PEDIATRIC DENTISTRY/Copyright © 1980 by
The American Academy of Pedodontics/Vol. 2, No. 1

CLINICAL techniques

The stainless steel crown, welded sheath, and wire loop for posterior space maintenance

Theodore P. Croll, D.D.S.
Ronald Johnson, D.D.S.

Abstract

Space maintenance in the primary, mixed, and young permanent dentitions is a principal factor in preventive orthodontics. Numerous types of appliances are used to maintain position of teeth during growth and development, and all designs of space maintainers have certain advantages and disadvantages in their use. An appliance is described which consists of an orthodontic sheath welded to the buccal aspect of a stainless steel crown. The sheath accepts a stainless steel wire which is bent specifically to serve the purposes of space maintenance. Some disadvantages of other types of space maintainers are avoided with this appliance.

Introduction

Premature loss of primary posterior teeth usually results in space closure from movement of the teeth proximal to the edentulous site. Owen found that "96% of the extraction spaces present for one year or more result in closure."[1]

Space maintenance in the primary, mixed, and young permanent dentitions is of paramount importance in preventive orthodontics, and can be achieved with various types of appliances. Simple appliances such as the stainless-steel band with a soldered wire loop, or the lingual or palatal holding arch, are most common.[2-7] More complex space maintainers may involve precision, cast-metal splints with distal extension bars, or full banding with fixed-arch wiring. Removable, acrylic devices with prosthetic teeth for esthetic considerations that have embedded wires for retention of the appliance are also employed.[2-6]

Traditional unilateral appliances have certain disadvantages. The small size of the band and loop make them susceptible to swallowing or aspiration should the cement be lost and the band become dislodged. Besides the need for a laboratory procedure for appliance fabrication, cemented bands are known to predispose enamel to decalcification and caries by providing an environment for plaque retention. Another problem arises if the tooth to be banded requires a stainless crown restoration. Cementing a stainless steel band to a stainless steel crown in the oral environment is not generally successful for extended time periods. Some practitioners have solved the latter problem by soldering the wire loop directly to the crown prior to cementation.[2,3,5] Myers describes a means of placing the crown and soldered loop at the time of extraction.[9] However, the crown and soldered-loop space maintainer requires laboratory fabrication and finishing, and adjustments are difficult while preserving ideal adaptation of the crown.

It is noted that in the fabrication of both the band and loop, and crown and loop appliances, some practitioners prefer to use a *one-half loop* soldered to only one aspect of the band or crown.[2,8]

The purpose of this paper is to describe a technique which employs a preformed stainless steel crown, an orthodontic sheath welded to the crown, and a specially-bent, stainless-steel wire for space maintenance. The appliance fulfills the goals of the band, or crown and soldered-loop space maintainer, and eliminates some disadvantages.

Indications

The stainless steel crown, welded sheath and wire loop appliance is indicated with:

1. Premature loss of a primary first molar with caries affecting the primary second molar in the same quadrant.

Accepted: October 9, 1979

Figure 1. The stainless crown, welded sheath, and wire loop serve as a distal extension space maintainer. Space closure is prevented until the permanent first molar can be banded for a conventional palatal holding arch wire.

2. Premature loss of a primary second molar with insufficient eruption of the permanent first molar to facilitate banding for a holding arch, or band and loop space maintainer. The appliance in this case is fabricated by crowning the primary first molar, and utilizing a wire extending distally, contacting the mesial aspect of the first permanent molar (Figure 1). Upon eruption of the permanent molar, a conventional band and loop or holding arch is generally fabricated in consideration of future exfoliation of the first primary molar abutment.
3. Very early loss of a primary first molar with many years before anticipated eruption of the first premolar. The presence of the developing second premolar *must* be radiographically confirmed prior to preparation of the primary second molar.

The stainless-steel crown, sheath and wire loop is indicated for permanent teeth only in certain unusual cases in which crowning of a permanent tooth is essential,[10] and premature loss of a primary second molar necessitates space maintenance.

Technique

A full arch impression is taken initially, and a model is poured in fast-set plaster or stone. The usual procedure for fabricating a preformed stainless steel crown is performed in the mouth.[10-12] Prior to cementation of the crown, however, an orthodontic sheath designed to fit the double bend of an .036 stainless-steel wire (Figure 2) is welded to the buccal aspect

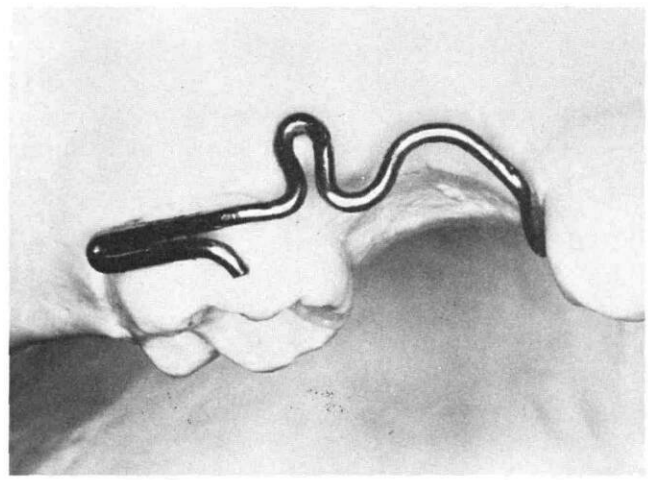

Figure 2. A .036 stainless steel wire is adapted on the model.

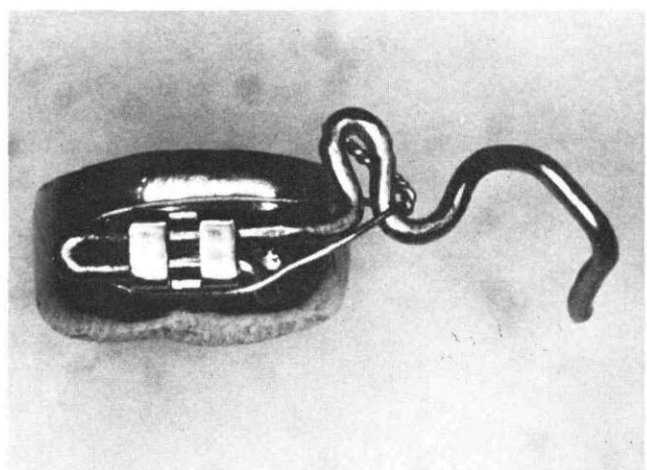

Figure 3. The finished appliance is shown out of the mouth. Note the small bend at the end of the wire, the tie-back loop, and ligation of the .036 wire.

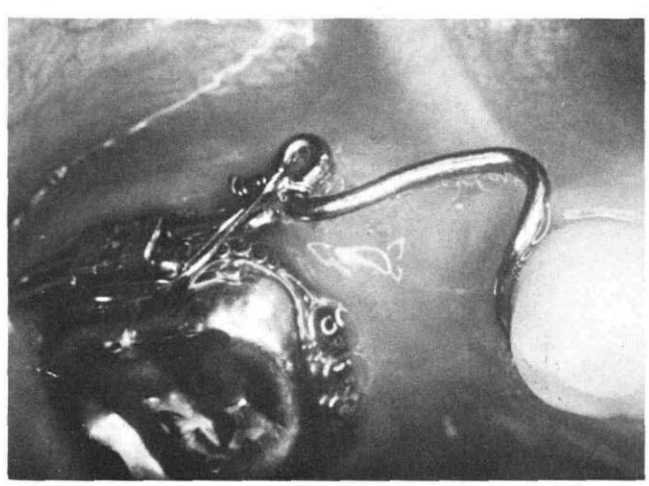

Figure 4. The finished appliance is shown in the mouth 10 months after placement.

of the crown. The sheath is positioned in the middle one-third of the crown both occluso-gingivally and mesio-distally. Careful positioning prevents occlusal interferences and facilitates insertion of the wire (Figures 3 and 4). Soft wax is placed in the sheath during cementation to avoid clogging the sheath with cement.

The stainless steel wire is then bent on the model in such a way that the double bend will insert into the sheath and protrude at least one mm beyond the sheath's distal end (Figures 3 and 4). The wire can also be adapted directly in the oral cavity, but the authors recommend using the plaster model for ease of manipulation and patient comfort. A small bend at the terminal end of the wire acts as a stop, preventing over-insertion into the sheath (Figure 3). A tieback loop is bent in the edentulous span facilitating firm ligation of the wire into the sheath, so mesial displacement does not occur. The wire is bent so that it crosses the edentulous span close to the gingiva, terminating in a curve around the convexity of the proximating tooth, incisal or occlusal to the greatest surface convexity. Placement above the convexity aids in preventing gingival submersion of the wire as time passes.

After adaptation on the model, the wire is taken to the patient's mouth where fine adjustments are made. A 12-inch length of dental floss should be tied to the wire to protect against accidental swallowing or aspiration during intraoral manipulation. The wire is tied into the sheath securely with .010 ligature wire (Figures 3 and 4).

Discussion

There are distinct advantages to the stainless steel crown, welded sheath, and wire-loop space maintainer. Laboratory requirements are minimal, and loosening of the appliance from the abutment is most unusual in contrast to the band and loop space maintainer. The danger of swallowing or aspiration is greatly reduced and the appliance can be completed in one appointment. The need for further treatment due to recurrent caries is greatly reduced if not eliminated altogether. A final advantage is that the practitioner avoids banding primary molars which have great cervical bulges and tapering coronal anatomy that make ideal band adaptation and cementation difficult.

One may question the recommendation of preparing a noncarious primary molar for a stainless-steel crown as an abutment for a space maintainer. However, the authors view the space-maintaining procedure in the same way one might view fixed bridgework in the permanent dentition. The treatment is advocated for the long-term goal of preventing potential malocclusion with little or no periodic clinical intervention.

It is prudent for the practitioner to closely study each case during treatment planning with an eye for the future. If a stainless steel crown is to be placed on a tooth that is a potential abutment for a space maintainer, a sheath should be welded on the crown as a "preparatory" measure. If space maintenance eventually is required, then only wire bending and chairside adaptation need to be performed. During treatment planning, the eventual possibility of space maintenance may also influence the choice of stainless steel crowns rather than multisurface silver alloy restorations in the young child.

References

1. Owens, D. G.: "The Incidence and Nature of Space Closure Following Premature Extraction of Deciduous Teeth: a Literature Study," *Am J Ortho,* 59:37-49, January 1971.
2. Graber, T. M.: *Orthodontics Principles and Practice,* 3rd Ed., Philadelphia: W. B. Saunders Co., 1972, pp. 645-660.
3. Law, D. B., Lewis, T. M., and Davis, J. M.: *An Atlas of Pedodontics,* Philadelphia: W. B. Saunders Co., 1969, pp. 221-233.
4. Finn, S. B.: *Clinical Pedodontics,* 3rd Ed., Philadelphia: W. B. Saunders, 1967, pp. 286-288.
5. Sim, J. M.: *Minor Tooth Movement in Children,* St. Louis: C. V. Mosby Co., 1972, pp. 12, 83, 242-248.
6. Binder, R. E.: "An Improved Band and Loop Space Maintainer," *J Dent Child,* 40:359, September-October, 1973.
7. Eastwood, A. W.: "The Lingual Arch in Space Control," *Dent Clinic N Amer,* 383-97, July, 1968.
8. Griffith, R.: "Use of the Band-Arm Fixed Space Maintainer," *Dent Surv,* 49:40, October, 1973.
9. Myers, D. R.: "A Direct Technique for the Placement of a Stainless Steel Crown-and-Loop Space Maintainer," *J Dent Child,* 42:37-39. January-February, 1975.
10. Croll, T. P. and Castaldi, C. R.: "The Preformed Stainless Steel Crown for Restoration of Permanent Posterior Teeth in Special Cases," *J Am Dent Assoc,* 97:644-649, October, 1978.
11. Troutman, D. C.: "Chrome Steel Crowns: a Simplified Self-Assessment Technique," *J Acad Gen Dent,* 24:28, May-June, 1976.
12. Castaldi, C. R.: "Operative Dentistry," Goldman, H. M., *et al.,* Ed. *Current Therapy in Dentistry,* Vol. 2, St. Louis: C. V. Mosby Co., 1966, pp. 621-655.

DR. THEODORE CROLL is a Clinical Associate, Department of Orthodontics/Pedodontics, University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania.

DR. RONALD JOHNSON is Professor and Chairman, Department of Orthodontics/Pedodontics, University of Pennsylvania School of Dental Medicine and Director of Graduate Education, The Children's Hospital, Philadelphia, Pennsylvania.

Requests for reprints may be sent to Dr. Theodore Croll, Landmark Building, Doylestown, Pennsylvania 18901.