

**MODERN CONCEPTS OF SPACE MAINTAINERS AND SPACE REGAINERS: A
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ABSTRACT

Children lose their teeth in their early childhood due to dental caries, trauma, infection and crowding. Maintenance of space created by the lost teeth especially molars is necessary till the eruption of their permanent successors. Space maintainers are appliances used to maintain or regain minor amount of space created by the lost teeth. However due to delay in interception just after extraction or early loss of space it becomes difficult for permanent successor to occupy the space. In such cases space regainers are used to regain the loss space to accommodate the mesio-distal dimension of their successors. Many space maintainers and regainers have been introduced in Pediatric dentistry. It would be wise to consider their advantages over disadvantages while selecting which appliance to be used.

KEYWORDS: Dental caries, space maintainers, space regainers.**INTRODUCTION**

Deciduous dentition plays a vital role in the growth and development of a child. It not only helps in mastication, speech and esthetics but also maintains the space till the eruption of their permanent successors.^[1] Early loss of deciduous teeth and failure to maintain the space created results in crowding and malocclusion. The most common orthodontic problem encountered today is the lack of space in the permanent dentition. Early loss of deciduous teeth causes shifting of adjacent teeth into the space created resulting in abnormal axial inclination, spacing between teeth and shifting of dental midline. This prevents the normal eruption and deviation of their permanent successors from their normal eruption pathways leading to malocclusion.

The term space maintenance was coined by JC Brauer in 1941. He defined space maintenance as the process of maintaining a space in a dental arch previously occupied by a tooth or a group of teeth. Hence a space maintainer is used to maintain the space created by the lost deciduous tooth or teeth till the eruption of their successors. Boucher defined space maintainer as a fixed or removable appliance designed to preserve the space created by the premature loss of a primary tooth or a group of teeth.

The objectives of space maintainer are preservation of primate space, integrity of the dental arches, normal

occlusal planes and to aids in esthetics & phonetics in case of anterior space maintainer. A successful restored carious tooth is the best space maintainer. Careful considerations of factors affecting planning of space maintainers must be decided while selecting a space maintainer. Radiographic and space analysis should be considered before planning a space maintainer.^[2] The present article reviews on the indications, contraindications, types and modern designs of space maintainers used in Pediatric dentistry.

Classifications of space maintainers^[3]

- 1) According to Hitchcock- removable or fixed or semi-fixed; with bands or without bands; functional or non-functional; passive or active; certain combinations of above.
- 2) According to Raymond C Thourow- removable; complete arch- lingual arch and extraoral anchorage; individual tooth space maintainer
- 3) According to Hinrichsen- Class I fixed- Non-functional types such as bar type, loop type; Fixed Functional types such as pontic type, lingual arch type; Class II Cantilever types such as distal shoe, band and loop; Removable space maintainer such as acrylic partial dentures.

Indications of space maintainers

- 1) If the space after the premature loss of primary teeth shows sign of closing.

- 2) If the use of a space maintainer makes the future orthodontic treatment simple.
- 3) When the succedaneous tooth is not ready for eruption.
- 4) When there is at least 1 mm of bone coverage over the space created.
- 5) After space analysis when there is possibility of space inadequacy for the permanent successor due to unbalance forces from the adjacent teeth.

Contraindications of space maintainers

- 1) When there is no bone coverage overlying the erupting permanent successor.
- 2) When the root of the succedaneous tooth has 2/3rd completion.
- 3) When the succedaneous tooth is absent and the space needs closure.
- 4) When the space created is less than the mesio-distal diameter of the crown of the permanent successor.

Pre-requisites of space maintainers

- 1) Should maintain the mesio-distal dimension of the space.
- 2) Should be simple in construction.
- 3) Should be able to withstand occlusal forces.
- 4) Should not interfere or deviate the normal eruption path of the successor.
- 5) Should be easily adjustable.
- 6) Should not interfere in speech, mastication or deglutition.
- 7) Should be cost effective.
- 8) Should not promote food entrapment and promote easy cleaning.

Case selection^[4]

- 1) Early loss of 2nd deciduous molar.
- 2) In congenitally missing 2nd premolar the permanent molar should be encouraged to drift mesially to close the space created.
- 3) In congenitally missing permanent lateral incisor the cuspid should be encourage to drift mesially to close the space created.
- 4) In case of missing or extracted 1st permanent molar the 2nd permanent molar should be encouraged to drift mesially to close the space created.
- 5) Delayed eruption of permanent anteriors may lead to the development of tongue thrusting habits.

Factors affecting planning for space maintainers

- 1) Time elapsed since tooth loss: Space closure takes place within first six months after extraction and hence appliance should be inserted just after extraction.
- 2) Rate of space closure: Space closure is rapid during the first six months after extraction and is more rapid in younger children.
- 3) Amount of bone coverage over the tooth: According to McDonald resorption of 1 mm of bone requires 4-6 months and hence if there is bone coverage over

the erupting successor teeth space maintainers should be planned.

- 4) Dental age of the patient: It is calculated as per the age of the last permanent teeth erupted in the oral cavity in normal eruption sequence.
- 5) Root formation status: Tooth erupts in the oral cavity when 3/4th of its root formation is completed irrespective of the chronological age of the patient.
- 6) Abnormal oral habits: If there is tendency for the development of abnormal oral habits after premature loss of primary teeth space maintainers should be planned to prevent exertion of pressure on dental arch.

Commonly used space maintainers in Pediatric dentistry

- 1) Removable non-functional space maintainer: It is made of acrylic plate placed over the alveolar mucosa within the space created without any artificial teeth.
- 2) Removable functional space maintainer: It is made of acrylic place with artificial acrylic or composite teeth to replace the lost primary teeth. It is usually bilateral and used to restore esthetics and mastication.
- 3) Band and loop space maintainer: Most common fixed space maintainer indicated in single loss of primary molar or bilateral loss of single primary molar before the eruption of permanent incisors and loss of 2nd primary molar after eruption of 1st permanent molar. Modifications include crown and loop, crown-band and loop, Meyne's space maintainer, reverse band and loop, bonded band and loop, band and bar, long band and loop, etc.
- 4) Nance palatal arch space maintainer: Bilateral, non-functional, passive, maxillary fixed space maintainer indicated to stabilize maxillary 1st permanent molar in position when there is bilateral premature loss of primary teeth.
- 5) Transpalatal arch space maintainer: Unilateral, non-functional, passive, maxillary fixed space maintainer indicated to stabilize maxillary 1st permanent molar in position when primary molars require extraction.
- 6) Distal shoe space maintainer: It is also known as intra-alveolar appliance indicated when the primary 2nd molar is lost before the eruption of 1st permanent molar.
- 7) Lingual arch space maintainer: Bilateral, non-functional, active/passive, mandibular fixed appliance indicated in unilateral or bilateral loss of primary molars after the eruption of mandibular permanent lateral incisors.

Modern designs of space maintainers

- 1) Ribbond space maintainer^[5] (Fig.1): It is made of fibre reinforced composite resin usually developed to rectify the disadvantages of a conventional band and loop space maintainer.
- 2) EZ space maintainer (Fig.2): It is cost effective, less time consuming appliance than the traditional space

- maintainer. It does not require impression taking, no laboratory procedure and can be bonded directly during a single dental visit.
- 3) Nikhil appliance⁶ (Fig.3): It is a tube and loop space maintainer designed by Nikhil Srivastava et al. It is less time consuming and does not require impression taking, lengthy laboratory procedure and soldering like the conventional band and loop space maintainer.
 - 4) H- Appliance⁷ (Fig.4): It is a simple bracket and hook space maintainer designed by Pheiroijam Herojit Singh. This appliance does not require the lengthy procedure of band making, welding and soldering like the conventional band and loop space maintainer and hence it is easy and quick to fabricate.
 5. Yeluri R, Munshi AK. Fibre reinforced composite loop space maintainer: An alternative to the conventional band and loop. *Contemp Clin Dent*, 2012; 3(Suppl 1): S26-S28.
 6. Srivastava N, Grover J, Panthri P. Space Maintenance with an Innovative “Tube and Loop” Space Maintainer (Nikhil Appliance). *Int J Clin Pediatr Dent*, 2016; 9(1): 86-89.
 7. Singh PH. Simplify your space maintenance with the new H-appliance: A case report. *Int J Med Dent Case Rep*, 2019; 6: 1-3. doi:10.15713/ins.ijmdcr.119.

Space regaining in Pediatric dentistry^[3]

Space maintainers are required during early loss of primary teeth, however, if space is progressively lost, then regaining of space should be considered to avoid further dental disharmonies. Some of the commonly used appliances for space regaining are given below.

- 1) Jaffe’s appliance: First described by Paul E Jaffe in 1963 for minor space regaining. It is useful in the presence of ankylosed teeth, early loss of primary molar or an extraction result in mesial drifting into the space created.
- 2) Gerber’s appliance: Used compressed open coil springs to regain space.
- 3) Hotz lingual arch: A method of molar distalization usually indicated when the lower 1st permanent molar has drifted mesially but the premolar or cuspid has not drifted distally.
- 4) King’s appliance: Described by King in 1971 for space regaining in both maxillary and mandibular arches.
- 5) Miscellaneous: Hawley’s appliance with expansion screw, quad helix, screws, etc.

CONCLUSION

An early intervention with space maintainer is important when there is premature loss of primary teeth after considering the factors affecting planning of space maintainers. This will save time and expenditure without the need of complicated orthodontic treatment in future. However, the use of space regainers is also effective when there is delay in space maintenance.

REFERENCES

1. Peter Schopf. Indication for and Frequency of Early Orthodontic Therapy or Interceptive Measures. *Journal of Orofacial Orthopedics*, March 2003; 649(3): 186-200.
2. Durward CS. Space maintenance in the primary and mixed dentition. *Annals of the Royal Australasian College of Dental Surgeons*, 2000; 15: 203-205.
3. Nikhil Marwah. *Textbook of Pediatric Dentistry-3rd Edition*.
4. Sidney B. Finn. *Clinical pedodontics-4th edition*.