



Prevalence of Removable Functional Appliance Usage in the Management of Class II Malocclusion

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Article History:

Received on: 22 Jun 2020
Revised on: 28 Jul 2020
Accepted on: 10 Aug 2020

Keywords:

Malocclusion,
Functional Appliances,
Musculature,
Growth,
Prevalence,
Twin block appliance

ABSTRACT

A Removable functional appliance is composed of polished acrylic shields and stainless steel wires prescribed for patients with more pronounced class II malocclusion or open bite. These appliances work comfortably with a patient's inherent growth to produce the desired Skeletal or Dental development. It can be achieved by dentoalveolar effects, alteration of soft tissue and utilisation of greater Mandibular growth potential. The commonly used Removable functional appliances are Twin Block appliance, Activator, Bionator, Frankel appliance, etc. This study aims to assess the frequency of the usage of removable functional appliances in a hospital based set up. The data of patients undergoing Removable functional appliance therapy was retrieved from the case sheets of the patients. The collected data was tabulated in Excel and statistically analysed with the help of SPSS software. From the results obtained, Twin block appliance was the most prevalent Removable functional appliance with a frequency of 60.6%. Frankel appliance and Activator each had a frequency of 9.1%. Based on the age, Twin block appliance was preferred for the age group 10-15 years, Frankel appliance for 5-10 years, Activator and Other appliances for 10-15 years. Therefore, within the limits of this study, we observed that Twin block appliance was the most preferred Removable functional appliance used in the management of Class II malocclusion and the most common age group receiving appliance therapy is 10-15 years.



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ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL3.2898>

Production and Hosted by

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INTRODUCTION

Functional appliances in Orthodontics can transmit, guide or eliminate the natural forces of the musculature and are used to modify the mandibular position in the Vertical, Sagittal and Transverse plane resulting in Orthodontic and Orthopedic changes (Linsen et al., 2016). They are designed to modify the response of muscle groups that influence the function and position of the mandible. Functional appliances are commonly used for treating cases of skeletal class II malocclusion and Class III malocclusion in growing children. Hence they are also known as

Growth modifying or Interceptive appliances (Linsen *et al.*, 2016; Kettle, 2020). They are useful in procedures such as growth modifications that aim to interfere and treat jaw discrepancies, bring changes in spatial relationship of the jaws, change in direction of growth of the jaws and acceleration of desirable growth (Messina, 2019). Functional appliances have been in use since the 1930s. Also there are controversies regarding their use, method of action and effectiveness. The commonly used Removable functional appliances are Twin Block appliance, Activator, Bionator, Frankel appliance, Lip bumper, etc (El-Huni *et al.*, 2019). These appliances work comfortably with a patient's inherent growth to produce the desired Skeletal or Dental development (Rahhal, 2014).

Twin block appliances (Figure 1) are simple bite blocks designed for full time wear that might maximize the expansion response to functional mandibular protrusion by using an appliance system that is comfortable, simple and aesthetically pleasing to the patient (Mohamed *et al.*, 2020). The favorable proprioceptive contacts replaces the cuspal contacts of a distal occlusion on the inclined planes of the dual block to correct the malocclusion (Ajami, 2019). The history of such appliances evolved in response to a clinical problem when a young patient, son of a Dental colleague fell and luxated an upper incisor (Sivamurthy and Sundari, 2016). Twin blocks can be used full time during the Active phase of treatment (Samantha, 2017). The target of Twin block therapy is to correct the arch relationship within the sagittal, vertical and transverse dimensions. The support phase aims to retain the corrected incisor relationship until the buccal segment occlusion is fully established (Krishnan *et al.*, 2015). The lower twin block is overlooked at this stage and posterior bite blocks are removed. A traditional period of retention follows treatment after occlusion is fully established. An equivalent appliance used during the support phase is employed, where in appliance wear is gradually reduced to nighttime time wear (Krishnan *et al.*, 2015; Vikram, 2017).

Reactivation of the dual block are often done as an easy chair side procedure by the addition of cold cure acrylic to increase the anterior incline of the upper twin block mesially (Kamisetty, 2015; Viswanath, 2015). Twin block appliances have a wide range of benefits over other functional appliances belonging to the monobloc series. Because the upper and lower components are separated, there's freedom of jaw movements in anterior and lateral excursion (Felicita, 2017b). Speech of the patient is less affected as there's no restriction in the movements of the tongue, lip or mandible. Enriched com-

fort and aesthetics brings in excellent patient cooperation. If necessary, twin blocks can be easily fixed to the teeth temporarily or permanently to enhance patient compliance (Rubika *et al.*, 2015; Jain *et al.*, 2014).

The Frankel appliance (Figure 2) in Orthodontics was introduced by Rolf Fränkel in the 1950s (Dugger, 1982; Janson, 2003). This appliance primarily focused on the modulation of neuromuscular activity so as to supply changes in jaw and teeth (Schneekluth, 1985). Frankel appliances had A, B and C. In functional appliances, the most approved one is the function regulator (FR 2) of Frankel (Kumar, 2011; Krishnan *et al.*, 2018). This appliance was developed by Rolf Frankel as an orthopedic exercise device projected to reeducate the neuromuscular system of the orofacial complex (Felicita, 2017a). Frankel appliance is based on orthopaedic effect that considers muscle movement as an important factor in bone development. Vestibular shields extend the orofacial capsule and induce an anterior functional shift of the mandible (Felicita *et al.*, 2013). It is used to eliminate functional disorders that interfere with normal growth by aggravating incorrect postural behavior of the orofacial musculature and inadequate space conditions in the oral cavity. Class II Malocclusion is corrected with Frankel 2 by advancing the jaw with muscular training.

The Activator appliance (Figure 3) was developed by Viggo Andresen in 1908. It is called an Activator because of its ability to activate the muscle force (Leonardi and Barbato, 2007). This was one among the primary functional appliances that was developed to correct functional jaw within the early 1900s. Activator appliance was indicated initially in growing or young patients (Clinthorne and Somers, 1983; Linsen *et al.*, 2016). Therefore, young adolescents with growth potential showed the simplest results of this appliance. Additionally, a teenager or adult patient with retrognathic mandible, well aligned maxillary and mandibular dentition were also other indications of this appliance. A number of the malocclusions which will be treated with this appliance included Class II Division I, Class II Division II, Class III and Open Bites (Dinesh, 2013). Many authors feel that there is little evidence to claim that functional appliances affect the Mandibular growth significantly. Some suggested changes in the mandible after timely intervention. (Felicita, 2018). However most of the patients might have difficulty in wearing or tolerating the appliances in turn which makes the compliance difficult (Madurantakam, 2016). This study helps in assessing the treatment needs of the patients and the prevalence

of Removable functional appliances and the assessment of Removable functional appliance usage in the management of Class II malocclusion .

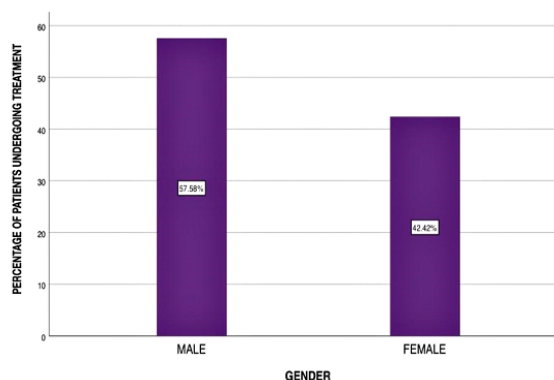
MATERIALS AND METHODS

This study was conducted as a retrospective study in a hospital setting. The study setting had certain advantages like flexibility in data collection and less expenditure. The ethical approval for the current study was obtained from the Institutional Review board. The data of patients undergoing removable functional appliance therapy was retrieved from the case sheets of the patients. The required data from September 2019 to March 2020 were collected and reviewed. The necessary data such as Age, Gender and Type of Appliance advised for the patients were collected and tabulated in Excel. The data was cross verified by the analyser. Incomplete data was excluded from the study. The tabulated data from Excel is imported to SPSS for Windows for statistical analysis. The data is represented by the means of bar graphs and the statistical tests used were Chi square and correlation analysis. Descriptive statistics was performed for the obtained results and comparison between groups were done using Chi square tests. p value <0.05 was considered as statistically significant. The prevalence of Removable functional appliances and its association with age and gender was analysed.

RESULTS AND DISCUSSION

The data of patients receiving Removable functional appliance therapy was collected after reviewing the case sheets. Patients from different age groups such as 5-10 years, 10-15 years, 15 years and above were taken for the study. 33 patients underwent Removable functional appliance therapy from September 2019 to March 2020. 57.58% of the patients were Males and 42.4% were Females (Graph 1). 78.8% of the patients belong to 10-15 years, 15.2% belong to 5-10 years and 6.1% belong to above 15 years category (Graph 2). Twin block appliance was the most prevalent Removable functional appliance with a frequency of 60.6%. Frankel appliance and Activator each had a prevalence of 9.1% (Graph 3). Twin block appliances were mostly preferred for males with a prevalence of 42.42% than females whereas Activator is preferred mostly for females with a prevalence of 9.09% (Graph 4). Based on the age, Twin block appliance is preferred for the age group 10-15 years(57.58%), Frankel appliance for 5-10 years(9.08%), Activator(6.06%) and Other

appliances for 10-15 years (Graph 5).



Graph 1: Bar graph showing the percentage of gender distribution of the patients undergoing Removable functional appliance therapy

Graph 1 Shows, X axis denotes the gender of the patients and Y axis denotes the percentage of distribution. Majority of the patients were males followed by females.

The data was analysed in SPSS using Chi square tests and correlation analysis. The frequency of age, gender, prevalence of each removable functional appliance and its associations were represented as bar graphs. In this study, we observed that the Twin block appliance has a prevalence of 60.6%. It was the most prevalent Removable functional appliance. Previous studies also show that Twin block therapy is the most preferred and well tolerated for class II malocclusion. The patient cannot occlude comfortably in former distal protrusion and the mandible tends to adapt a protrusive bite in occlusion when a Twin block is used (Fleming and Lee, 2016). Treatment time varies, but is usually around 9 months. Twin Blocks also can be wont to cure an overbite, which may mean treatment could also be slightly longer. If this is often the case, treatment can vary from 6 to 11 months. However it also had few drawbacks like increase in vertical face dimension and mandibular incisor proclination, therefore it is not preferred in few cases (Vaghela et al., 2019).

Graph 2 Shows, X axis denotes the age group of the patients and Y axis denotes the percentage of distribution. Majority of patients belonged to the 10-15 years age group followed by patients in 5-10 years and rest of them belonged to the above 15 years age group.

The Frankel appliance has a prevalence of 9.1%. It is a Myofunctional and soft tissue based appliance. Frankel appliance works well with mixed dentition and commonly used in children. However Frankel appliance does not work after cessation of growth,

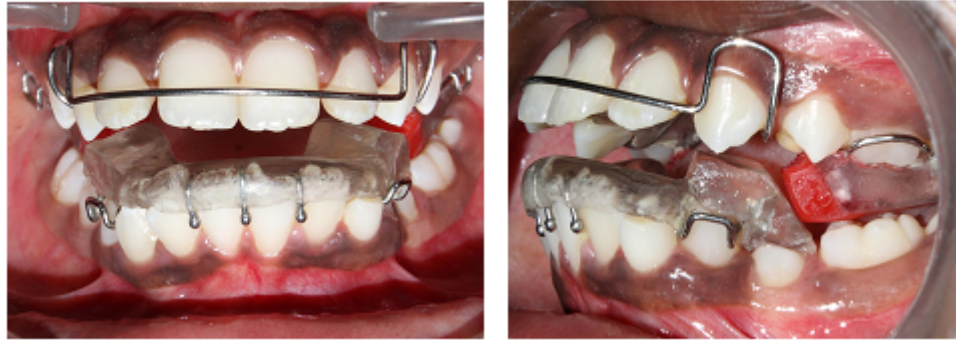


Figure 1: Twin block appliance

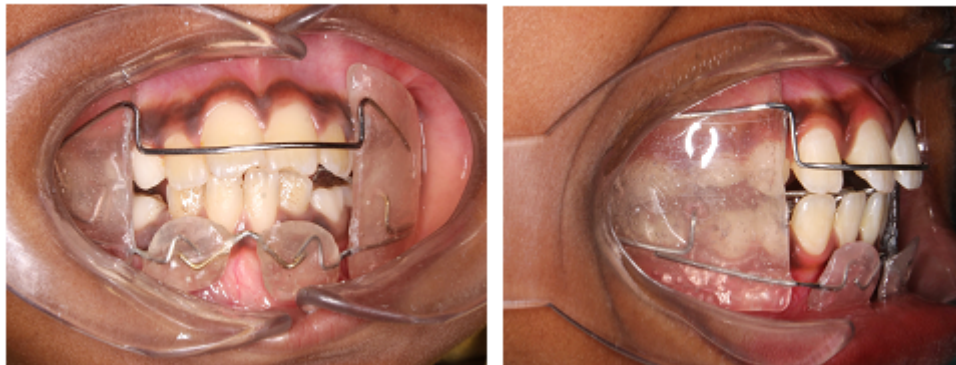


Figure 2: Frankel appliance

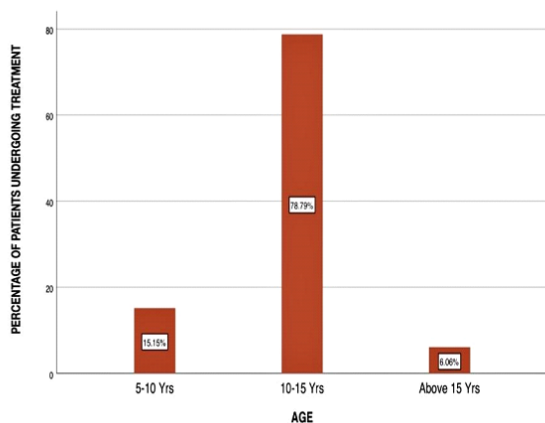


Figure 3: Activator appliance

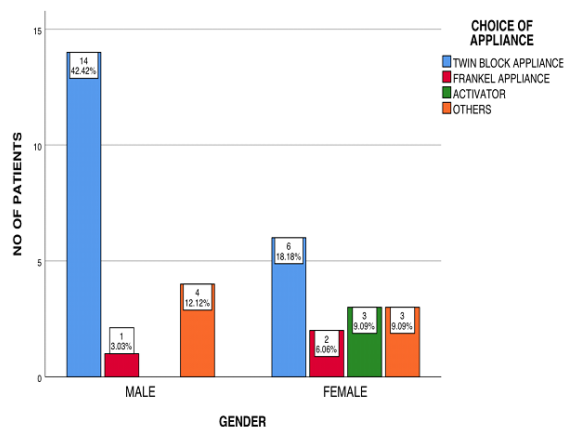
hence it cannot be used in adults, so the prevalence is less (Perillo, 2011). It also causes an increase in both apical bases and maxillary, mandibular arch widths. It also produces reduction in protrusion of the upper lip. The design and construction of the Frankel appliance permits a further advancement of the mandible after a favourable response to the treatment from the construction bite. The effects of the functional regulator in the correction of Class II malocclusions are primarily dento-alveolar, with a smaller participation of skeletal changes (Campbell, 2020). The prevalence of the Activator appliance is 9.1%. Activator appliance can activate the muscles and is preferred for Class I, Class II and Crossbite correction. Activators also had few draw-

backs like low precise detailing. It is also contraindicated in cases like severe crowding, high angle case, abnormal perioral musculature and uncooperative patients (Malik and Karnik, 2011). Activator was designed to be loose fitting and the patient needs to actively hold the appliance in place (Nedeljkovic, 2010). Therefore it is also known as an exercise appliance. Based on gender of the patients, the Twin block appliance is preferred more for males than females. In previous studies of Twin block appliances, males showed better results than females.

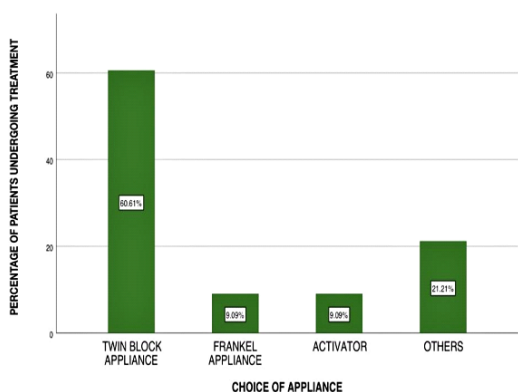
Graph 3 Shows, X axis denotes the choice of appliance and Y axis denotes the percentage of distribution. Twin block appliance has the highest prevalence rate followed by Frankel and Activator.



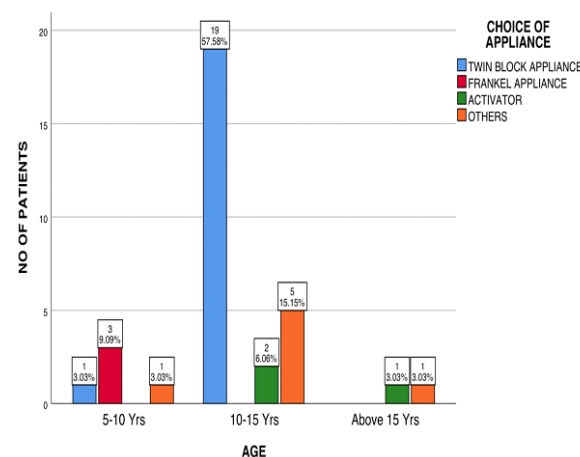
Graph 2: Bar chart showing the percentage of age distribution of the patients undergoing Removable functional appliance therapy



Graph 4: Bar chart showing the prevalence of Removable functional appliances based on Gender of the patients



Graph 3: Bar chart showing the percentage and prevalence of each Removable functional appliance prescribed for the patients



Graph 5: Bar chart showing the prevalence of Removable functional appliances based on Age of the patients

Based on the age of the patients, Twin block appliance was preferred for the age group 10-15 years, Frankel appliance for 5-10 years whereas Activator and other appliances are preferential for the 10-15 years age group. In previous studies of Twin block therapy, the mean age of the patients were 12 years 11 months +/- 1 year months immediately before treatment and 14 years 4 months +/- 1 year 3 months immediately after discontinuation of Twin block therapy. (Baccetti *et al.*, 2000). The treatment outcome of functional appliance depends on proper case selection, diagnosis and proper appliance selection.

Graph 4 Shows, X axis denotes the gender of the patients and Y axis denotes the number of patients. Twin block appliances were mostly preferred for males than females whereas Activator was more preferred for females. However these are statistically not significant (Chi square tests, p value =

0.109 (>0.05).

Graph 5 Shows, X axis denotes the age of the patients and Y axis denotes the number of patients. Twin block appliance was commonly preferred for the age group 10-15 years followed by Frankel appliance for 5-10 years, Activator and Other appliances for 10-15 years. Chi square tests, p value - 0.00 (<0.05) hence, statistically significant.

CONCLUSION

Within the limits of this study, we observed that Twin block appliance was the most preferred Removable functional appliance used for Class II malocclusion and the most common age group receiving Removable functional appliance therapy was 10-15 years. Males show higher frequency of

Removable functional appliance usage than females. However treatment may not be always universally successful. Any patient who needs Removable functional appliance therapy needs to be carefully selected at the right age and skeletal morphology. Patients also need to be informed about the need for good cooperation for effective treatment. Awareness of these appliances can provide better treatment options for the patients. Further research should be done to improve the drawbacks of these appliances.

Limitations of the study

The study is limited by a few factors. It is a unicentric and a short duration study. So therefore not much quantitative data is obtained. The quality of life is not assessed. The study also has geographical limitations since it is a hospital setting. Hence the data obtained should be confirmed using a large sample size for a longer duration.

Future scope of the study

The study can be multicentric and done with a large population of people from different ethnicities for longer durations to get better results. Knowledge of these appliances can provide better treatment options for the patients. Further research can be done to improve the drawbacks of these appliances.

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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