# TYPES OF SPACE MAINTAINERS

1. **Removable Space Maintainers**

They are space maintainers that can be removed and reinserted into the oral cavity by the patient. It can be functional or nonfunctional, and are bilateral most of the time. Types of removable space maintainers are:

a. Acrylic partial denture.
b. Complete denture; given when there is loss of all the teeth as in rampant caries or ectodermal dysplasias.
c. Removable distal shoe space maintainer; acts as acrylic immediate partial denture with distal shoe extension into the alveolus. It is used when fixed distal shoe cannot be placed due to many missing teeth.

2. **Fixed Space Maintainers**

They can be unilateral or bilateral, functional or nonfunctional, active or passive space maintainers that are designed to be cemented on to the tooth and thus cannot be removed by the patient. Types of fixed space maintainers are:

a. Band and loop, crown and loop space maintainer
b. Passive lingual arch space maintainer
c. Transpalatal-bar space maintainer
d. Nance palatal arch space maintainer
e. Distal shoe space maintainers

**Band and Loop Space Maintainers**

They are unilateral, fixed, nonfunctional and passive space maintainers.

Indications of band and loop space maintainer:

1) Used when single tooth is missing in the posterior segment.
2) It can also be given in bilateral posterior tooth loss, before the eruption of permanent anterior incisors in the mandible, where two band and loop space maintainer can be given instead of passive lingual arch space maintainer.

Contraindications of band and loop space maintainer

1) High caries activity
2) Marked space loss
3) More than one adjoining teeth missing.

Disadvantages of band and loop space maintainer

1) Nonfunctional
2) Does not prevent continued supraeruption of opposing tooth
3) Caries check is difficult
4) Oral hygiene maintenance is difficult
5) The loop may slip from the position and impinge on the gingiva. Occlusal rests given to the loop that rests on the occlusal surface of the mesial abutment tooth prevents this disadvantage.

Technique:

1. A stainless steel band is fitted on the tooth.
2. Impression of dentition and band, the band is removed from the tooth and seated in the impression.
3. On the stone model of the impression, a piece of 0.036-inch steel wire is used to prepare the loop and soldered to the band.
4. Band and loop appliance is cemented intraorally

**The stainless steel crown and loop maintainer** is a modification of the band and loop space maintainer. It may be used

1) if the posterior abutment tooth has extensive caries and requires a crown restoration or
2) if the abutment tooth has had vital pulp therapy, in which case it is desirable to protect the crown with full coverage.

The technique:

1) The steel crown should be prepared
2) Before cementation, a compound impression is made
3) The crown is removed from the tooth and seated in the impression ,
4) The stone model is prepared from the impression.
5) A piece of 0.036-inch steel wire is used to prepare the loop.

- Because it is difficult to remove the crown to make adjustments in the loop, some dentists prefer to adapt a band over a cemented appliance.

**Passive Lingual Arch Space Maintainer**

It is a bilateral, fixed or semi-fixed, nonfunctional, passive space maintainer for the mandibular arch.

- Indicated when there is bilateral loss of molars after the eruption of the permanent incisors in the lower arch.
- If the lingual arch is given before the eruption of the permanent lower incisors it may interfere with the eruption of the permanent incisors.
- The right and left first permanent molars are banded in the lower segment.
- A 'U' shaped arch wire extends from the lingual surface of the molar bands to the lingual surface of the anterior teeth. They are placed above the cingulum of the lower incisors.
- It prevents the mesial movement of the posterior teeth and collapse of the anterior segment.

**Nance Palatal Arch Space Maintainer**

It is a bilateral, fixed, passive and nonfunctional space maintainer for the maxillary arch.

- The first permanent molars are banded
- The arched wire extends from the palatal surface of one molar band to the other. Anteriorly it extends up to the rugae area and is embedded in an acrylic button. The acrylic button that is firmly placed on the rugae provides good anchorage
- Indicated when there is bilateral missing deciduous molars in the upper arch.
- It can be made active by incorporating 'U' loop to the wire. Opening the loop causes distalization of the first permanent molar.
- The acrylic button may irritate the soft tissues and this appliance may not be suitable for patients allergic to acrylic.

**Transpalatal-bar Space Maintainer**

It is indicated for the maxillary teeth when one side of the arch is intact and several primary teeth are missing on the other side. In this case, the rigid attachment to the intact side usually provides enough stability for space maintenance. However, when primary molars have been lost bilaterally, both permanent molars may tip mesially with a transpalatal-bar arch. A Nance appliance is preferred in this situation

**Distal Shoe Space Maintainers**

It is a unilateral, fixed, nonfunctional and passive space maintainer. It is an intra-alveolar appliance, in which a portion of the appliance is extending into the alveolus.

Indications of distal shoe space maintainer:

1) It is indicated when there is premature loss of second deciduous molar before the eruption of the first permanent molar.
2) Used only when one tooth is lost on one quadrant as the strength of the appliance is limited. So when both the first and second deciduous molars are missing in the same quadrant, removable distal shoe is preferred.

Contraindication of distal shoe space maintainer

1) Inadequate abutments due to multiple loss of teeth
2) Poor oral hygiene
3) Missing permanent first molar
4) Lack of patient and parent cooperation
5) Presence of medical conditions such as blood dyscrasias, congenital cardiac defect predisposing to subacute bacterial endocarditis, history of rheumatic fever, diabetes, general debilitation.

# PREMATURE LOSS OF DECIDUOUS TEETH

## LOSS OF PRIMARY INCISORS

The main concern is based on esthetics speech and function.

1. **Loss of mandibular primary incisors**

Early loss of lower primary incisors is generally due to ectopic eruption of the permanent incisors in reflecting excessive incisor liability. The loss of lower incisors in other circumstances, such as trauma, advanced caries, or extraction of a neonatal tooth, may result in anterior space loss if it occurs before primary canine stabilization is realized.

2. **Loss of maxillary primary incisors**

Premature loss of maxillary primary incisors does not generally result in decreased upper intracanine dimensions if the incisor loss occurs after the primary canines have erupted into occlusion at approximately 2 years of age.

The major consequence of early loss of maxillary primary incisors is:

1. Delayed eruption timing of the permanent successors as reparative bone and dense connective tissue cover the site.
2. Unattractive appearance
3. Potential development of deleterious habits (e.g., tongue-thrust swallow, forward resting posture of the tongue)
4. Improper pronunciation of fricative sounds such as "s" and "f") may be of concern following premature loss of primary maxillary incisors.

**Management:**

a. Removable appliance

An anterior appliance incorporating artificial primary teeth may be considered to satisfy aesthetic and functional needs. Acrylic partial dentures have been successful in the replacement of single and multiple maxillary primary incisors.

b. Fixed appliance

A fixed option may be considered using primary incisor denture teeth secured from a rigid stainless steel wire (0.036- or 0.040-inch) extended to bands or stainless steel crowns on the primary molars, a so-called "Hollywood" bridge.

## PREMATURE LOSS OF PRIMARY CANINES

1. **Mandibular primary canine**

Most often due to ectopic eruption of permanent lateral incisors, early loss of a mandibular primary canine is a significant indicator of a tooth size–arch size discrepancy.

The consequences of early loss of lower primary canines are:

a. **Unilateral loss of a lower primary canine:**

This is frequently followed by:

1) A shift in the dental midline toward the side of loss
2) Lingual collapse of the incisor segment
3) Possibly deepening of the bite

The asymmetric disruption in arch integrity complicates normal eruption of the permanent canines and premolars toward the affected side.

b. **If ectopic eruption involves bilateral loss of both lower primary canines, this is followed by:**

1) Pronounced lingual inclination and distal drifting of the permanent incisors.
2) Deepening of the overbite
3) Increased overjet
4) Significant loss of arch perimeter

**2. Maxillary primary canine**

The ectopic loss of maxillary primary canines occurs less frequently than does mandibular loss. When it occurs, ectopic loss of a maxillary primary canine typically reflects a very distal eruptive displacement of the permanent lateral incisor and not necessarily a significant tooth mass problem. The following may occur:

a. Atypical upper anterior alignment
b. Resultant crowding and blockage of the permanent canine because it erupts so late in normal transition.

Early loss of maxillary primary canines is an indicator for early orthodontic treatment with an understanding that the child is a definite candidate for comprehensive orthodontic intervention.

**Management:**

a. If one primary canine is lost during incisor eruption, it may be desirable to extract the contralateral primary canine to help maintain arch symmetry. Although extraction of the contralateral primary canine may improve the appearance of incisor alignment and midline integrity, crowding problems requiring such intervention strongly indicate a significant arch length deficiency that will likely become grossly evident upon permanent canine and premolar eruption.
b. A lingual holding arch may be used with spur attachments to control incisor positioning and prevent encroachment on permanent canine eruption positions when primary canines are lost prematurely.

## PREMATURE LOSS OF FIRST PRIMARY MOLAR

The effect of premature loss of first primary molars in both arches is mostly dependent on the **state of eruption of the first permanent molars.**

1) If the primary first molar is lost during the primary dentition from ages 3 to 5 years, there should be little or no space loss associated with mesial movement of the second primary molar.
2) If the primary first molar is lost as the first permanent molars erupt at ages 5 to 7 years, this will cause:
    a. A strong force is exerted that pushes the second primary molar forward into the first primary molar space.
    b. A loss of posterior arch length within the quadrant that can lead to crowding as the canines and premolars erupt in later stages.
    c. Mandibular arch length may be further compromised by distal and lingual shifting of anterior teeth toward the side of first primary molar tooth loss.

Therefore the loss of a first primary molar in either arch, approximating eruption of first permanent molars, indicates that the use of a space maintainer is generally desirable to stabilize second primary molar and canine positioning.

3) If the first primary molar is lost after first permanent molars have erupted into occlusion and the second primary molar is still in position, minimal space loss should be evidenced in either arch.

**Management:**

a. For unilateral loss of primary first molar a unilateral band or crown and loop is usually the appliance of choice. The appliance incorporates a band or crown on the second primary molar with a soldered wire-loop extension extending forward to come into contact with the distal-cervical surface of the primary canine in the quadrant.
b. If first primary molars are lost bilaterally within a lower arch and the second primary molars are retained, two separate unilateral loop appliances are generally indicated until first permanent molar and incisor eruption is complete. Lingual holding arch designs should not be placed before eruption of the permanent incisors because the lingual wire may interfere with incisor positioning during eruption. Additionally, primary incisors as anterior stops do not offer sufficient anchorage to prevent loss of arch length in most cases.

## PREMATURE LOSS OF SECOND PRIMARY MOLAR

The effect of the loss of the second primary molars also depends on the **state of eruption of the first permanent molars.**

1) If a second primary molar is lost in a child 2 to 5 years of age, no space loss should occur while the first permanent molar is in basal bone. The options for managing such early loss are very limited due

to lack of retention elements for fixed appliances and difficulties with patient cooperation in the use of appliances at this age.

2) If the first permanent molars erupt considerable loss in arch length can occur if no second primary molar is present as an eruptive guide. The upper first permanent molar displaces forward through bodily crown-root movement and mesiolingual rotation around the palatal root. While the lower first permanent molars move forward by pronounced mesial tipping of the crown in addition to the distal movement and retroclination of teeth anterior to the space.
3) If the loss of the second primary molar occurs after the first permanent molars have fully erupted and normal cuspal interdigitation has been established, the degree of space loss should be less dramatic than earlier during molar transition, regardless of the arch involved.

**Management:**

a. If the loss occurs just before eruption of the first permanent molar, that is, when the first molar crown is still covered with oral mucosa and a thin partial covering of bone, a space maintainer to guide the positioning of the first permanent molar into normal occlusion is desirable. The appliance of choice is a distal shoe for both the maxillary and mandibular arches.
b. If the first permanent molars are erupting the classic bilateral mixed-dentition space maintainer in the mandibular arch is the passive lingual arch with bands fitted to the first permanent molars, a 0.036- or 0.040-inch stainless steel wire is contoured to the arch and extended forward to make contact with the cingulum area of the incisors.

- As stated earlier, lower lingual arches should not be placed before the eruption of the permanent incisors because of their frequent lingual eruption path. The lingual wire may interfere with normal incisor positioning if the appliance is in position before lateral incisor eruption. Additionally, abutting against primary incisors as anterior stops does not offer sufficient anchorage to prevent significant loss of arch length.

c. While in the maxillary arch the bilateral mixed dentition space maintainer, to stabilize molar positions bilaterally, is Nance appliance. The Nance appliance uses a contoured rigid wire with an acrylic "button" in contact with the palatal shelf as an anterior stop for bilateral molar stabilization in the maxillary arch. Providing the same molar rotation and bodily movement control as transpalatal bars, the added bracing of the acrylic button against the anterior palatal vault offers some additional resistance against forward tipping movements of the molars.