

Prevalence of Functional Appliance for Growth Modification in Class II Patients - A Retrospective Study

Research Article

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Abstract

Functional appliance is usually advocated as a method of growth modification in early correction of skeletal class II correction. The ability of functional appliances to reduce overjets by means of Modifying dental relationships. This study aimed at determining the need for functional appliance therapy for correction of skeletal class II malocclusion in growing individuals. The samples for the study were retrieved from patient management software. Many of the reports concerning growth effects of functional appliances have been characterized by poor methodology. Among the cases Class II growing patients were identified and the different treatment plans of functional appliances were assessed. The dental college witnessed a total of 119 growing class II patients of which majority were female patients who sought treatment. . The criteria considered were severity, age and compliance of patient and type of appliance including removable and fixed functional appliance. The removable twin block appliance was the most commonly advised functional appliance. In younger adults with maxillary prognathism additionally headgear was used either alone or in combination with the various functional appliances.

Keywords: Functional Appliance; Class II Malocclusion; Orthodontics; Twin Block.

Introduction

The main goal of orthodontic treatment in children with skeletal malocclusion is to produce well balanced facial profile and an acceptable and esthetic smile [33]. In most studies, functional appliances effects to apply the role of a mandibular protrusive musculature in protruding condylar cartilage and strengthening and lengthening mandible with muscle emphasis of the musculature like lateral pterygoid [17]. It is shown in previous studies that growing children treated with twin block appliances witness an increase in mandibular length to a greater extent reflecting an increase in ramus and length of the body of the mandible [15].

The major aspect of functional appliances therapy for treating class II malocclusion is that patient cooperation and compliance are needed [28]. For a young child with severe class II malocclusion just after eruption of permanent teeth orthodontists are often at dilemma regarding the ease of appliance usage and compliance expected from the patient [20]. The treatment provided should be effective in reducing overjet, improving skeletal rela-

tions and also the child's self-esteem. Functional appliances are used for correction of class II malocclusion which is shown to modify neuromuscular environment of dentition and associated bones [10]. The class II corrector mechanisms hold the mandible in the forward position.

Previously our team has a rich experience in working on various research projects across multiple disciplines. (Jain 2017 [11]), (Varghese et al. 2019 [26]), (Ashok and Ganapathy 2019 [5]), (Padavala and Sukumaran 2018), (Ke et al. 2019), (Ezhilarasan 2018 [5]), (Krishnan et al. 2018 [22]), (Pandian et al. 2018 [22]), (Ramamurthy and Mg 2015 [40]), (Gupta et al. 2018), (Vikram et al. 2017 [39]), (Paramasivam et al. 2020 [38]), (Palati et al. 2020), (Samuel et al. 2020 [16]). Now the growing trend in this area motivated us to pursue this project.

The aim of this study was to determine the prevalence of usage of functional appliances in growth modification for growing skeletal class II patients.

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Materials and Methods

The methodology of retrospective search helped provide a large range of data at a given point of time. The study was approved by the ethical committee of the university's review board. The study was done in Saveetha Dental College using the Dias record keeping software. A limitation of selection bias of appliance and choice of appliance varies among practitioners. Given the power of the study to be 90, the estimated sample size was 100 cases opted for functional appliance therapy. In order to reduce the non-response bias only the treatment plan was considered.

The evaluation of patients reporting to orthodontic clinics was segregated to identify class II skeletal patients. The inclusion criteria for this study are patients who have a retro gnathic mandible or a combination of skeletal anatomy leading to a class II skeletal profile, age group of 9 to 16 years. The treatment protocol advised for each patient was sorted. Total of 1200 case sheets were reviewed of which 119 cases were within our inclusion criteria. To avoid bias, patient photographs and radiograph were cross checked.

The data was tabulated in an excel sheet. The inclusion criteria included 9 to 16 years of age and the dependent variable are the

type of functional appliances. SPSS statistics (version 19) was used for statistical analysis.

Results & Discussion

Out of the total 1200 case sheets examined, 478 were identified as class II patients of which 119 were within our inclusion criteria. This consisted of 66 female patients and 53 male patients. Among the 119 patients who were included, 79 were treated with camouflage; nine of them were treated with a fixed functional appliance and the remaining with functional or orthopedic appliances. In all the cases, the fixed functional appliances usage was planned after the initial period of fixed orthodontic appliance therapy and hence no entry was made regarding the plan for utilization of appliances like forsus or advansync during the initial treatment. Figure 1 represents that camouflage was done most commonly among patients who had mild to moderate class II and among the functional appliances twin block was most commonly used followed by fixed functional appliances and that the in functional appliances camouflage is most commonly used in males and females as shown in figure 2.

Of the remaining cases treated with removable functional appliances, twin block was most commonly used followed by eva

Figure 1: Bar chart depicting the association between age and treatment plan for growth modification in class II patients. X axis represents age from 9-16 years and Y axis represents the number of patients with Class II malocclusion. Association between the age and treatment plan was statistically significant. [Pearson Chi Square Value- 87.3 , P value is 0.31 which >0.05 and is not statistically significant]. Camouflage was done most commonly among patients who had mild to moderate class II and among the functional appliances twin block was most commonly used followed by fixed functional appliances.

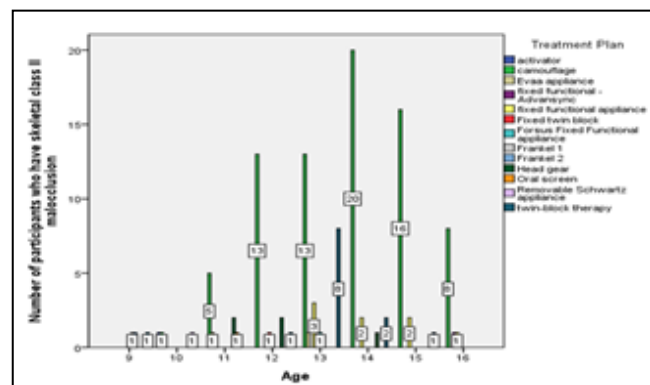
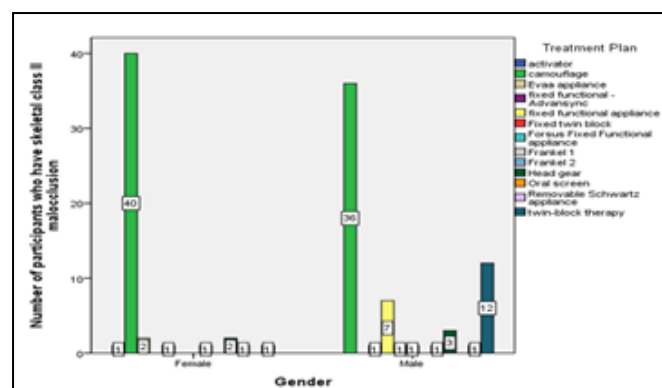


Figure 2: This bar graph represents comparison between the gender of patients who have skeletal class II and the various treatment plans. The X axis represents the gender and the Y axis represents the number of patients with Class II malocclusion. Association between the gender and treatment plan was statistically significant. The Pearson chi-square value is 22.82 and the p value is 0.029 which is statistically significant. The inference from this graph is that the functional appliances camouflage is most commonly used in males and females.



appliance, Frankel type 1 and Frankel type 2, oral screen and activator. In cases where the maxilla was at fault headgear was used either alone or in combination with other functional appliances.

The choice of removable or fixed functional appliance was based on different variables like age and growth status of the individual. The compliance of the patient was important and the patients at the end of growth phase were mostly treated with fixed functional appliances.

Class II malocclusion with mandibular retrognathism was mainly due to reduced mandibular length and dentoalveolar modifications. All appliances produced measurable changes in skeletal, dental and soft tissues [3]. For patients in their pubertal peak growth phase, clinically significant increments in total mandibular length and ramus height were noted [23]. Hence the utilization of the pubertal growth spurt in treatment period can be regarded as a key factor [36].

Fixed functional appliances designed for class II exert a protrusive force on the mandible. They are rigid enough to advance mandible based on the principle of inclined plane and its placement in buccal corridors make it nearly invisible [13].

In certain studies, twin block appliances have shown to reduce treatment duration [19]. The only factor that influences is the final discrepancy was the pretreatment relationship and associated dentoalveolar compensations [28].

After the appliance is fitted, the patient is reviewed once in every 4-6 weeks. The amount of overjet reduction is noted every 2 months. Once the intended tooth movement is obtained and profile is assessed and the appliance is then discontinued and further treatment with edgewise fixed appliances is continued if needed [1].

Class II treatment for growth adaptation is given in children and adolescents. In case of fixed functional appliance patient cooperation is not required as it works 24 hours. Treatment is short because of full time wear [21]. Opinion is emerging that the fixed functional appliance causes localized proliferation of cells in the extracellular matrix [18].

Orthodontic treatment involves the application of forces that are continuous in activity on as many areas of the dentition as possible and working in the direction in which the teeth are intended to move [4]. Orthodontic movement of such a tooth is a challenge to any orthodontist [30, 7]. The fundamental of orthodontics is that teeth move through the alveolar bone when adequate forces are delivered [14]. In spite of our knowledge that air abrasion is inefficient as an enamel conditioning method, we included it in this study only as a known parameter to highlight the difference in depth of resin penetration [27]. The data was recorded in the record sheet prepared for each patient for the purpose of follow up which included all the required personal details of the patient [31]. Recycling has been the subject of debate within the profession following the regulations concerning the use and reuse of medical devices [12]. Elastic traction of the maxilla is done by an acrylic plate supported on the maxillary dentition and palate [39]. Mini screws as effective temporary anchorage devices have occupied a central role in a typical orthodontic setup, since anchorage control and patient cooperation are very critical [11, 40]. This direction

of applied force is determined by the length of the attachment and the height of the mini-implant from the base arch wire [7]. While providing absolute anchorage, these devices are used for specific periods of time and rely only on mechanical retention with the surrounding bone [34]. Social acceptance, psychological well-being, and self-esteem of an individual are related to physical appearance. It has been established that self-esteem is strongly dependent on facial appearance [22]. Remodeling of bone at the end of orthodontic extrusion causes new bone formation which occurs at about 4-5 weeks [8]. To measure the linear cephalometric dimensions of anterior and posterior segments of the craniofacial complex sagittally, to establish ratios between different linear dimensions of sagittal segments and check for dimensional balance among the various segments in subjects with normal occlusion, pleasing profile and facial harmony [9].

The limitation of this study is that there are not enough samples in each appliance and variation in number of patients in camouflage and appliances. There were also different types of sample in fixed functional appliances and growth status to be specified.

Our institution is passionate about high quality evidence based research and has excelled in various fields (Pc, Marimuthu and Devadoss, 2018 [24]; Ramesh et al., 2018 [26]; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018 [38]; Ezhilarasan, Apoorva and Ashok Vardhan, 2019 [5]; Ramadurai et al., 2019 [25]; Sridharan et al., 2019 [35]; Vijayashree Priyadharsini, 2019 [37]; Chandrasekar et al., 2020 [2]; Mathew et al., 2020 [16]; R et al., 2020 [29]; Samuel, 2021 [32]). We hope this study adds to this rich legacy.

Conclusion

The conclusion from this study is that camouflage is most commonly attempted in growing children with a mild skeletal Class II malocclusion; twin block is the most common fixed functional appliance. The future scope of this study is to undergo a well-planned RCT for comparison between fixed functional and removable functional appliances, comparison among various removable appliances and evaluation.

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