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Space Maintainers

Definition: A device used to preserve arch length following the premature loss of a primary tooth or teeth.

The S.M. allows the permanent tooth to erupt unhindered into alignment and occlusion.

The best space maintenance treatment is the preservation of primary molars until natural exfoliation.

The premature loss of primary teeth is still one of the most common controllable causes of malocclusion.

Factors considered in space maintainer construction:

In construction of S.M. certain considerations are important for the dentist after the ultimately loss of primary teeth**.**

1. Time elapsed since loss

It is very important factor because if the space closes occurs during the 1st 6 months after extraction. So space maintainer prefer to be done immediately after extraction. If a patient comes after one year after one extraction. In this case a change already been developed . so there is no need to a construct a space maintainer but we can do a space regainer (space maintainer appliance)that will regain the lost space before the eruption of the permanent teeth (active space maintainer).

2. Dental age of the patient.

The chronologic age of the patient is not so important as the development age. The development age is very important because in the time of eruption of teeth. Some children have erupted their bicuspid at 8 years other at 12 years.

The dentist must depend on dental X-Ray to be sure that tooth will erupt in the right time. According to the researcher , the tooth starts to erupt when 3\4 of the root develop regardless of child chronological age. If 3\4 of the root is not formed, so do space maintainer.

3. Amount of bone covering unerupted tooth.

the tooth will erupt when 3\4 of the root developed. This is known by the radiograph also one can estimate if there is infection. So we see the resorption of bone and the crown of the permanent it will erupt in jaw prematurely before 3\4 of the root formed So in this case we prepare a space maintainer. When 3\4 of the root is formed as develop. We remove the space maintainer so we let the tooth to erupt. also we can see the amount of the bone covering the unerupted tooth if the amount of bone is thick so we can predict that the eruption will not occur and we can construct S.M.

A guide for predicting emergency is that erupting premolars usually require 4 to 5 months to move through 1 mm of bone as measured on a bite-wing radiograph.

This method of prediction is less reliable than that based on root development. If the amount of bone is thin we predicted that the tooth eruption will occur early and there is no need for S.M.

4. Sequence of the eruption of teeth.

The dentist should observe the relationship of developing teeth adjacent to the space create by the untimely loss of a tooth. For e.g. if 2 nd primary molar has lost prematurely and the 2 nd permanent molar is ahead of the second of the second premolar in its eruption. There is a possibility that permanent molar will exert a strong force on the 1 st permanent molar causing it to drift mesially and to occupy some of the space required by the 2 nd premolar.

Othe e.g. 1 st permanent molar lost prematurely and permanent lateral incisor in an active state of eruption (it will cause distal movement of primary canine and an encroachment on the space needed by the 1 st premolar.

This condition 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 over bite way result.

5. Delayed eruption of the permanent teeth.

Individual permanent teeth are often observed to be delayed in their development and consequently in their eruption (partially impacted permanent teeth or deviation in the eruption path). It is necessary to extract the primary tooth, construct a S.M. and allow the permanent tooth to erupt and assume its normal position. If the permanent teeth in the same area of opposing dentition have erupted, it is advisable to incorporate an occlusal "stop" in the appliance to prevent suppuration in the opposing arch during the space – maintenance period. Extraction of the second primary molar space maintenance were indicated because of prolong retention of the primary tooth and partial impaction of the second premolar. The second premolar eventually erupted into its normal position.

6. Congenital absence of the permanent tooth.

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. It is important to consult orthodontist for the patient of this type.

7. Presentation of problems to parents.

it is very important before doing any S.M. to tell the parent about the problem and discuss the possibility of the development of future mal-occlusion if the steps are not taken to maintain the space or to guide the development of the occlusion.

Make the patient to understand that the S.M. will not correct an existing mal-occlusion but it will prevent further complications.

Requirement for S.M.

1. Maintain sufficient space to allow eruption permanent.
2. Not interfere with growth and development of teeth and alveolar bone.
3. Not interfere with speech and mastication.
4. Should improve appearance in case of anterior teeth and provide occlusion in posterior teeth.

Types of space maintainers:

1. Fixed appliances.

2. Removable appliances

There are four basic type space maintainers (sm):

- **The band and loop (crown and loop) space maintainer:**

  Used to maintain the space loss of single primary first or second molar.

- **The Nance holding arch:**

  Maintains the maxillary arch length after the premature loss of than primary maxillary molar in the same quadrant or after a bilateral loss of primary molars.

- **The fixed lingual arch:**

  Used to maintain the mandibular arch length and prevent mesial tipping and \or rotation of the permanent first molars.

  The fixed lingual prevents lingual tipping of the permanent incisors.

- **The intra-alveolar space maintainer (distal shoe appliance):**

  Used to prevent mesial migration of the unerupt permanent first molar after premature loss of primary second molar.

Band and loop S.M.

A Band and loop sm.is a fixed unilateral appliance used to maintain arch length in the primary or mixed dentitions following the premature loos of a primary molar.

Part of a band and loop:

- A molar band adapted to primary molar.
- A wire loop which is soldered to the molar band and which extends over the edentulous area to contact the neighboring tooth, there by preventing migration of teeth (loss of arch length).

Contraindications:

1. An occlusion that is extremely crowded or already exhibits marked space loos.
2. High dental caries activity.
3. Replacement of primary anterior teeth.

This appliance should be removed each year so that the abutment tooth can be inspected and polished, fluoride is then applied and the appliance recmented.

Bilateral fixed space maintainer

Maxillary appliances:

That not interfere with the occlusion are the **Nance holding arch and the transpalatal bar.**

The Nance appliance has its wire bent from the molar and into the anterior palate at the junction of the horizontal and anterior vertical, or premaxilla-maxilla junction.

The wire is free except for the solder joints on the bands and a small piece of acrylic resin as button over the anterior extension.

The transpalatal bar has its wire bent directly from one molar band to the other but the wire is contoured to the out line of the hard palate, just off the tissue.

Mandibular appliances:

The fixed lingual arch is most often used in the mandibular arch. It is a passive wire soldered from a band on one side of the arch to a band on the other side.

its problem in the maxillary arch are related to the over bits:

the mandibular incisors occlude in to the wire at the cingula or the maxillary incisors.

Indications of fixed lingual arch:

1. Maintenance of arch perimeter not just quadrant perimeter.
2. Maintenance of mandibular changes in arch length.
3. Retention or stabilization of the positions of the mandibular anterior teeth after tooth movement to prevent relapse in mandibular anterior crowding and changes in bite depth.

Contraindications:

1. Rampant dental caries, high plaque scores, and or poor patient cooperation.
2. Anterior or posteriors cross bite.
3. Extreme mandibular anterior crowding or lingual erupting succedaneous teeth.

Place the child on a recall program to check for loose bands make sure that the lingual wire is not preventing tooth eruption or impinging on the soft tissue.

Premature loss of a primary molar:

1. If the permanent first molar has erupted into the oral cavity before the loss of the primary second molar, usually a band or crown and loop retainer can be used.
2. In the event: there are bilateral losses of teeth in the arch, a lingual or palatal holding arch appliance is perhaps the best treatment.
3. If permanent first molars have not erupted the use of an intra-alveolar (distal shoe) appliance.

Intra alveolar (distal shoe) appliance:

The main objective is to retain and guide the permanent first molar into normal eruptive position.

Roche has advocated a crown and band appliance with a distal intra gingival extension. This appliance or modifications of it may be used as a space maintainer or in some instances to influences the active eruption of the first permanent molar in a distal direction.

Using the first primary molar as the abutment the dentist first prepares the tooth for a stainless steel crown, which is carefully contoured and cemented.

Then band is placed over the steel crown on the abutment tooth. Then SSL-shaped bar manufactured and step welded and soldered to the distal surf. Of crown or band the bar extends posterior to position even with the mesial surface of the permanent first molar or the distal root socket of primary second molar.

Contra -indications

1. If several teeth are missing, there may be lack of abutment to support.
2. Poor oral hygiene or lack of patient and parent cooperation greatly reduces the possibility of a successful clinical result.
3. Medical conditions that contra-indicate the use of the distal shoe such as congenital heart defects, history of rheumatic fever or diabetes.

Advantages:

1. It is proved efficient appliance for the purpose.
2. It prevents elongation of opposing dentition.
3. It may be fabricated by direct or indirect means.
4. The cost is moderate.

Disadvantages:

1. The patient must be under close observation while the appliance is in place.
2. There is no allowance for inaccuracy in measurement or fabrication.

Two possibilities for treatment:

1. Allow the tooth to erupt and regain space latter.
2. Use removable or fixed appliance that dose not penetrates the tissue but places pressure on the ridge mesial to the un-erupted permanent molar.

If serval teeth are missing, the removable appliance can be designed to restore function and prevent super eruption of opposing teeth.

Periodic recall:

- It is very important to impress on the child's parent the need for periodic recall.
- Observing the patient at 3 month intervals is most appropriate.
- The distal shoe appliance (intra-alveolar space maintainer) when used in the appropriate situation and with parents, who are cooperative, prevents a potential orthodontic problem.