

Original Research

Comparative study of two fixed functional appliance in class II malocclusion patients

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ABSTRACT:

Background: Class II malocclusion is characterized by an incorrect relationship of maxillary and mandibular dental arches resulting from either skeletal or dental abnormalities, or even a combination of these conditions. Functional fixed appliances constitute a third alternative to treat Class II malocclusions without extraction or surgery. **Aim of the study:** To compare study of two fixed functional appliance in class II malocclusion patients. **Materials and methods:** The present study was conducted in the Department of Orthodontics of the Dental institution. The ethical clearance for the study was approved from the ethical committee of the hospital. All patients signed an informed consent to participate in the study. The study included 40 patients selected from the department OPD list. The patients were grouped based on the treatment, Group 1 and Group 2. Group 1 patients were treated with Jasper Jumper and Group 2 patients with Herbst appliance. Two lateral head films were obtained from each patient in the following stages of orthodontic treatment: pre-treatment (T1) and post-treatment (T2), after use of the orthopedic appliance, leveling, alignment and finishing procedures. **Results:** The mean age of patients in group 1 was 13.06 years and in group 2 was 12.27 years. The mean follow up period was 2.09 years for group 1 and 2.83 years for group 2. The number of male patients in group 1 was 9 and in group 2 was 8. The number of female patients in group 1 was 11 and in group 2 was 12. We observed that significant improvement was seen among maxillary component, mandibular component, sagittal jaw relationship, growth pattern, maxillary dentoalveolar component, mandibular dentoalveolar component and dental relationships in both the groups. **Conclusion:** Within the limitations of the present study, it can be concluded that the effects of the different fixed functional appliances were similar in correcting Class II malocclusion.

Keywords: Functional appliances, class II malocclusion, fixed appliances, orthodontic treatment.

Received: September 22, 2020

Revised: October 20, 2020

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This article may be cited as: Bhat JM, Abdullah MY, Bhat IA. Comparative study of two fixed functional appliance in class II malocclusion patients. J Adv Med Dent Scie Res 2020;8(11):19-22.

INTRODUCTION:

Class II malocclusion is characterized by an incorrect relationship of maxillary and mandibular dental arches resulting from either skeletal or dental abnormalities, or even a combination of these conditions.¹⁻³ It is considered as one of the most common orthodontic malocclusions.⁴ Several strategies are available for Class II treatment, and most orthodontists tend to choose a treatment protocol based on which part of the craniofacial skeleton is believed to be most affected by

the appliance.⁵ Class II malocclusions in adults are usually treated by either orthognathic surgery or camouflage treatment, depending on the severity of the skeletal discrepancy.⁶ A common strategy in the treatment of Class II division 1 malocclusions in growing patients is a two-step approach. In the first phase of treatment, the sagittal jaw relationship is normalized, so Class II malocclusion is transformed into a Class I malocclusion. In the second phase of treatment, tooth positions are adjusted, usually with

fixed appliances.⁷ Functional fixed appliances constitute a third alternative to treat Class II malocclusions without extraction or surgery.^{6,8,9} Fixed appliances with flexible intraoral force modules are used in the first phase of treatment.¹⁰ Fixed functional appliances offer several advantages, such as 24-hour-a-day usage; short-term treatment (approximately 8 to 10 months); esthetics is not adversely impacted; and no compliance issues.¹¹ Hence, the present study was conducted to compare study of two fixed functional appliance in class II malocclusion patients.

MATERIALS AND METHODS:

The present study was conducted in the Department of Orthodontics of the Dental institution. The ethical clearance for the study was approved from the ethical committee of the hospital. All patients signed an informed consent to participate in the study. The study included 40 patients selected from the department OPD list.

Inclusion criteria:

- 1) Class II division 1 malocclusion with bilateral Class II molar relationship (minimum severity of one half Class II molar relationship);
- (2) no craniofacial syndromes or systemic diseases;
- (3) no tooth agenesis or missing permanent teeth;
- (4) mandibular arch with minimal or no crowding.

The patients were grouped based on the treatment, Group 1 and Group 2. Group 1 patients were treated

with Jasper Jumper and Group 2 patients with Herbst appliance. Two lateral headfilms were obtained from each patient in the following stages of orthodontic treatment: pre-treatment (T1) and post-treatment (T2), after use of the orthopedic appliance, leveling, alignment and finishing procedures.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student’s t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

RESULTS:

Table 1 shows demographic data of Group 1 and 2 patients. The mean age of patients in group 1 was 13.06 years and in group 2 was 12.27 years. The mean follow up period was 2.09 years for group 1 and 2.83 years for group 2. The number of male patients in group 1 was 9 and in group 2 was 8. The number of female patients in group 1 was 11 and in group 2 was 12. [Fig 1] Table 2 shows the comparison of various cephalometric changes with treatment in Group 1 and 2. We observed that significant improvement was seen among maxillary component, mandibular component, saggital jaw relationship, growth pattern, maxillary dentoalveolar component, mandibular dentoalveolar component and dental relationships in both the groups.

Table 1: Demographic data of Group 1 and 2 patients

	Group 1	Group 2
Mean age (years)	13.06	12.27
Mean follow up period	2.09	2.83
Number of male patients	9	8
Number of female patients	11	12

Fig 1: Demographics

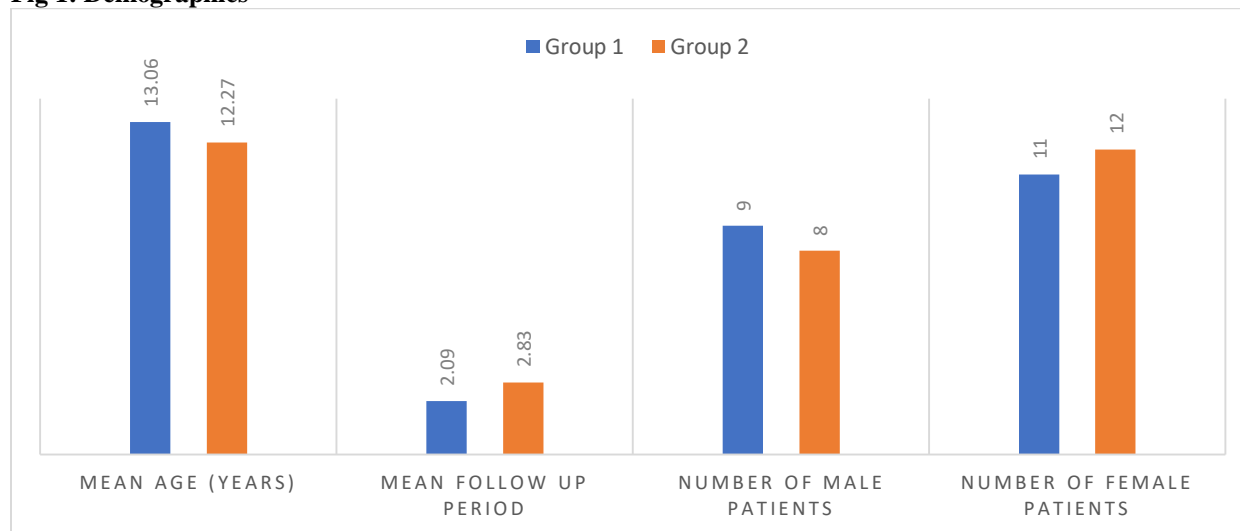


Table 2: Comparison of various cephalometric changes with treatment in Group 1 and 2

Variables	Group 1	Group 2	p-value
SNA (degrees)	-1.36	-1.29	Significant
SNB (degrees)	0.11	0.77	Significant
ANB (degrees)	-1.55	-1.82	Significant
NAP (degrees)	-3.41	-3.97	Significant
SN.GoGn (degrees)	0.49	0.09	Significant
1.NA (degrees)	-2.35	-0.67	Significant
1.NB (degrees)	2.49	4.27	Significant
Overjet (mm)	-3.49	-2.98	Significant
Overbite (mm)	-2.58	-1.68	Significant

DISCUSSION:

In the present study, we observed that significant improvement was seen in skeletal and dental parameters with Jasper Jumper and Herbst appliance. SNA was significantly decreased in both the groups. Similarly, overjet and overbite was significantly reduced. Over the treatment period, significant improvement was observed in malocclusion with both the appliances. The results were compared with previous studies and were found to be consistent. Cacciatori G et al assessed the cephalometric skeletal and soft-tissue of functional appliances in treated versus untreated Class II subjects in the long-term (primarily at the end of growth, secondarily at least 3 years after retention). Randomised and non-randomised controlled trials reporting on cephalometric skeletal and soft-tissue measurements of Class II patients (aged 16 years or under) treated with functional appliances, worn alone or in combination with multi-bracket therapy, compared to untreated Class II subjects. Eight non-randomised studies published in 12 papers were included. Functional appliances produced a significant improvement of the maxillo-mandibular relationship, at almost all time points. The greatest increase in mandibular length was recorded in patients aged 18 years and above, although the improvement of the mandibular projection was negligible or not significant. The quality of evidence was 'very low' for most of the outcomes at both primary time points. They concluded that functional appliances may be effective in correcting skeletal Class II malocclusion in the long-term, however the quality of the evidence was very low and the clinical significance was limited. Ajami S et al assessed the dentoskeletal effect of a modified Twin Block appliance for treatment of class II malocclusions. Lateral cephalograms of 25 Class II malocclusion patients were compared to evaluate skeletal, dentoalveolar and soft tissue changes pre- and post-treatment with a modified Twin Block appliance. A total of 33 angular and linear variables were used for analysis. The differences were calculated at the start and end of treatment. The paired T test was performed to compare the cephalometric measurements before and after treatment. Compared the pre- and post-

treatment measurements, there was a significant increase in SNB, CO-Gn, ANS-Me, Mandibular base, Lower 1 to NB ($^{\circ}$), Lower 1 to NB (mm), and Z-angle following functional therapy with modified Twin Block appliance. On the other hand, a significant decrease was observed in ANB, NA-Pog, overjet, and overbite, Upper 1 to palatal plane, UL-E-line, LL-E-line, and H-angle after treatment with modified Twin Block appliance. They concluded that the modified Twin-Block improves facial esthetics in Class II malocclusion by a combination of changes in skeletal as well as dentoalveolar structures. The increase of mandibular unit length was observed to be due to a true mandibular growth not just a repositioning of the mandible. The modified appliance, however, did not show any superior effects in terms of less dental compensation compared to the conventional Twin-Block appliance.^{12, 13}

LeCornu M et al analyzed 3-dimensional skeletal changes in subjects with Class II malocclusion treated with the Herbst appliance and to compare these changes with treated Class II controls using 3-dimensional superimposition techniques. Seven consecutive Herbst patients and 7 Class II controls treated with Class II elastics who met the inclusion criteria had cone-beam computed tomographs taken before treatment, and either after Herbst removal or at posttreatment for the control subjects. Three-dimensional models were generated from the cone-beam computed tomography images, registered on the anterior cranial bases, and analyzed using color maps and point-to-point measurements. The Herbst patients demonstrated anterior translation of the glenoid fossae and condyles, whereas posterior displacement predominated in the controls. There was more anterior projection of B-point in the Herbst patients. Anterior displacement of A-point was more predominant in the controls when compared with the Herbst patients. They concluded class II patients treated with the Herbst appliance demonstrated anterior displacement of the condyles and glenoid fossae along with maxillary restraint when compared with the treated Class II controls; this might result in more anterior mandibular projection. Tarvade SM et al evaluated skeletal and dentoalveolar effects of Forsus

fatigue resistant devices (FRD) and twin-block (TB) appliance in Class II malocclusion cases. Twenty young adult patients with a Class II division 1 malocclusion were randomly divided into two groups: group I included 10 patients treated with TB, Group II included 10 patients treated with FRD. Dentoskeletal changes were analyzed on lateral cephalograms taken before (T1) and (T2) at the end of the treatment. Both were useful in improving the esthetics. However, more AP skeletal changes were seen with TB appliances as compared with Forsus. Vertical skeletal measurements were increased after functional appliances. These results were more pronounced with Forsus appliance than TB. Increase in incisor mandibular plane angle was seen in both groups, but was found to be more pronounced with Forsus group. Similarly, extrusion of upper and lower molars and lower incisors was also seen in both groups. In conclusion, they found TB to have more mandibular lengthening effect as compared to Forsus, and thus it was found to be more effective in treatment of Class II cases.^{14, 15}

CONCLUSION:

Within the limitations of the present study, it can be concluded that the effects of the different fixed functional appliances were similar in correcting Class II malocclusion.

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