Mandibular Protraction Appliance IV

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Articles published by Pancherz[1,2] on the Herbst* appliance in the last two decades seem to have stimulated the development of several other fixed appliances that work according to the same mechanical philosophy, without requiring unusual patient compliance.[3-11] In 1995, I presented two versions of a non-compliance device that could be made in the office, called the Mandibular Protraction Appliance** I and II.[11,12] These appliances were soon replaced by an improved MPA III.[13,14]

*Registered trademark of Dentaurum, Inc., 10 Pheasant Run, Newtown, PA 18940.

**Patent pending.

Fig. 1 Two sections of .040" stainless steel tubing spot-welded together prior to soldering.

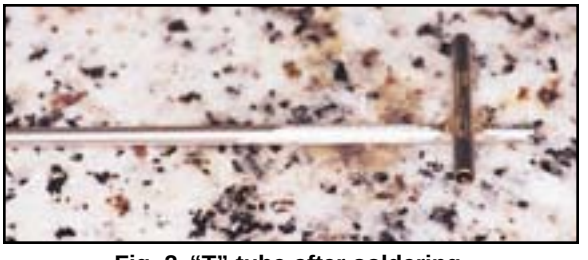

Fig. 2 "T" tube after soldering.

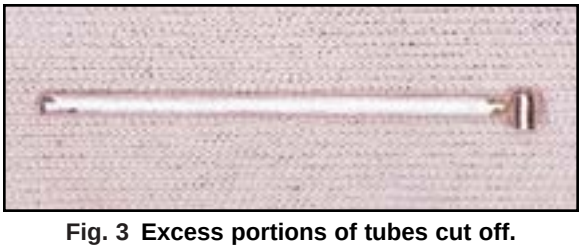

Fig. 3 Excess portions of tubes cut off.

The latest version, the MPA IV,** is much easier to construct and install, and much more comfortable for the patient. The MPA IV is made up of the following parts:

- "T" tube
- Upper molar locking pin
- Mandibular rod
- Mandibular archwire

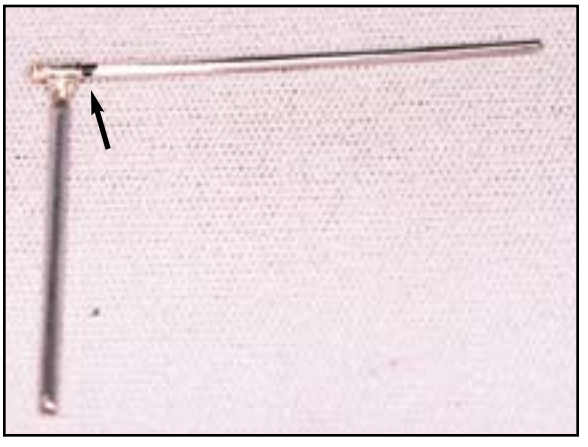

Fig. 4 Molar locking pin inserted through smaller tube and marked at end of tube.

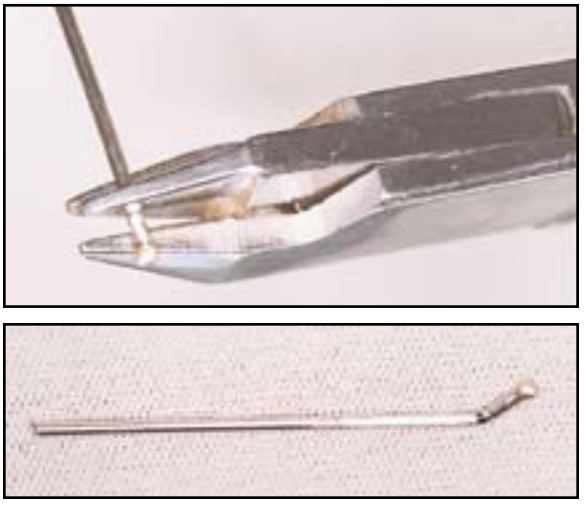

Fig. 5 Molar locking pin bent gently with three-prong plier.

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Appliance Fabrication

1. Spot-weld two perpendicular sections of .040" stainless steel tubing to hold them in place until soldering (Fig. 1). This process can be repeated several times along the longer tube, as long as there is at least 37mm between shorter tubes.

2. Solder each spot-welded intersection of the longer and shorter tubes (Fig. 2).

3. Cut off the excess of each shorter tube flush with the longer section (Fig. 3). Cut the longer section flush with the short tube. The excess tubing can be reused. Several sets of "T" tubes and mandibular rods can be prefabricated at one time and saved for later use.

4. Fabricate the upper molar locking pin by adding a small drop of silver solder to one end of a section of .040" stainless steel wire. Round off the solder drop with a disc and a bur to make it as small and smooth as possible and thus avoid buccal irritation.

5. Insert the molar locking pin into the smaller section of the "T" tube, and pull it through until the solder drop catches against the tube. Mark the molar locking pin with a pen at the point where it emerges on the other side of the "T" tube (Fig. 4).

6. Remove the molar locking pin, and bend it gently at the ink mark with a three-prong plier (Fig. 5). Reinsert the molar locking pin all the way into the smaller section of the "T" tube. If the bend is too acute, deactivate it a bit with the plier.

7. Insert a piece of .040" stainless steel wire into the longer section of "T" tube to prevent deformation of the tube, then bend the mandibular locking pin with finger pressure until it is parallel to the longer tube (Fig. 6). If necessary, use a heavy plier to complete the bend (Fig. 7).

8. Cut the molar locking pin to a manageable length, and anneal its tip to make it easy to bend during installation (Fig. 8).

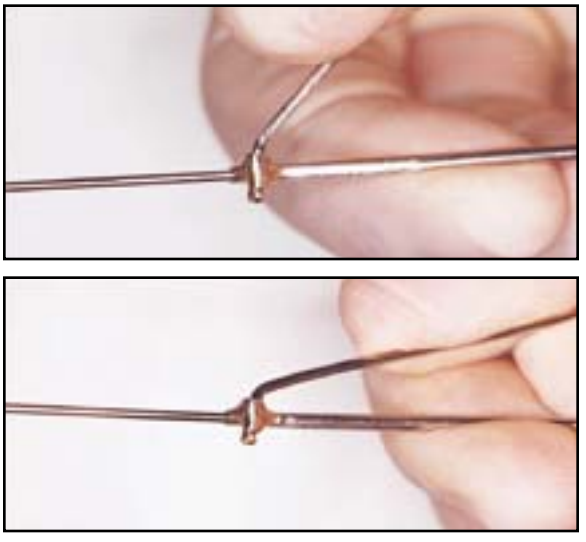

Fig. 6 Piece of .040" stainless steel wire inserted into longer tube to prevent deformation while bending molar locking pin with finger pressure.

Fig. 7 Bend finished with heavy plier so molar locking pin is parallel to longer portion of "T" tube.

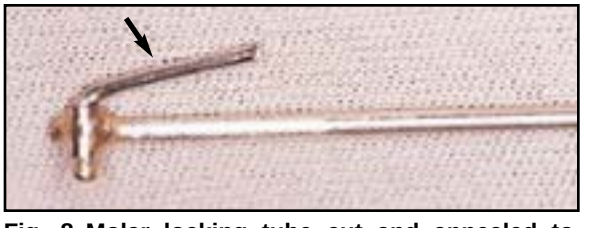

Fig. 8 Molar locking tube cut and annealed to make it easy to bend during installation.

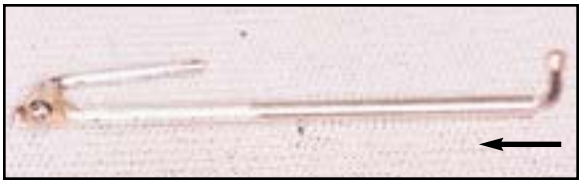

Fig. 9 Mandibular rod inserted into “T” tube.

Fig. 10 Circular loops placed in mandibular archwire occlusal to archwire and distal to cuspids.

9. Fabricate the mandibular rod by making a 90° bend at one end of a section of .036" stainless steel wire, forming a longer and a shorter leg. Add a small drop of solder to the tip of the shorter leg.
10. Insert the mandibular rod into the “T” tube (Fig. 9).

Installation

1. The .019" × .025" stainless steel mandibular archwire must have two small circular loops extending occlusally just distal to the cuspids (Fig. 10).
2. Insert each mandibular rod into a circular loop from the lingual, pull it through, and turn it upward (Fig. 11).
3. Insert each molar locking pin into a maxillary .045" first molar tube from the distal. Ask the patient to posture the mandible forward to simulate the desired overjet and midline, then mark the intersection of each “T” tube with the corresponding circular loop of the mandibular archwire (Fig. 12). This defines the length of the MPA IV so that it will keep the mandible in the protracted position at rest. Also mark each molar locking pin at the point where it emerges from the mesial end of the first molar tube.
4. Remove each maxillary assembly from the molar tube, and cut the molar locking pins and “T” tubes at the marks.
5. On each side, while holding the “T” tube with a plier, insert the mandibular rod into the tube (Fig. 13). Grasp the molar locking pin with a plier, and insert it into the maxillary .045" molar tube from the distal (Fig. 14). Complete the insertion by pushing the assembly forward with a finger.
6. With the patient at maximum opening, use a How plier to firmly bend each molar locking pin

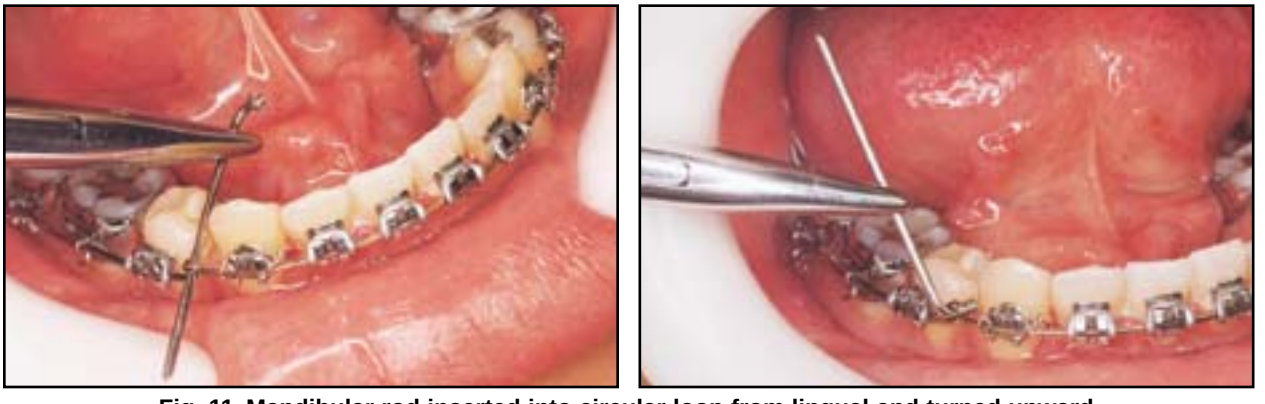

Fig. 11 Mandibular rod inserted into circular loop from lingual and turned upward.

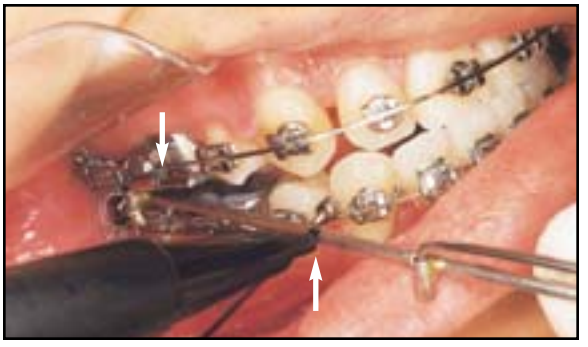

Fig. 12 Molar locking pin inserted into maxillary first molar tube; intersection of "T" tube and circular loop marked, and molar locking pin marked where it emerges from mesial end of molar tube.

Fig. 13 Mandibular rod inserted into "T" tube in mouth.

Fig. 14 Molar locking pin inserted into maxillary first molar tube from distal.

Fig. 15 Molar locking pin bent mesial to first molar tube.

Fig. 16 Molar locking pin tied to maxillary archwire.

mesial to the first molar tube (Fig. 15). If the molar tube is on the occlusal side, bend the pin upward; if the tube is gingival, bend the pin downward. In any event, the tube must cross the .018" × .025" rectangular maxillary archwire so that it can be tied to the archwire at the molar tube for stabilization (Fig. 16).

When the MPA IV is inserted from the distal of the maxillary first molar tube, as shown above, the "T" tube is long enough that it will almost never disengage from the mandibular rod. In some cases, however, the clinician may prefer to insert the MPA from the mesial. To check whether this can be done without disengagement of the upper and lower parts, insert the molar

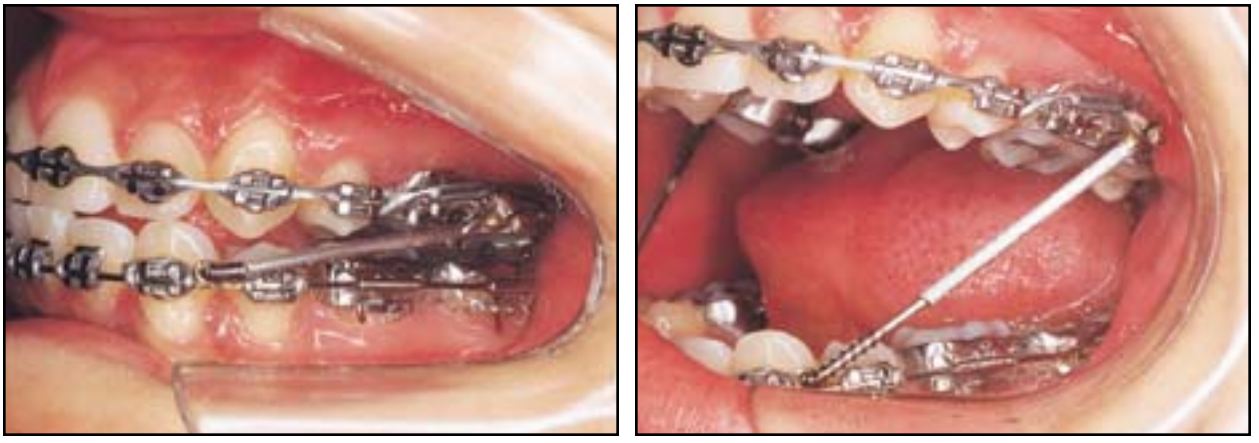

Fig. 17 MPA IV activated by winding section of nickel titanium coil spring over mandibular rod.

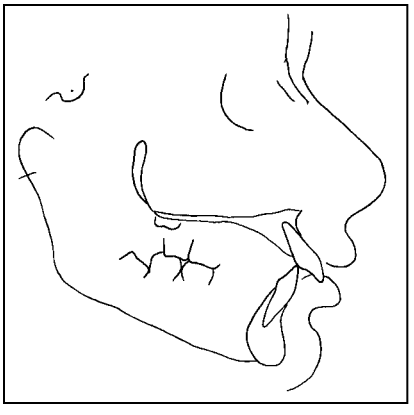

Fig. 18 12-year-old female with Class II, division 1 malocclusion before treatment.

Fig. 19 MPA IV in place.

TABLE 1
CEPHALOMETRIC DATA

	Before Treatment	After Treatment
Wits	+3mm	+0.5mm
S-N	73.5mm	77mm
Go-Me	72.5mm	80.5mm
S-Ar	32mm	34mm
Ar-Go	39mm	42mm
$\overline{1}$-NPg	5mm	5.5mm
SNA	85°	89.5°
SNB	80°	83.5°
ANB	5°	6°
$\underline{1}$-SN	115°	104°
SN-GN	61.5°	61°
S	126°	122°
Ar	134°	140°
Go	123°	130°

locking pin into the mesial end of the first molar tube. With the patient in an incisor edge-to-edge position, measure the distance from the mesial of the molar tube to the circular loop on the mandibular archwire. Then measure the same distance with the patient at maximum opening. If the second measurement is equal to or greater than twice the first measurement minus 2-3mm, there is no possibility of the mandibular rod disengaging from the "T" tube at maximum opening. When inserting the MPA IV from the mesial, assuming the maxillary second molars are banded, the emerging end of the molar locking pin must be bent distal to the first molar tube and tied to the rectangular maxillary archwire.

The MPA IV can be activated on either or both sides simply by winding a section of nickel titanium coil spring over the mandibular rod. The amount of activation will be determined by the number of turns in the coil (Fig. 17).

Case Report

A 12-year-old female presented with a Class II, division 1 malocclusion (Fig. 18). She was treated without extractions using the MPA IV (Fig. 19). A satisfactory result was achieved in 18 months (Fig. 20, Table 1).

Conclusion

The Mandibular Protraction Appliance has proven to be effective during approximately 10 years of clinical use. This fourth version seems to be as efficient as its antecedents, but is much more practical to construct, easy to manipulate, and comfortable for the patient.

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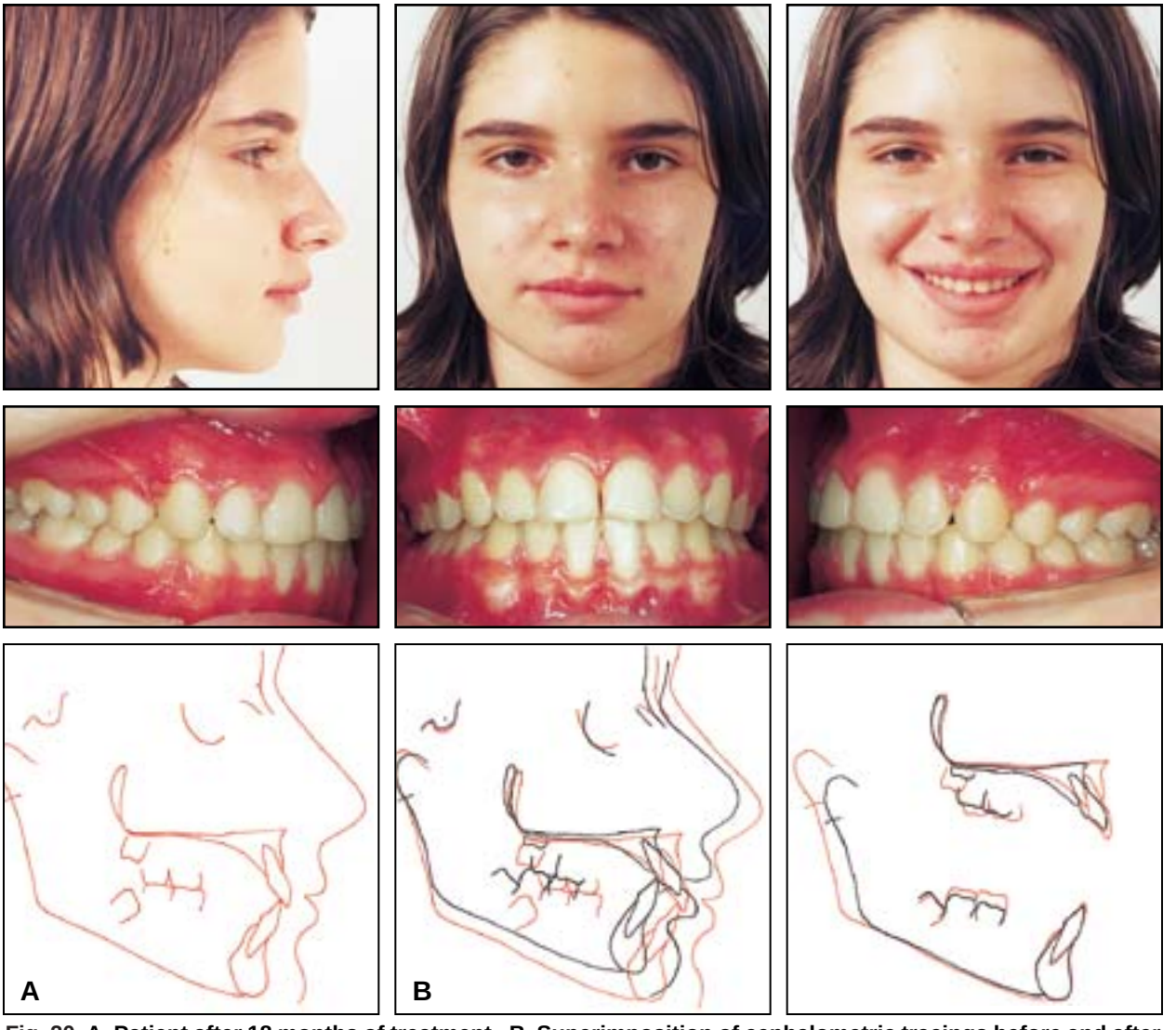

Fig. 20 A. Patient after 18 months of treatment. B. Superimposition of cephalometric tracings before and after treatment.

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