

Prevalence of Space Maintainers as A Treatment Modality in Maxillary Arch among Children between the Age Group of 6 to 12 Years- A Retrospective Study

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Abstract

Early loss of primary teeth can affect the arch length and thereby lead to malocclusion. Space maintainers were introduced to effectively maintain the space after a premature tooth loss. This study aims to assess the prevalence of various space maintainers provided in the maxillary arch among children aged 6 to 12 years and describes the trends in the use of space maintainers to bring about better understanding about these appliances. The patient records from June 2019-April 2020 of children who underwent space maintainer therapy in maxillary arch were selected by non- probability sampling. Data was collected and exported to the Statistical package for social science for windows (SPSS version 20.0,IL,Chicago,USA) for analysis. The results of the study showed that among the space maintainers provided, Band and loops (51.6%) were commonly used followed by Groper's appliance (27.4%). The rarely provided space maintainers were Transpalatal arch (1.6%). The use of space maintainers in the maxillary arch had a male predominance (62.9%). The age of the children for whom space maintainers were commonly provided were 8 year olds (53.2%). Age and type of the space maintainer given was found to have no strong association ($p=0.264$, $p>0.005$).

The study draws attention to the fact that space maintainers are widely used in Paediatric dentistry as a part of preventive orthodontics. In this study, Band and loop space maintainers were prevalent. Male dominance was observed and use of space maintainers especially in the age of 8 years was common. There was no association between age and the type of space maintainers used. Extensive research based on space maintainers and the dentist's preferences and skill regarding the same has to be done. Alternatives for the current space maintainers have to be found to overcome their drawbacks .

Keywords : *Band and loop; Caries; Groper's appliance; Premature loss; Space maintainers*

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Introduction

Child's growth and development is influenced by primary dentition. It affects appearance, speech, mastication and also helps to guide the eruption of permanent teeth into the occlusal plane¹⁻⁴. Exfoliation of primary teeth and emergence of permanent teeth is considered to be a normal physiological process⁵⁻⁷. Several factors like extensive caries, trauma etc, which

causes loss of primary teeth can lead to mesial migration of teeth and can overall manifest as malocclusion in the form of crowding, impaction, supraeruption etc⁸⁻¹¹. The apt way to eliminate these problems is by preserving the deciduous tooth in the arch till its normal exfoliation time is attained^{12,13}. Hence, it is usually said that deciduous teeth act as best space maintainers for permanent dentition¹⁴⁻¹⁷.

Space maintainers are usually indicated to preserve the space created by premature loss of primary teeth in either of the arches. There are various fixed space maintainers among which Band and loop space maintainers are one of the most frequently used¹⁸. They are used because of their high success rates¹⁹. But there are also various disadvantages associated with them like cement disintegration, caries forming along the margins of the band and prolonged construction time²⁰. This had led to numerous pilot studies that suggests the use of newer adhesives like Glass fibre reinforced composite resins (GFRCR), Ribbond and Everstick as an alternative to fixed space maintainers^{21,22}. For maxillary arch with bilateral loss of teeth, there are two options of fixed space maintainers, namely Nance palatal arch and Transpalatal arch space maintainers²³. Transpalatal arch has lesser food impaction and improved compatibility with soft tissues when compared with Nance palatal arch space maintainers²⁴.

Deciduous maxillary anterior teeth are often lost due to early childhood caries, systemic conditions or syndromes and trauma^{25,26}. This has known to affect the child's speech development as well, especially labiolingual sounds. Inappropriate speech compensations can develop if these teeth are missing²⁷, and it can also affect the esthetics and thereby lower the self esteem of the growing child. This led to the introduction of Groper's appliance²⁸. Although various appliances are available for different clinical situations, they usually have their very own adverse effects. This study sheds light on etiological factors that makes the children prone to early loss of tooth and also gives importance to why the particular appliances were preferred. It focuses on understanding the current scenario in use of space maintainers in maxillary arch for children aged 6 to 12 years.

Materials And Methods

A retrospective study of space maintainers used in the maxillary arch was carried out by examining the records of 100 patients from June 2019 to March 2020. Institutional ethical committee clearance was obtained for data retrieval and usage as needed for the study (SDC/SIHEC/2020/DIASDATA/0619-0320). Patients with incomplete records and double entries were excluded from the study. Type of space maintainer given was confirmed using photographic evaluation. For each child, details on type of space maintainer, age and gender were collected.

Statistical Analysis

Following the collection of data of children who underwent space maintainer therapy in maxillary arch by non- probability sampling. Data was subjected to statistical analysis.

Microsoft Excel 2016 data spreadsheet was used to collect data and later exported to the Statistical package for social science for windows (SPSS version 20.0,IL,Chicago,USA). The distribution percentages were obtained following which correlations were assessed using Chi square tests.

Results and Discussion

The final data set consisted of 62 children within the range of 6-12 years who were given space maintainers in the maxillary arch.

Age group associated with the highest use of space maintainers was found to be 8 years (53.2%) and the least was observed in children aged 9 and 11 years (3.2% each).[Table 1] Gender distribution among the children who had space maintainers in the maxillary arch depicts male predominance (62.9%).[Figure 1]

Band and loop space maintainers were most commonly provided (51.6%), followed by Groper's appliance (27.4%), and the least provided were Transpalatal arch (1.6%).[Table 2]

The type of space maintainer provided and the age of the child showed no significant association ($p=0.264$). [Figure 2]

The data for this study was based on residents of

Chennai seeking treatment at Saveetha dental college, Chennai. There is dearth in literature about studies assessing the prevalence of types of space maintainers among children in their mixed dentition phase in the given region. There was no sorting process and all of the data available was included to avoid sampling bias. This study sheds light on use of different space maintainers and their prevalence as a treatment modality to prevent malocclusion or other consequences of early tooth loss in a growing child.

In a study conducted by N. Venugopal Reddy et al, it was established that the maximum percentage of premature loss of deciduous teeth occurred in the age of 8 years, followed by 7 and 9 years making them in need of space maintenance²⁹. These findings are similar to the present study which suggests that space maintainers were provided frequently at higher percentages to 8 year old (53.2%) children and the most uncommon age group were 9 and 11 years (3.2%) [Table 1]. Also in another study by S.Syed Shaheed Ahamed et al, there was significant early loss of primary teeth in 8 year old children³⁰. The reason can be that the early loss of primary teeth is associated with oral hygiene, consumption of soft drinks, and previous experience of dental caries.

In the present study [Figure 1], there was a male predominance (62.9%) in use of space maintainers. This can be explained as an increase in premature loss of primary teeth in male children than females which was established in a study by Dhanalakshmi Jayachander in Chennai³¹. In another study by Saravanan et al, it was concluded that male children were subjected to longer feeding periods when compared to the female children irrespective of their economic status which led to higher DFT scores among them³².

Among the type of space maintainers used [Table 2], Band and loop space maintainers were most often provided than the other space maintainers in the given study population. This is coherent with the results of the study conducted by Muawia et al, establishing that band and loop space maintainers were often given to children³³. This can be because the most commonly affected tooth by early loss was found to be primary molars in a study by Leite-Cavalcanti et al³⁴. This in turn means that since band and loops were given

following loss of primary molars, they were provided more. Another reason can be that deciduous molars are critical for streptococcus mutans colonization as they erupt into the oral cavity between 16 to 29 months of age and have deep fissured occlusal surfaces that act as windows of infectivity³⁵.

Groper's appliances were the second most prevalent space maintainers in the present study (27.4%) [Table 2]. The reason can be that maxillary anterior teeth were affected by trauma more often compared to the mandibular teeth, and central incisors were the most affected teeth³⁶. This will lead to increased requirements for Groper's appliance. The least preferred appliances were Transpalatal arch space maintainers (1.6%) which was contradictory to the study by Ari Kupietzsky, which claims that Transpalatal arch have more benefits than Nance palatal arch, like better maintenance of arch width, tissue compatibility and addition of bite planes³⁷. This result can change with increased sample size and can vary according to study populations.

In the present study [Figure 2], Groper's appliances were frequently provided for children aged 6 years (17%). However, there was no statistically significant association between the type of space maintainer given and the age of the patient. This can be due to loss of tooth due to extensive caries irrespective of age and due to other reasons like trauma and syndrome causing aggressive periodontitis which invariably leads to early loss of tooth and requirement for space maintenance.

8. TABLES AND GRAPHS

Age of the children	Frequency	Percentage
6	8	12.9
7	12	19.4
8	33	53.2
9	2	3.2
10	5	8.1
11	2	3.2
Total	62	100

Table 1: Age distribution of children with space maintainers in maxillary arch.

Table shows the age distribution of the study population. Highest preference for space maintenance was observed among children aged 8 years (53.2%) and the least in children among the age groups of 9 and 11 years (3.2% each)

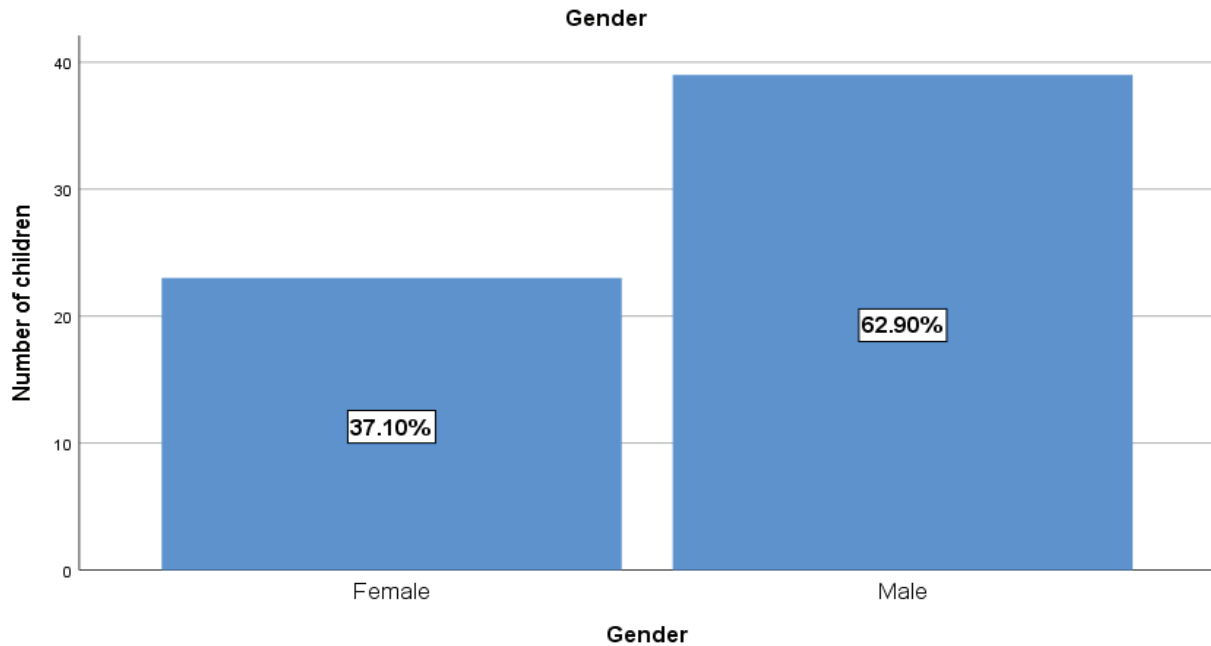


Figure 1: Gender distribution of space maintainers.

Graph shows the gender distribution of the study population (N=62). X axis represents the gender and Y axis represents the number of children. 62.9% were males, while 37.1% were females.

Type of space maintainer	Frequency	Percentage
Band and Loop	32	51.6
Groper’s appliance	17	27.4
Nance palatal arch	12	19.4
Transpalatal arch	1	1.6
Total	62	100

Table 2: Distribution of space maintainers in maxillary arch among children.

Table shows the prevalence in the use of space maintainers in the maxillary arch among children. 51.6% were Band and loop space maintainers, followed by Groper’s appliances (27.4%), and the least provided were Transpalatal arch (1.6%).

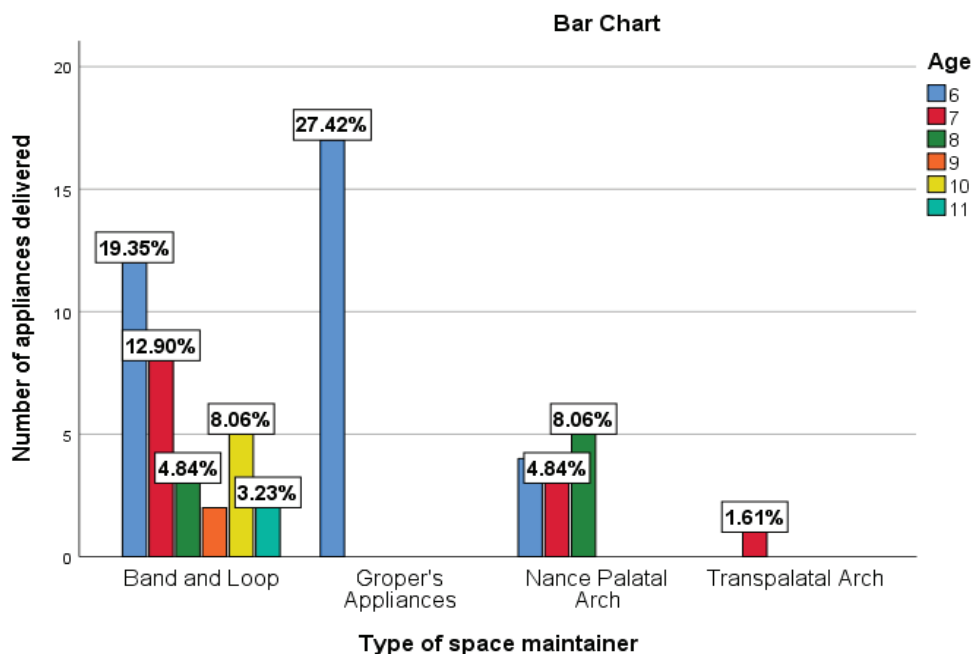


Figure 2: Bar graph depicting the association between type of space maintainer provided and the age of the patient. X-axis represents the types of space maintainer and y-axis represents the number of appliances delivered. Blue depicts 6 years, red depicts 7 years, green depicts 8 years, orange depicts 9 years, yellow depicts 10 years and cyan depicts 11 years. Groper’s appliances were mostly provided for children aged 6 years (17%). There was no statistically significant difference between the type of space maintainer provided and the age of the child (Pearson Chi-Square test, p value- 0.264, p>0.05).

Conclusion

Within the limitations of the present study, it was found that Band and loop space maintainers were predominant. Prevalence was higher in male children than females. It was also observed that the most common age associated with use of space maintainers in the given study population were children aged 8 years .

Conflict of Interests : No conflict of interests

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