

Management of Malocclusion in Children Using Myobrace Appliance: A Systematic Review

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Background: Bad habits are something that is common in children aged less than six years and can stop on their own (spontaneously). If these bad habits continue after the age of six years, it can cause malocclusion in children. In the world of pediatric dentistry, one of the treatments for malocclusion is Oral Myofunctional Therapy (OMT). One of the myofunctional tools that can be used to correct malocclusion as well as bad habits in children is the Myobrace Appliance. Myobrace is an intraoral device system used in interceptive orthodontics, designed for the treatment of malocclusion in pediatric patients. **Aim:** The purpose of this systematic review is to find and explore the management of malocclusion in children using the Myobrace Appliance. **Methods:** The data was collected by searching the literature on an article search site, namely Google Scholar, published from 2016 to 2020. The data search was carried out systematically using the keywords Malocclusion in Children and Myobrace Appliance. After eliminating duplicated articles, the titles and abstracts of each article were analyzed on 108 articles which resulted in the exclusion of 42 articles. The full-text articles in the remaining 9 articles were re-analyzed and excluded 3 articles and produced 6 articles which were then entered into the analysis. **Result:** There are 6 articles that discuss the management of malocclusion in children using the myobrace appliance. **Conclusion:** Myobrace appliance can be used as an alternative treatment for malocclusion in children, especially to correct class II malocclusion and class III malocclusion (mandibular prognathy and maxillary retrognathy). In addition, this tool is also capable of correcting overbite, overjet, crowding of upper and lower anterior teeth, sagittal molar relationships, lip seals, facial asymmetry.

Keywords: *Malocclusion, Myobrace, Oral Myofunctional Therapy*

Introduction

A habit is a pattern of behavior that is repeated and is generally a normal stage of development. Repetitive behavior is common in childhood and most of these behaviors start and can stop spontaneously. The mouth is a general and permanent location for emotional expression and is a source for releasing desire and anxiety in both children and adults, stimulation can be through the tongue, fingers or nails which can be a palliative action (a state that can provide calm). Habits that occur in the oral cavity (Oral Habits) can be classified into two, namely physiological and non-physiological Oral Habits. Physiological oral habits are normal human habits such as nasal breathing, chewing, talking, and swallowing. Non-physiological oral habits are abnormal human habits that cause pressure and tendencies that persist and are repeated continuously so that they affect craniofacial growth and are usually called Bad Habits.^{1,2,3,4}

Bad habits are something that is normal in children aged less than six years and can stop on their own (spontaneously). If these bad habits continue after the age of six years, it can cause malocclusion in children. Malocclusion is defined as an abnormal dentofacial condition which refers to an abnormal occlusion or impaired craniofacial relationship that can affect appearance (aesthetics), function, facial balance, and psychosocial states. Malocclusion is one of the most common dental problems with a prevalence ranging from 20% -80% in different studies and is a common study. Examples of bad habits that can lead to malocclusion include thumb sucking, pacifier sucking, tongue placing pressure on teeth, nail biting, mouth breathing, bruxism and lip biting (lip sucking). A habit that lasts a total of at least 6 hours a day, of sufficiently high frequency with sufficient intensity to cause malocclusion. Of these three factors the most influential is the duration or duration of the habit. Bad habits are often distributed as a cause or risk factor for various types of malocclusion, be it in an open bite, with the maxillary incisor sloping facial (protrusive), mandibular to lingual (retrusive) incisors, and the eruption of several incisors becomes obstructed causing increased overjet and reduction of overbite.^{1,5,6,7}

In the world of pediatric dentistry, one of the treatments for malocclusion is Oral Myofunctional Therapy (OMT). OMT is defined as the treatment of dysfunction of the facial and mouth muscles, with the aim of correcting orofacial functions, such as chewing and swallowing, and improving nasal breathing.^{8,9} The goal of myofunctional therapy is to strengthen the muscles necessary for normal breathing, chewing, and breathing. and swallowing with a focus on increasing the tone and mobility of the oral and cervical structures.^{10,11,12} One of myofunctional tool that can be used to correct malocclusion as well as bad habits in children is the Myobrace Appliance. Myobrace is an intraoral appliance system used in interceptive orthodontics, designed for the treatment of malocclusion in mixed dentition patients (ages 8-12 years). Myobrace can also be used in adult patients but only for non-extractive cases and for mild or moderate malocclusion. This tool works to improve the balance of facial muscles and chewing, and restore tongue posture. Myobrace has the following objectives: 1) to get a myofunctional effect, 2) to restore the position of the

mandible, 3) to stimulate the muscles of the face, masseter and tongue, 4) to move the mandible forward, 5) and to stimulate horizontal growth.^{13,14}

Methods and Materials

Data source

The data was collected by searching the literature on an article search site, namely Google Scholar, which was published from 2016 to 2020, the search was carried out until December 2020. The data search was carried out systematically using the keywords Malocclusion in Children, and Myobrace Appliance.

Research Criteria

A. Inclusion Criteria

1. Articles Published between 2016-2020
2. Articles in English
3. Scientific articles that are published and available online
4. Articles which research about children using *Myobrace Appliance*

B. Exclusion Criteria

1. Articles that cannot be freely accessed
2. Articles which does not talk about malocclusion treatment in children

Data collection

The data that will be used in this research are secondary data. The data is obtained from articles that are searched for in the article database which will then be reviewed according to the research criteria set by the researcher.

Research procedure

1. Literature search was conducted on the Google Scholar online database. In addition, a search for the list of references to articles that fall into the inclusion criteria was also carried out to find out whether there were other related studies that were relevant to this research.
2. Keywords were determined in literature searches, namely Malocclusion in Children, and Myobrace Appliance
3. Eliminate duplicated literature
4. Articles are filtered on the basis of title, abstract, and keywords
5. Read complete or partial articles that have not been eliminated to determine whether the articles meet the eligibility criteria.
6. Data collection was done manually by creating a research matrix containing: author's name, year, title, and conclusion.
7. Processing the data that has been obtained
8. Literature search was carried out on an online database, namely Google Scholar using keywords, namely Malocclusion in Children, Myobrace Appliance

9. Elimination of duplicated literature found 108 articles.

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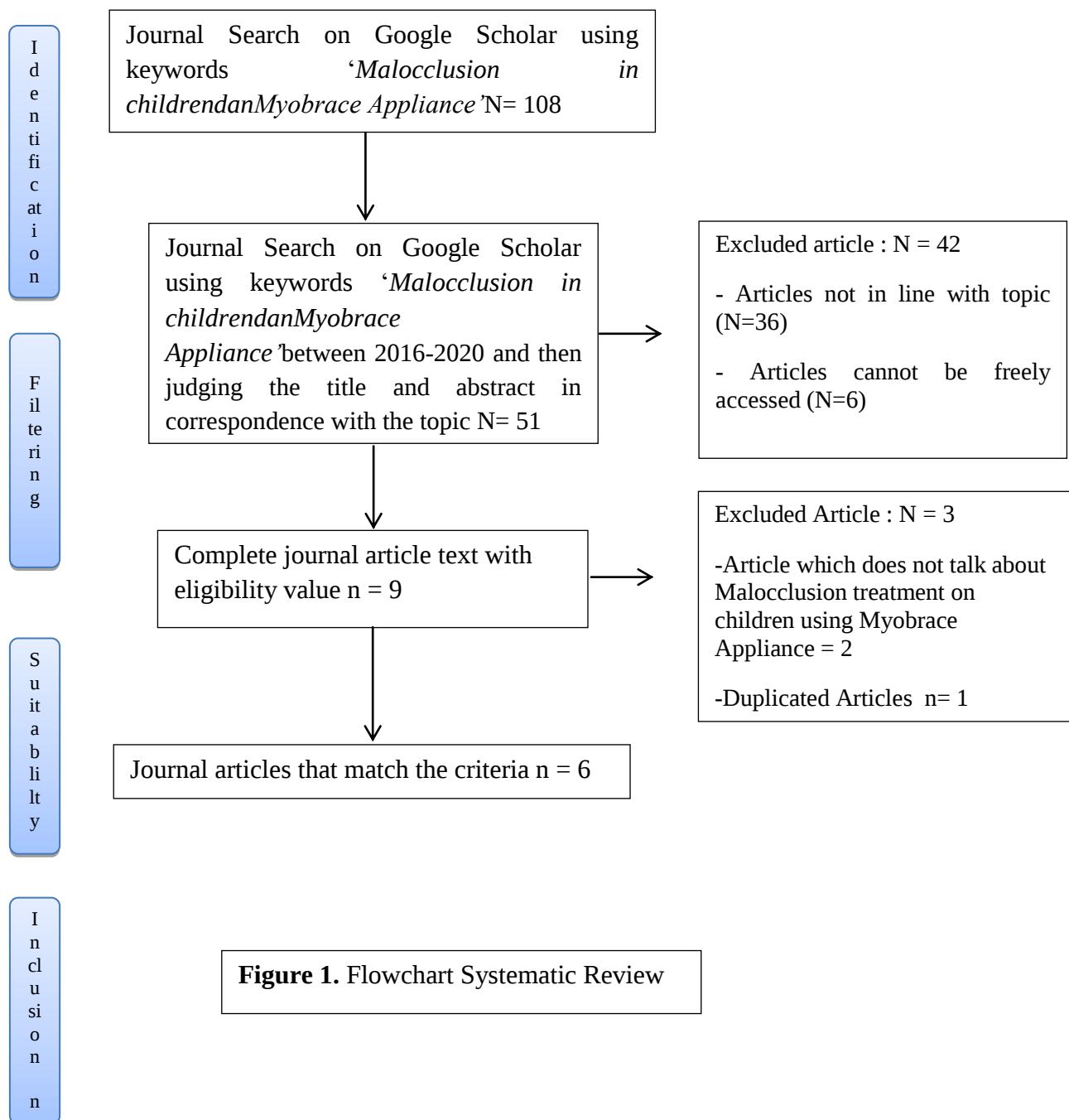


Figure 1. Flowchart Systematic Review

Result

After eliminating duplicated articles, the titles and abstracts of each article were analyzed on 108 articles which resulted in the exclusion of 42 articles. The full-text articles in the remaining 9 articles were re-analyzed and excluded 3 articles and produced 6 articles which were then entered into the analysis.

Table 1. The characteristics of each article entered into a systematic review

No	Authors	Years	Titles	Conclusion
1	Kee-Sang Hong, Youn-Soo Shim, So-Young Park, Ah-Hyeon Kim, So-Youn An ¹⁵	2016	Oropharyngeal Airway Dimensional Changes after Treatment with Trainer for Kids (T4K) in Class II Retrognathic Children	In the case of Class II malocclusion where the maxillary anterior teeth were protrusive and the mandible was retrognathized, using Myobrace the position of the mandible could be moved forward using the anterior teeth as support. Thereby obtaining the corrective effect of the excess axial to labial angle of the maxillary anterior teeth to the palatal region, therefore expansion of the airway can be achieved.
2	Isha Aggarwal, Manu Wadhawan, Vishesh Dhir ¹⁶	2016	Myobrace: Say No to Traditional Braces: Review Article	The Myobrace System TM caters to increasing public pressure on non-invasive, preventive and more stable care by addressing the causes that impede children's facial development. Myobrace is a three-stage equipment system specially designed to correct poor oral habits while addressing maxillary and mandibular development problems in children.
3	Kizi G, Ventura I, Barata R,	2017	Early treatment of a class III malocclusion with the	In this case, Myobrace demonstrated its

	Riba D, CastañoSeiquer A ¹⁷		myobrace system clinical case	effectiveness when used at an early stage, showed good yield and stability, and was able to correct anterior crossbite.
4	Rohan Wijey ¹⁸	2017	Treatment for Class III Malocclusion: Surely we can do better? – Case report	In this case, it shows that the use of myobrace interceptive class III appliance series shows a significant change in class III malocclusion cases. This type of myobrace is able to retrain the posture and function of the tongue, stop the forward progression of the mandible, and increase the sagittal displacement of the maxilla.
5	Hisham Mohammed, EminaČirgić, Mumen Z. Rizk, and Vaska Vandevska- Radunovic ¹⁹	2019	Effectiveness of prefabricated myofunctional appliances in the treatment of Class II division 1 malocclusion: a systematic review	In this study shows that Prefabricated myofunctional appliances (Myobrace, trainers for kids) are generally effective in treating Class II division 1 malocclusion.
6	M Wishney, MA Darendeliler, O Dalci ²⁰	2019	Myofunctional therapy and prefabricated functional appliances: an overview of the history and evidence	Prefabricated functional appliances (Myobrace appliance) are able to repair Class II Division 1 malocclusion in a relatively cost-effective manner

Discussion

The results of this systematic review show that Myobrace appliance can be used as an alternative treatment for malocclusion in children, especially to correct class II malocclusion and class III malocclusion (mandibular prognathy and maxillary retrognathy). In addition, this tool is also capable of correcting overbite, overjet, crowding of upper and lower anterior teeth, sagittal molar relationships, lip seals, facial asymmetry.^{20,21,22,23} Myobrace appliance is a prefabricated functional appliance with myofunctional training characteristics, which is used to correct malocclusion in children who are in the development stage.²⁴

Malocclusion is a form of maxillary and mandibular connection which deviates from the standard form which is accepted as the normal form, malocclusion can be caused by the absence of dentofacial balance. Malocclusion is a fairly large dental and oral health problem in Indonesia and its prevalence is still very high, around 80% of the population and is in the third place after dental caries and periodontal disease.^{25,26,27} One of the causes of malocclusion is bad habits. Bad habits that are done repeatedly and continuously during the development of the jaw will result in malocclusion. Bad habits such as finger / nipple sucking, nail biting, lip biting, mouth breath, and tongue sticking have an impact on the prevalence of malocclusion, especially in children.^{28,29,30} Examples of bad habits such as finger sucking are likely to interfere with the position of the teeth, disturbing Bone growth patterns that can alter craniofacial growth are known to cause malocclusions, this habit can result in malocclusion in the open anterior bite. There is a significant relationship between the development and prevalence of malocclusion and the prevalence of bad habits.^{31,32,33,34} The results of the study on children aged 7-15 years who have bad oral habits show that around 80% of children suffer from malocclusion, such as class II and class III malocclusion. According to Singh, children who have bad mouth habits, especially finger sucking, tend to experience class II malocclusion. This proves a correlation that bad oral habits lead to malocclusion. Previous studies involving children aged 8 to 10 years revealed that children with malocclusion were more likely to have a negative impact on their quality of life than individuals who were malocclusion free. Some types of malocclusion also have a higher impact on quality of life.^{35,36,37}

Myobrace appliance was introduced by the same company in 2004. It also contains various tools for different age groups and is available in various sizes. The Myobrace appliance is available for four stages of treatment, including habit correction, arch extension,

tooth alignment and retention. The Myobrace System Kit has a structural element similar to that of a trainer system, consisting of a tough nylon element, called the Inner-Core or Dynamicore. The manufacturer states that dynamicore helps withstand the forces developed on the teeth by the buccinator and orbicularis muscles allowing correction of misaligned teeth by providing better arch shape. The presence of additional channels in the area of the anterior teeth on the Myobrace System device is claimed to increase its ability to align teeth because it can exert direct force on the teeth. They are available in a variety of sizes for primary, mixed and permanent teeth and for different treatment purposes.^{38,39,40}

The goals of treatment using the myobrace appliance are: 1) Restoring nasal breathing from mouth breathing, 2) correcting correct tongue posture, 3) correcting correct swallowing, 4) Correcting alignment of teeth and jaw to the correct position, 5) there is no retention or retention, 6) minimal or no use of braces, 7) achieve optimal health, 8) unhindered craniofacial development.^{41,42,43} Use of Myobrace at least two hours every day and a maximum of overnight, this aims to provide adequate expansion and arch strength of the jaws to align the anterior teeth.^{44,45,46}

The parts of the myobrace appliance consist of:⁴⁷

- a. Guides For Teeth: as a guide to aligning the teeth in the correct position.
- b. Labial and buccal shields: To prevent interposition of lips and cheeks, as well as to provide some strength to misaligned anterior teeth.
- c. Tongue tag: Positioned on the retro-incisive papilla, acts as a proprioceptive stimulus to the tip of the tongue, and as a myofunctional trainer to improve tongue posture
- d. Tongue Guard: To prevent tongue jostling and interposition, forcing the tongue in its original position, stimulating nasal breathing and preventing bad habits.
- e. Lip Bumper: Prevents mentalist muscle hyperactivity.

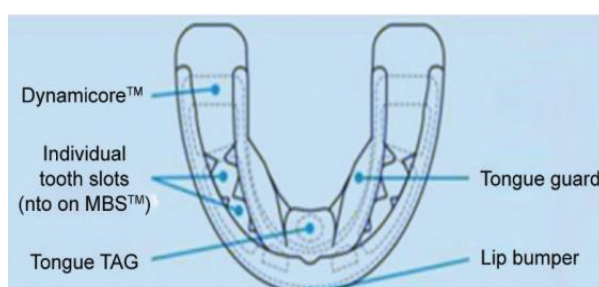


Figure 2. Components of Myobrace Appliance^{47,48}

Things that need to be considered when using myobrace appliance, namely: 1) The patient must wear the appliance for 1 to 2 hours every day and overnight while sleeping, 2) It is necessary to use routine every day. If it is not used every day, then the treatment will not be successful, 3) At least one myofunctional function exercise must be completed every day, 4) The patient must learn how to swallow correctly and position the tongue in the correct place in the mouth, 5) The patient must guard their mouth closed when not talking or eating.¹⁶ Based on the age group, myobrace appliance is classified into four, namely:

a. Myobrace for Juniors (Age 3-6 years)

Myobrace for Juniors is a three-stage equipment system specially designed to correct bad oral habits while addressing developmental problems of the upper and lower jaw. Myobrace for Juniors is most effective on primary teeth from three to six years of age. This device is specially designed to correct mouth breathing problems, improve tongue position and swallowing pattern, train jaw muscles, change pacifiers, improve natural curve development, early treatment for open bites and cross bites.^{49,50}

b. Myobrace for Kids (Age 6-10 years)

Myobrace® for Kids is a three-stage equipment system specially designed to correct bad mouth breathing and oral habits, which helps to solve problems with the development of the upper and lower jaw. This allows the permanent teeth to adjust to their original position. Most effective in the early stages until the teeth are mixed, ages 6-10 years. It is specially designed to correct class II division 1 and 2 malocclusion, crowding of upper and lower anterior teeth, deep bite, and open bite.^{49,50}

c. Myobrace for teens (10-15 years)

Myobrace for Teens is a four-stage Myofunctional Orthodontic system designed to replace complex orthodontics with braces and extractions. Its main purpose is to correct oral breathing and poor myofunctional habits that can lead to malocclusion, while the stage 3 (T3) apparatus guides permanent teeth to grow in parallel positions that are in the developmental stage of the tooth. It is specially designed to treat class II malocclusion in the final stages of mixed teeth, class II division 1 and 2, crowding of upper and lower anterior teeth, deep bite, and open bite.^{49,50}

d. Myobrace for adults (> 15 years)

Myobrace for Adults is a three-stage equipment system for permanent teeth. For adult patients, all growth has occurred and the tooth is in the most stable position. Improper mouth breathing and swallowing habits have developed over the years and are more difficult to correct. For this reason, outcomes in adults are not as predictable as in children. It is specially designed to treat most malocclusions in adult patients, crowding of upper and lower anterior teeth in mild to moderate cases, treatment of relapsed anterior teeth after fixed orthodontics, moderate cases of Class II division 1 and 2 malocclusion.^{49,50,51,52,53,54,55}



Figure 3. (a) overview before treatment using myobrace appliance, (b) overview after treatment using myobrace appliance



Figure 4. (a,b,c)overview before treatment using myobrace appliance, (d,e,f) overview after treatment using myobrace appliance

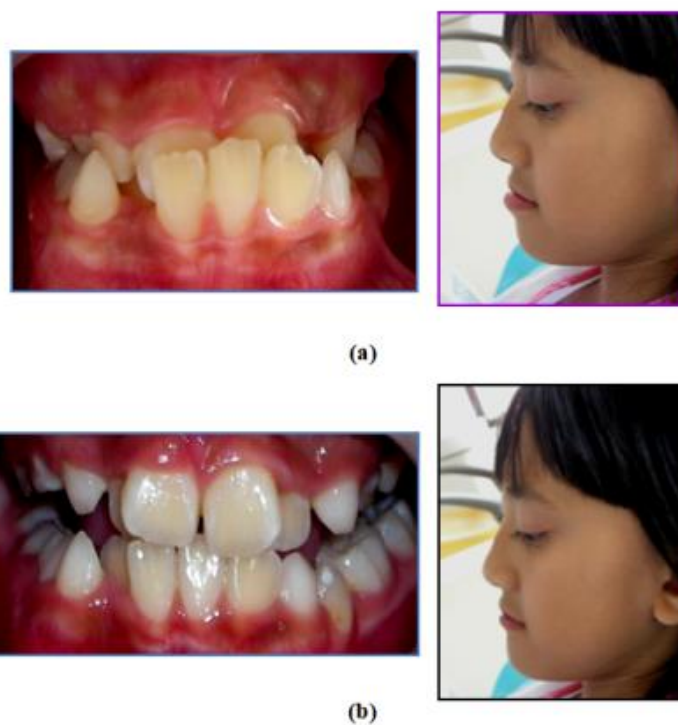


Figure 5.(a) Overview before treatment using myobrace appliance, (b) Overview after treatment using myobrace appliance

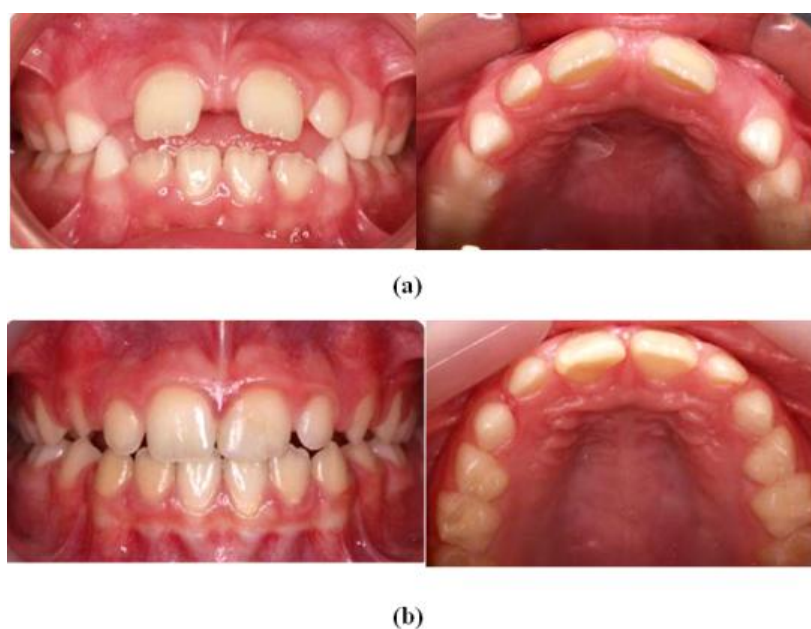


Figure 6.(a) Overview before treatment using myobrace appliance, (b) Overview after treatment using myobrace appliance

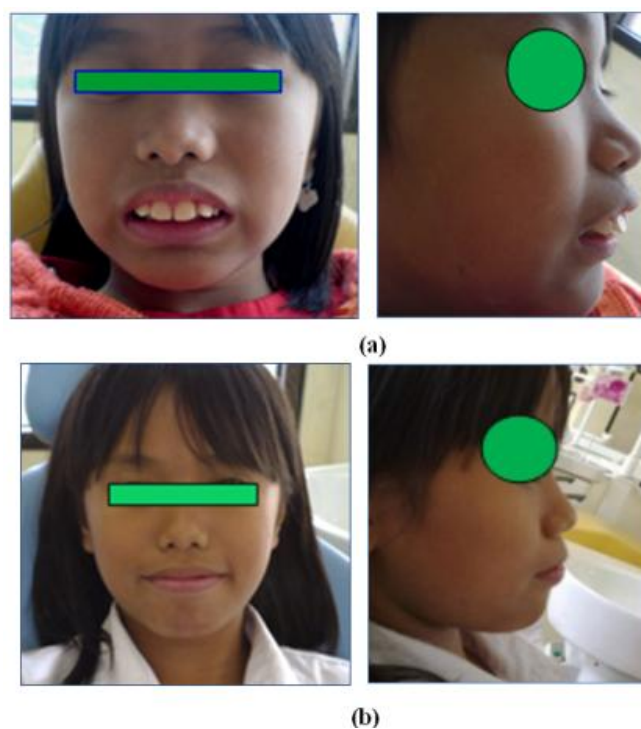


Figure 7.(a) Overview before treatment using myobrace appliance, (b) Overview after treatment using myobrace appliance

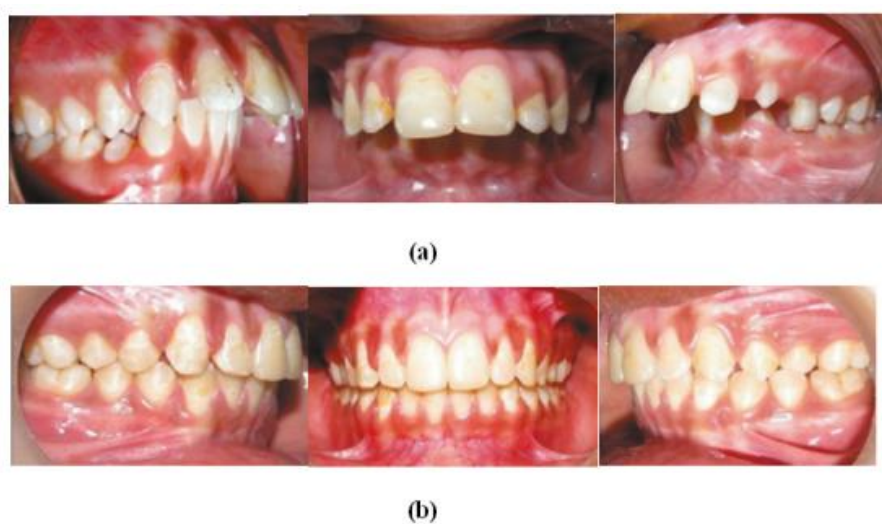


Figure 8.(a) Overview before treatment using myobrace appliance,(b) Overview after treatment using myobrace appliance

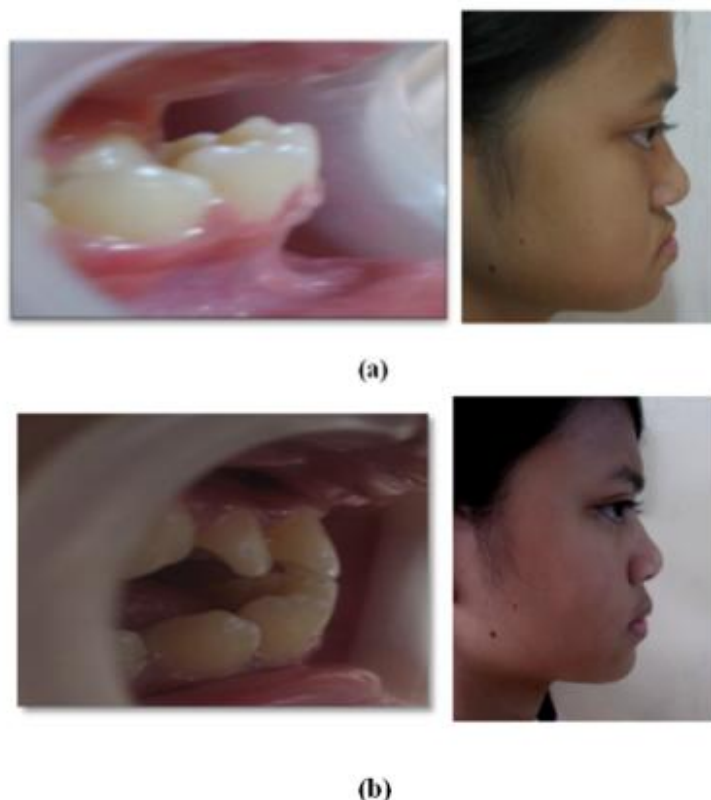


Figure 9.(a) Overview before treatment using myobrace appliance, (b) Overview after treatment using myobrace appliance

Conclusion

Myobrace appliance can be used as an alternative treatment for malocclusion in children, especially to correct class II malocclusion and class III malocclusion (mandibular prognathy and maxillary retrognathy). In addition, this tool is also capable of correcting overbite, overjet, crowding of upper and lower anterior teeth, sagittal molar relationships, lip seals, facial asymmetry.

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