

Space Maintainer

A space maintainer is an appliance that is custom-made by a dentist or orthodontist in acrylic or metal material. It can be either removable or cemented in a child's mouth. Its purpose is to keep the space open to allow the permanent tooth to erupt and come into place.

SPACE MAINTENANCE IN THE PRIMARY DENTITION

Space maintenance can be defined as the provision of an appliance (active or passive)which is concerned only with the control of space loss without taking into consideration measures to supervise the development of dentition.

Children may need space maintainers if they lose a tooth early or have a baby (primary) tooth extracted due to dental decay. If either is the case, it is important to know the benefits of using a space maintainer and how it can help support your child's dental health.

A space maintainer is an appliance that is custom-made by a dentist or orthodontist in acrylic or metal material. It can be either removable or cemented in a child's mouth. Its purpose is to keep the space open to allow the permanent tooth to erupt and come into place. Deciduous teeth are important to the development of the teeth, jaw bones and muscles and help to guide permanent teeth into position when the baby teeth are lost. If a space is not maintained, then teeth can shift into the open space and orthodontic treatment may be required. Not every child who loses a baby tooth early or to dental decay requires a space maintainer; however, a professional consultation with your dentist or orthodontist should be conducted to determine if using a space maintainer is needed.

Space maintainers are appliances used to maintain space or regain minor amounts of space lost, so as to guide the unerupted tooth into a proper position in the arch.

IDEAL REQUIREMENTS

- It should maintain the entire mesio-distal space created by a lost tooth.
- It must restore the function as far as possible to prevent over-eruption of opposing teeth.
- It should be simple in construction. It should be strong enough to withstand the functional forces.
- It should not exert excessive stress on adjoining teeth.
- It must permit maintenance of oral hygiene.
- It must not restrict normal growth & development and natural adjustments which take place during the transition from deciduous to permanent dentition.
- It should not come in the way of other functions.

CLASSIFICATION OF SPACE MAINTAINERS

Acc. To Hitchcock-

- ☐ Removable or fixed or semi-fixed.
- ☐ With bands or without bands.
- ☐ Functional or non-functional.
- ☐ Active or passive.
- ☐ Certain combinations of the above.

Acc. To Raymond C.Thurow-

- ☐ Removable
- ☐ Complete arch
 - Lingual arch
 - Extra-oral anchorage
- ☐ Individual tooth

Acc. To Hinrichsen-

- ☐ Fixed space maintainers-
 - CLASS I
 - a) Non-functional types
 - i. Bar type.
 - ii. Loop type.

- b) Functional types-
 - i. Pontic type.
 - ii. Lingual arch type.

CLASS II Cantilever type (distal shoe, band & loop.)

Removable space maintainers-

Acrylic partial dentures

PLANNING FOR SPACE MAINTENANCE

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

- A. 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 & all factors indicate the need for space maintenance, it is best to insert an appliance as soon as possible after the extraction. Often the best approach, if possible, is to fabricate an appliance before the extraction & deliver it at the extraction appointment.
- B. Dental age of the patient-** the chronologic age of the patient is not so important as the developmental age. Gron studied the emergence of permanent teeth based on the amount of root development, as viewed on radiographs, at the time of emergence. She found that teeth erupt when three-fourths of the root is developed, regardless of the child's chronological age.
- C. Amount of bone covering the unerupted tooth-** if there is bone covering the crowns, it can be readily predicted that eruption will not occur for many months, a space-maintaining appliance is indicated.
- D. Sequence of eruption of teeth-** The dentist should observe the relationship of developing & erupting teeth adjacent to the space created by the untimely loss of a tooth.
- E. Delayed eruption of the permanent tooth-** in case of impacted permanent tooth, it is necessary to extract the primary tooth, construct a space maintainer & allow the permanent tooth to erupt at its normal position. If the permanent teeth in the same area of the opposing dentition have erupted, it is advisable to incorporate an occlusal stop in the appliance to prevent supraeruption in the opposing arch.
- F. Congenital absence of the permanent tooth-** if permanent teeth are congenitally absent, the dentist must decide whether it is wise to hold the space for many years until a fixed replacement can be provided or it is better to allow the space to close. If the decision is made to allow the space to

close, there will rarely if ever be bodily movement of the teeth adjacent to the space. Therefore, orthodontic treatment will be needed to guide the teeth into a desirable position.

- G. Presentation of problems to parents-** take sufficient time to explain existing conditions & discuss the possibility of the development of a future malocclusion if steps are not taken to maintain the space or to guide the development of the occlusion. Also explain that the space- maintaining appliance will not correct an existing malocclusion but will only prevent an undesirable condition from becoming worse or more complicated.

APPLIANCE THERAPY	
Fixed space maintainers	Removable space maintainers
<ul style="list-style-type: none"> ● Band & loop space maintainer ● Crown & loop appliance ● Lingual arch appliance ● Palatal arch appliance ● Transpalatal arch ● Distal shoe ● Esthetic anterior space maintainer ● Band & Bar type space maintainer 	<ul style="list-style-type: none"> ● Acrylic partial dentures ● Full or complete dentures ● Removable distal Shoe maintainer

Four appliances generally used to maintain space in the primary dentition are-

- The Band & Loop
- The Lingual Arch
- The Distal Shoe
- The Removable Appliance

Fixed Space Maintainers

Space maintainers which are fixed or fitted onto the teeth are called fixed space maintainers.

ADVANTAGES:

1. Bands and crowns are used which require minimum or no tooth preparation.
2. They do not interfere with passive eruption of abutment teeth.
3. Jaw growth is not hampered.

4. The Succedaneous permanent teeth are free to erupt to the oral cavity.
5. They can be used in un-co-operative patients.
6. Masticatory functions are restored if pontics are placed.

DISADVANTAGES:

1. Elaborate instrumentation with expert skill is needed.
2. They may result in decalcification of tooth material under the bands.
3. Supra eruption of opposing teeth can take place if pontics are not used.
4. If pontics are used it can interfere with vertical eruption of the abutment tooth & may prevent eruption of replacing permanent teeth if patient fails to report.

CONSTRUCTION-

The fixed space maintainer generally are constituted of the following components-

- Band
- Loop / archwire
- Solder joint
- Auxiliaries

BAND-

The band forms an important part of the constructions of the various fixed appliances several bands are employed such as-

1. Loop bands
2. Tailored bands
3. Performed seamless bands made of precious metal or chrome alloy.

Every band should possess a few ideal criteria such that-

- It should fit the contours of the tooth as closely as possible, thereby enhancing the placement of the attachment in relationship to the tooth.
- Should not extend subgingivally any more than necessary.
- Band material should resist deformation under stresses in the mouth.
- Resist tarnish.
- Inherent springiness.
- Cause no occlusal interference.

STEPS IN BAND FORMATION-

- A. Separation of teeth By
 - i. Brass wire
 - ii. Elastic threads
- B. Band formation By
 - i. Direct formation
 - ✓ Band pinching
 - ✓ Festooning
 - ✓ Trimming
 - ✓ Folded flap
 - ii. Preformed bands
 - iii. Indirect band technique

C. Welding

D. Soldering

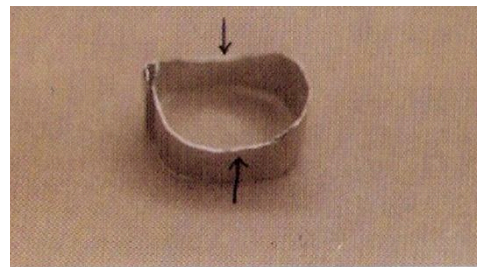


Fig. 9.15 Band showing the festooning the

WELDING-

- It is the process during which a portion of metal being joined is melted & flowed together.
- Bands are generally joined by welding.

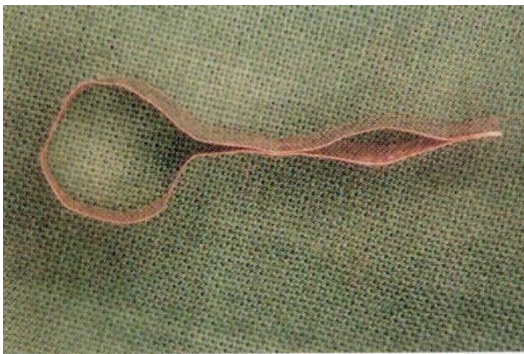


Fig. 9.12 Welded band material with eyelet

SOLDERING-

- It is the process by which the two metals are joined together by an intermediary metal of a lower fusion temperature. The most common solder used is the silver solder containing silver, zinc, copper & tin.

Removable Space Maintainers

- The appliance is typically used when more than one tooth has been lost in a quadrant.



- It is often the only alternative because there are no suitable abutment teeth and because the cantilever design of the distal shoe or the band and loop is too weak to withstand occlusal forces over a two-tooth span.
- Not only can the partial denture replace more than one tooth, it also can replace occlusal function.
- Two drawbacks of the appliance are retention and compliance.

Advantages:

1. Easy to clean and permit maintenance of proper oral hygiene.
2. Maintain or restore the vertical dimension.
3. be worn part time allowing circulation of the blood to the soft tissues.
4. Room can be made for permanent teeth to erupt without changing the appliance.
5. Stimulate eruption of permanent teeth.
6. Help in preventing development of tongue thrust habit into the extraction space.

Disadvantages:

1. May be lost or broken by the patient.
2. Un-co-operative patients may not wear the appliance.
3. Lateral jaw growth may be restricted, if clasps are incorporated.
4. May cause irritation of the underlying soft tissues.

Indication:

1. When aesthetics is of importance.
2. In case the abutment teeth cannot support a fixed appliance.
3. In cleft palate patients who require obturation of the palatal defect.
4. In case the radiograph reveals that the unerupted permanent tooth is not going to erupt in less than five months time.
5. If the permanent teeth have not fully erupted it may be difficult to adapt bands.
6. Multiple loss of deciduous teeth which may require functional replacement in the form of either partial or complete dentures.

Contraindications:

1. Lack of patient co-operation.
2. Patients who are allergic to acrylic material.
3. Epileptic patients.

BAND & LOOP APPLIANCE (Fixed, Non functional, Passive space maintainer)

- It is used to maintain the space of a single tooth.
- Inexpensive & easy to fabricate.
- It does not restore the occlusal function of the missing tooth.

Indications

- Unilateral loss of the primary first molar before or after eruption of the permanent first molar.
- Bilateral loss of a primary molar before the eruption of the permanent incisors.

LINGUAL ARCH (Fixed, Non functional, Passive Mandibular arch appliance)

- Used to maintain the posterior space in the primary dentition.
- The lingual arch is often suggested when teeth are lost in both quadrants of the same arch.
- Belong to those groups of space control appliances which not only control anteroposterior movements but also are capable of controlling & preventing an arch perimeter distortion, by controlling the lingual collapse of single tooth or segments of the arch.
- It consists of a round stainless steel or precious alloy wire, 0.32 to 0.40 inches in diameter closely adapted to the lingual surfaces of the teeth & anchored to bands on the first permanent molars.
- The means used to anchor the arch wire to the bands will define whether the lingual arch is of a removable or fixed type.
- Because the permanent incisor tooth buds develop & erupt somewhat lingual to their primary precursors, a conventional mandibular lingual arch is not recommended in the primary dentition (bilateral band & loop appliances are recommended in this situation.)

PASSIVATION-

The lingual arch wire should be completely passive. This is done by heating the wire to a dull brownish appearance, while keeping the wire gently in place on the cingula with an old instrument.

- The maxillary lingual arch is feasible in the primary dentition because it can be constructed tourist away from the incisors.

- Two types of lingual arch designs are used to maintain maxillary space- The
 - Nance arch
 - The Transpalatal arches
- These appliances use a large wire(36 mil) to connect the banded primary teeth on both sides of the arch that are distal to the extraction site.
- The difference b/w the two appliances amount to where the wire is placed in the palate. The Nance arch incorporates an acrylic button that rests directly on the palatal rugae. The Transpalatal arch (TPA) is made from a wire that traverses the palate directly without touching it.

NANCE ARCH or NAMESPACE HOLDING APPLIANCE (Fixed,Non-functional, Passive, Maxillary arch appliance)

- Nance(1947) described the “preventive lingual wire”.
- It consists of bands on the upper molars,with the arch wire extending forward into the vault.

Construction:

- The acrylic button is present on the slope of the palate→CONSTRUCTION- & provides an excellent resistance against forward movement (U loop).The wire should extend from the lingual of bands to the deepest &
- ‘U’ bend is→most anterior point in the middle of the hard palate. Given in the wire for the retention of the acrylic 1-2 mm away from the soft tissue.

TRANSPALATAL ARCH (Fixed,Non-functional,Passive appliance)

- The arch is soldered to both sides,straight without a button & without touching the palate.
- The basis of the appliance is that the migration & rotation is caused by rotation around the lingual root.By preventing this,space loss is prevented by the appliance.
- Cross arch anchorage can be used if only one of the primary molars is lost & both the permanent molars are erupted.

DISTAL SHOE (Intra-alveolar, Eruption guidance appliance)

- Used to maintain the space of a primary second molar that has been lost before the eruption of the permanent first molar.
- An unerupted permanent first molar drifts mesially within the alveolar bone if the primary second molar is lost prematurely.The result of the mesial drifts is loss of arch length & possible impaction of the second premolar.

DISADVANTAGES-

- Because of its cantilever design & the fact it is anchored on the occlusally convergent crown of the primary first molar, the appliance can replace only a single tooth & is somewhat fragile.
- No occlusal function is restored because of this lack of strength.
- Histologic examination shows that complete epithelialization does not occur after placement of the appliance.

1

Wearing the space Maintainer

Once the space maintainer is made by the dentist or orthodontist. It may take the child a few days to get accustomed to wearing the appliance whether it is removable or fixed. The dentist should review with the child and parent the proper ways to clean the space maintainer thoroughly in order to keep the gum tissue healthy and free of dental plaque. Proper instruction for tooth brushing and flossing should be considered for improved oral hygiene.

If the space maintainer is fixed, it will be important to avoid chewy and sugary foods, and gum or candy, which may loosen or get caught on the appliance. Also, the space maintainer should not be pressed or pushed with the tongue or fingers because it could loosen or bend the appliance.

The child should be seen by the dentist or orthodontist on a regular basis to monitor the progress of treatment with the space maintainer and continue to receive a regular six-month professional cleaning appointment with your dental professional.