog to N Perpendicular** | **-1.5mm** | **-1mm** |
| **Dental** | **Upper 1 to point A** | **8.1mm** | **6mm** |
| **Sagittal** | **Lower incisor protrusion** | **$2^0$** | **$1^0$** |

**Table 2**

## TREATMENT PLAN:

Following a comprehensive clinical and data-base analysis, a myofunctional appliance was planned for the patient because of the patient's age and associated dental and muscle issues. Given that the adolescent had a mixed dentition and was cooperative, it was decided to use a preorthodontic trainer. Treatment objective would include:

1. Correcting the maxillary teeth's proclination
2. Relieve crowding of the lower anterior teeth of the jaw.
3. In order to accommodate the emerging permanent teeth, arch expansion was also required.
4. Enhance the arch shapes and the tongue's resting position
5. Establish the skeletal and molar class 1 relationship.

## APPLIANCE CHOICE:

Orthodontic trainers (Figure 5) are functional appliances which become active through skeletal and dentoalveolar alterations, as well as muscular forces. They are used to obtain expansion by the correction of the tongue posture. Some types are used to treat mandibular retrognathia by enhancing mandibular growth; they are constructed in protruded position of the mandible (Activator effect). In this case it was a developing class 2 malocclusion the occlusion plane reorientation which is recommended in class II malocclusions associated to retrognathia was not required as patient premolar was in erupting stage.

## TREATMENT PROGRESS:

The patient was referred to an otorhino-laryngologist for evaluation of the upper airway condition. An allergic rhinitis was diagnosed and treated. To accomplish the remaining goals, the patient was told to wear the trainer for 14 hours each day. The patient compliance was preserved, during the treatment period, by continuous information about treatment goals and short-term rewards. (Figure 4)

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**Figure 4**

**Figure 5**

## TREATMENT RESULTS:

Treatment results (Figure 7 and 8) were obtained after 18 months and they were evaluated with superimposition of T1 and T2 cephalograms. It was seen that the maxillary teeth's proclination had decreased and the mandible's anterior teeth were crowded. Arch expansion was also accomplished to make room for the emerging permanent canines. Improved arch forms and proper tongue resting position were observed. Patient profile considerably improved. Also accomplished was Class 1 skeletal and molar relationship. To achieve a stable occlusal relationship, a u-loop was positioned in the lower arch until the eruption of the canine lingual arches..

**Figure 7a,b**

**Figure 8a,b**

## DISCUSSION

The trainer for kids (T4KTM, Myofunctional Research Co., Australia) is a polyurethane prefabricated functional appliance that promotes the idea that by treating muscular dysfunction and realigning the jaw, it can rectify malocclusions at a young age. It is made up of a number of components intended to activate the tongue, masticatory, and facial muscles. Therefore, a clinical course meant to cure a malocclusion must include appliances that eliminate soft tissue dysfunction affecting the cheek, lip, and tongue muscles while also realigning the teeth and jaws. When compared to the pre-treatment goals, the use of the prefabricated orthodontic trainer produced positive dento-skeletal effects after 18 months (figure7,8 &9) which is in accordance with studies done by conducted by Das and Reddy in India after 15 months[1] and the study conducted by Usumez and Coll in Turkey after 13 months. As was the case in our report, the literature stated that these findings required the patients' and their parents' compliance.[1,15]

Using clinical and radiographic examinations, it was shown that abnormal swallowing was addressed, bruxism was decreased, and nasal breathing functions had improved in this study of skeletal Class II cases. According to Quadrelli et

al., reduction in the open bite and the ANB angle were also discovered in addition to the noticeably increased inter-molar breadth (2002). 11 Also found were a significant rise in total face height, proclination of the lower incisors, retroclination of the upper incisors, and a decrease in overjet, which are similar to findings from a research by Usumez et al. on 20 patients with Class II Division I mixed dentition (2004).[12]

In our study it was noted that a significant reduction in the ANB angle, decrease in overjet and a significantly higher increase in the angle of facial convexity was detected which is similar to results obtained by Idris et al. (2018) who compared the soft tissue and hard tissue changes next to treatment with Activator and T4K in 54 Class II Division I patients between age 8 and 12 years using Activator as compared to T4K. Nasolabial angle significantly reduced with Activator while compared to T4K. A significant decrease in overjet was also noticed with the Activator appliance as compared to T4K.[13]

There is evidence that malocclusion carries an unlimited weight wherever (Disha et al.,2017). Malocclusion must be corrected with orthodontic therapy, but if any abnormal muscle activity is disregarded, malocclusion might recur (Danz et al.,2012). To avoid the danger of recurrence and to achieve stable orthodontic outcomes, it is vital to retrain the aberrant muscle tone and function in addition to correcting the dento-alveolar system (Ramirez and Farrell,2005).[14]

Guven et al. (2013) conducted a comparison study on individuals with Class II profiles and mandibular retrusion who were between the ages of 6 and 12 years old. They compared the improvements brought about by the Frankel II appliance, fixed anterior bite plane, and T4K trainer. They discovered that, in addition to other groups, the T4K group displayed a significant rise in mandibular inter-canine width and a decreased overjet, which is comparable to the findings of this study. Similar to the findings of Guven et al. (2013), T4K in our study resulted in a reduction in the length and depth of the maxillary arch and an increase in the mandibular arch. Additionally, it was discovered that the Trainer caused less discomfort and was more tolerable, similar to the findings of Szuhanek et al.[15]

The trainer has three effects: jaw positioning, myofunctional training, and tooth guidance. It straightens the teeth and has practical advantages. A non-thermoplastic silicone or polyurethane with inherent memory and flexibility is used to make the tooth guidance in a trainer. In other words, they are pre-moulded to the parabolic shape of the natural arches and are flexible enough to fit any size arch. The labial bows and anterior tooth channels provide a steady stress on crooked anterior teeth to help improve their alignment. These elements of the trainer may have led the teeth to line up properly, improving the arch. At the end of the interception, the corpus axis improved from 54mm to 62mm which can be explained by the mandibular growth forward. Das and Reddy have reported also the decrease of the class 2 skeletal pattern in the group treated by trainers after 15 months application.[1] The occlusal plan was successfully reoriented thanks to the appliance customization, as shown in the superimpositions. This reorientation is a guarantee for the treatment results long term stability. The customization allowed, in the other hand, a better patient compliance because it increases the comfort and acceptance of the appliance.[16] Publications often discuss the impact of myofunctional habits, such as aberrant lip and tongue function, on craniofacial development and orthodontic issues. This issue has been dealt with using a variety of appliances. To achieve muscular balance, get rid of oral dysfunction, and correct or decrease maxillary incisor protrusion/proclination have been the main goals of employing myofunctional equipment. Numerous problems remain unresolved about the growth and development of craniofacial structures as well as the effect of the perioral muscles on the location of teeth, particularly in relation to neuromuscular behaviour during various orthodontics treatment approaches. Since they have been in use for so long, myofunctional appliances occupy a significant place in modern orthodontics. They are simple and inexpensive, but the cases must be carefully selected, and the operator should be well-versed in their use.[17,18,19]
Despite the fact that functional appliances are primarily used to correct malocclusions, they have few drawbacks, such as their bulk, construction with rigid material, lack of patient and parental compliance, frequent discomfort, and patients' simple giving up on the treatment.

## CONCLUSION

Preorthodontic trainers helps in enhanced nasal breathing, optimal swallowing pattern and removal of habits like tongue thrusting and mouth breathing. Pre-orthodontic trainers can relieve lower anterior crowding, straighten incisors, and regulate growing space loss. Therefore, it can be concluded that Class II malocclusions and other dental malocclusions with associated oral habits can be treated using pre-orthodontic trainers.. It can be employed as a real alternative to other techniques and appliances for the correction of the class II malocclusions in growing patients specially in low-income countries.

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