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Preference of orthodontists on type of fixed functional appliance for correction of skeletal class II malocclusion

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Abstract

Background: The most common appliances used to treat skeletal Class II malocclusion are fixed functional appliances. The objective of this study was to assess the preference of orthodontists on type of different fixed functional appliances used in India for skeletal Class II correction.

Material and Methods: A survey questionnaire was developed with an online survey platform Google Forms and distributed to a random sample of 150 practicing orthodontists between the age range of 25-60 years. A total of 104 orthodontists completed the survey. Descriptive statistics and association between participant demographic characteristics and the use and preference of fixed functional appliances were assessed using chi-square testing.

Results: The most preferred rigid fixed functional appliance was the FORSUS- fatigue resistant device with 72.1% response while the least preferred appliance was the Herbst with 44.2% responses, patient comfort

being the most important factor considered by the orthodontists for selection. The participants' desired outcome was mandibular advancement from the appliances. Fixed functional appliances were used only in 21-44% of patients having class II malocclusion by the orthodontists.

Conclusion: Forsus fatigue resistant device was the most preferred fixed functional appliance amongst the participants while Herbst was the least preferred one.

Patient comfort was the most important factor while selecting a fixed functional appliance according to the participants.

Mandibular advancement was the most desired outcomes of the fixed functional appliance as selected by the participants.

Only 21-40% of the class II patients having mandibular retrognathism were treated by fixed functional appliances by majority of the participants.

Keywords: Orthodontist, Fixed functional appliance, Skeletal Class II, Class II Malocclusion, Mandibular retrognathism, Herbst, FORSUS- fatigue resistant device.

Introduction

Altering patient's facial profile has been a challenge for orthodontists over the years. Growth modification is the most effective approach to treat a jaw discrepancy because it allows the patient to grow out of the skeletal disharmony.

(Kragt and Herman S Duterloo, 1982)

Class II malocclusions have either a dental, skeletal, and/or functional components or characteristics.[1] The etiology for skeletal Class II malocclusion can be maxillary prognathism, mandibular retrognathism, or a combination of both.[2] The most consistent diagnostic finding in skeletal Class II malocclusions is mandibular retrognathism.[3,4] Fixed functional appliances are used for treatment of skeletal Class II malocclusions caused due to mandibular retrognathism and they have been shown to produce a combination of dental and skeletal effects during the treatment to effectively reduce overjet in growing patients and normalize maxillary and mandibular positions in the anteroposterior plane.[1,5]

The ideal time for treatment with fixed functional appliance is permanent dentition (to ensure a stable intercuspation of teeth post treatment) and after the pubertal growth spurt (to reduce retention period). (Issacson, 1990)

Fixed functional appliances provide constant horizontal forces, particularly when the mouth is closed and have an additional headgear effect.[5]

Classification of fixed functional appliances: By Ritto A. Korrodi (2001)[6]

- **Rigid Fixed Functional Appliances (RFFA)**

1. The Herbst Appliance and its modifications.
2. The Mandibular Protraction Appliance (MPA)
3. The Mandibular Anterior Repositioning Appliance (MARA)
4. The Ritto Appliance
5. The IST-Appliance
6. The Biopedic Appliance

- **Flexible Fixed Functional Appliances (FFFA)**

1. The Jasper Jumper
2. The Adjustable Bite Corrector
3. The Churro Jumper.
4. The Amoric Torsion Coils.
5. The Scandee Tubular Jumper
6. The Klapper Super Spring
7. The Bite Fixer

- **Hybrid Fixed Functional Appliances (HFFA)**

1. Eureka Spring
2. FORSUS- Fatigue Resistant Device
3. The Twin Force Bite Corrector.

4. Alpern Class II Closers

5. The Calibrated Force Module

Typically, the results obtained by functional appliance in correction of class II malocclusion consists of combination of orthopaedic (30-40%) and dentoalveolar (60-70%) effects. (Graber et al., 1997)[7]

Functional appliance

↓

Increased contractile activity of lateral pterygoid muscle

↓

Intensification of retrodiscal pad by repetitive activity (bilaminar zone)

↓

Increase in growth stimulating factors:

a) Enhancement of local mediators

b) Reduction of local regulating factors

↓

Additional growth of condylar cartilage and sub periosteal ossification of posterior border of ramus

↓

Supplementary lengthening of mandible

Flow chart: Showing mechanism of action of the fixed functional appliances

With a variety of rigid fixed functional appliances available, there is a lack of information in the literature about the most preferred appliance for Class II correction.[1]

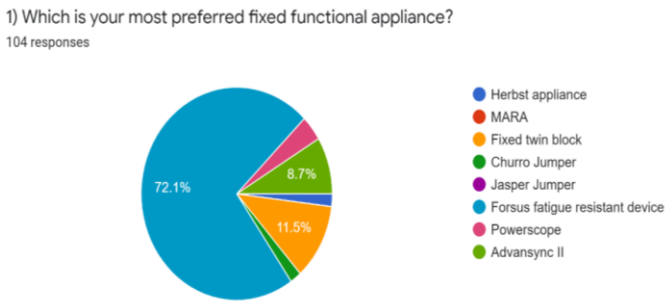
The purpose of this survey study was to evaluate the most preferred and commonly used type of fixed functional appliance by orthodontists to correct skeletal Class II malocclusion caused by mandibular retrognathism and explore why orthodontists prefer one appliance over the other.

Materials and method

A survey questionnaire was developed with an online survey platform Google Forms. The survey was distributed to a random sample of 150 practicing orthodontists between the age range of 25-60 years. A total of 104 orthodontists completed the survey. Descriptive statistics and association between participant demographic characteristics and the use and preference of fixed functional appliances were assessed using chi-square testing.

Results

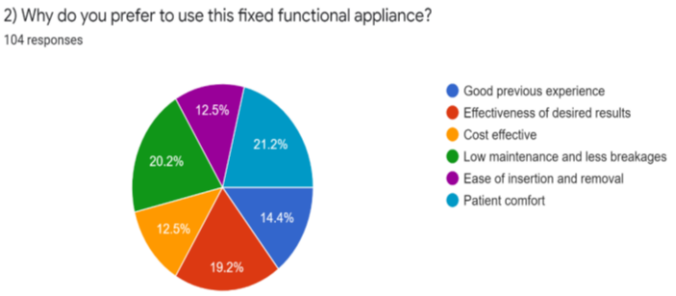
The appliance that was most preferred amongst the participants of the survey was the Forsus fatigue resistant device with a 72.1% preferential rate. 11.5% preferred using the fixed twin block while 8.7% preferred the AdvanSync II. Power scope had a preferred rate of 3.8%, only 1.9% of the participants preferred the Churro Jumper and the Herbst appliance. None of the participants of the study chose the Jasper Jumper or MARA.



Graph 1:

The most common reason for the preference of the fixed functional appliance was patient comfort which was chosen by 21.1% of the total participants followed by 20.1% of them choosing low maintenance and less breakages.

19.1% of the participants chose effectiveness of the desired results, 14.4% chose good previous experience. Cost effectiveness was chosen by 13% and ease of insertion and removal was chosen by 12.3% of the total participants.

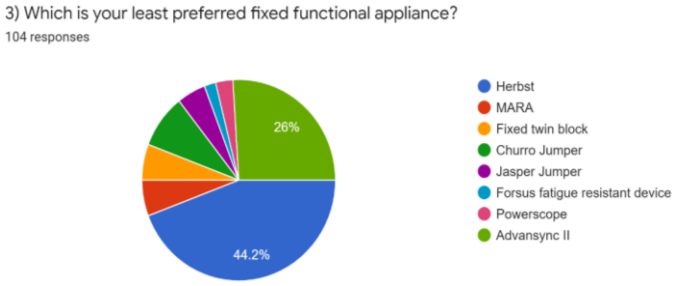


Graph 2:

The least preferred fixed functional appliance was the Herbst which was chosen by 44.2% of total participants followed by AdvanSync II chosen by 26%.

Churro Jumper was not preferred by 8.7% of the participants while MARA and twin block were chosen by 5.8% of them.

Jasper Jumper was chosen by 4.8%. Forsus fatigue resistant device was chosen by least i.e., 1.9% of participants.

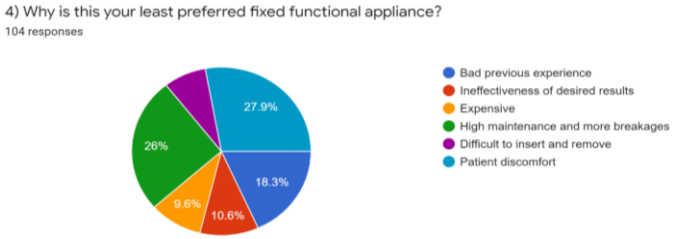


Graph 3:

Patient discomfort was chosen to be the most common reason for not preferring the fixed functional appliance selected by 27.9% of the participants.

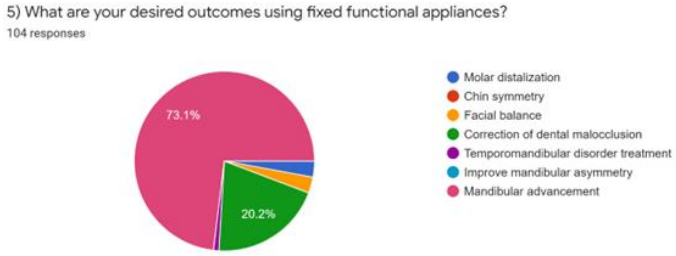
26% chose high maintenance and low breakages while bad previous experience was chosen by 18.4% of total participants.

10.6% chose ineffectiveness of the desired results. Expense was an issue with 9.7% of participants. 7.8% participants expressed difficulty of insertion and removal.



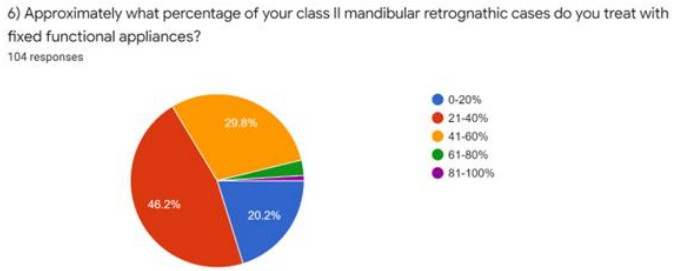
Graph 4:

When the participants were asked about the desired outcome of the fixed functional appliance, the highest response was given to mandibular advancement with a response rate of 73.1% followed by correction of dental malocclusion chosen by 20.1% of the participants. 2.9% participants chose molar distalization and facial balance. 1% participants chose improvement of tempo romandibular disorders. None of the participants chose chin symmetry and improving mandibular asymmetry.



Graph 5:

Highest response received by the question about percentage of class II mandibular retrognathic cases treated with fixed functional appliances in their practice settings was 21-40% with response rate of 46.2%. 29.8% of the participants chose the 41-60% option. 0-20% option was chosen by 20.2% while 2.8% participants chose 61-80%. Only 1% of the participants chose 81-100%.



Graph 6:

Table 1:

Sr. No	Questions		options	n	%	x^2	P-value
1.	Which is your most preferred fixed functional appliance?	a)	Herbst appliance	2	1.9	347.8462	<0.001
		b)	MARA	0	0		
		c)	Fixed twin block	12	11.5		
		d)	Churro jumper	2	1.9		
		e)	Jasper jumper	0	0		
		f)	Forsus fatigue resistant device	75	72.1		
		g)	Power scope	4	3.8		
		h)	AdvanSync II	9	8.8		
2.	Why do you prefer to use this fixed functional appliance?	a)	Good previous experience	15	14.4	7.794877	<0.001
		b)	Effectiveness of desired results	20	19.1		
		c)	Cost effective				
		d)	Low maintenance and less breakages	13 21	13 20.1		
		e)	Ease of insertion and removal	13	12.3		
		f)	Patient comfort	22	21.1		
3.	Which is your least preferred fixed functional appliance?	a)	Herbst appliance	46	44.2	91.1465	<0.001
		b)	MARA	6	5.8		
		c)	Fixed twin block	6	5.8		
		d)	Churro jumper	9	8.7		
		e)	Jasper jumper	5	4.8		
		f)	Forsus fatigue resistant device	2	1.9		
		g)	Power scope	3	2.8		
		h)	AdvanSync II	27	26		
4.	Why is this your least preferred fixed functional appliance?	a)	Bad previous experience	19	18.4	7.5918	<0.001
		b)	Ineffectiveness of desired results	11	10.6		
		c)					
		d)	Expensive	10	9.7		
		e)	High maintenance and more breakages	27 8	26 7.8		
		f)					
		g)	Difficult to insert and remove Patient discomfort	29	27.9		
5.	What are your desired outcomes using fixed	a)	Molar distalization	3	2.9	18.179	<0.001
		b)	Chin symmetry	0	0		

	functional appliances?	c)	Facial balance	3	2.9		
		d)	Correction of dental malocclusion	21	20.1		
		e)	Temporomandibular disorder treatment	1	1		
		f)	Improve mandibular asymmetry	0	0		
		g)	Mandibular advancement	76	73.1		
6.	Approximately what percentage of your class II mandibular retrognathic cases do you treat with fixed functional appliances?	a)	0-20%	21	20.2	7.380346	<0.001
		b)	21-40%	48	46.2		
		c)	41-60%	31	29.8		
		d)	61-80%	3	2.8		
		e)	81-100%	1	1		

Discussion

In this study, Forsus fatigue resistant device received the maximum response from the participants as most preferred fixed functional appliance. The Forsus Fatigue Resistant Device (FRD) is a hybrid fixed functional appliance commonly used for treating Class II malocclusion. A mandibular push rod attaches directly to the lower archwire distal to the canines, and a telescoping spring attaches to the headgear tube with an L-pin or EZ module. Forces are unloaded when the patient's jaw opens, resulting in intrusive rather than extrusive force vectors. In contrast, Class II elastics load upon jaw opening, producing extrusive forces at their terminal ends and potentially undesirable side effects as the occlusal plane undergoes clockwise rotation.[8] Forsus fatigue resistant device does not require bite registration by the orthodontist. Insertion and removal are very easy and does not require excess chairside time.

Patient comfort was the most common reason given by the participants for using the appliance. Orthodontic treatment extends over a long span of time in which co-operation of the patient is desired. When the patients experience minimal discomfort, they generally offer full co-operation throughout the treatment. Some amount of discomfort to the patient is expected while using fixed functional appliances. The most common complaints being cheek irritation, difficulty in opening mouth wide, soreness of jaws and halitosis due to difficulty in keeping appliance clean. For most of the patients the problems generally resolve within 2-4 weeks. [9]

When asked about their least preferred fixed functional appliance, maximum participants chose the Herbst appliance. The appliance can be compared to an artificial joint working between the two jaws. A bilateral telescopic mechanism attached to stainless-steel orthodontic bands keeps the mandible mechanically in a continuous anterior jumped position. Each telescopic device consists of a plunger, a tube, two pivots, and two screws, for each side. The pivot for the tube is usually soldered to the maxillary permanent first molar band, and the pivot for the plunger to the mandibular first premolar band. The screws prevent the telescoping parts from slipping off the pivots. The length of the tube determines the amount of jumping of the bite. Usually, the mandible is retained in an incisal end-to-end relationship. The length of the plunger is kept at a

maximum in order to prevent it from slipping out of the tube when the mouth is opened wide.[10] Bite registration is necessary for placement of the appliance in patient which increases chairside time.

The most chosen response for the reason for not preferring the fixed functional appliance was discomfort caused to the patient. Maximum patients experience cheek irritation because of the appliance. Also, most of the appliances are high maintenance and have tendency to breakages. This increases the chairside time and number of visits of the patient.

Mandibular advancement was the most desired outcome as selected by the participants. Correction of dental malocclusion was also desired by some participants. Correction of facial asymmetries or improvements in temporomandibular disorders was not desired by many participants.

The participants did not use fixed functional appliances for correction of class II malocclusion with mandibular retrognathism in all indicated patients but only for 21-40% of the patients.

Conclusion

1. Forsus fatigue resistant device was the most preferred fixed functional appliance amongst the participants while Herbst was the least preferred one.
2. Patient comfort was the most important factor while selecting a fixed functional appliance according to the participants. Appliance also must be low maintenance and have less breakages to reduce chairside time and its removal and insertion must be easy.
3. Mandibular advancement and correction of dental malocclusions were the most desired outcomes of the fixed functional appliance as selected by the participants.
4. Only 21-40% of the class II patients having mandibular retrognathism were treated by fixed functional appliances by majority of the participants.

References

1. Bishara SE. Class II malocclusions: diagnostic and clinical considerations with and without treatment. In Seminars in Orthodontics 2006 Mar 1 (Vol. 12, No. 1, pp. 11-24). WB Saunders.
2. Borghei S, Broadbent J, Stevens R, Chaudhry K, Subramani K. Orthodontists' preference on type of rigid fixed functional appliance for skeletal Class II correction: A survey study. Journal of Clinical and Experimental Dentistry. 2020 Oct;12(10): e958.
3. McNamara JA Jr. Components of class II malocclusion in children 8-10 years of age. The Angle orthodontist. 1981; 51:177-202.
4. Moyers RE, Riolo ML, Guire KE, Wainright RL, Bookstein FL. Differential diagnosis of class II malocclusions. Part 1. Facial types associated with class II malocclusions. American journal of orthodontics. 1980; 78:477-94.
5. Pacha MM, Fleming PS, Johal A. A comparison of the efficacy of fixed versus removable functional appliances in children with Class II malocclusion: A systematic review. European journal of orthodontics. 2016 Dec 1;38(6):621-30.
6. Ritto AK, Ferreira AP. Fixed functional appliances--a classification. The Functional Orthodontist. 2000 Jan 1;17(2):12-30.
7. Graber T, Rakosi T. Dentofacial Orthopedics with functional appliances.
8. Sood S. The Forsus Fatigue Resistant Device as a fixed functional appliance. J Clin Orthod. 2011 Aug 1;45(8):463-6.
9. Bowman AC, Saltaji H, Flores-Mir C, Preston B, Tabbaa S. Patient experiences with the Forsus fatigue resistant device. The Angle Orthodontist. 2013 May;83(3):437-46.

10. Pancherz H. The Herbst appliance—its biologic effects and clinical use. American Journal of Orthodontics. 1985 Jan 1;87(1):1-20.

11. Moro A, Borges SW, Spada PP, Morais ND, Correr GM, Chaves Jr CM, Cevidanes LH. Twenty-year clinical experience with fixed functional appliances. Dental press journal of orthodontics. 2018 Mar; 23:87-109.

12. Verma N, Garg A, Sahu S, Singh Choudhary A, Baghel S. Fixed functional appliance-A Bird's Eye view. Iosr-Jdms [Internet]. 2019;18(3):67-83.