



Parental acceptance and patient satisfaction of using functional lingual arch space maintainer compared to conventional lingual arch space maintainer- A Questionnaire Survey

Janvi M Gandhi¹, Deepa Gurunathan^{2*}

¹Post Graduate Student, Department of Pediatric and Preventive Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India.

²Professor, Department of Pediatric and Preventive Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India.

***Corresponding author:** Deepa Gurunathan, Professor, Department of Pediatric and Preventive Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India, Email: deepag@saveetha.com

Submitted: 14 March 2023; Accepted: 17 April 2023; Published: 06 May 2023

ABSTRACT

Background:

Aim: To evaluate the parental acceptance and patient satisfaction of using different lingual arch space maintainers in children.

Materials & Methods: 20 patients selected between the age group 7-9 for whom lingual arch space maintainers were indicated. A questionnaire was formulated pertaining to the function, aesthetics and comfort of the child with the new appliance. Responses were collected from parents of 20 participants through an electronic questionnaire which consisted of 10 questions, who were given a lingual arch space maintainer.

Results: The responses from the questionnaire survey favoured the use of functional lingual arch when compared to the conventional lingual arch as 80% of the conventional lingual arch participants had a significantly increased chewing time (p value 0.001) and 80% had a change in diet; preferred soft foods and liquids. (p value 0.001)

Conclusion: From the present study we can conclude that, there can be a shift in the gold standard from conventional lingual arch design to the functional lingual arch space maintainer as it has improved chewing efficiency compared to the conventional lingual arch.

Keywords: *Functional lingual arch, space maintainer, space loss, premature loss, functional space maintainer, E space*

INTRODUCTION

It is rightly quoted that a natural tooth is the best space maintainer (1). A number of forces work together to keep a tooth in the proper position inside the dental arch.

If one of these forces is changed or eliminated, the relationship between adjacent teeth will change, causing teeth to drift leading to arch discrepancies and space loss.

J Popul Ther Clin Pharmacol Vol 30(10):e32–e37; 06 May 2023.

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The use of space maintainers is necessary when there is premature loss of primary teeth before the typical exfoliation has occurred. It may be possible for the succedaneous teeth to erupt properly into position without additional treatment if sufficient space is created and maintained (5,6) .

With the aid of space maintainers, appropriate space can be maintained. Deep dental caries, trauma or iatrogenic injury, and congenital conditions are all potential causes of tooth loss. The first few studies carried out on space loss after the premature extraction of primary teeth highlighted the need for a space maintainer. (5) The American Academy of Pediatric Dentistry (2011-12) guidelines state that the objectives of space maintenance are to prevent the loss of arch length, arch width, and/or arch perimeter by maintaining the relative position of the existing dentition (4) . Space maintainers can be broadly classified as removable and fixed. (1) . Fixed space maintainers are beneficial as the children cannot remove them easily and there is no risk of swallowing it or misplacing it as with removable space maintainers. However, fixed space maintainers can have an impact on the gingival health of children (2) . The lingual arch space maintainer is a type of fixed space maintainer used in pediatric dentistry. It is typically used to maintain space in the lower arch when one or more primary molars have been lost prematurely unilaterally or bilaterally. Only children with fully erupted lower permanent incisors can be indicated with lingual arch space maintainers. In interceptive orthodontics, a lingual arch appliance is frequently employed to maintain the arch length and preserve the leeway space. In the mixed dentition, it can maintain the 'E' space after the primary second molars are lost too soon, but it can also maintain the leeway space in crowded cases to prevent premolar extractions and treat mandibular incisor crowding (7,8) .

The conventional design of a lingual arch space maintainer involves a 19 gauge wire that is shaped like an arch and is placed on the lingual side of the lower teeth. The wire is attached to bands that are cemented to the anchor teeth; permanent lower first molars. The wire extends

across the arch, connecting the bands on the left and right sides of the arch (9,10) . Recent modifications of the lingual arch include a fixed functional lingual arch. Artificial pontics were intended to be used in edentulous spans to maintain space while also enhancing children's masticatory function. The advantage of using wire framework underneath the artificial pontic was that it provided support for the pontics and helped to disperse occlusal stresses placed on the pontics during chewing because it was soldered to the major part of a conventional lingual arch space maintainer. As a result, the child's oral health is improved to its full potential.

Our team has extensive knowledge and research experience that has translated into high quality research (11-18) . The aim of this survey was to evaluate the parental acceptance and patient satisfaction of using different lingual arch space maintainers in children.

MATERIALS AND METHODS

Ethical approval

Ethical approval for this survey was obtained from the Institutional Review Board, Saveetha Institute of Medical and Technical Sciences.

Study Design

The electronic survey was implemented using google forms and distributed to the parents or guardians of the participants from January 2021 to December 2022.

A questionnaire survey was conducted and answers were recorded by the parent after the insertion of the appliance at the post-insertion follow up visits. An initial questionnaire was piloted with a small group of Specialists and Trainees (n=5) and changes were made as a result of feedback. The final questionnaire consisted of a 10-item online survey including multiple choice questions presented using Google Forms. The questions were pertaining to the function, aesthetics and comfort of the child with the new appliance which the parent recorded based on the child's response.

STATISTICAL ANALYSIS

To compare proportions between study and control groups for the questionnaire survey responses Chi-Square test is applied. To analyse the data SPSS (IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp. Released 2019) is used. Significance level is fixed as 5% ($\alpha = 0.05$).

RESULTS

The responses from the questionnaire survey favoured the use of functional lingual arch when

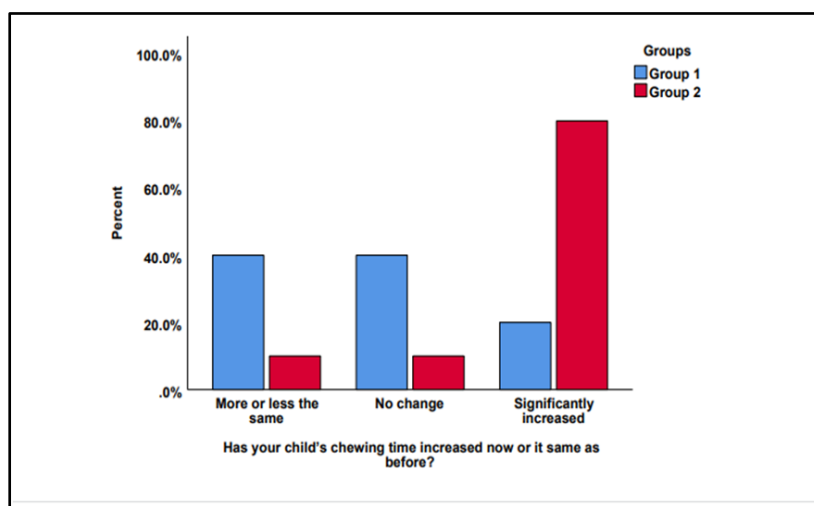
compared to the conventional lingual arch as the inter-group comparisons of function and efficiency using conventional lingual arch with functional lingual arch showed statistically significant difference between both groups, in terms of chewing efficiency, 80% of the participants had a significantly increased chewing time (p value 0.001) and 80% had a change in diet, participants of conventional lingual arch group preferred soft foods and liquids. (p value 0.001)

TABLE 1: Intergroup Comparison Of Chewing Efficiency Using The Appliance In Both Groups Based On Questionnaire Survey.

		Group 1- Functional lingual arch		Group 2- Conventional lingual arch		p value
		N	%	N	%	
Is there any change in your child's chewing efficiency with the appliance compared with your natural teeth?	Dissatisfactory (Not OK)	0	.0	8	80.0	0.001
	Satisfactory	10	100.0	2	20.0	
	Total	10	100.0	10	100.0	
Has your child's chewing time increased now or it same as before?	More or less the same	4	40.0	1	10.0	0.048
	No change	4	40.0	1	10.0	
	Significantly increased	2	20.0	8	80.0	
	Total	10	100.0	10	100.0	
Does your child have any food habits changed after placing the appliance?	Eating same as before, hard and soft foods	10	100.0	2	20.0	0.001
	Prefering liquids and soft foods	0	.0	8	80.0	
	Total	10	100.0	10	100.0	

Table represents inter-group comparisons of function and efficiency using conventional lingual arch with functional lingual arch showing statistically significant difference between both groups. (p value <0.05) Participants of Group 1 (Functional lingual arch showed a significant

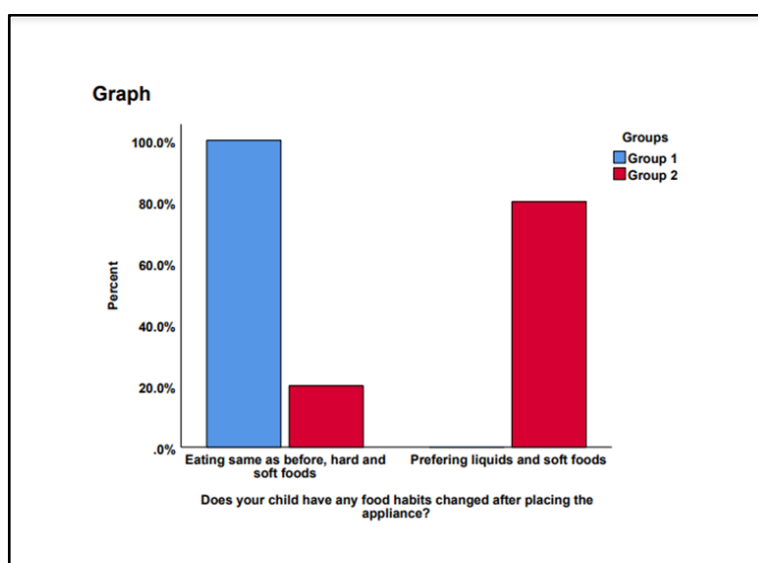
increase in chewing time than the participants of Group 2 and they preferred liquids and soft foods whereas participants of group 2 had the same dietary habits as before, preferring both hard and soft foods as reported by their parents.



GRAPH 1: Bar Chart Represents The Responses To The Questionnaire Regarding Increase In Child's Chewing Time After Wearing The Appliance For Both Groups.

Above bar chart represents response to the questionnaire survey on increase in chewing time of the child after placing the appliance for both test and control groups. X-axis denotes whether the chewing time was significantly increased, more or less the same or had no change, measured in both groups. Y-axis represents the percentage

of responses given by the participants in Group 1 and Group 2. An increase in percentage of responses, in conventional lingual arch group (Group 2) towards the option, significant increase in chewing time post insertion of the appliance was seen.



GRAPH 2: Bar Chart Represents The Responses To The Questionnaire Regarding Change In Food Habits After Placing The Appliance For Both Test And Control Groups.

Above bar chart represents response to the questionnaire survey on change in food habits after placing the appliance for both test and control groups. X-axis denotes whether the

children preferred eating hard and soft foods same as before or preferred soft foods and liquids now, measured in both groups. Y-axis represents the percentage of responses given by the

participants in Group 1 and Group 2. An increase in percentage of responses, in conventional lingual arch group (Group 2) towards the option, preferring liquids and soft foods was seen.

DISCUSSION

Space loss may occur if a tooth is lost too soon and a space maintainer is not inserted as directed. The degree to which space is affected varies according to the arch affected (maxilla or mandible), site in the arch and time elapsed since tooth loss (5). In this study, this particular age group was chosen as the participants belonging to this group have lower permanent incisors and permanent molars fully erupted as indicated for the ideal requisites of a lingual arch space maintainer. Despite being widely used, the main disadvantage of the lingual arch is that it cannot replace missing primary teeth by successfully restoring masticatory function (6). The purpose of utilising artificial pontics in edentulous spans was to increase children's masticatory effectiveness and space maintenance. Because the wire framework is soldered to the main part of a typical lingual arch space maintainer, it helps to distribute the occlusal forces placed on artificial pontics during chewing, which is an added advantage (3).

This questionnaire survey was conducted assessing the difference in comfort, function and aesthetics using the novel appliance in the test group compared to the conventional design, reported by the parents. The questionnaire conducted consisted of a 10-item online survey including multiple choice questions. All the questions were to be answered by the parents based on the observations made post insertion of the appliance for the child. It was reported that chewing time had significantly increased for 80% of the participants in the conventional lingual arch group whereas it had increased for only 20% of the participants of the functional group, the rest of whom had no significant change in their chewing time compared to before. It was also found that 80% participants of conventional lingual arch group preferred soft foods and liquids post insertion of the appliance whereas the functional group participants were comfortable with hard and soft foods. (Table 1,

Graph 1,2) all these responses favour the use of the functional lingual arch.

A study was conducted with similar findings to our study where a functional lingual arch was used as a space maintainer in a 9 year old boy with bilateral early loss of primary mandibular 1st molars. Follow up after 1 year had satisfactorily maintained space for eruption of permanent teeth. Another study, also with findings similar to our study that highlights a functional lingual arch with a hinge-type lockable dentulous component that incorporates molar tubes, with various advantages over the conventional lingual arch (3,5).

With proper maintenance, oral hygiene instructions and regular follow up, functional lingual arch may be as clinically effective as the conventional lingual arch with the added benefit of improving masticatory efficiency of the child.

CONCLUSION

From the present study we can conclude that, there can be a shift in the gold standard from conventional lingual arch design to the functional lingual arch space maintainer as it has improved chewing efficiency compared to the conventional lingual arch.

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