


Managing the Developing Occlusion

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Guidance of eruption and development of the primary, mixed and permanent dentitions is an integral component of comprehensive oral healthcare for all pediatric dental patients. Such guidance should contribute to the development of a permanent dentition that is in a stable, functional, and esthetically acceptable occlusion. Early diagnosis and successful treatment of developing malocclusions can have both short-term and long-term benefits while achieving the goal of occlusal harmony, function, and dental facial esthetics.

space supervision is “when the judgment of the dentist determines that the individual patient’s occlusion will have a better chance of obtaining optimum development through supervised intervention of the transitional dentition than without clinician directed intervention.”



Baume⁴ reported two consistent morphologic arch forms of the primary dentition: either generalized spaces between the teeth were present (type I) or the teeth were in proximal contact without spacing (type II).

The arch form in both types appears congenital rather than developmental because the original pattern exhibited upon eruption was maintained from ages 3 to 6 years.

Spaced

arches frequently exhibit two distinct diastemas—referred to as *primate spaces*—one between the mandibular canine and first primary molar and the other between the maxillary lateral incisor and primary canine

until the eruption of the permanent first molars, the sagittal dimension of the primary dental arches remained essentially unchanged, with the possible exception of a slight decrease as the result of the development of dental caries on the proximal surfaces of the molar teeth.

minor changes in the transverse dimension of the primary dental arches occurred during 3 to 6 years of age unless negatively influenced by deleterious functional patterns.

Given these findings, orthodontic intervention during the primary dentition up to 6 years of age is mostly directed toward maintaining inherent arch dimensions and arch integrity with preventive and restorative services.

Space maintainers, when primary teeth are lost prematurely, are the next major consideration in maintaining arch dimensions.

Control of functional problems such as

elimination of deleterious thumb-sucking habits and correction of functional crossbites may also receive attention

during the primary dentition years. While desirable, treatments for these factors are often deferred depending upon the cooperation of the child with appliance protocols.

The early-mixed dentition (6 to 9 years of age) is a period much more prone to localized factors that may result in severe malocclusion problems if undetected.

“Early” mesial shift during first permanent molar eruption occurs at the expense of any posterior spacing that might have been present to include breakdown spaces resulting from interproximal caries.

transverse widening of the intercanine width of the upper and lower dental arches occurred during eruption of the permanent incisors

agreeing that the pattern of transition involving the straight terminal plane is normal, suggested that the occlusion forming a mesial step (distal surface of the lower second primary molar is mesial to the same surface of the maxillary molar) is most ideal for Class I development. A distal step (distal surface of lower second primary molar is distal to the same surface of the maxillary molar) indicates a developing Class II malocclusion. Proper permanent molar occlusion was achieved from a straight terminal plane by a second mesial shift of the molars as second primary molars are exfoliated. This “late” shift of the mandibular first molar, often under the additional influence of the emerging second permanent molar, occurs at the expense of the leeway space with a decrease in attendant arch length of 2 to 3 mm on average.

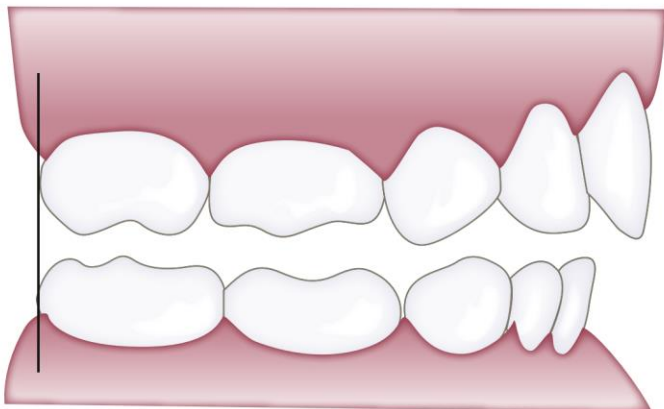
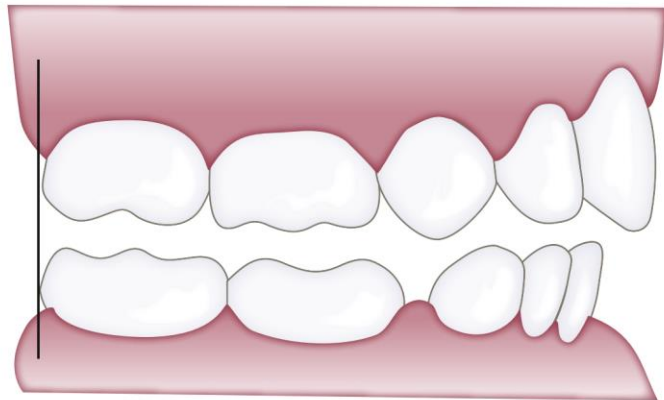
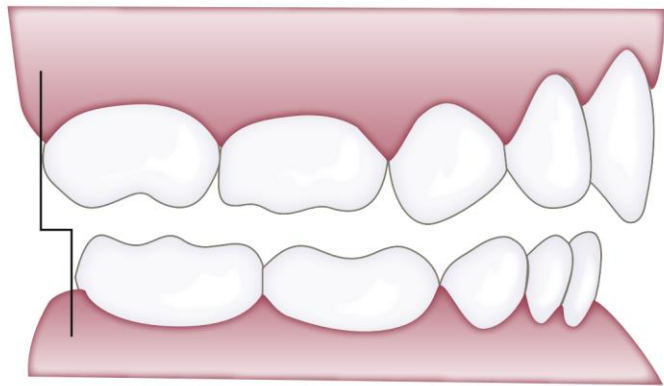


Diagram showing mesial step terminal plane that allows the first permanent molar to erupt directly into proper Class I occlusion. **B**, Straight terminal plane with primary spacing. “Early mesial shift” of mandibular molars closing primary spaces will help establish proper first permanent molar occlusion. **C**, Straight terminal plane without primary spacing. Permanent molars erupt into end-on position in the mixed dentition. Proper first permanent molar occlusion may be attained when the second primary molars exfoliate and a “late mesial shift” of the mandibular first permanent molar occurs.

Nance⁹ observed that in the average patient's mandibular arch, a leeway size difference of +1.7 mm per side exists, with the combined mesiodistal widths of the primary canine, first primary molar, and second primary molar being larger than the mesiodistal widths of the corresponding permanent canine and premolars. The difference between the total width of the corresponding three primary teeth in the maxillary arch compared with the three permanent teeth that succeed them is +0.9 mm per side of leeway space.

control of leeway space will accommodate typical levels of lower incisor crowding in approximately 75% of mixed-dentition patients presenting for orthodontic treatment.

Lower arch length deficiencies of more than 2 to 3 mm per quadrant should be considered a discrepancy beyond simple guidance procedures.

EARLY LOSS OF TEETH AND SPACE MAINTENANCE

If arch integrity is disrupted by early loss of primary teeth, problems may arise that affect the alignment of the permanent dentition. Opposing teeth can supraerupt, more distal teeth can drift and tip mesially, and more forward teeth can drift and tip distally

Altered tooth positions may include a “symptomatic” space deficiency with loss of arch length and circumference, blocked or deflected eruption of permanent teeth, unattractive appearance, food impaction areas, increased caries and periodontal disease, and other negative aspects of malocclusion. The altered occlusal relationships may evidence traumatic interference and untoward jaw relationships. When early primary tooth loss occurs, corrective measures such as passive space maintenance, active tooth guidance with space regained, or a combination of both may be needed to optimize the normal process of occlusal development.

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NEEDS ASSESSMENT

1. *Incidence of space loss.*

2. *Time elapsed since loss*

Most of the space loss usually takes place during the first 6 months after the primary tooth is lost

space closure tends to occur more rapidly in the maxillary arch than in the mandible

it is best to insert an appliance as soon as possible after the extraction.

3. *Stage of development/dental age of the patient*

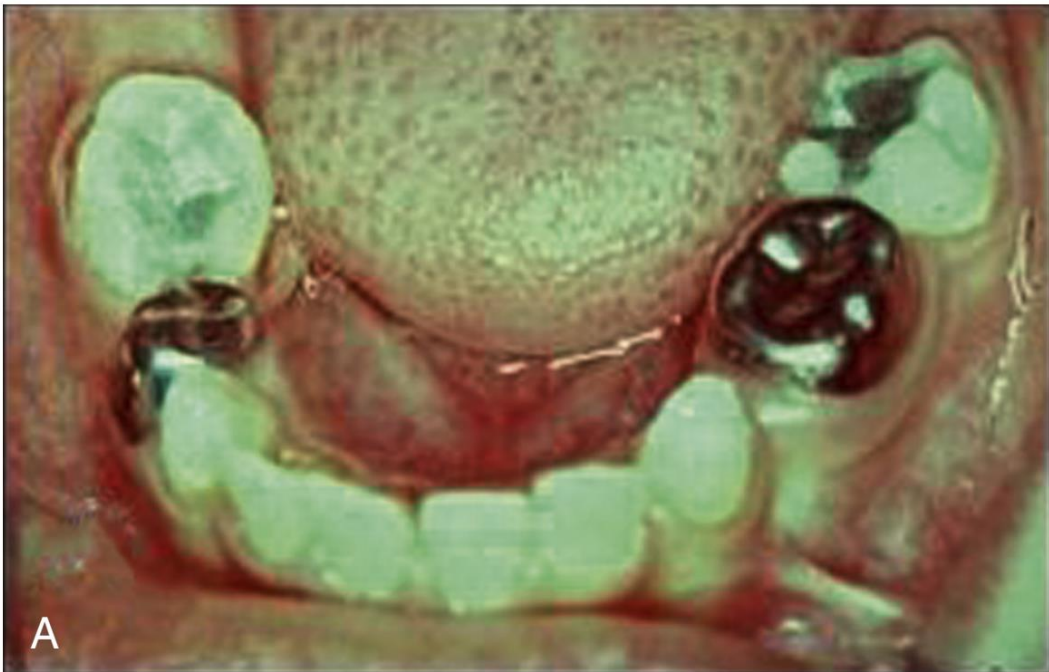
In general, more space loss is likely to occur if teeth are actively erupting adjacent to the area left by the premature loss of the primary tooth.

The amount of space closure is usually less if the permanent molars are fully erupted into occlusal interdigitation at the time of primary tooth loss. A similar situation exists if the first primary molar has been lost prematurely and the permanent lateral incisor is in an active state of eruption.

4. Amount of space closure

Loss of maxillary second primary molars results in the greatest amount of closure, up to 8 mm of space loss in a quadrant

Loss of mandibular second primary molars shows the next greatest amount—up to 4 mm in a quadrant



5. *Direction of closure*

Maxillary posterior spaces close predominantly by mesial bodily movement and mesiolingual rotation around the palatal root of the first permanent molars. Only minimal mesial crowntipping of the first molar is usually noted. In contrast, mandibular spaces close primarily by mesial tipping of the first permanent molars, along with distal movement and retroclination of teeth anterior to the space



6. *Eruption timing of permanent successors*

teeth normally erupt when three fourths of the root is developed

Several studies have indicated that loss of a primary molar before 7 years of age leads to delayed emergence of the succedaneous tooth, whereas loss after 7 years of age leads to early emergence

7. Amount of bone covering the nonerupted tooth

A guide is that premolars usually require about 4 to 6 months to move through 1 mm of bone, as measured on bitewing radiographs.

8. Abnormal oral musculature

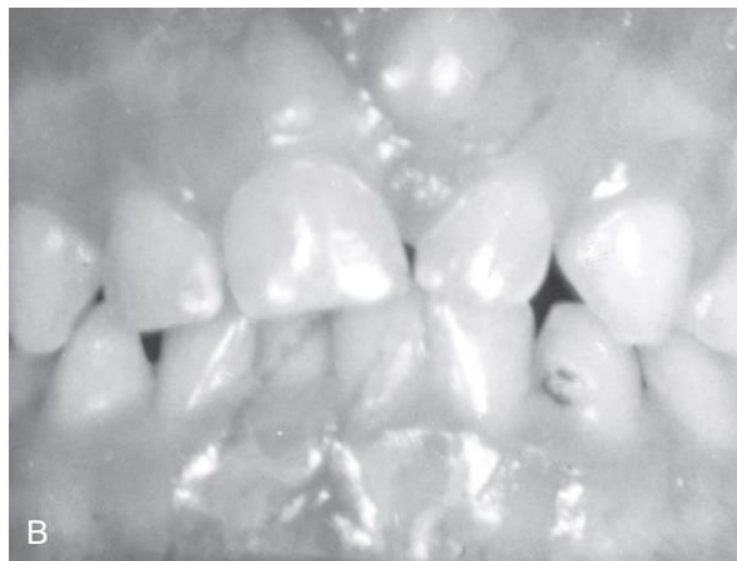
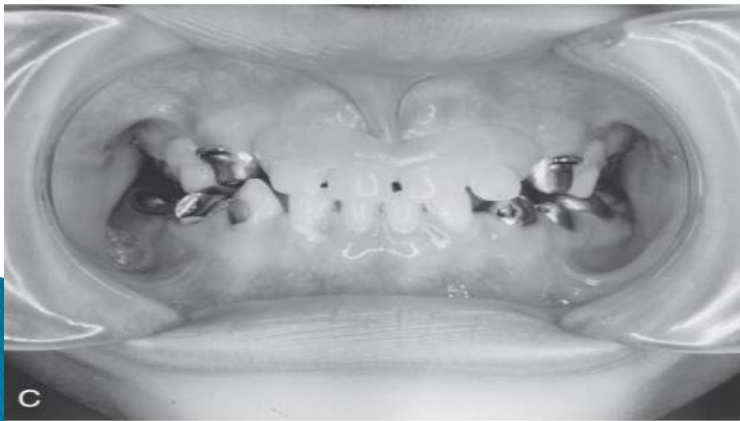
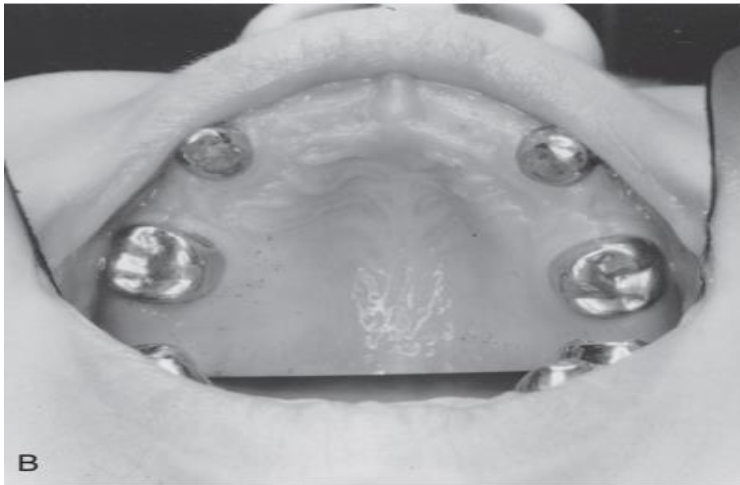
Strong mentalis muscle patterns may have a pronounced negative effect after loss of mandibular primary molars or canines, with collapse of the arch and the distal drifting of the anterior segment that is often exhibited. Thumb or finger habits may similarly produce abnormal forces in initiating collapse of the dental arches after untimely loss of primary teeth.

9. Congenital absence of the permanent tooth

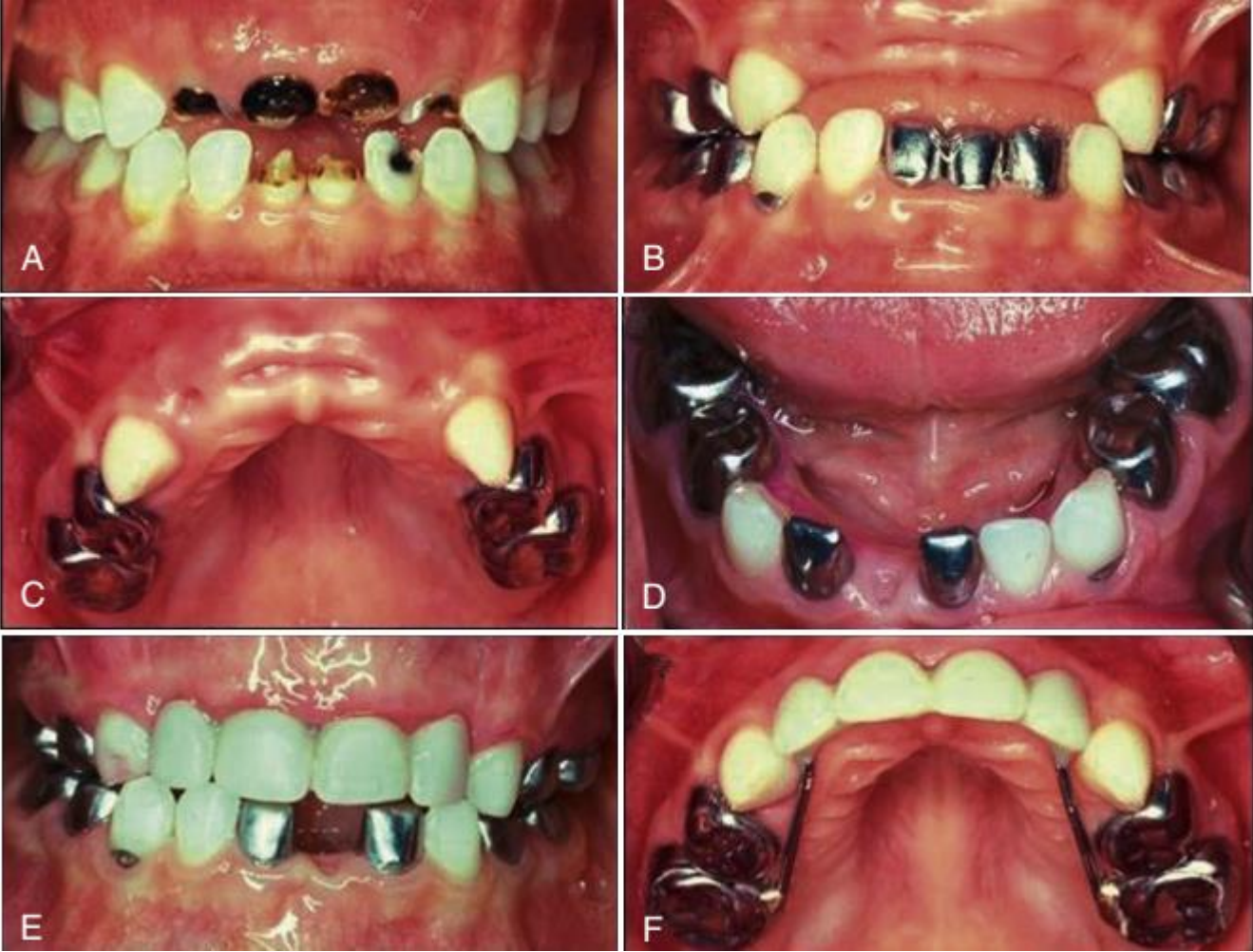
The appliance should not interfere with masticatory function, nor should it inhibit or deflect normal growth changes. It should be simple to construct and maintain; durable, strong, and stable; passive in not imposing pressures on remaining teeth that might affect orthodontic movements; and easily cleanable without enhancing dental caries or soft-tissue pathology. Beyond these fundamental roles, space maintainers may be designed to prevent supraeruption of teeth opposing the space, improve esthetics, and assist in speech

SPECIFIC TOOTH LOSS STRATEGIES

Loss of Primary Incisors



A fixed option 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, may be a more predictable option



Loss of Primary Canines

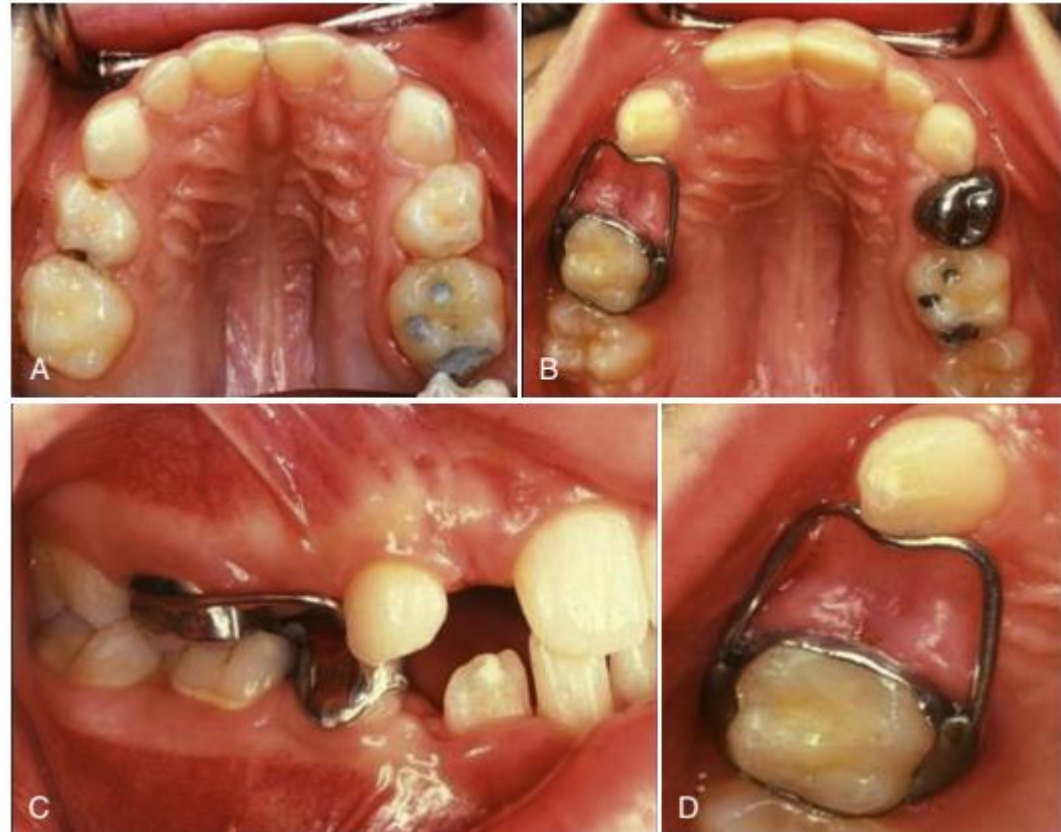
Unilateral loss of a lower primary canine is frequently followed by a shift in the dental midline toward the side of loss, lingual collapse of the incisor segment, and possibly deepening of the bite

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

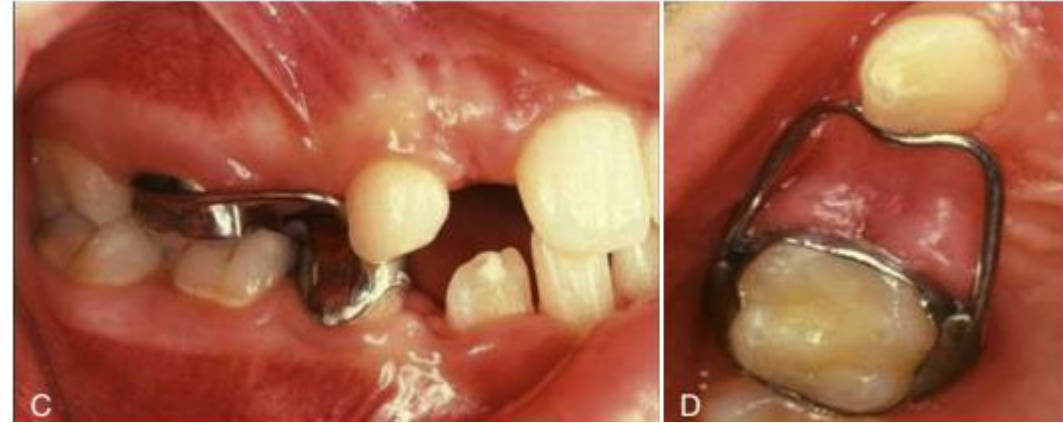


Loss of First Primary Molars

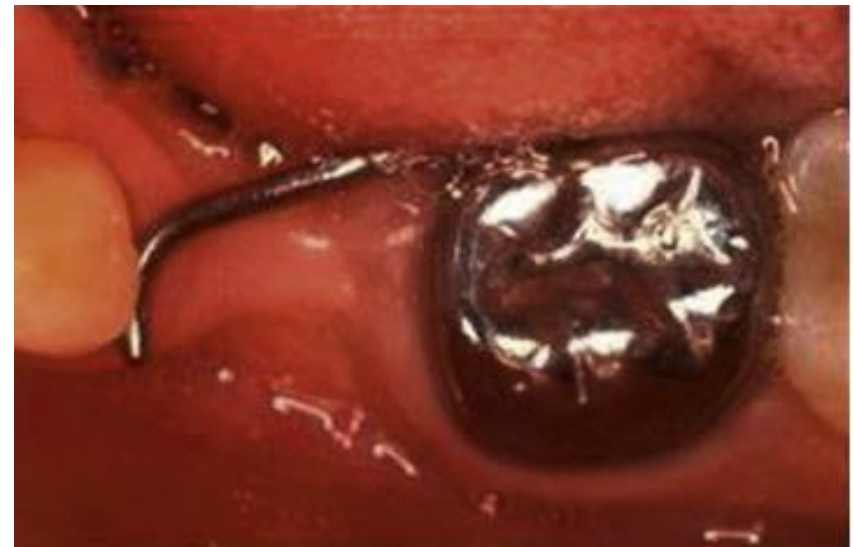
The effect of premature loss of first primary molars in both arches is mostly dependent on the state of eruption of the first permanent molars. If the primary first molar is lost during the primary dentition from ages 3 to 5 years, there should be little or no space loss associated with mesial movement of the second primary molar. However, as first permanent molars erupt at ages 5 to 7 years, a strong force is exerted that pushes the second primary molar forward into the first primary molar space



The loop uses 0.036- or 0.040-inch stainless steel wire strong enough to withstand biting forces while ensuring a rigid abutment contact in stopping forward movement of the second primary molar and distal movement of the primary canine.



wire-loop extension extending forward to come into contact with the distal-cervical surface of the primary canine in the quadrant



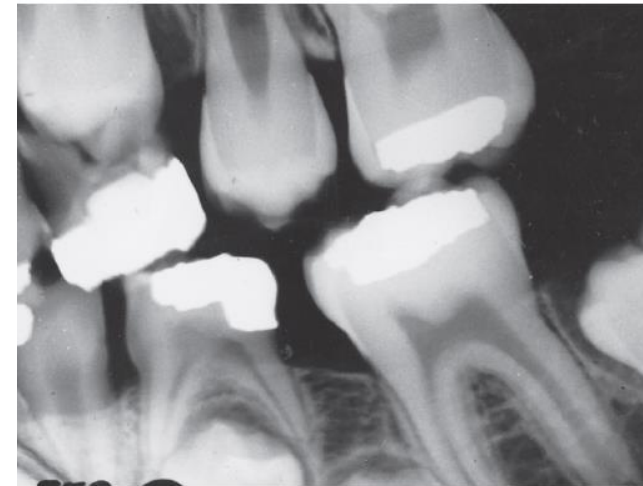
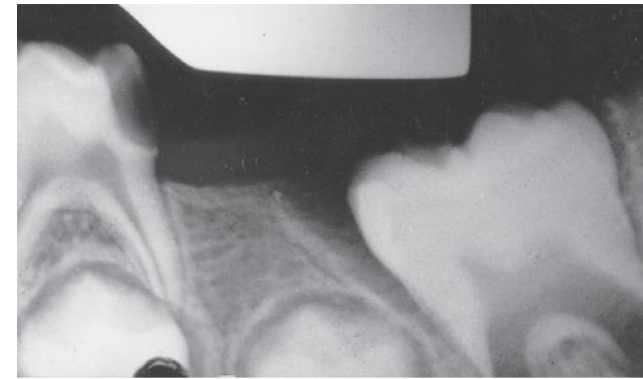
If first primary molars are lost bilaterally within a lower arch and the second primary molars are retained, two separate unilateral loop appliances are generally indicated until first permanent molar and incisor eruption is complete. Bilateral lingual holding arch designs should not be placed before eruption of the permanent incisors because the lingual wire may interfere with incisor positioning during eruption



Loss of Second Primary Molars

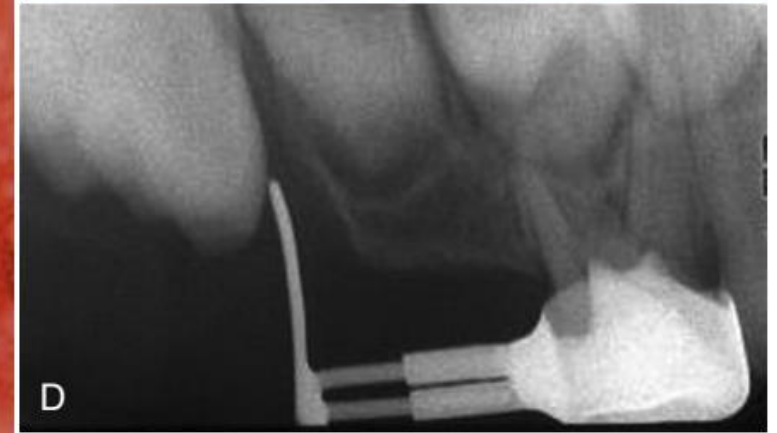
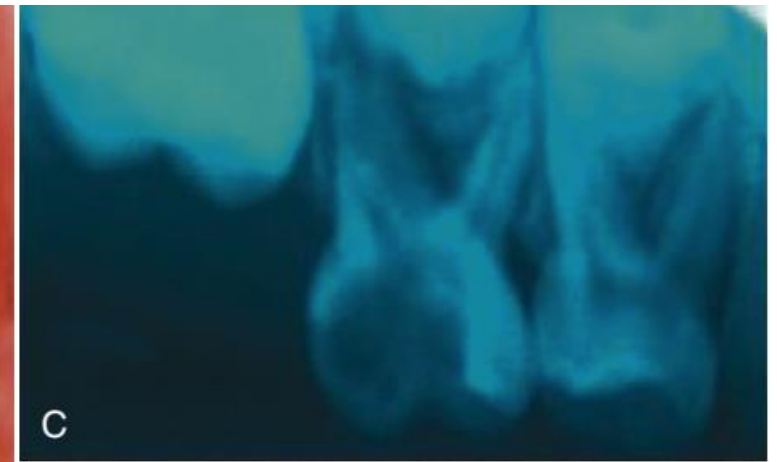
If a second primary molar is lost in a child 2 to 5 years of age, no space loss should occur while the first permanent molar is in basal bone.

Space loss of as much as 8 mm in a maxillary quadrant has been documented as the first permanent molar displaces forward through bodily crown-root movement and mesiolingual rotation around the palatal root. Early loss of lower second primary molars in conjunction with first permanent molar eruption timing results in up to 4 to 6 mm of space loss during transition.

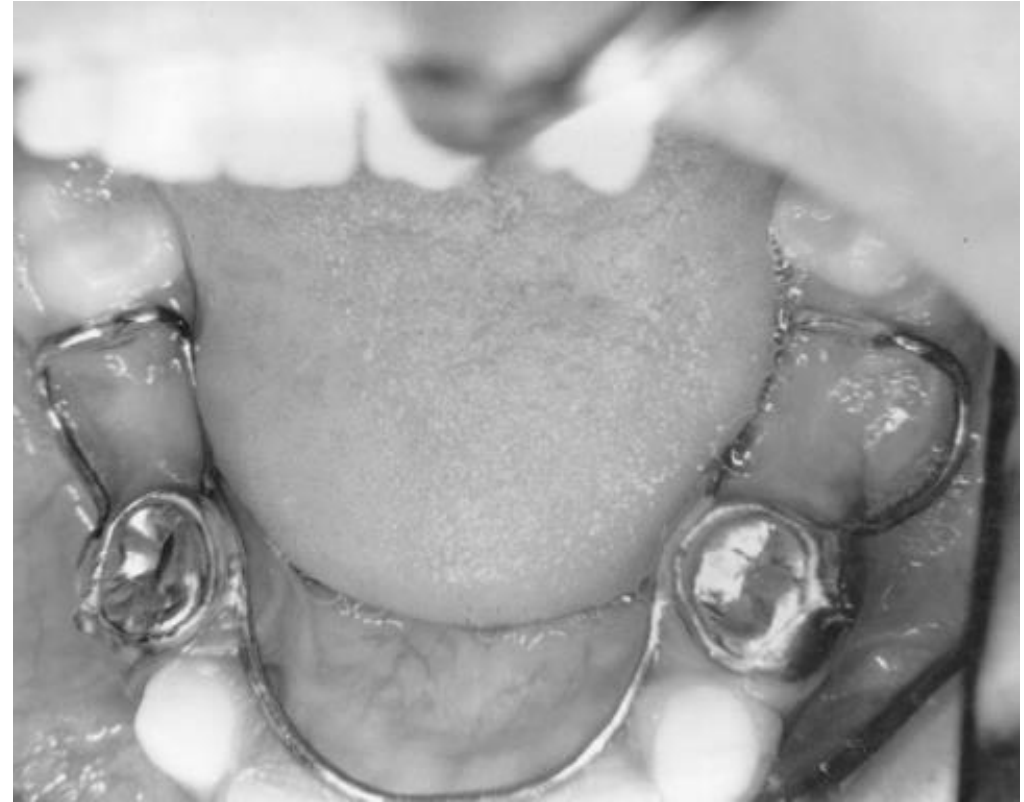


The appliance of choice is a distal shoe for both the maxillary and mandibular arches

a posterior wire-loop extension from the first primary molar that supports a vertical tissue blade positioned to come into contact with and guide the erupting permanent molar into normal position. The depth of the intragingival extension should be about 1.0 to 1.5 mm beyond the mesial marginal ridge of the molar



medical conditions such as blood dyscrasias, immunosuppression, congenital heart defects, history of rheumatic fever, and diabetes contraindicate the use of the appliance. If the distal shoe is contraindicated, two possibilities for treatment exist: (1) allow the tooth to erupt and regain space later, or (2) use a removable or fixed appliance that does not penetrate the tissue but places pressure on the ridge mesial to the unerupted permanent molar



After the first permanent molar has been guided into position, a distal shoe is usually indicated for replacement with a different appliance.

once the first permanent molars have erupted sufficiently to be banded, a more preferred option for the replacement of a distal shoe is the use of a bilateral space maintainer such as a mandibular lingual holding arch, maxillary transpalatal bar, or maxillary Nance appliance

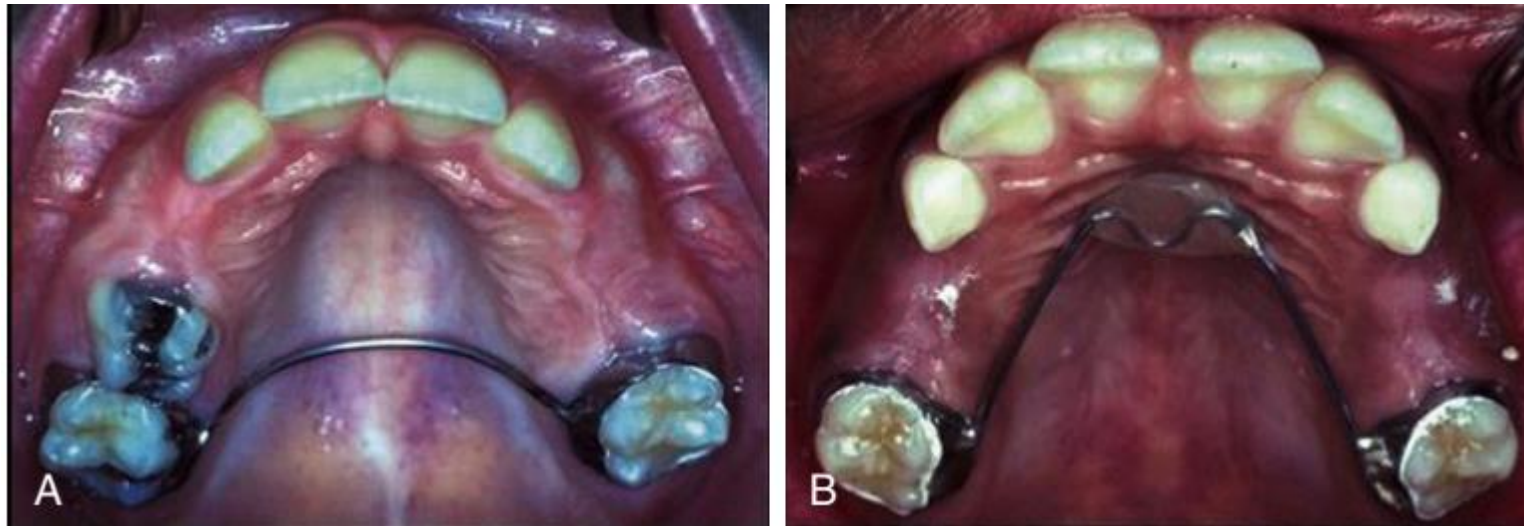
The classic bilateral mixed-dentition space maintainer in the mandibular arch is the soldered lingual holding arch

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



The design stabilizes lower molar positions from moving mesially and incisor relationships from retroclining linguallly in sustaining the canine-premolar segment space

Used in the maxillary arch to stabilize molar positions bilaterally, the soldered transpalatal bar incorporates a transverse palatal wire of 0.036- or 0.040-inch stainless steel wire soldered to molar abutments



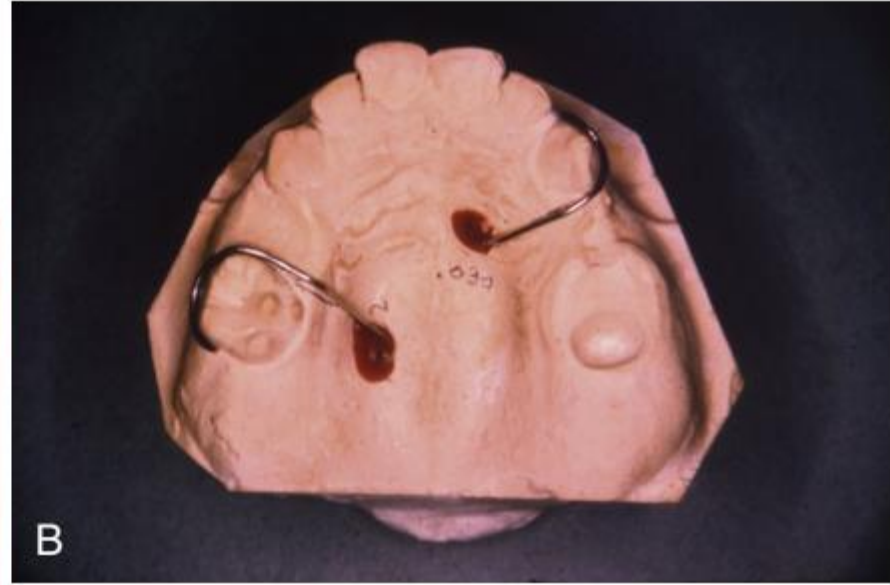
The Nance appliance uses a contoured rigid wire with an acrylic “button” in contact with the palatal shelf as an anterior stop for bilateral molar stabilization in the maxillary arch

Areas of Multiple Primary Molar Loss

Removable acrylic partial dentures have been used successfully in either arch after the loss of multiple teeth.

the appliances require patient cooperation and can be easily lost or broken during wear.

During the transitional stages of exfoliation and eruption, stability of removable appliances is often difficult to sustain with the loss of abutments. The wire clasps and resin contact areas may present “food traps” for plaque accumulation, with increased potential for soft-tissue irritation and dental caries.



some children even today must have all of their teeth removed because of widespread oral infection and because the teeth are nonrestorable. Preschool children can wear complete dentures successfully before the eruption of permanent teeth



Thanks for your
attention

