



# **SPACE MAINTAINERS**

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## Space Retainer or Maintainer

- According to Boucher it is a fixed or removable appliance designed to preserve the space created by the premature loss of a primary tooth or a group of teeth.

## Requirements of Space maintainers

- Should maintain desired proximal dimensions of space created by loss of teeth
- Should be functional
- Should not interfere with eruption of opposing tooth
- Should not interfere with eruption of erupting teeth
- Should not interfere with speech or mastication
- Should be simple and strong
- Should not impose excessive stress on adjacent tooth
- Easily cleansable
- Should not restrict normal growth and function



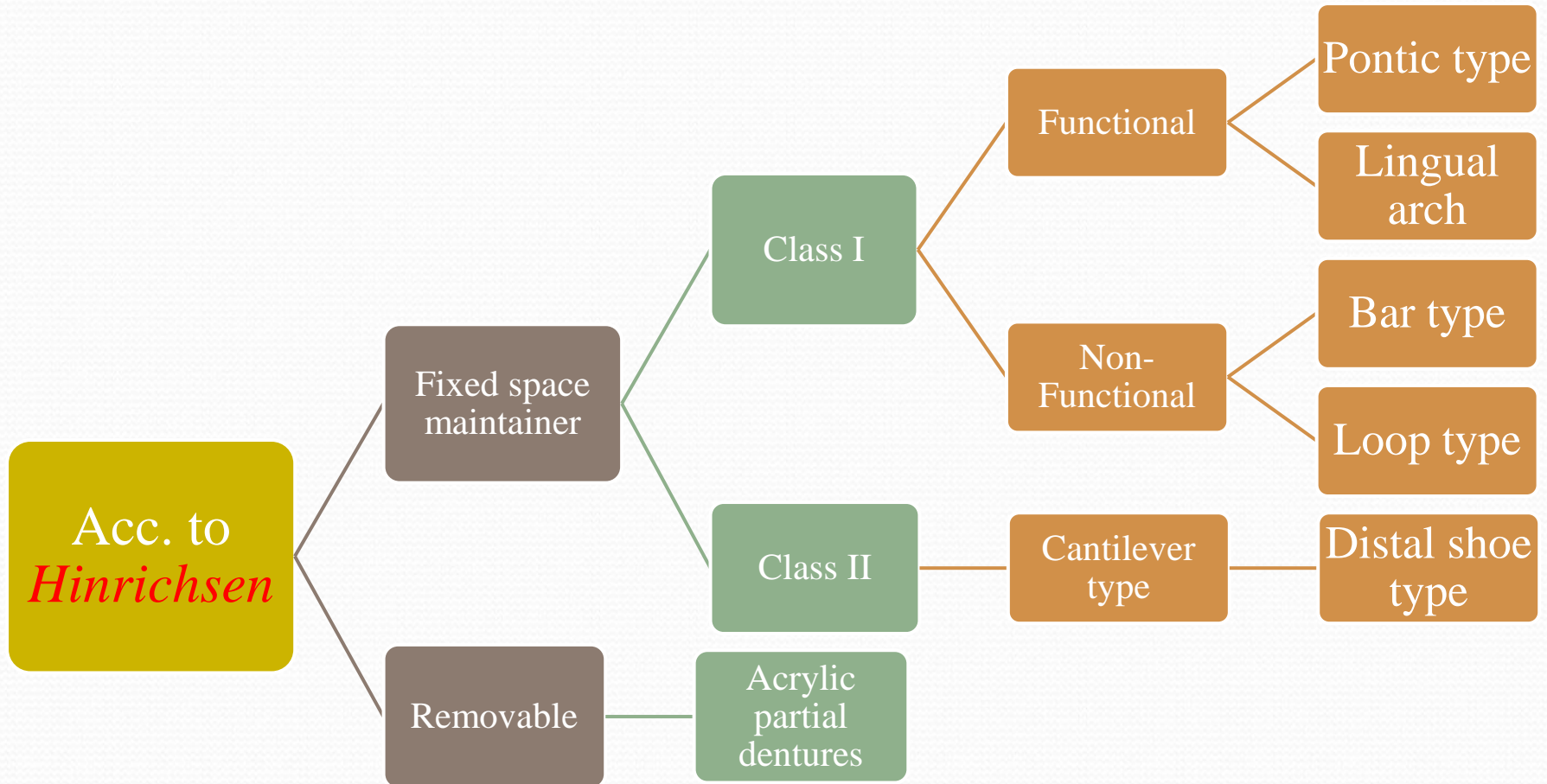
# Classification

Acc. to *Raymond C  
Thurrow*

- Removable
- Complete arch
  - Lingual arch
  - Extra oral anchorage
- Individual tooth space maintainer

Acc. To *Hitchcock*

- Removable or Fixed or Semifixed
- With bands or without bands
- Functional or Nonfunctional
- Active or Passive
- Combinations of above



# Removable space maintainer

## Advantages

- Easy to clean
- Maintains and restores vertical dimension
- Can be used in combination with other preventive measures
- Worn part time – maintaining circulation to soft tissues
- Stimulates eruption of permanent teeth
- Band construction is not necessary
- Room can be made for erupting permanent teeth with out changing the appliance

## Disadvantages

- May be lost or broken
- May not wear the appliance
- Lateral jaw growth may be affected
- May irritate the underlying tissues

# Fixed space maintainer

## Advantages

- Easy manipulation
- Bands used without tooth preparation or with minimum preparation if SSC are used
- Do not interfere with passive eruption of tooth
- Succedaneous tooth are well guided into occlusion
- Used for uncooperative patients
- Masticatory function is restored if pontics are used

## Disadvantages

- Requires more armamentarium
- Decalcification of tooth under bands
- Harmful to abutment tooth due to development of torque forces resulting in appliance breakage
- Supra eruption of opposing tooth
- If pontics are used:
  - interferes with eruption of opposing teeth
  - prevents eruption of replacing tooth if patient fails to report



# Dental Arch Space Changes Following Premature Loss Of Primary First Molars: A Systematic Review

William Tunison, BSc. • Carlos Flores-Mir, DDS, DSc. • Hossam ElBadrawy, DDS, MSc. • Usama Nassar, DDS, MSc. • Tarek El-Bialy, DDS, MSc OSci, PhD.

**Purpose:** The purpose of this study was to consider the available evidence regarding premature loss of primary molars and the implications for treatment planning.

**Methods:** Electronic database searches were conducted—including published information available until July 2007—for available evidence. A methodological quality assessment was also applied.

**Results:** Although a significant number of published articles had dealt with premature primary molar loss, only 3 studies had the minimal methodological quality to be considered for this systematic review.

**Conclusion:** A reported immediate space loss of 1.5 mm per arch side in the mandible and 1 mm in the maxilla —when normal growth changes were considered—was found. The magnitude, however, is not likely to be of clinical significance in most cases. Nevertheless, in cases with incisor and/or lip protrusion or a severe predisposition to arch length deficiency prior to any tooth loss, this amount of loss could have treatment implications.

(Pediatr Dent 2008;30:297-302)



# I. Band & Loop

- Unilateral, fixed, non-functional & passive space maintainer

## Indications: (*Currier & Austerman, 1992*)

- Premature loss of 1<sup>st</sup> primary molar in primary dentition or loss of 1<sup>st</sup> primary in transitional dentition
- Premature loss of primary 2<sup>nd</sup> molar as 1<sup>st</sup> permanent molar is erupting clinically

## Contraindications:

- Extreme space loss
- High caries activity
- Replacement of primary anterior teeth
- Replacement of primary 2<sup>nd</sup> molars in primary dentition without 1<sup>st</sup> permanent molar
- Replacement of primary 2<sup>nd</sup> molars in transitional dentition with permanent molars banded (rare exception)
- In cases of sequential extraction of primary teeth

# Construction

Select appropriate band or SSC

Band seater or Tongue blade → to seat the band

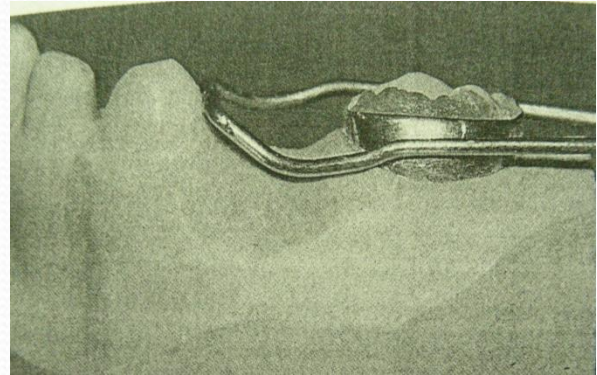
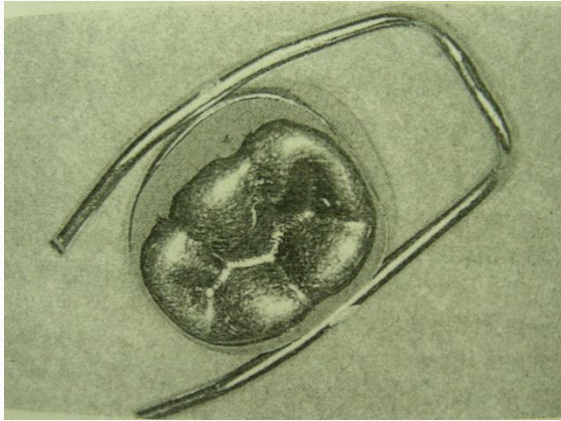
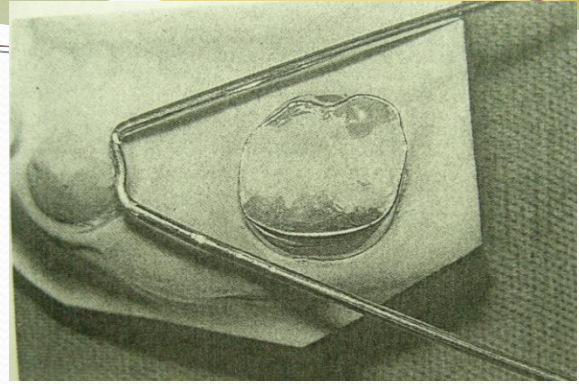
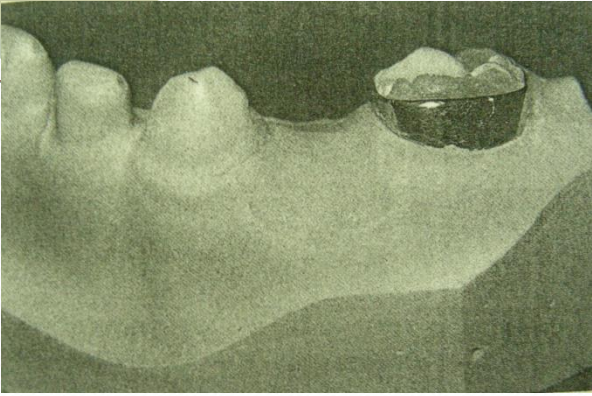
Band pusher → adapt & burnish band

Quadrant impression extending 5 to 6 mm beyond distal abutment tooth

Stabilize band & pour cast

Trim flat base & stone distal to abutment tooth → no interference with wire bending







3 prong plier (No.139 pliers) → bend 3” length of 0.036 wire into loop

Wire held at right angles to beaks of pliers

Loop should dip towards the ridge & parallel to soft tissues

Finished loop should be in middle 3<sup>rd</sup> of band or crown (above soft tissues)

Leave about 0.25” of wire distal to band

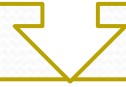
Solder the wire to band

Immerse cast in water

Remove the stone from appliance

Cut excess wire

Smooth & polish appliance



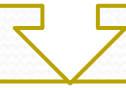
Try in appliance



Check for occlusion



Remove the appliance



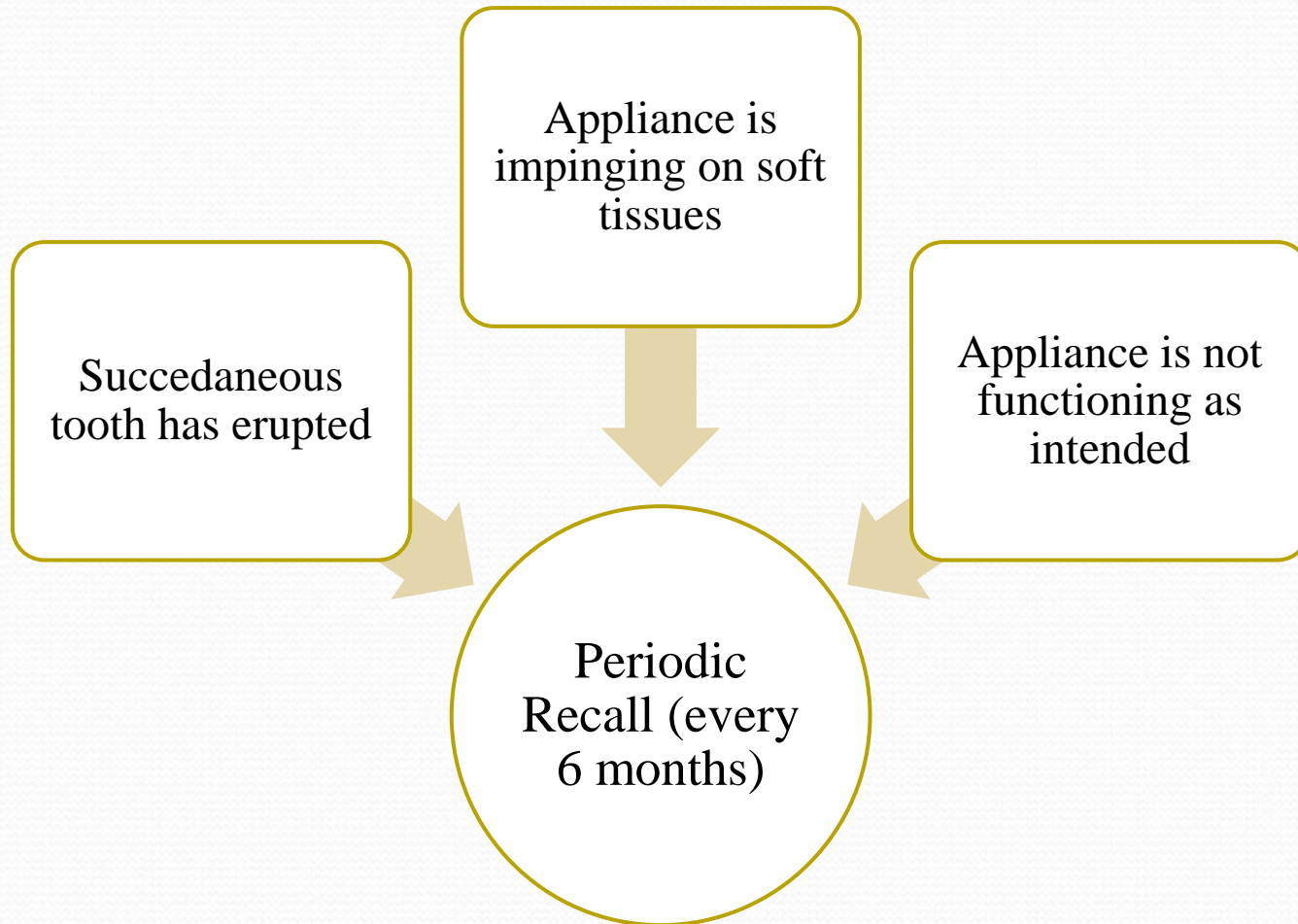
Cement the appliance & remove the excess

## Criteria for loop

- Parallel to edentulous ridge – 1mm off the gingival tissues
- Should rest against the adjacent tooth at contact point
- Faciolingual dimension should be approx. 8mm – to allow permanent tooth to erupt freely into loop
- Should not restrict any physiological tooth movements - ↑ in intercanine width

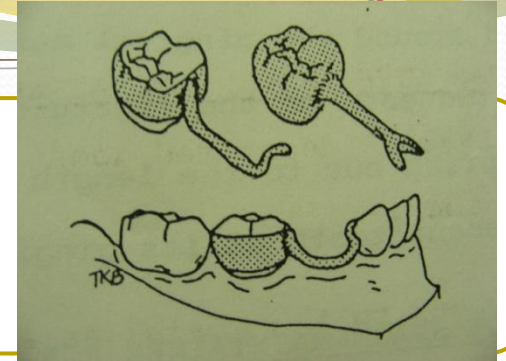






# Modifications

- *Band & Bar*
- *Bonded Band & loop*
  - Difficult to maintain due to shearing force from occlusion
  - In case of breakage – space loss / aspiration
  - Difficult to adjust
- *Crown & loop*
  - Difficult to adjust intraorally
  - Should be redone if soldering fails
  - *Overcome by placing band over crown*
- *Extended Band & loop*



## Direct or Single sitting Band & Loop

Band is pinched

Prefabricated loop is selected

Loop is tried intra orally & minor adjustments are carried out

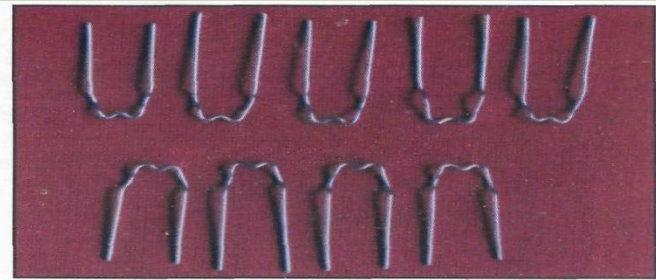
Horizontal mark is made on band where the loop contacts the band

Vertical markings made on loop at anterior most point of contact of loop with band





**Fig. 1: Band Adaptation.**



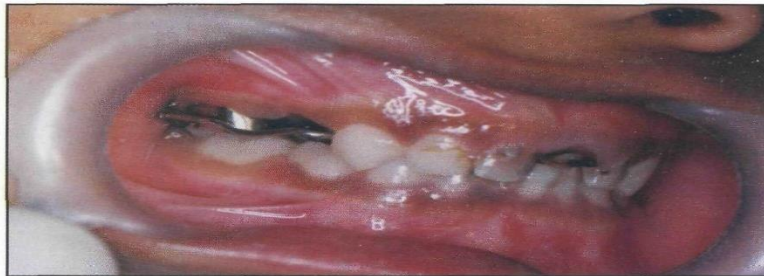
**Fig. 2: Prefabricated Loops.**



**Fig. 3: Marking on the Band and Loop.**



**Fig. 4: Spot welding of Loop on the Band.**



**Fig. 5: Try-in to check for fit.**



**Fig. 6: Second spot welding done for stability.**




**Fig. 7: Invested and soldered Band and loop.**



**Fig. 8: Polished and cemented.**

Band is removed from tooth & with above reference markings the loop is spot welded to band in position



Band & loop is then tried intraorally



Excess trimmed & spot welded for better stability



Invested & soldered again



appliance is trimmed & polished



Cemented using luting cement



## Advantages

- Easy, economical to make, little chair time & adjusts to developing dentition

## Disadvantages

- Do not restore chewing function
- Do not prevent continued eruption of opposing teeth



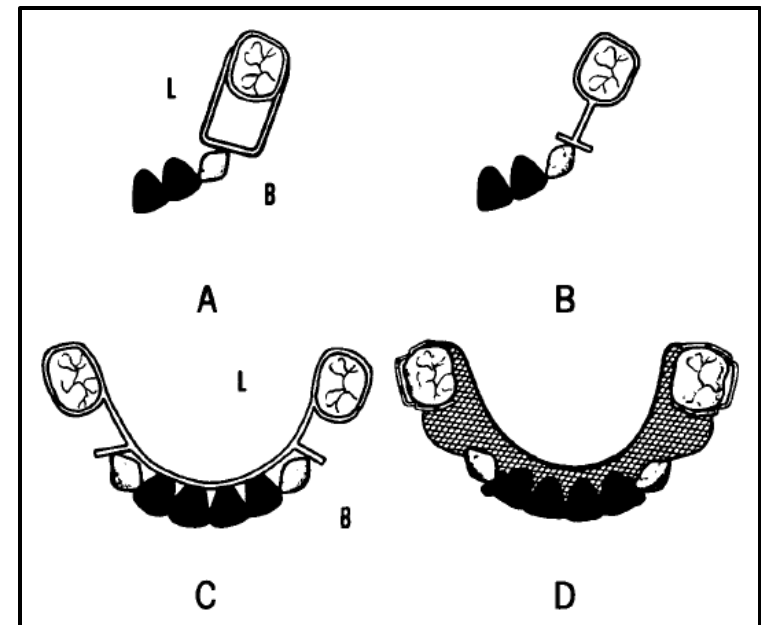
## A new design for space maintainers replacing prematurely lost first primary molars

Robert Rapp, DDS, MS, FRCD(C)

Isik Demiroz, DDS, MS

Modification of space maintainers which facilitates normal occlusal development in the canine region.

- a. A band and loop space maintainer replacing a prematurely lost first primary molar. **The anterior portion of the loop slopes in a buccal (B) and distal direction to allow physiologic movement of the primary canine.** Sufficient space in the arch is maintained to accommodate the unerupted first premolar.
- b. A cast T-bar space maintainer, replacing a prematurely lost first primary molar. **The bar of the T-bar space maintainer slopes in a distobuccal direction to allow canine movement.**
- c. A lingual arch, bilateral space maintainer replacing prematurely lost first and second primary molars. **Finger springs Positioned distal to the primary canines are sloped in a distobuccal direction to facilitate canine repositioning.**
- d. A removable, bilateral space maintainer replacing prematurely lost first and second primary molars. Note the **distobuccal slope created in the acrylic base material.**



## II. Fixed Lingual Arch



- Bilateral, fixed or semi-fixed, non-functional passive arch appliance
- Holds molar position distally & incisor segment anteriorly
- Advantages:
  - Prevents incisors from collapse
  - Prevents space loss from deep bite or from lingual pressures from oral habits
  - Preserves primary canine space - maintaining arch length

## Indications

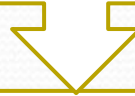
- Maintenance of arch perimeter (not just quadrant perimeter) – mainly in mandibular arch
- Maintenance or prevention of mandibular changes in arch length, over jet or over bite from incisor repositioning in transitional dentition
- Retention or stabilization of mandibular anterior teeth after correction

## Contra indications

- Anything that requires frequent adjustments
- Rampant caries, high plaque scores, poor patient cooperation
- Anterior or posterior cross bite
- Extreme mandibular crowding

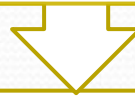


Select appropriate band for molar



Complete arch impression

Impression should indicate the outline of molar bands



Stabilize the band with sticky wax



Pour the cast



Draw the appliance on cast

Wire runs from middle 3<sup>rd</sup> of molar bands along the gingival 3<sup>rd</sup> of primary molars

Continues along the cingula of incisors slightly above gingival papillae

Use of 0.036 wire & No. 139 pliers to bend U-shaped wire

Wire should be passive

Solder the wire to band

Remove & polish the appliance

Try-in appliance

## Types

- Fixed – soldering wire to band
- Semi-fixed – ends of arch wire fitted into tubes attached to lingual surfaces

## Modifications

- U loops – space regaining (*Hitchcock, 1974*)
- Canine spurs – to prevent midline shift
- Wire can be welded from buccal side with canine stoppers from same wire (*Chawla et al, 1984*)
- Wire bent to create space for lingually erupting incisors
- Fixed-Removable lingual arch - Mershon arch





SAME WIRE FOR CANINE STOPPERS



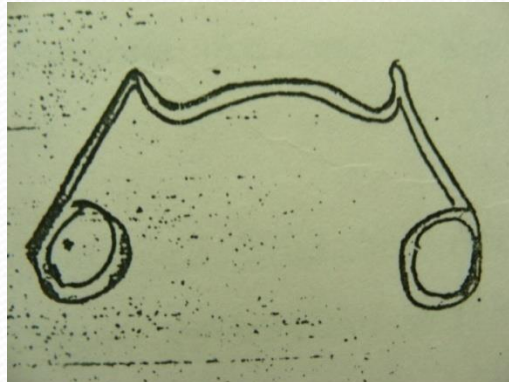
WITH CANINE STOPPERS



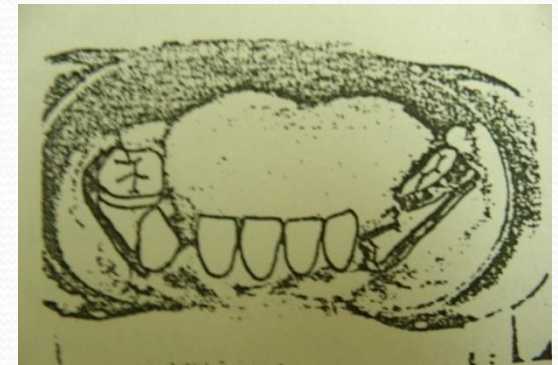
HOTZ modification



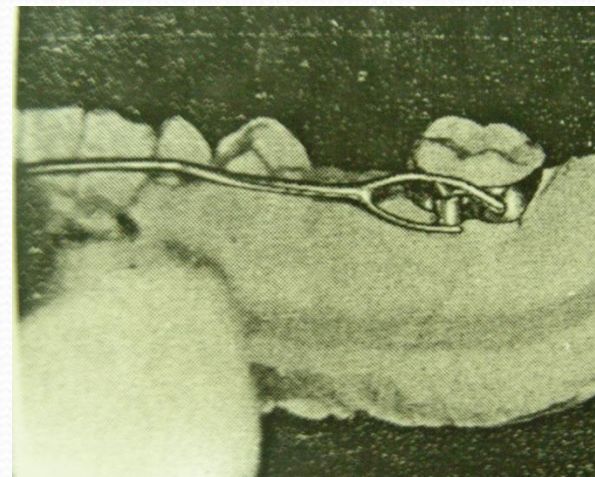
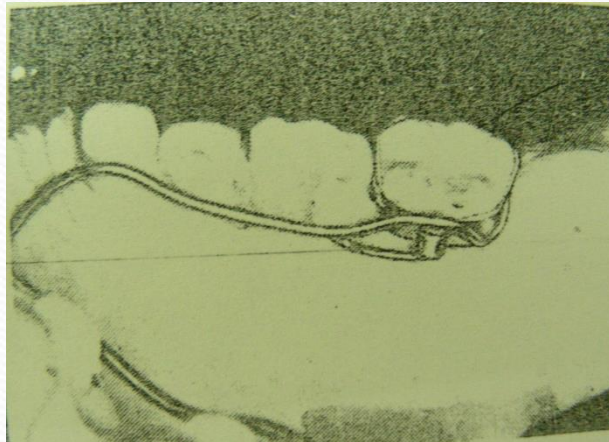
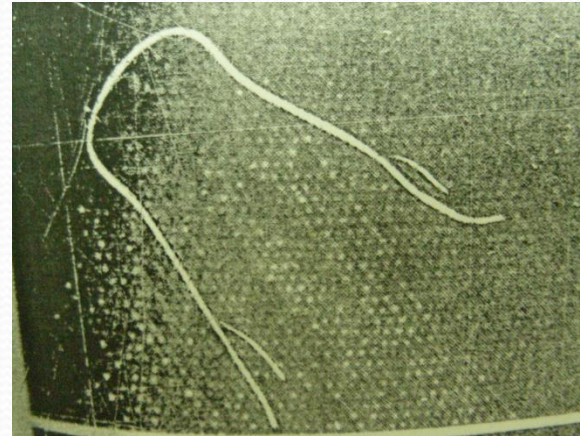
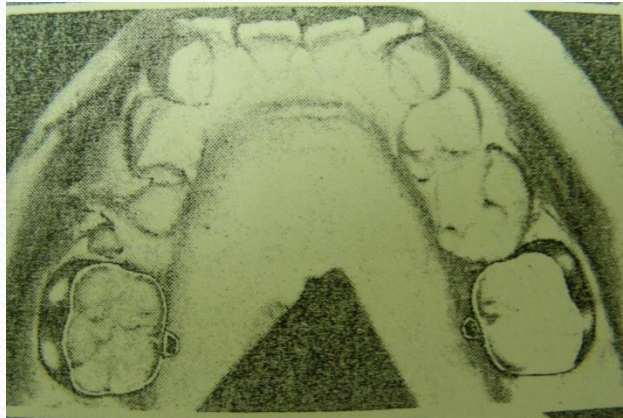
MODIFIED FOR ERUPTING INCISORS



CHAWLA modification







**FIXED\_REMOVAL LINGUAL ARCH - MERSHON ARCH**

## Advantages

- Excellent source of anchorage – resistance against several teeth
- Allows free of movement of teeth while maintaining space in desired arch
- Little or no inconvenience to patient – as compared with removable acrylic space maintainer
- Serves as space maintainer for more than 1 succedaneous teeth

## Disadvantages

- Decalcification of banded tooth
- Arch wire embedded into soft tissues (patients with poor oral hygiene)
- Wire may be distorted by masticatory forces



### III. Intra-alveolar (distal shoe) appliance

#### Objective

- To retain & guide the 1<sup>st</sup> permanent molar into normal eruptive occlusion

#### Indication

- Maintain space of primary 2<sup>nd</sup> molar that has been lost before the eruption of 1<sup>st</sup> permanent molar

#### Contra indication

- If several teeth are missing (abutment to support the cemented appliance may be missing)
- Poor oral hygiene
- Certain medical conditions like SABLE, Blood dyscrasias, etc.
- Congenitally missing 1<sup>st</sup> permanent molar (rare)

## In cases of contra indication

- Allow the tooth to erupt & then regain space
- Pressure appliance (*Caroll & Jones, 1982*)





## *Willet* distal guiding shoe (1929)

- Made of Cast gold – increased cost & difficulties in tooth preparation
- Bar type of extension into the soft tissues & bony alveolus to guide the erupting PFM
- *Disadv:*
  - Injure the permanent unerupted tooth
  - Erupting 1<sup>st</sup> permanent molar is guided by the distal primary crown (not root) surface – use of tissue inserted distal shoe is ill-advised
- *Overcome by:*
  - Distal shoe that do not enter the tissue but curves on top of the ridge
  - Molar distal ridge → corresponds to mesial margin of unerupted permanent molar
  - Free end of acrylic saddle of removable space maintainer represents distal crown surface of missing primary molar



# Modified Willet's appliance for bilateral loss of multiple deciduous molars: A case report

Dhinds a A.1, Pandit I. K.2

In place of giving two separate space maintainers for each side some modifications were planned in Willet's appliance. Bands were made on lower first deciduous molar and canine on right side and on lower left deciduous canine. The distal extension was calculated radiographically, a cut was made in the cast and wire components were adapted using 21 gauge wire. Anteriorly the wire component was made like lingual holding arch and posteriorly short term modified Willet's appliance was made but bilaterally. The wire components were soldered on bands on both the sides.



**Figure 3:** Showing bilateral distal shoe immediately after insertion



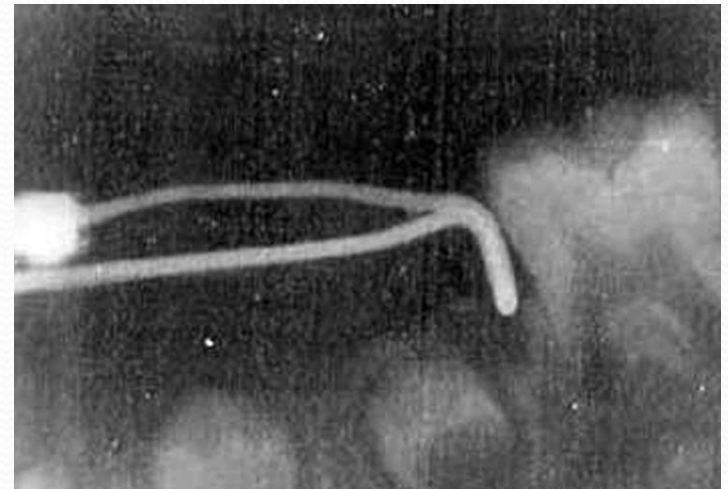
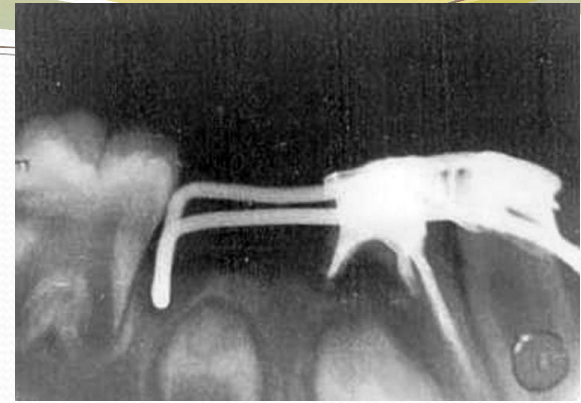
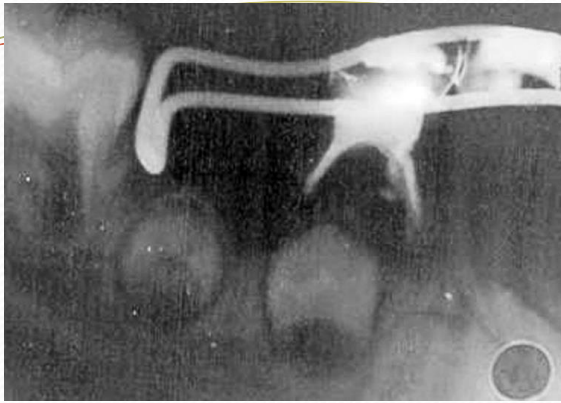
**Figure 1:** Showing pre-operative photograph of the patient



**Figure 2:** Showing design of bilateral distal shoe



**Figure 4:** Showing bilateral distal shoe seven months after insertion



**Figures 5 and 6:** Showing bilateral distal shoe immediately after insertion

**Figures 7 and 8:** Showing bilateral distal shoe seven months after insertion



## *Roache (1968)*



- Advocated crown or band appliance with distal intragingival extension
- V-shaped extension – broader surface → prevents rotations
- Greater chances of success even if unerupted tooth lies buccal or lingual in arch
- *Disadvantages:*
  - Cantilever design → anchored on occlusally convergent crown of 1<sup>st</sup> primary molar
  - Can replace only one tooth
  - No occlusal function is restored





# Techniques of construction

# Direct method (Single appointment)

Prepare primary 1<sup>st</sup> molar for SSC

adapt SSC

Fit a unit of bar material to distal surface of SSC

If bar material extends beyond the gingival margin of SSC – trim off excess

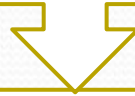
Spot weld the bar to crown

From clinical or radiographic measurement, measure the distance between distal surface of primary 1<sup>st</sup> molar to mesial surface of 1<sup>st</sup> permanent molar

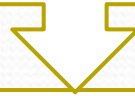
Mark on bar – with No. 139 pliers hold the appliance

With No. 104 pliers bend material at the marked point

Unless previously removed, extract primary 2<sup>nd</sup> molar



Allow time for hemostasis



Put appliance in place



Check with radiograph



# Indirect method ( 2 appointments)

Prepare primary 1<sup>st</sup> molar for SSC

Fabricate SSC

Take impression

Remove crown & place in impression & pour cast

From radiograph, measure the distance of distal extension

Transfer the measurement on cast

Fabricate the bar, trimming & abutting on the distal surface of crown

Using opposing model, adjust for bar height

Solder the bar to crown

Under LA, insert the appliance

## Alternative technique (*Levit, 1971*)

Impression taken but cast is not poured

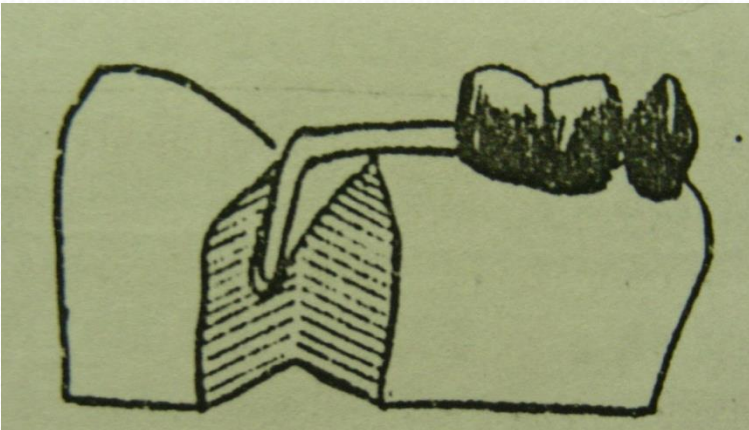
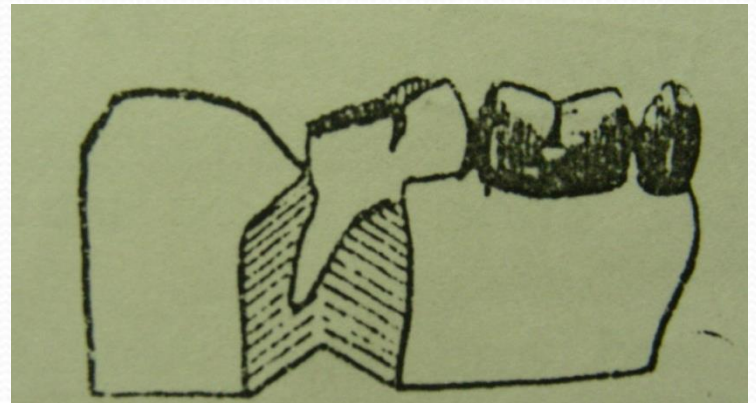
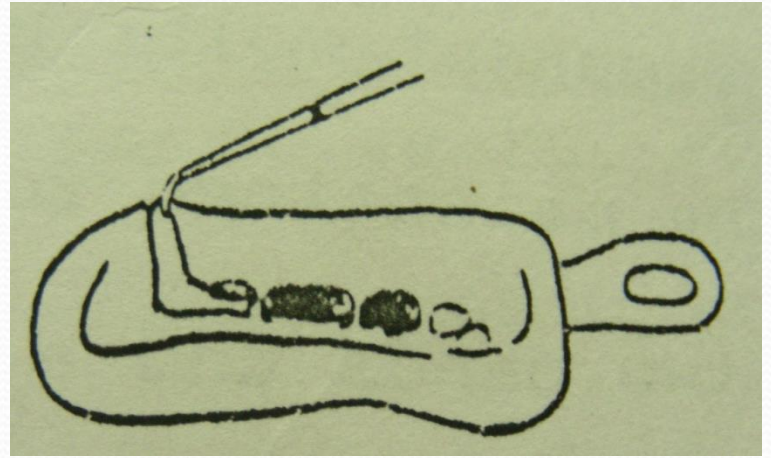
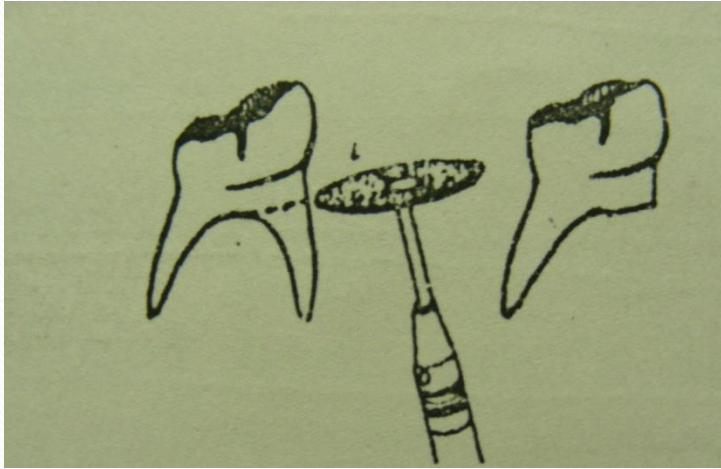
Primary 2<sup>nd</sup> molar is extracted & mesial root is cut off

Tooth is placed in impression & then stone is poured

Once stone has set, the tooth with the distal root is removed

Appliance is fabricated with loop directly bent into the artificial distal socket

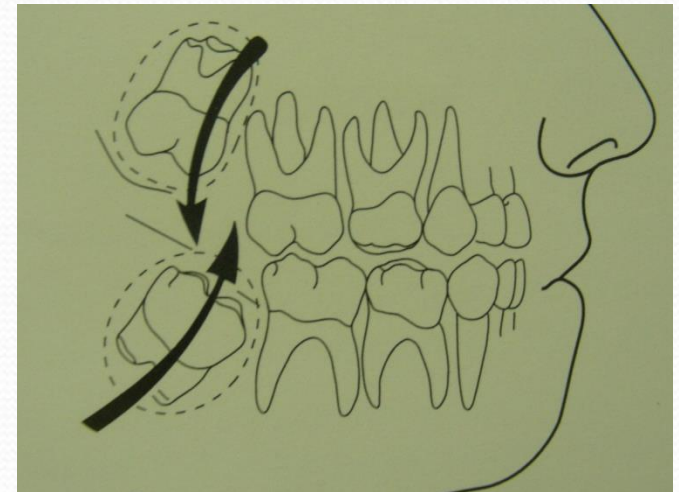
*Advantages:* eliminates intraoral adjustments & X-ray exposure





## Position & width of distal extension

- Path of eruption of maxillary & mandibular molars
- Mandibular 1<sup>st</sup> permanent molar
  - mesial & lingual direction → erupts against the distal surface of primary 2<sup>nd</sup> molar
  - Contact area of the distal extension should be slightly lingually positioned – prevents the slipping of tooth under the appliance
- Maxillary 1<sup>st</sup> permanent molar
  - distal & buccal → till it reaches muscular resistance → then erupts mesially
  - Contact area of distal extension should be slightly buccally placed
- Width of the extension should closely approx. the contact area of the unerupted PFM



## Length of distal extension (horizontal bar)

### A] Measuring the 2<sup>nd</sup> primary molar

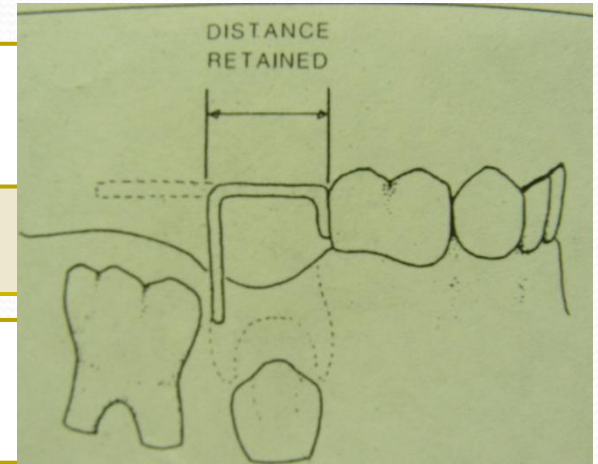
- If not removed before

### B] Measured from the radiograph

- distance between distal surface of primary 1<sup>st</sup> molar & unerupted PFM (if already missing)
- May force the tooth to erupt too far distally (if fabricated at 3 to 4 years of age) → disto-occlusion of molars

### C] Measure the MD width of antimere

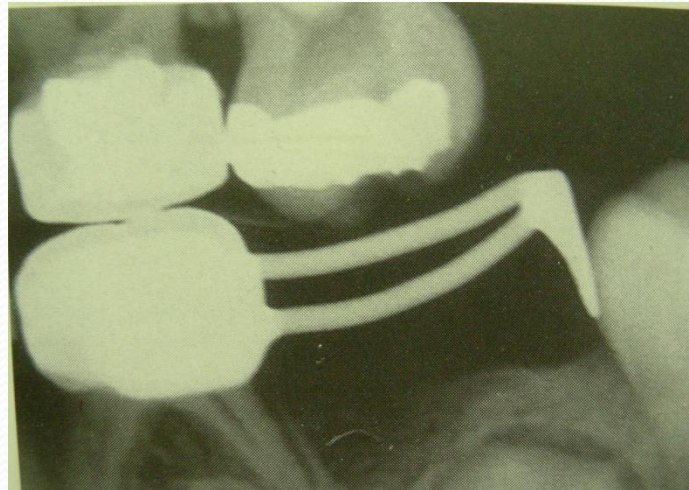
- Comparing with radiograph





## Depth of extension (vertical bar)

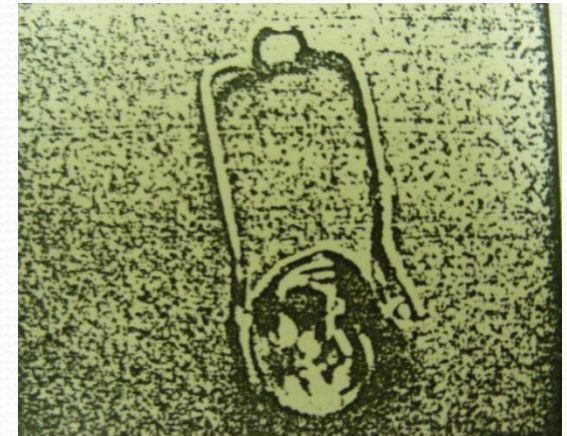
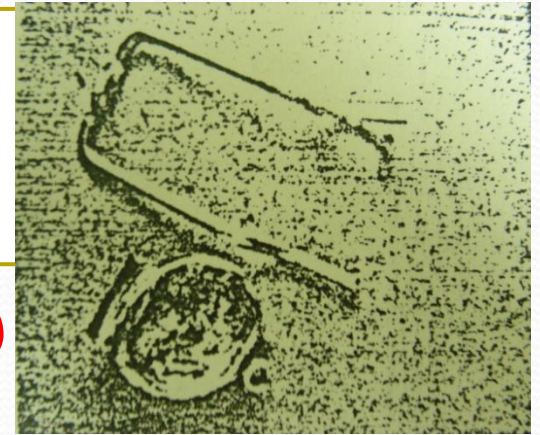
- 1mm below the MMR of unerupted 1<sup>st</sup> permanent molar (*Hicks*)
- V shaped edge should be sharp if inserted into extraction site after healing
- Can be polished & smooth if inserted on day of extraction
- Too long → injures the developing 2<sup>nd</sup> premolar
- Too short → unerupted 1<sup>st</sup> permanent molar might slip under the extension





## Modification

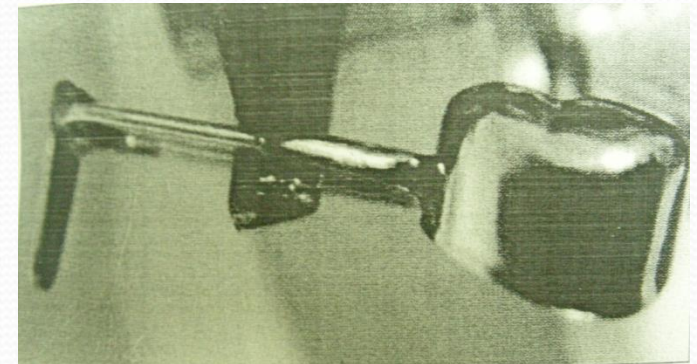
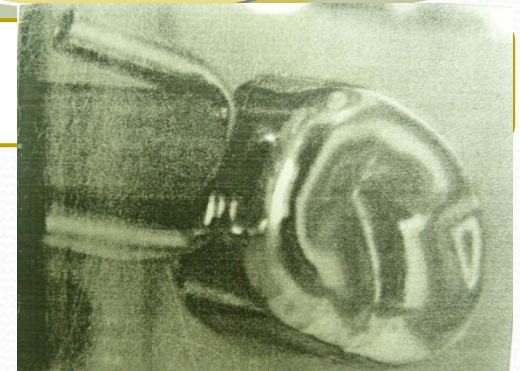
- Removable Distal shoe (*Beaver et al, 1967*)
  - appliance for molar guidance
  - Impression is taken & cast is poured
  - Buccal tubes soldered on buccal & lingual surfaces of crown
  - Horizontal position (buccally) & vertical position (lingually) tooth cut from cast
  - Arch wire inserted into buccal tubes
  - Distal alveolar shoe is then soldered to wire



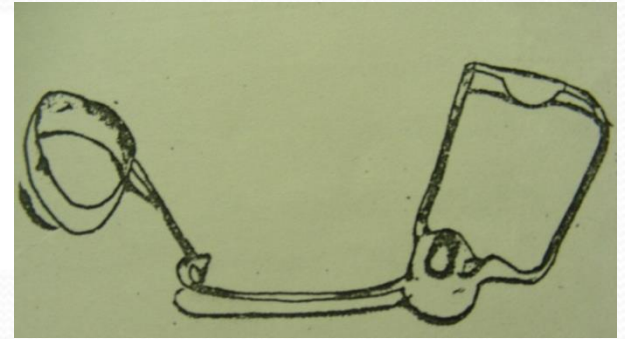


## Modification

- Chair side fabrication (*Warren Brill, 2002*)
  - 1<sup>st</sup> primary molar is prepared for SSC
  - Primary 2<sup>nd</sup> molar is extracted & hemostasis is achieved
  - Female component is welded to SSC
  - Legs of male component is shortened (cut ends smoothed) & inserted into tube of female component
  - Crown is seated & male component extended to most distal aspect of extraction socket



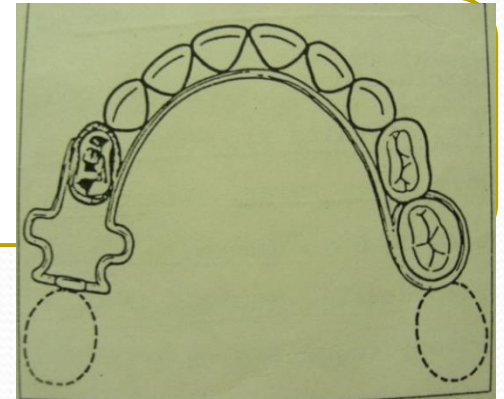
## Modification



- Combination of distal shoe & lingual arch (*Psaltis & Fischer, 1982*)
  - Absence of primary 1<sup>st</sup> molar on one side & 2<sup>nd</sup> molar on other side
- Loops in horizontal arms of distal shoe (*Chawla, 1985*)
  - For adjustment during placement
- Only band & loop with pressure on distal contact of 2<sup>nd</sup> primary molar
- Crown & distal shoe



## Modification



- Garcia-Godoy appliance (*Sheryl, 1989*)
  - Consists of SS wire extending from buccal & lingual surface of primary 1<sup>st</sup> molar to primary 2<sup>nd</sup> molar on the contralateral side
  - 1 U-loop on each side of edentulous area ; 1 small loop on area contacting mesial surface of 1<sup>st</sup> permanent molar
  - To correct mesial tipping & minor space regaining

## Follow up

periodic recall at 3-months interval

With partial eruption of 1<sup>st</sup> permanent molar

- Reverse crown / band & loop



Complete eruption of 1<sup>st</sup> permanent molar

- Band & loop (Mandibular arch)



Complete eruption of lower anteriors

- Lingual arch holding appliance (Mandibular arch)



Complete eruption of 1<sup>st</sup> permanent molar

- Nance palatal appliance (Maxillary arch)



## Nance holding arch appliance

- Bilateral, fixed, passive & non-functional space maintainer
- *Indications*
  - Bilateral loss of multiple primary teeth after eruption of 1<sup>st</sup> permanent molar
  - Also serves as habit breaking appliance (tongue thrusting) – using spurs
- Similar to lingual arch holding appliance except the anterior portion of arch wire do not contact the lingual surfaces of maxillary incisors
- At rugae area, a small U-shaped bend is given which approximates 1cm distal to the lingual surfaces of incisors
- Bend enhances the retention of acrylic button (0.5” in diameter)
- *Disadvantages:*
  - Soft tissue irritation





## The Nance Holding Arch with Bite Rim

JOHN J. BACCELLI, DDS, MSD

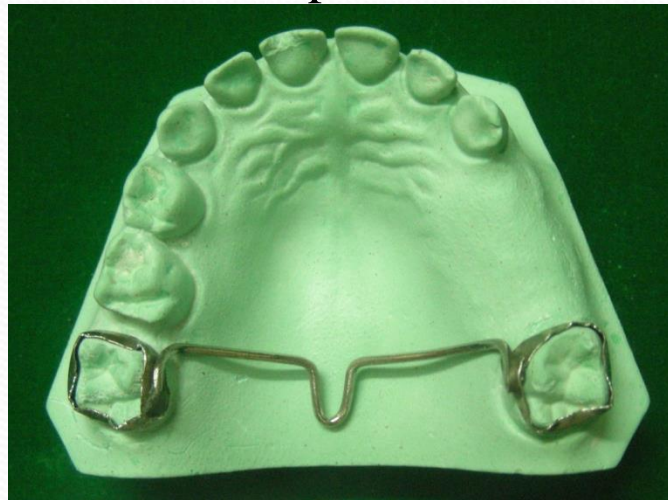
Maxillary bite plates, used in patients with **severe deep bites** to allow placement of mandibular **brackets** earlier in treatment, are removable, and their *effectiveness depends on patient cooperation*. This led to investigate the **feasibility of a fixed bite plate**.

The maxillary **molars are banded**, and .036" sheaths are welded to the occlusolingual aspects of the bands. An .036" wire is adapted to the sheaths and carried over the lingual surfaces of the anterior teeth. A **clear plastic bite rim is then extended** over the anterior incisal edges



## Transpalatal appliance

- Bilateral, fixed, passive & non-functional space maintainer
- Indicated in unilateral loss of primary 2<sup>nd</sup> molar after eruption of 1<sup>st</sup> permanent molar
- Effective in preventing molars from rotating around palatal roots
- Prevents anchorage loss
- Transpalatal arch runs across the palatal vault avoiding contact with soft tissue





# A Modified Transpalatal Arch

HORACIO GARCIA-ROJAS  
GUERRA, DDS, MSD

Studies have found that 90-95% of all Class II malocclusions have mesial rotations of the upper first permanent molars. Correcting these rotations can gain as much as 1-2mm of space per side. The modified transpalatal arch described here **can correct molar rotations while providing anchorage and torque control.**

## Fabrication and Activation



After taking an alginate impression, **fit the molar bands** in the patient's mouth, and place them on the plaster cast (A).



**Incorporate helices** 7-8mm from each side of the central omega loop of an .032" stainless steel transpalatal bar (B).



Adjust the transpalatal arch on the cast so it is **3mm away** from the roof of the palate (C).



**Solder** the arch to the bands, and finish the appliance. **Remove** the appliance from the cast. **Activate** the transpalatal arch by placing one end of a three-prong plier at the distal end of the omega loop and adding as much of a rotation angle as needed (D).



With a birdbeak plier, activate the omega loop to compensate for this constriction of the appliance (E).



**Replace** the appliance on the cast to check the amount of activation and expansion (F). If more expansion is needed, activate the omega loop further. **Attach** the bands to the molars with glass-ionomer cement.



# Bilateral Space Maintainers: A 7-year Retrospective Study from Private Practice

Todd R. Moore BSc, MSc, DDS<sup>1</sup>; David B. Kennedy BDS, MSD,<sup>2</sup>

**Purpose:** The purpose of this study was to report **survival times and problems encountered with bilateral space maintainers** placed over a 7 year period.

**Methods:** Charts were reviewed for all patients who had bilateral space maintainers placed between January 1, 1996 and December 31, 2003. Appliance lifetime and problems encountered were recorded and assessed on July 30, 2005, if still in use. *Failures were recorded as: (1) cement loss; (2) solder breakage; (3) split band; (4) eruption interference; (5) bent wire; (6) loss; or (7) not specified. Also recorded were: (1) failed appliances; (2) transferred patients; and (3) those lost to follow-up.*

**Results:** A total of **482 space maintainers** were evaluated, with **114 failures (24%)** and **349 successes (72%)**. Of the 114 known failures: **68 (60%) were from cement loss**; 12 (10%) were from solder breakage; 11 (10%) were from split bands; and 13 (11%) were from reasons not specified. No statistical differences were noted between types of failures or between genders. Mean pooled survival times were **20 months for lingual arches and 23 months for Nance appliances**, with no statistical differences between arches, except in successful appliances where Nance was superior ( $P=.011$ ). Of the 114 failed appliances: 44 (39%) were not recemented or remade, which was considered clinically successful; 51 (45%) were recemented; and 19 (17%) were remade. Eight appliances were lost to follow-up or transferred.

**Conclusion:** The **majority of bilateral space maintainers (72%) lasted their anticipated lifetimes.**

# MANAGEMENT OF SPACE PROBLEMS IN THE PRIMARY AND MIXED DENTITIONS

PETER NGAN, D.M.D.; RANDY G. ALKIRE, D.D.S., M.S.; HENRY FIELDS JR., D.D.S., M.S., M.S.D.



A. Anterior view



B. Maxillary occlusal view



C. Mandibular occlusal view

Pretreatment photographs of a 4-year-old patient with premature loss of primary maxillary incisors and unrestorable teeth





A. Anterior view



B. Maxillary occlusal view



C. Mandibular occlusal view

Teeth were extracted. Maxillary Nance appliance with prosthesis and mandibular band and loop appliances with occlusal rest on the canines were used for space maintenance

# Removable space maintainers

## Indications

- Esthetics is of importance
- If abutment can not support a fixed appliance
  - early loss – normal root resorption
  - Previous injury
- Cleft palate to be closed with denture
- Child with mental age of 2<sup>1/2</sup> yrs
- When all primary teeth have erupted
- Incompletely erupted 1<sup>st</sup> permanent molar for banding
- Multiple loss of primary teeth

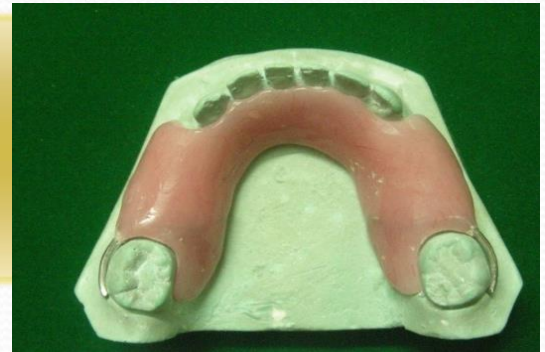
## Contraindications

- Lack of patient cooperation
- Allergic to acrylic materials
- Epileptic patients
- High caries activity
- Child with mental age less than 2<sup>1/2</sup> yrs



## Classification

- Functional *or* Non-functional
- With clasps *or* without clasps
- Acc. To *Brauer et al*
  - Class 1 – Unilateral maxillary posteriors
  - Class 2- Unilateral mandibular posteriors
  - Class 3 – Bilateral maxillary posteriors
  - Class 4 – Bilateral mandibular posteriors
  - Class 5 – Bilateral maxillary anteriors & posteriors
  - Class 6 – Bilateral mandibular anteriors & posteriors
  - Class 7 – one or more primary or permanent anteriors
  - Class 8 – Complete primary



## Acrylic partial dentures

- Multiple loss teeth
- Readily adjusted to allow eruption of teeth
- Lingual bar can be incorporated to minimize breakage of appliance

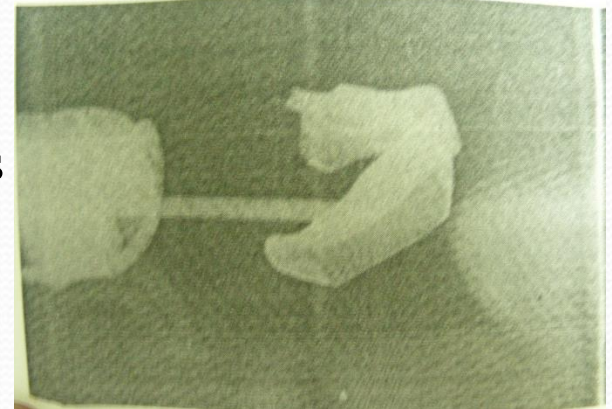


## Full or complete dentures



## Free-end space maintainers

- If one or both primary 2<sup>nd</sup> molars are lost at a short time before the eruption of 1<sup>st</sup> permanent molar
- “immediate” acrylic partial denture with acrylic distal shoe extension
- Exerts pressure without cutting into membrane
- Occluso-cervical thickness – 9mm; vestibulo-lingual thickness-10mm
- “trick” the nature by simulating the cervical part of the root & distal surface of 2<sup>nd</sup> primary molar
- Verified with lead foil lining distal wall
- Extension can be removed once the tooth erupts



# Space maintenance for Primary & Permanent incisor area

## Removable partial dentures

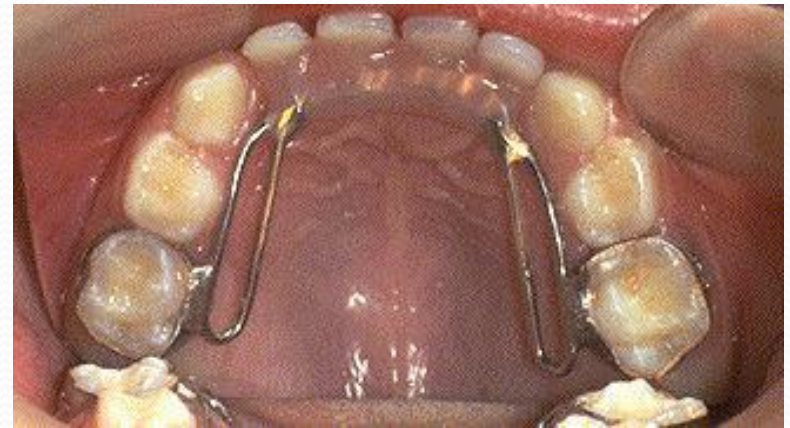
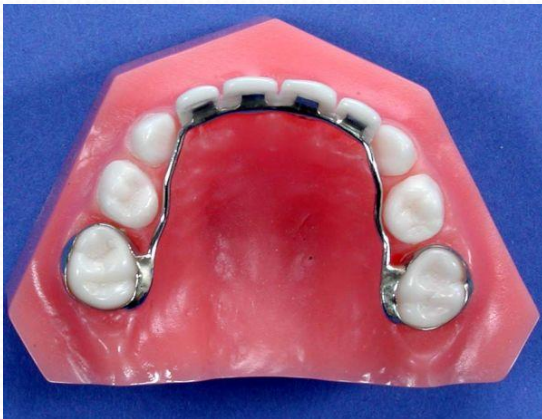
- Esthetic
- Maintains function
- Prevents abnormal speech & tongue habits
- *Indicated* in young cooperative children
- *Contraindicated* in children with high caries risk





## Fixed appliances (Groper's appliance)

- Attach the anterior replacement teeth to 0.040" SS wire framework retained with bands or crowns on 2<sup>nd</sup> primary molar
- If primary 1<sup>st</sup> molars are present – place indirect retainers (occlusal rest) to prevent flexing of wire
- Additional stabilization with Nance button



## In case of space loss

- Partial denture-activating appliance
- Contoured steel clasps adapted to 1<sup>st</sup> permanent molar
- Adams clasps (for more retention)
- Helical finger springs to distalize the tooth
- Wire is placed cervically as possible
- Adjusted 1-1.5mm for every 3 to 4 weeks
- Neither labial bow or palatal acrylic material should interfere with teeth movement
- After regaining space – new retainer with replacement of tooth can be used





## Cementation

- Pumice prophylaxis
- Application of fluoride varnish or gel
- Isolation with cotton rolls
- Cementation of SS space maintainers (*Croll, 1983*)
  - Roughening of internal surface of band – coarse diamond bur
  - Crimping gingival 3<sup>rd</sup> of band – for better adaptation
  - Smoothing & finishing of gingival margin – rubber wheel
  - Small strip of autoclave masking tape is placed over the occlusal surface of band
  - 3/4<sup>th</sup> of band is filled with cement
  - Positioned over tooth (first with finger pressure – then with band pusher)
  - After setting of cement, remove the tape & excess cement gingivally

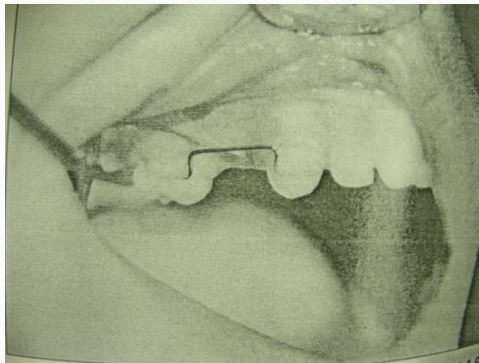


## Bonded space maintainer

- Overcome problems of
  - Multiple visit
  - Loosening of bands
  - Decalcification of abutment tooth

## Simple fixed space maintainer

- introduced by *Swaine & Wright, 1976.*
- Fixed space maintainer bonded to the abutment tooth
- *Advantages:*
  - Eliminates problem of rotation of abutment tooth
- *Modification:*
  - Fixed space maintainer combined with open-faced SSC



**Simsek, Yucel & Taskin.** Clinical evaluation of Simple fixed space maintainers bonded with flow composite resin. J Dent child 2004; 71: 163-168.

**Yucel , Elcin, & Nihal.** Fixed space maintainer combined with open-faced SSC. J Contemp Dent Pract 2006; 7(2): 95-103.



# Fixed Space Maintainers Combined with Open-Face Stainless Steel Crowns

Yucel Yilmaz, PhD, DDS; M. Elcin Kocogullari, DDS; Nihal Belduz, DDS

**Objective:** This study investigates the **clinical performance of fixed space maintainers placed on seriously damaged abutment teeth.**

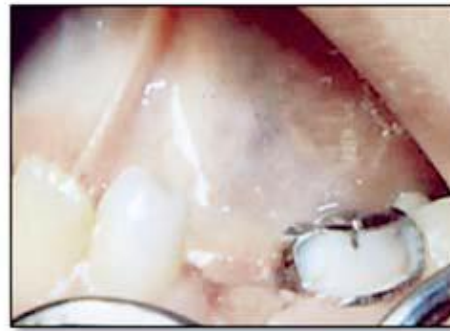
**Methods:** **Crowns were placed** on damaged abutment primary teeth. Fixed space maintainers were **prepared by using rectangular wire between the window in the facial surface of the crowns and other abutment teeth and were subsequently bonded with a flowable resin composite.** This procedure was introduced clinically, and the cases were **observed over a period of twelve months.**

**Results:** Twenty-seven fixed space maintainers (25 on lower jaw, two on upper jaw) were included in this study. **No clinical failure was recorded** in any of the cases in the observation time, and the rate of clinical performance was 100%.

**Conclusion:** The study shows the effectiveness of fixed space maintainers combined with stainless steel crowns (“open-face fixed space maintainers”) which were placed on primary molar teeth used as abutments in cases with extensive caries and loss of occlusogingival dimension.



**Figure 1.** Tooth #75 exhibits extensive caries on the mesio-occlusal surfaces.



**Figure 2.** Tooth #75 was restored with a stainless steel crown and a window was created on the buccal surface of the crown



**Figure 3.** A space maintainer fixed on the abutment teeth on a plaster model.



**Figure 8.** View of 12 months after insertion of the space maintainer bonded to teeth #83 and #85.



**Figure 7.** Intraoral view six months after insertion of the space maintainer bonded to teeth #63 and #65.



**Figure 4.** Intraoral view immediately after insertion of the space maintainer bonded on the buccal surfaces of teeth #73 and #75.



**Figure 9.** View nine months after insertion of the space maintainer bonded to teeth #83 and #85.



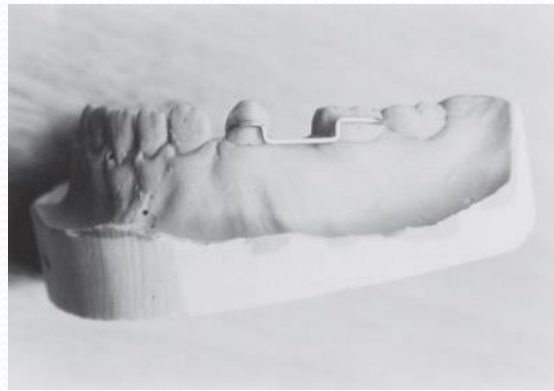
# Clinical Evaluation of Simple Fixed Space Maintainers Bonded With Flow Composite Resin

Sera Simsek, PhD, DDS Yucel Yilmaz, PhD, DDS Taskin Gurbuz, PhD, DDS

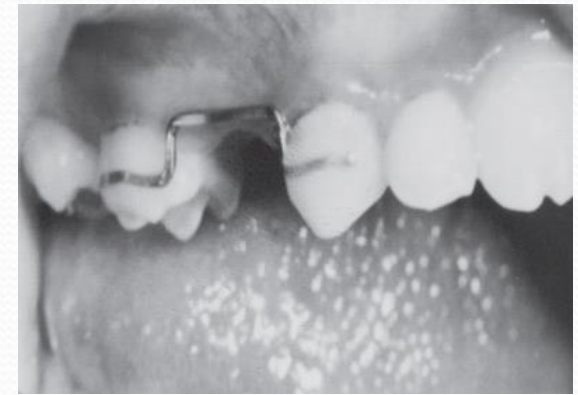
The aim of this study was to evaluate the clinical performance of **simple fixed space maintainers** bonded by using a **flow composite resin (Tetric Flow)** to prevent space resulting from early extracted primary teeth. For that reason, **64 fixed space maintainers** (34 in the lower jaw and 30 in the upper jaw) were applied to **45 patients**. The patients followed up for **12 to 18 months**. Survival rate, prevention ability of that space, and whether damage to the abutment teeth occurred were evaluated. **Five percent of space maintainers were determined to be unsuccessful** at the end of the control period. During this period, loss of space among the abutment teeth was found to be statistically insignificant ( $P>.05$ ). Finally, it was observed that the **use of simple fixed space maintainers was successful due to operator experience and the choosing of favorable patient groups**.



The inner-mouth appearance of a patient prior to the application.



The appearance of the prepared space maintainer on the study model.



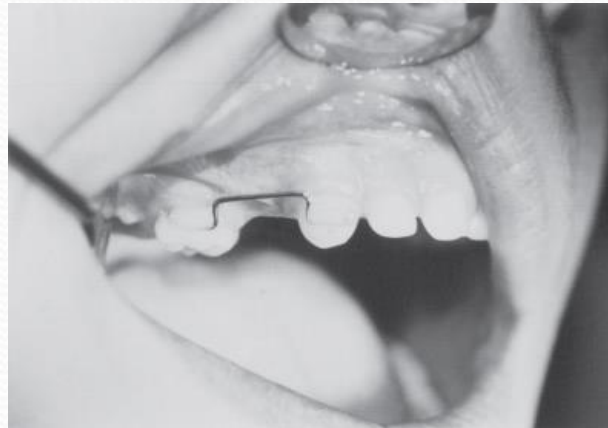
The inner-mouth appearance of the prepared space maintainer after the application.



The intra-oral appearance of a patient at 12 months.



The intra-oral appearance of a patient at 14 months.



The intra-oral appearance of a patient at 18 months.



## Glass fiber-reinforced composite resin – everStick

- Translucent colored
- Matrix contains poly methylmethacrylate
- *Advantages:*
  - Easy to apply & require only one visit
  - No need of impression making
  - No contact with soft tissues – good oral hygiene
  - esthetic, less bulky & occupy less space in oral cavity
- *Disadvantages:*
  - Technique sensitive
  - Fracture at enamel-composite interface
  - Framework fracture



In order to determine the length of GFRCR, the distance from MB line angle of C to DB line angle of E was measured

LA & RD isolation

Both abutment teeth cleaned with pumice slurry & etched with 37% orthophosphoric acid for 40 S

Then rinsed, air-dried, & wetted with adhesive (light cured for 20 S)

Reapplication for 4 to 5 times (to avoid contraction gap formation)





Thin layer of flowable composite on buccal surfaces of abutment teeth without light-curing it

Cut length of GFRCR is placed from mesial surface of C to distal surface of E

Ends of fiber adapted to tooth surfaces with plastic instrument

Preliminary curing for 40 S & flowable CR was placed over the GFRCR

Final curing done for another 40 S

Repeated on lingual surface

Occlusion checked

Final polishing done





GFRCR superior retention compared to Band & Loop space maintainer at 12-months follow up  
*(Subramanian et al, 2008)*



Survival time for GFRCR – 5 months  
*(Kargul et al, 2005)*

**Subramanian, Babu & Sunny.** Glass fiber-reinforced composite resin as a space maintainer: A clinical study. J Indian Soc Pedod Prevent Dent 2008; S98-103.

**Kargul, Caglar & Kabalay.** GFRCR as fixed space maintainers in children: 12-month clinical follow-up. J Dent Child 2005; 72: 109-112.



## Glass Fiber-reinforced Composite Resin as Fixed Space Maintainers in Children: 12-month Clinical Follow-up

Betul Kargul, PhD Esber Çağlar, DDS, PhD Ugur Kabalay, PhD

**Purpose:** The purpose of this clinical evaluation was to **assess fixed space maintainers** for child patients whose missing primary molars were replaced with space maintainers made with **everStick** during a 12-month follow-up period

**Methods:** **Twenty-three clinical cases** presented in this paper were evaluated in the Department of Pediatric Dentistry, Marmara University, Istanbul, Turkey. EverStick was used as part of a space maintainer on occasions where **1 or 2 teeth** were lost in either the maxillary or mandibular arch.

**Results:** This study showed that the **glass fiber-reinforced composite resin space maintainers** functioned well during a mid-term evaluation.

## Success of Reinforced Fiber Material Space Maintainers

Zuhal Kırzioğlu, DDS, PhD M. Semra Ozay Erturk, PhD

Recently, fiber-reinforced composites (FRC) have been introduced and used in different branches of dentistry. The objective of this study was **to assess long-term results** for a newly developed space maintainer as an alternative procedure for practitioners.

**Methods:** This study used **Splint-it** (Jeneric/Pentron, Wallingford, Conn), a FRC, to prepare a newly developed space maintainer chairside in 1 appointment. **A total of 40 space maintainers were applied to 29 children** (14 girls, 15 boys) between 7 to 14 years old (mean±SD=10 years, 1 month±1 year, 11 months) to protect the space of their early extracted first and second primary molar teeth. **For 4 children, space maintainers were prepared with artificial teeth to restore the anterior teeth loss, which occurred due to trauma.** To protect the space until the fixed partial dentures were constructed, 5 space maintainers were applied to 3 children who had 2 permanent first molar teeth extracted.

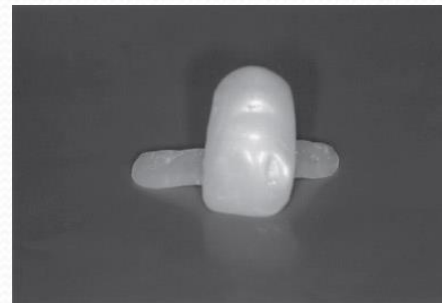
**Appliances were observed for up to 2 years.**

**Results:** Twenty-nine (73%) space maintainers were dislodged at the end of the sixth month. The space maintainers placed on primary teeth (1 or both abutments) showed the highest failure rate (94%).

**Conclusions:** This study suggested that **Splint-it space maintainers can be accepted as successful appliances only for short periods.** Prolonged use of this material for space maintenance in children must be further evaluated.



Appearance of a Splint-it space maintainer prepared for posterior teeth on the model.



Splint-it space maintainers constructed with artificial teeth for the patients with anterior tooth trauma



Survival time of  
Removable &  
Fixed space  
maintainers



Survival time  
with respect to  
arch (*Tulunoglu et  
al, 2005*)



Survival time of  
bilateral space  
maintainers  
(*Moore &  
Kennedy, 2006*)

- **7 months**  
(*Qudeimet &  
Fayle, 1998*)
- **14 months**  
(*Baroni, 1994*)
- **18 months**  
(*Rajab, 2002*)

- Space  
maintainers for  
maxilla - **7.17  
months**
- Space  
maintainers for  
mandible -  
**6.69 months**

- Mandibular  
lingual arch –  
**19.9 months**
- Maxillary  
Nance  
appliance –  
**22.7 months**

**LLHA**  
• 14 mos

**Removable**  
• 18 mos

**Band &  
Loop**  
• 20 mos

**Nance**  
• 24 mos  
(*Rajab, 2002*)



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- 15. Simsek, Yucel & Taskin. Clinical evaluation of Simple fixed space maintainers bonded with flow composite resin. J Dent child 2004; 71: 163-168.



## Modifications of lingual arch

- Addition of canine “spurs” (Mershan type)
- 2 omega bends in the canine region (Konstantinos et al 1998)



- 2 inch adjustment loops (Hotz)



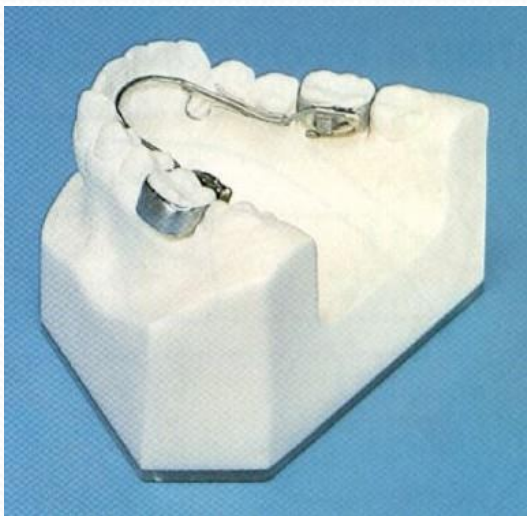
Maxillary lingual arch



- Sleeve arrangement to allow lateral growth



- Fixed removable lingual arch



- Bonded lingual SM (Lin JYK, King NM)



Fig. 1. Configuration of the 010751" x 010215" rectangular stainless steel archwire on the study cast. U-bands (shown by covered wires placed to facilitate minor adjustment).



#### Advantages

- No decalcification
- No ulcerations
- Fissure sealing

#### Disadvantages

- Cannot be used as regainer
- Only bondable to tooth enamel.



# Construction

## COMPONENTS

- Band
- Loop / archwire
- Solder joint
- Auxillaries

## STEPS

- Band fabrication
- Impression making
- Pouring of cast
- Wire bending
- Soldering
- Polishing
- Cementation

# BAND

## Loop bands

- Precious metal (Johnson)
- Chrome alloy bands.

## Tailored bands

## Preformed Bands

A range of bands from 1-32 depending on the mesio-distal width of the tooth are available



## Spool sizes :

Anterior teeth	0.003x0.125	2 inches
Bicuspid	0.004x0.150	2 inches
Molar (primary)	0.005x0.018	2 inches
Molar (permanent)	0.006x0.018	2 inches

- Characteristics of an ideal band
  - Close fit
  - Should not extend too subgingival
  - Resist deformation
  - Resist tarnish
  - No occlusal interference



## ● Steps in band Fabrication

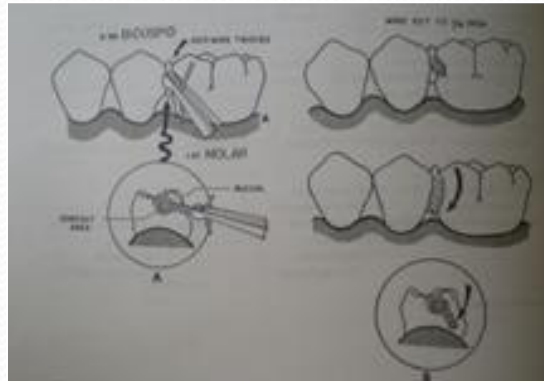
- Separation
- Band fitting (pinching)
- Welding

### Separation

- In place for a week.
  - Brass wire .015 - .020 inch
  - Elastic threads
  - Rubber wedges

### ● Band formation

- Direct technique
- Preformed bands
- Indirect technique



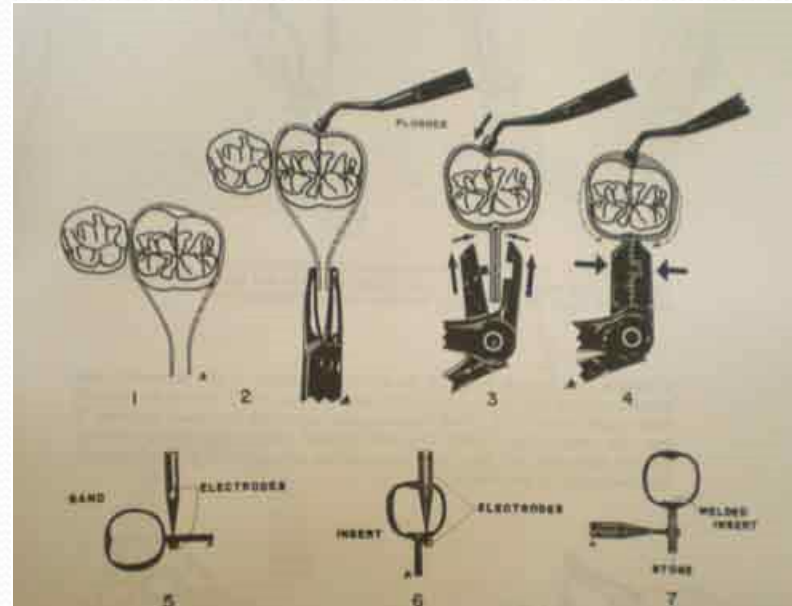
## • Direct technique

### • Armamentarium:

- Regular how pliers
- Universal pliers
- Amalgam condensor
- Peak pliers



- Contour band strips in an occluso-gingival direction
- Weld ends to make loop
- Pinch at cuspal area and not on groove areas
- Upper molar – palatal pull
- Lower molar – lingual pull
- Seam of band mesially and lingually
- Edges of seam must be parallel
- Pinch with peak pliers
- Keep joint vertical





- Festooning
  - Done proximally to follow gingival contour
  - More trimming on distal side
- Trimming
  - On buccal and lingual to adjust height
- Folded flap method
  - Folding of remnant against lingual surface
  - Performed on tooth
  - Spot weld
  - Additional reinforcement

## Electric spot welding



### ● Specifications

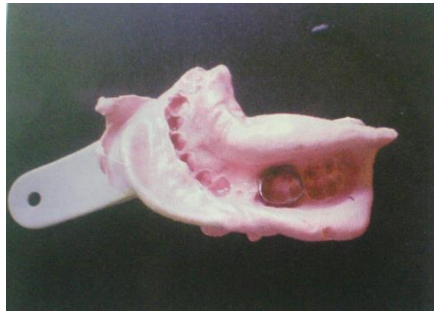
- Occlusal margins
  - 1mm below proximal ridge
- Gingival margin
  - 0.5 to 1 mm in gingival sulcus (Owen 1984)
  - Check for blanching
- Buccally
  - Below level of opposite cusp contact
- Lingually
  - below deepest portion of lingual developmental groove.

- **INDIRECT TECHNIQUE**

- Trim depth 1.5 to 2 mm on cast
- Follow direct method

- **Impression taking**

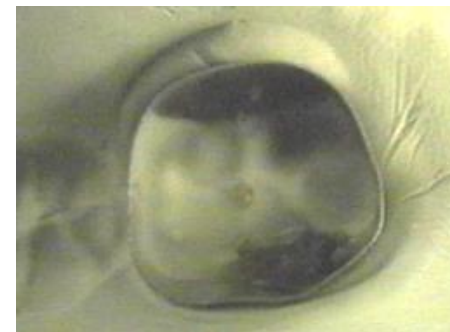
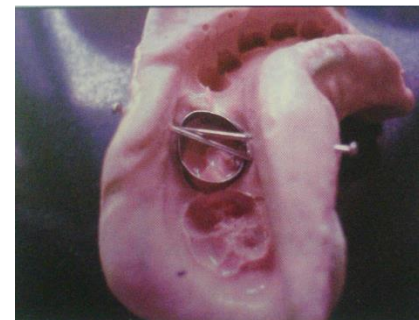
- Alginate



- Take alginate impression
- Check that the occlusal margin of the band is clearly reproduced
- Remove band and orient in compound index
- Stabilize band with sticky wax
  - **on buccal and lingual at the occlusal aspect of band**

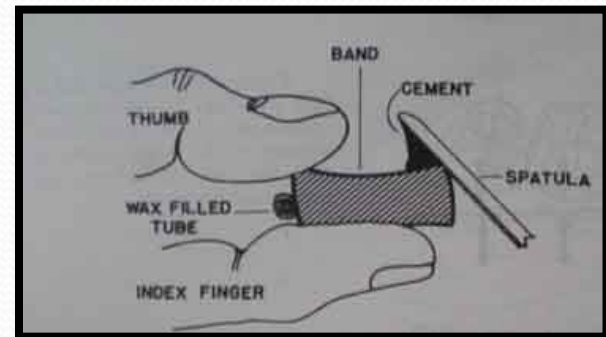
- **Pouring of impression**

- Stabilization of band





- Wire bending for loop / archwire
- Soldering
  - Silver solder
  - Flux
    - Increases flow
    - Prevents oxidation
- Finishing with green stone and polishing with rouge
- Cementation
  - Clean tooth with pumice slurry
  - Isolate
  - Mix cement as per manufacturers instructions
    - Powder-liquid ratio : 2:1
    - Mixing time = 30 secs
    - Mix 1 scoop power in 2 increments 15 secs apart in 1 drop liquid
    - Setting time = max 6.5 mins



## **Principles of Banding / Pinching**

1. The shiny surface of the band should be towards the tissues.
2. Gingival extension of the band should be at marginal gingiva or 1mm below the gingival margin.
3. The band should be 1mm below the occlusal table.
4. There should be no voids and pockets when the band is adapted to the tooth.
5. It should not rock or tilt when banded.
6. Proper festooning and trimming of the margins.