

Management of space problems

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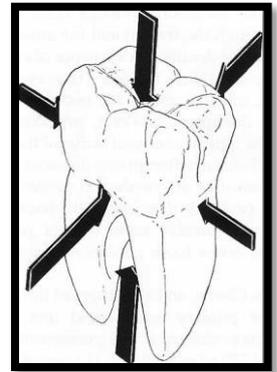
Dr. Abeer Zwain

PLANNING FOR SPACE MAINTENANCE

Ideally, as the occlusion develops from the primary dentition through the transitional (or mixed) dentition to the permanent dentition, a sequence of events occurs in an orderly and timely fashion. These events result in a functional, esthetic, and stable occlusion. When this sequence is disrupted, however, problems arise that may affect the ultimate occlusal status of the permanent dentition. When such disruptions do occur, appropriate corrective measures are needed to restore the normal process of occlusal development. Such corrective procedures may involve some type of passive space maintenance, active tooth guidance, or a combination of both.

Usually the tooth is maintained in its correct relationship in the dental arch as a result of the action of a series of forces. If one of these forces is altered or removed, changes in the relationship of adjacent teeth will occur so if arch integrity is disrupted by early loss of primary teeth, problems may arise that

- 1-Affect the alignment of the permanent dentition.
- 2-Opposing teeth can supraerupt,
- 3-More distal teeth can drift and tip mesially,
- 4- More forward teeth can drift and tip distally.
- 5-Altered tooth positions may include
 - A.A “symptomatic” space deficiency with loss of arch length and circumference,
 - B.Blocked or deflected eruption of permanent teeth,
 - C.Unattractive appearance,
 - D. Food impaction areas,
 - E.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.

Space maintainers

Space maintainers are devices used to maintain or regain the space following the loss of deciduous tooth/teeth. The goal of space maintenance is to prevent loss of arch length, width, and perimeter by maintaining the relative position of the existing dentition.

Requirement of a space maintainer

1. Should maintain the desired proximal dimensions of the space created by the loss of tooth.
2. Preferred to be functional.
3. Should not interfere with eruption of occluding teeth.
4. Should not interfere with the eruption of the replacing permanent teeth.
5. Should not interfere with speech, mastication or functional movement of mandible.
6. Should be simple and strong.

7. Should not impose excessive stress on adjacent tooth, that means it's passive in not imposing pressures on remaining teeth that might affect orthodontic movements
8. Easily cleansable without enhancing dental caries or soft-tissue pathology.
9. Should not restrict the normal growth and function.

The following factors are important when space maintenance is considered after the untimely loss of primary teeth.

1. Incidence of space loss. Almost all cases of early primary molar loss show some decrease in arch length (i.e., mesial movement of permanent molars, distal movement of anterior teeth). The amount of closure is affected by numerous variables (e.g., tooth involved, time of loss).

2. Time elapsed since loss. If space closure occurs, it usually takes place during the first 6 months after the extraction. When a primary tooth is removed and all factors indicate the need for space maintenance, it is best to insert an appliance as soon as possible after the extraction.

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

- ❖ The chronologic age of the patient is not as important as the developmental age. Teeth erupt when three fourths of the root is developed, regardless of the child's chronologic age.
- ❖ However, the eruption timing of a permanent successor may be delayed or accelerated after premature loss of a primary tooth, depending
 - on the developmental status,
 - bone density of the area,
 - and nature of the primary tooth loss.
- ❖ Very early loss before significant root formation of the permanent successor usually results in delayed eruption timing that may alter normal transitional adjustments in arch length, arch width, and arch circumference. Several studies have indicated that the loss of a primary molar before 7 years of age (chronologic) will lead to delayed emergence of the succedaneous tooth, whereas the loss after 7 years of age leads to an early emergence. The magnitude of this effect decreases with age. In other words, if a primary molar is lost at 4 years of age, the emergence of the premolar could be delayed by as much as 1 year; emergence will occur at the stage of root completion. If the same primary molar is lost at 6 years of age, a delay of about 6 months is more likely; emergence will occur at a time when root development approaches completion.
- ❖ Other example, loss of a second primary molar at 5 years of age requires different considerations than loss of the molar prematurely during the late mixed dentition period.

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. Significant space loss is most influenced by the stage of eruption of the first permanent molars, with the potential particularly high if a primary molar is lost just before or during eruption of the first permanent molars. 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.
- ❖ Also, teeth erupting adjacent to the edentulous area have a greater effect on the amount of space lost than do fully erupted teeth. For example, if the first primary

molar is lost during the time of active eruption of the first permanent molar, a strong forward force will be exerted on the second primary molar, causing it to tip into the space required for the eruption of the first premolar. In addition, 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

4. Amount of bone covering the unerupted tooth.

Predictions of tooth emergence based on root development and the influence of the time of the primary tooth loss are not reliable if the bone covering the developing permanent tooth has been destroyed by infection. In such a situation the emergence of the permanent tooth is usually accelerated. If there is bone covering the crowns, it can be readily predicted that eruption will not occur for many months; insertion of a space-maintaining appliance is indicated. A guideline for predicting emergence is that erupting premolars usually require 4 to 5 months to move through 1 mm of bone as measured on a bite-wing radiograph.

5. Sequence of the eruption of teeth.

The dentist should observe the relationship of developing and erupting teeth adjacent to the space created by the untimely loss of a tooth. 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. The eruption of the permanent lateral incisor will often result in a distal movement of the primary canine and an encroachment on the space needed by the first premolar. This condition is frequently accompanied by a shift in the midline toward the area of the loss. In the mandibular arch a "falling in" of the anterior segment may occur and an increased overbite may result.

6. Delayed eruption of the permanent tooth.

Individual permanent teeth are often observed to be delayed in their development and consequently in their eruption. It is not uncommon to observe partially impacted permanent teeth or a deviation in the eruption path that will result in abnormally delayed eruption. In cases of this type it is generally necessary to extract the primary tooth, construct a space maintainer, and allow the permanent tooth to erupt and assume its normal position.



7. Congenital absence of the permanent tooth.

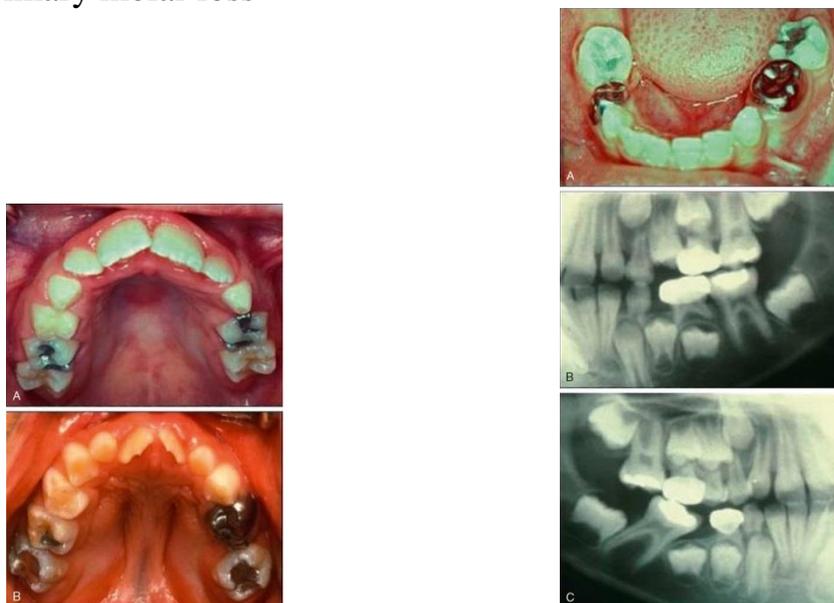
Before space maintenance, the presence of a normal successor must be ensured before space maintenance through radiographic evaluation. If permanent teeth are congenitally absent, the dentist must decide whether to hold the space for many years until a fixed replacement can be provided or to allow the space to close.

8. 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 crown tipping 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. Bodily movement of first molars is not typically notable in the lower arch as seen in the upper arch. Lower molars also tend to roll lingually in conjunction with their mesial crown-tipping during space loss movements.

9. 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 .
- Loss of upper or lower first primary molars shows almost equal amounts of space closure when compared with one another; the amount is most affected by timing of the first primary molar loss



- ✓ Space loss potential is particularly high if the primary molar loss occurs in approximation to first permanent molar eruption, irrespective of which primary molar is lost and in which arch the loss occurs.
- ✓ After first permanent molars have erupted into occlusion, loss of second primary molars may still result in significant space closure.
- ✓ Loss of a first primary molar with retention of the second primary molar shows minimal amounts of space closure because the second primary molar serves to buttress first permanent molar positions after occlusion is established.

10. 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.

As a conclusion: When a primary tooth is lost prematurely, a space maintainer need not be automatically necessary or desirable. The decision to place a space maintainer and the choice of design to use are affected by the following:

- ✓ the specific tooth that was lost,
- ✓ from which arch,
- ✓ at what time,
- ✓ whether the permanent successor is present and developing normally,
- ✓ the patient's overall oral health status and motivation,
- ✓ and the status of existing arch length to accommodate the permanent teeth.
 - If analysis indicates a positive arch length or deficiency of less than 1 to 2 mm per quadrant, a space maintainer may be beneficial in holding tooth positions. If the space is not held, the total arch length may be further decreased and lead to possible premolar extraction requirements. Holding the space may allow the permanent premolars and canines to erupt and utilize leeway space to alleviate anterior crowding.
 - However, if the arch length deficiency is 2 to 3 mm or more per quadrant, a significant discrepancy exists where space regaining, serial extraction, and/or comprehensive orthodontic treatment may be indicated.
 - If there is no question that permanent teeth will have to be removed to obtain a favorable occlusion, space maintenance may not be desirable because the space would need to be closed during orthodontic treatment anyway. In less obvious extraction cases, holding the space to allow teeth to erupt and prevent impactions can be a valuable service.