

A New Fixed Mandibular Expansion Appliance for Uncrowding Incisors During Early Mixed Dentition



Jeff I. Williams, D.D.S.



Fig. 1-A: Front face smiling, pre-treatment.



Fig. 1-B: Profile, right side, pre-treatment.

A New Fixed Mandibular Expansion Appliance for Uncrowding Incisors During Early Mixed Dentition

Introduction:

If you wish to start an argument among dentists who incorporate orthodontic treatment in their practices whether they are generalists, pediatric dentists, or orthodontists mention that you have found a new method of expanding the lower arch during early mixed dentition to create normal spacing and alignment of permanent lower incisors and canines. The history of orthodontics is rich with articles that speak pro and con on this issue.

Review of some appliances that have been used in the past: Appliances that have been designed in the recent past to gain mandibular canine width to allow incisor uncrowding include:

a selection of functional appliances (Gibbs et al, 1992¹); a lower Schwarz appliance with a mini jackscrew in the midline (McNamara's clinical report of his experiences in treating in mixed dentition, during his Hawaii presentation to the Pacific Coast Society of Orthodontists, as reported by Gerald Nelson², 1992); the HALB appliance (Ricci and Hatrak³, 1991); the lip bumper (Nevant et al⁴, 1991); and the lower Crozat appliance therapy (McInaney et al⁵, 1980), and the lower fixed-removable lingual arch with finger springs (Sim⁶, 1977 text).

Harris⁷, in a 1972 article in which he offered the combined use of lower lip bumper and upper rapid palatal expansion to treat crowded cases in mixed dentition, admirably summed up the problems of early lower arch expansion as the solution to lower anterior crowding when he wrote:

"It has been apparent to many orthodontists that the best chance of achieving these goals (correcting malocclusions and facial-jaw disharmonies) lies in early intervention when the dynamic changes associated with growth can be utilized to the maximum in aiding treatment. It is probable that a large number of cases in which the extraction of permanent teeth for esthetic or functional reasons is required were at one time 'borderline' extraction cases in which early intervention would have obviated the need for removing permanent teeth."

Special emphasis will be placed on means to develop arch length in the lower jaw, since this is usually the prime factor in determining the need for premolar extraction.

Review of Literature: A review of journal articles and chapters in recent orthodontic texts suggests strongly that intercuspid and molar width in the mandibular arch can be expanded during mixed dentition, but the expanded dentition usually cannot be expected to remain stable. However, it must be noted that the majority of these articles and chapters dealt with arch expansion measures in adolescent children.

Little⁸ and others studied the records of 26 patients in the University of Washington (Seattle) department of orthodontics to measure the amount of relapse seen in patients who were first treated with mandibular arch expansion during mixed dentition. The children's ages for beginning lower arch expansion ranged from 8 years to 14 years, 7 months, with median age being 10 years, 1 month. The children's models were measured at

“Pre-treatment (Mixed Dentition), Post-treatment (completion of adolescent edgewise orthodontic treatment), and Postretention (which averaged 7 years, 7 months following completion of adolescent treatment) for ‘summed displacement’ (re-crowning) of the anatomic contact points of the lower anterior teeth,” as described by Little in an earlier article⁹. It was found at the post-retention age that 23 of the 26 patients had relapsed to a crowding of 3.5mm. or greater in the incisor-canine segment. Only three patients showed neither loss nor gain of arch length.

Successful use of the Williams appliance: The usage of the appliance discussed and illustrated in this article appears to offer different, more positive results, provided that treatment is begun earlier. Records compiled by the principal author (Williams) over the past 10 years in a pediatric dentistry practice in Bartlett, TN., using this same appliance or several closely related versions of this appliance have proven in the majority of cases to establish quite stable lower incisor alignment when these arch expansion measures have been applied to children during early mixed dentition.

Usually the period of early mixed dentition is taken to be ages 6-8 years. Dentally, this period is defined as the growth period during which the following permanent teeth erupt: the 6-year molars, the four lower incisors, and the four upper incisors.

The working theory in the use of this appliance is that the anterior teeth are uncrowded by the action of the appliance to produce lateral remodeling of the base of the mandibular alveolar bone so that the lower incisors are allowed to align themselves nearly spontaneously during or shortly following their eruption. This mimics closely the alignment achieved by children who have sufficient primary spacing to permit uncrowded eruption and alignment of permanent lower incisors under normal lip and tongue forces.

Need for a new look at mandibular expansion strategies:

Because many of the current orthodontic philosophies stress non-extraction treatment, **the 1990's practitioner strives to avoid extractions of any deciduous teeth, including primary canines**, in cases where the lower incisors are severely crowded. It has been noted that early extractions of deciduous canines often lead to excessive lingual inclination of the lower incisors (although the actual alignment of the incisors may be improved), loss of lower midline relation, and quite routinely later leads to undesirable extraction of bicuspid. These bicuspid extractions may also increase the potential for Temporomandibular Dysfunction (TMD) in normal or low growth angle patients (Keller¹⁰, 1991, personal communication). Disking of the proximals of lower primary cuspids, a procedure commonly attempted to gain additional space for erupting incisors, seldom provides sufficient space for alignment of these crowded incisors. Indeed, it may result in unnecessary encroachment on the leeway space when the permanent canines erupt. The leeway space is more appropriately saved for bicuspid alignment and allowing the natural mesial migration of the lower 6-year molar into a Class I intercuspation.

If mandibular expansion is planned later in the child's development, during adolescence, the fully erupted permanent canines may prove difficult to stabilize in their transversely expanded relations. (Little⁸, et al). In addition, an overly full lip profile can result when lower incisors are moved labially to complete the uncrowding and rounding out of the arch.

Advantages of early mixed dentition arch development:

Several advantages are noted when the child's lower arch expansion is begun in early mixed dentition:

1. Both parents and children are concerned by the crowding of the newly erupted lower incisors, and are willing to accept measures to alleviate this problem.
2. The children are at a very cooperative age.

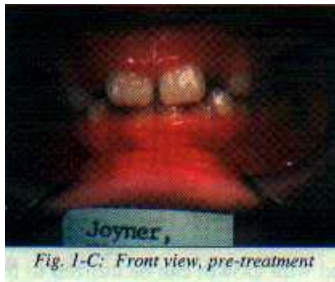


Fig. 1-C: Front view, pre-treatment



Fig. 1-D: Left side, occlusion, pre-treatment



Fig. 1-E: Right side occlusion, pre-treatment



Fig. 1-F: Appliance fitted to lower arch, before adjustment



Fig. 1-G: Appliance has been adjusted for six weeks, with a gain of 3mm of arch width.

3. Bone growth is taking place rapidly, and allows quite uncomplicated remodeling of the alveolar ridges outward in the canine areas.

4. The early arch development measures allow more natural alignment of the permanent incisors, reducing the tendency to relapse following treatment.

5. The incisors are not allowed to mature in a crowded relation, and following the expansion treatment the trans-septal fibers can establish attachments to normally aligned teeth, promoting arch stability.

6. Early correction of upper and lower anterior alignment leads to better looking smiles, and more self-confident children, during the important image-forming elementary school years.

7. Time required for any later full-banded/bonded treatment may be considerably reduced.

8. Necessity for extraction of permanent teeth to make space, or the need for distal-driving of molars to increase arch length, is also greatly reduced.

9. Problems related to temporomandibular joint dysfunction may be lessened.

Advantages of this new mandibular expansion appliance:

There are several important orthodontic advantages in the use of the special lower arch expansion appliance described here:

1. It is a fixed cemented appliance, with the chief anchorage being the mandibular second primary molars. Being fixed, it lessens the potential for loss or damage, as well as the need for constant repair during the treatment period.

2. It is composed of heavy duty materials, yet is comfortable for the patient to wear, and easy for the parent to see and adjust the special expansion screw.

3. Use of the fixed expansion screw allows a predictable expansion force with an increase of dimension at the recommended rate of 2 mm. a month (two turns each week).

4. It is versatile in that the light Nickel-Titanium wire forces against the lower incisors can be adjusted to provide force to a single lingually posed incisor, to two lingual incisors, to all incisors, or to none at all.

5. Construction is quite straightforward, if instructions are carefully followed. Chairside adjustments are easy, requiring only a few moments of the dentist's time.

6. Patient and parent acceptance has been excellent.

Ideal situations for treatment using this appliance: In the Sim orthodontic study clubs, this appliance has been termed the "Williams appliance" from the time of its original presentations by Dr. Williams in the Spring of 1992, since its design and usage differs importantly from all other lower arch expansion appliances that were reviewed during the preparation of this article. In addition, the philosophy of use of the appliance diverges from that of most other authors who have published articles in this field. Dr. Williams feels that, if both arches need expansion, **the mandibular arch expansion should be started first.** Only after nearly completing the **mandibular expansion**, is the **maxillary expansion** begun. Although this can result in an apparent posterior cross-bite relation, the subsequent more rapid expansion of the upper arch corrects this problem easily.

According to Dr. Williams, the ideal time to initiate treatment to uncrowd mandibular arches is when the child's lower permanent central incisors have erupted, but the lateral incisors have not. This allows time for the intercanine distance to be increased by the action of the appliance, so that the permanent lower central incisors and the later erupting lower lateral incisors will have adequate arch space into which all incisors can be aligned in a normal anterior segment. Space is also gained so that the lower permanent canines can erupt in an uncrowded fashion into their normative positions.

Materials and methods: Elastic separators are placed mesial



Fig. 1-H: Appliance has been adjusted for 16 weeks. Nearly enough arch length has been gained to allow normal positioning of permanent canines. Placement of composite ledges on the lingual aspect of the laterals will continue to align them.

and distal to the primary lower second molars to gain space for fitting bands. A week later the separators are removed and molar bands are fitted one-half size large than tightly fitted orthodontic bands to allow for the slight distortion during soldering. With the bands still in place, a thumb-sized gob of heat-softened compound impression is pressed onto each side of the arch around the second primary molars. Then a regular alignate impression is taken of the lower arch. If the bands do not come off with the impression, remove them from the teeth and carefully seat them in the impression. Next, the bands are half-filled with melted wax, which serves both to stabilize them in the impression compound as well as to permit faster soldering later (less heat needs to be applied to the bands to allow the solder to flow). The impression is poured in castone and allowed to set, after which the impression material and the wax are removed from the model. The bands now appear firmly seated in the stone model, but with a hollowed out area in the upper third of the bands.

Separators are placed again interproximally mesial and distal to the second primary molars and the patient is scheduled later for a half-hour appointment to fit and cement the appliance.

Fabrication of the appliance: A straight section of .025 (inside diameter) hollow stainless steel tubing is laid along the lingual groove of the first permanent molar forward to the middle of the lingual surface of the primary canine. The distal end of each tube is pinched, curved buccally slightly, and polished to avoid tongue abrasion while the appliance is being worn. Each section of hollow tubing is soldered to the lingual surfaces of the bands after the tubing is stabilized mesial and distal to the primary second molar by a pinch of Play-Doh pressed against the model.

A small section of .025 solid stainless steel lab wire is placed on top of each hollow tube so it extends forward from the mesial third of the first primary molar to a point 3 to 5 mm. mesial of the primary cuspid. After stabilizing with a pinch of Play-Doh, the extension wire is also soldered to the hollow tube. This extension wire is used to apply force low against the cingulum of the primary cuspid during the expansion procedure.

A small expansion screw (see note at end of article) with a 6 mm. expansion capacity is fitted with laterally extending arms of solid .036 stainless lab wire. The .036 wires are bent 90 degrees with about 4 mm. of wire beyond the band, and the short ends are fitted into the two holes on each side of the expansion screw's midline. These .036 wire extensions are soldered with a pin-point flame while the expansion screw is laid flat on the lab bench.

The expansion screw with its "wings" of .036 wire is lifted up and positioned on the model (supported by Play-Doh) so that the expansion screw is located midsagittally. Its extension wings of .036 wire should cross over at nearly 90 degrees to the solder joints that join the .025 extension wires and the hollow tube archwires. The location of the crossover will be approximately at the distal of the primary canines. This places the expansion screw approximately 5-8 mm. to the lingual of the lingual surfaces of the lower incisors, and the screw will clear the floor of the mouth by 5 mm. or so.

The wings of .036 wire will be soldered to the main archwire structure, with the waste ends then being cut off and polished. The whole appliance is cleaned and all other solder joints polished. The screw is checked for adequate resistance of the screw spindle within the housing (to prevent screw slip-back) and for proper orientation of the screw turn (toward the tongue).

Copyright JGO 1993, permission to reprint granted.

To be continued in next issue.