

The Universal Ribbon-Arch Appliance (URA)

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A preadjusted ribbon-arch appliance comprising a plurality of brackets and tubes is presented. The bracket features a rectangular slot in the gingival surface for securing round and rectangular archwires in ribbon-wise mode. The bracket allows free tipping, controlled tipping or bodily movement of a tooth depending on the mode of securing the archwire to the slot. The molar tube features atleast one rectangular tube which is vertical in cross-section, corresponding to the archwire slot of the bracket. The tube provides better control over the molars leading to stronger anchorage. The appliance allows different tooth movements with total control for precise positioning of all the teeth.

Two cases treated with the appliance have been presented.

In contemporary orthodontic practice fixed appliances have become the modality of choice. Broadly these appliances can be categorised as follows :

- 1) The Edgewise appliances and its modifications, mainly the straight wire appliance;
- 2) The Begg appliance, the Kamedanised Begg and the Tip-Edge appliance;
- 3) The Combination appliances.

The Edgewise appliances and specially the preadjusted ones are popular in most of the countries whereas the Begg appliance is still the appliance of choice in India. These appliances have their advantages and disadvantages, hence the combination appliances came into existence.

The advantages of the Edgewise/ PE Appliance are :

1. Total control exerted over tooth movements;
2. Rotation control is adequate;
3. Tooth movements are self limiting;
4. Precise finishing is obtained with rectangular archwires;
5. Simultaneous torquing of anterior and posterior teeth is possible;
6. Mesial movement of posterior teeth is easier.

The disadvantages of the Edgewise/PE Appliance are:

1. The bracket does not allow free tipping in mesiodistal direction as the archwire slot is horizontal;
2. Bodily movements require heavy forces causing loss of anchorage so the anchorage has to be reinforced with stabilising arches or a headgear;
3. Heavy forces cause more discomfort to the patient;
4. Built-in tip in canine brackets in PEA causes deepening of bite anteriorly and mesial movement of crowns;
5. These appliances are expensive.

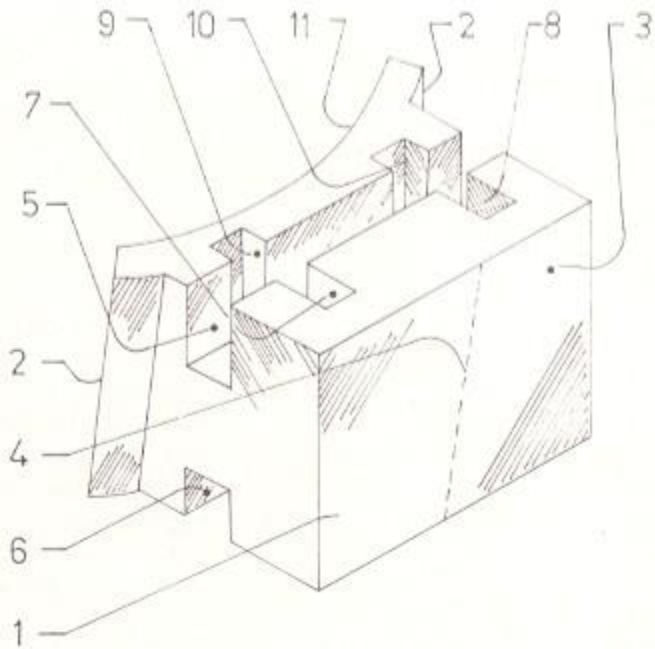


Fig. 1 : URA Preadjusted bracket

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The advantages of the Begg appliance are:

1. Light tipping forces cause less discomfort to the patient;
2. Teeth can be aligned rapidly;
3. Bite opening is effective and quick;
4. Enmasse tooth movements are carried out;
5. It is economical.

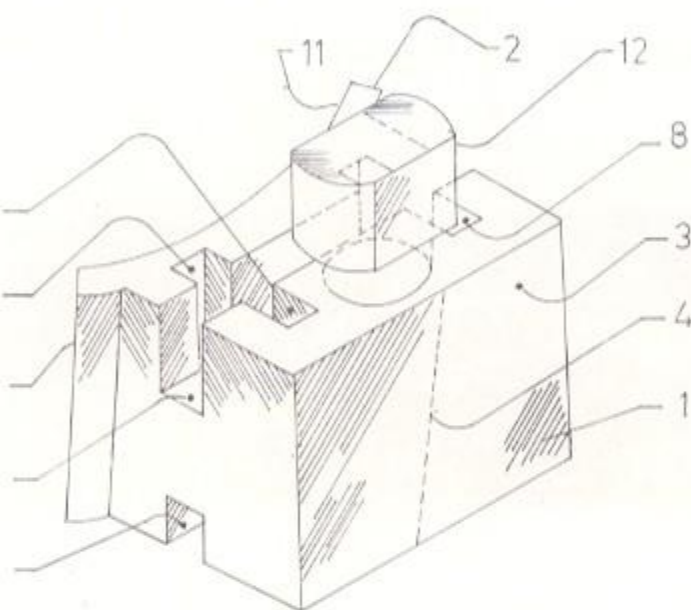


Fig. 2 : URA Preadjusted bracket with hook

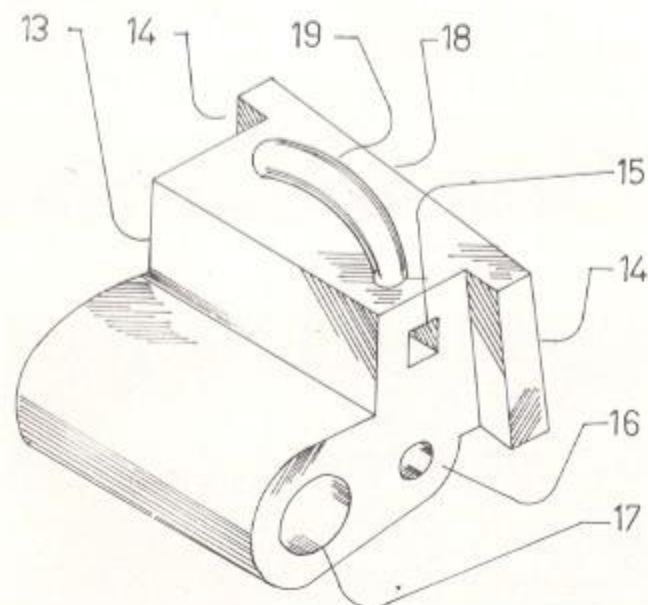


Fig. 4 : URA Upper right first molar tube

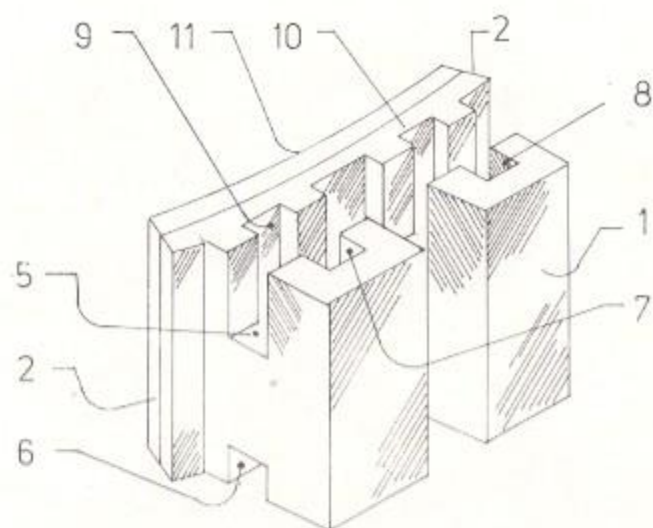


Fig. 3 : URA Plain bracket

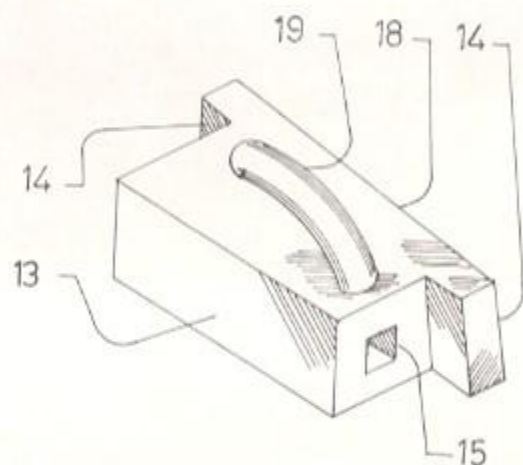


Fig. 5 : URA Upper right second molar tube

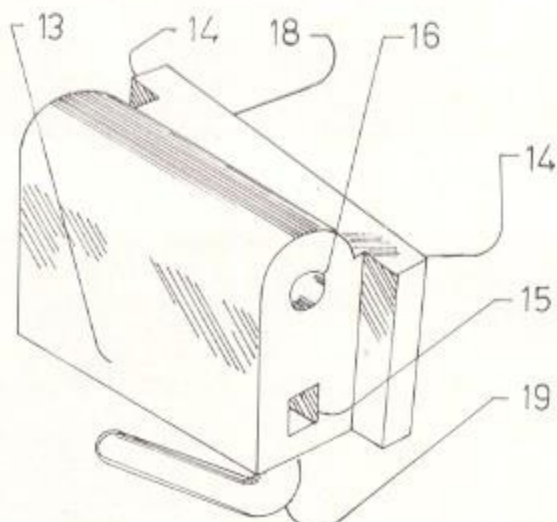


Fig. 6 : URA Lower right first molar tube

The disadvantages of the Begg appliance are:

1. The tipping of teeth is uncontrolled;
2. Tooth movements are not self-limiting;
3. Rotation control is not adequate as the bracket is not wide enough;
4. Precise finishing is difficult as rectangular arch wires are not used with conventional Begg appliance;

5. Torquing of anterior and posterior teeth simultaneously is difficult for the same reason;
6. Bite opening is difficult in some cases;
7. Tendency for the anchor molars to flare distobuccally in Stage III;
8. Mesial movement of posterior teeth is difficult as anterior teeth can not provide adequate anchorage.
9. Overall inadequate control over tooth movement.

The brackets of the combination appliances have one gingival vertical slot and one edgewise (horizontal) slot. These brackets allow free tipping and facilitate precise finishing with rectangular archwires but they are bulky and expensive. However, the later versions of these brackets are quite small with low profile.



Fig. 13 : A,B,C,D,E,F, - Pretreatment view of case V.B.



Fig. 14 A,B,C : Canine retraction



Fig. 15 A,B,C : Incisor retraction

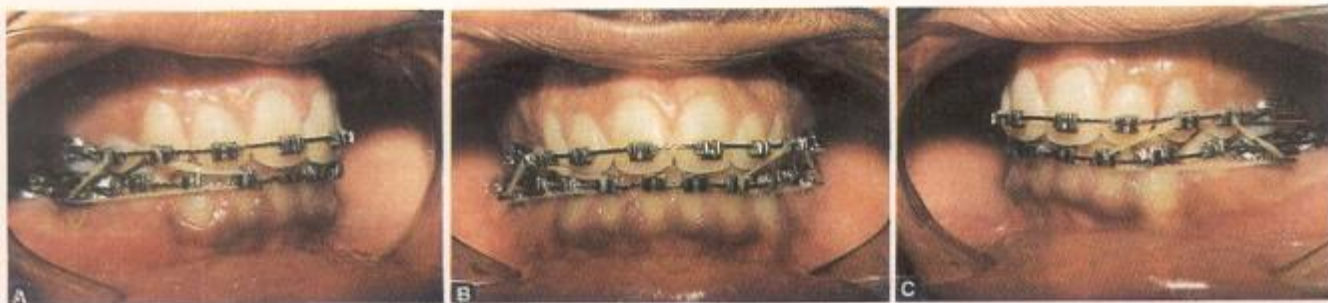


Fig. 16 A,B,C : Finishing with rectangular wires

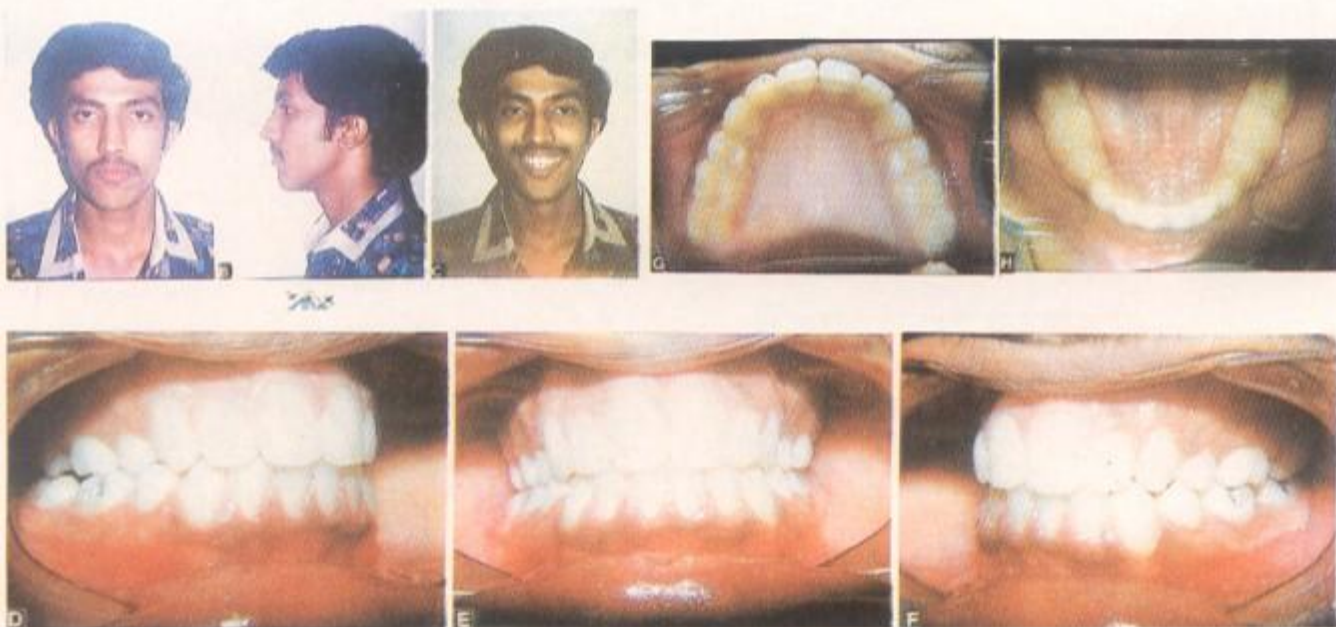


Fig. 17 A,B,C,D,E,F,G,H : Posttreatment views of case V.B.

The Tip-Edge Appliance and the KB Appliance allow limited tipping and precise finishing but special auxiliaries are needed with these appliances which make them more expensive. Also, headgear cannot be used with these appliances for growth modification.

In developing the Universal Ribbon Arch appliance, an attempt has been made to meet almost all the requirements of an orthodontist. This appliance can be used to treat any case efficiently and economically, with optimal results.

The idea of the appliance was first published in 1991 as Begg Ribbon-Arch Combination System (BRACS)¹. But subsequently, while treating patients, it was realised that the bracket of the appliance is not just a combination of two Begg brackets. The appliance is a complete one which can be used to treat all kinds of malocclusions with any of the existing techniques independently or in com-

ination. Hence, with further development, the appliance was renamed as the Universal Ribbon Arch appliance (URA).

APPLIANCE DESCRIPTION

The bracket (Fig. 3) of the Universal Ribbon-Arch appliance (URA) consists of a base (11) contoured to fit the tooth surface and a body (1) which has a main rectangular slot (5) in the gingival surface for engaging round and rectangular archwires. The rectangular archwires are inserted into the slot in a Ribbon-wise mode. The dimensions of the slot are 0.040" x 0.018". The main rectangular archwire slot can take up two wires simultaneously, if needed, as it is deep enough. There is another rectangular slot (6) in the incisal surface. This slot is used for ligature wires, elastic modules and chains. This slot may also be used for an additional archwire. The

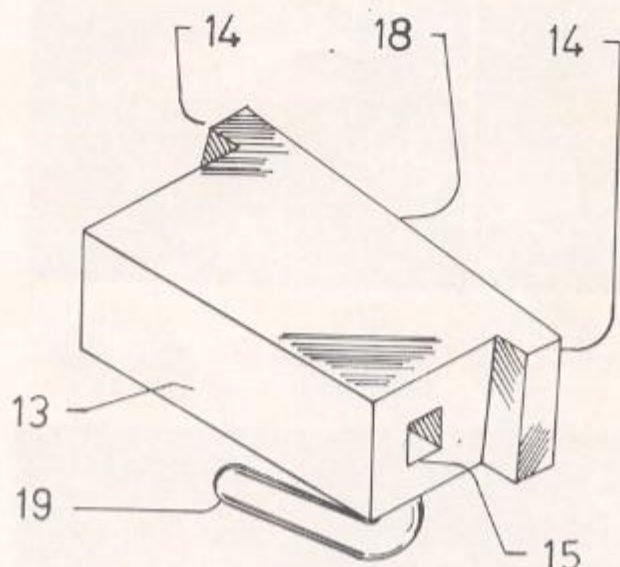


Fig. 7 : URA Lower right second molar tube

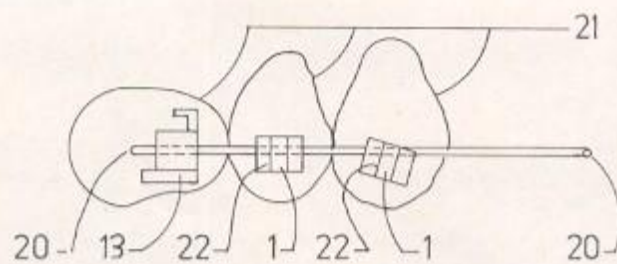


Fig. 10 : Controlled tipping of canine

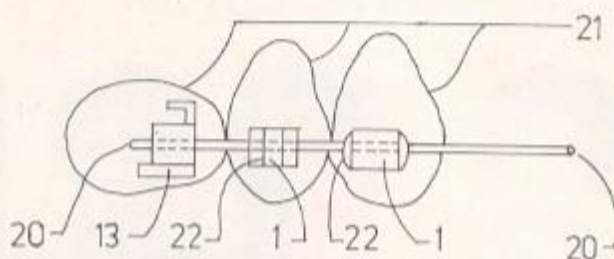


Fig. 11 : Bodily movement of canine

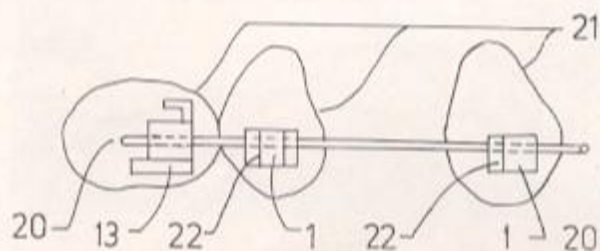


Fig. 8 : Beginning of canine retraction

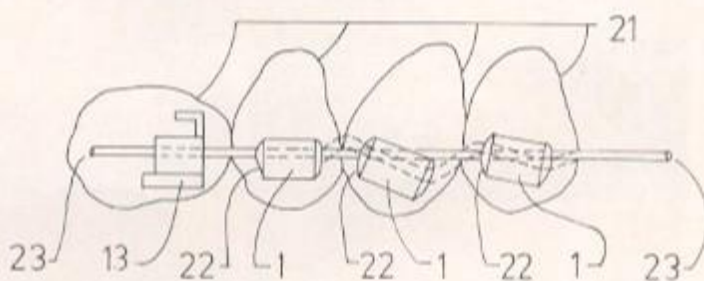


Fig. 12 : Uprighting of canine and lateral incisor

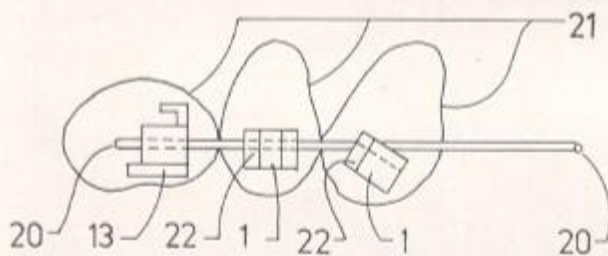


Fig. 9 : Free tipping of canine

dimensions of this slot are 0.020" x 0.020". A pair of vertical slots (7,8,9,10) pass through the body of the bracket. These are split into labial (7 & 8) and lingual parts (9 & 10) by the main rectangular archwire slot in the gingival surface and the slot in the incisal surface. These vertical slots are used for lockpins and ligature wires. The labial parts can also be used for uprighting springs, if needed.

In a URA preadjusted bracket (Figs. 1 & 2) the main slot makes an angle with the base in the vertical direction so that a positive or negative root torque is exerted on to

Numerical codes explaining parts of the appliance :

1. Bracket
2. Flanges
3. Identification Marking
4. Tip-angle marking
5. Main rectangular archwire slot
6. Incisal slot
- 7,8,9,10. Vertical slots
11. Base of the bracket
12. Hook
13. Tube
14. Flanges
15. Ribbon-Arch tube
16. Round tube
17. Headgear tube
18. Base of the tube
19. Hook
20. Arch wire
21. Tooth
22. Ligature wire
23. Rectangular arch wire



Fig. 18 A,B : Pre and Posttreatment Panoramic views of case V.B.

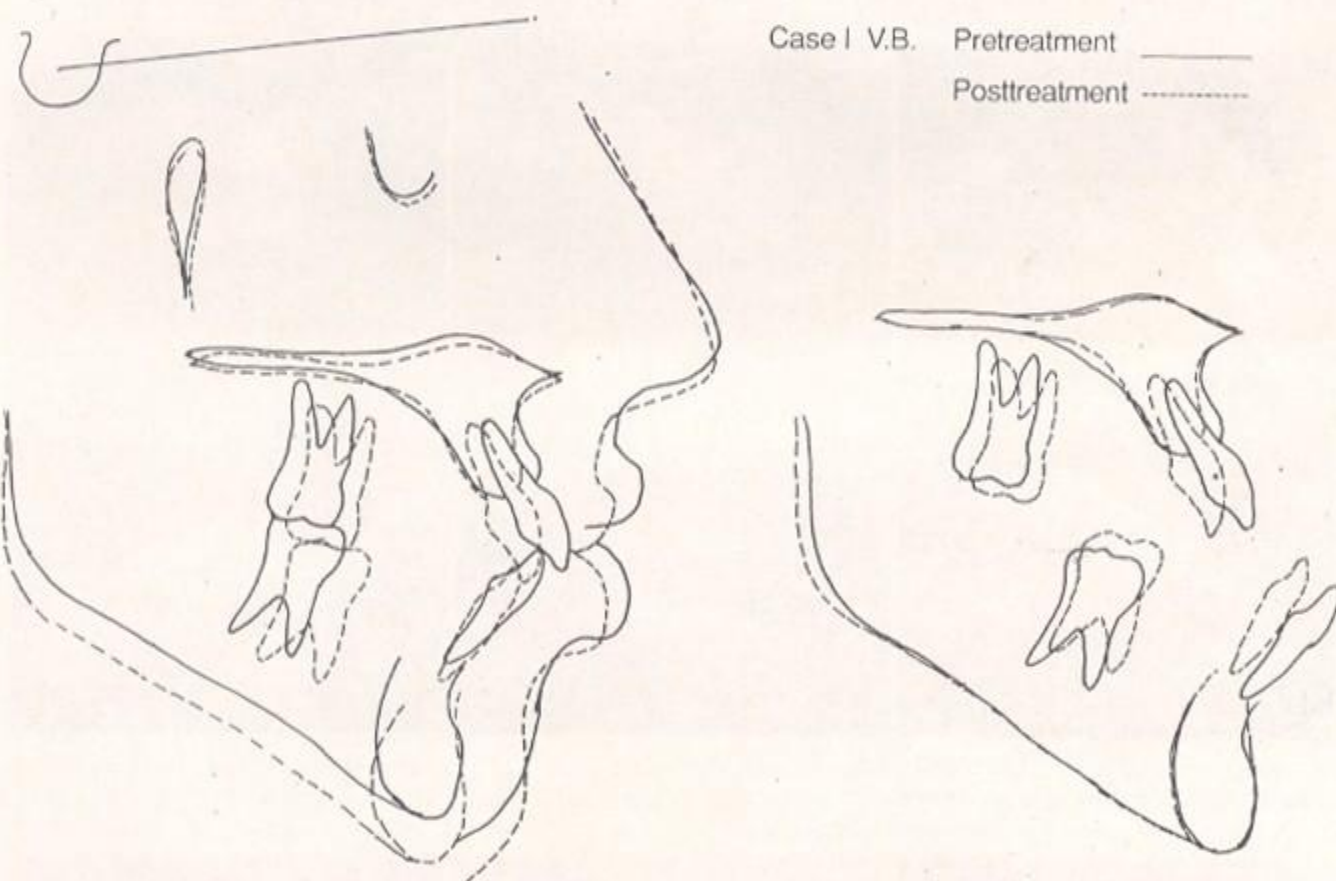


Fig. 19 : Pre and Posttreatment cephalometric tracing in case V.B.

the tooth when a rectangular archwire is engaged into the slot. The labial surface of the bracket has a tip angle marking (4). The marking line has to correspond with the long axis of the tooth when the bracket is bonded on to the tooth, so that at the end of the treatment the tooth is placed with the desired axial inclination mesiodistally. The thickness of the base varied to eliminate the "in and

out" bends. Since the bracket is specific for each tooth an identification marking (3) is put on the labial surface. A hook can also be added on lateral incisor bracket for engaging elastics. Flanges (2) are provided for welding on a band or a meshpad to the base.

All the first and second molar tubes (13) (Figs. 4,5,6

& 7) have a rectangular tube (15) in Ribbon-wise mode. The dimensions are 0.025" x 0.018". These are also preadjusted with a built-in torque and distal offset. The upper first molar has triple tubes (Fig. 4). There is one rectangular tube¹⁵ for the main archwire, one round tube (16) incisal to the rectangular tube for an additional round archwire and a headgear tube (17) buccal to the

round tube. A headgear can be used for growth modification. It can also be used for distalising molars and/or reinforcement of anchorage in some critical anchorage cases. The lower first molar tube (Fig. 6) has double tubes, one rectangular (15) and the other round (16). The rectangular tubes on the first molars can be manufactured as convertible tubes. Flanges (14) are provided to weld the base (18) to molar bands. Hooks (19) can be used for engaging elastics, chains etc.



Modes of tooth movements

The new bracket (URA) presented here allows free tipping, controlled tipping or bodily movement of teeth



Fig. 20 A,B,C,D,E,F : Pretreatment views of case N.D.

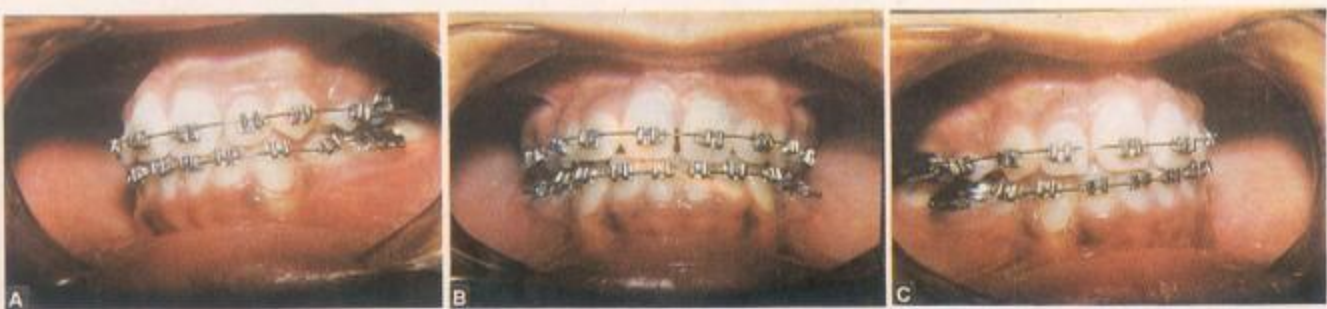


Fig. 21 A,B,C : Beginning of canine retraction



Fig. 22 A,B,C : Incisor retraction

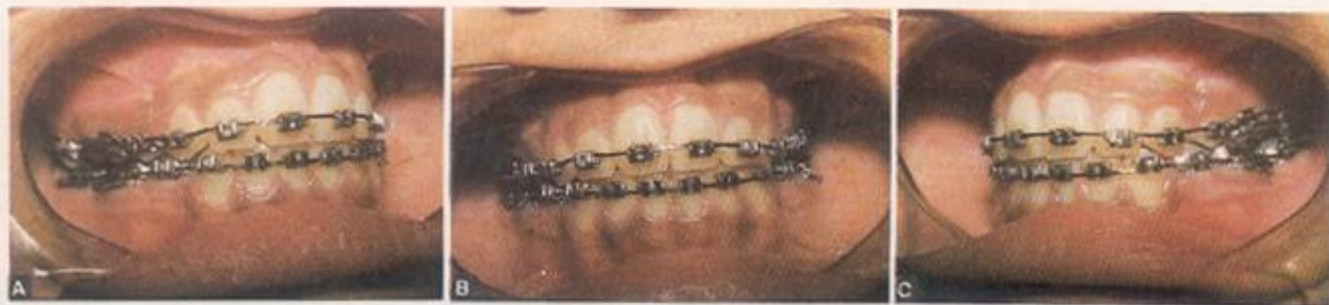


Fig. 23 A,B,C : Finishing with rectangular archwires of case N.D.

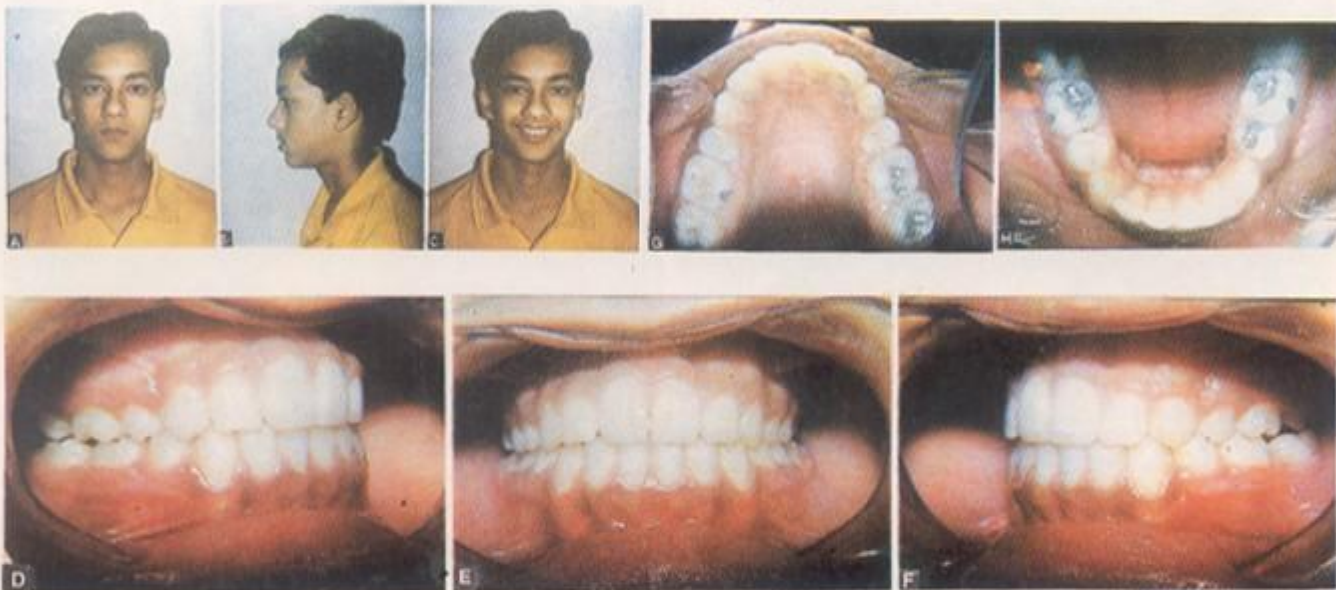


Fig. 24 A,B,C,D,E,F,G,H : Posttreatment views of case N.D.

at will. The method of engagement of the archwire to the bracket determines these selective movements. If the archwire (20) is tied with a ligature wire (22) or pinned to the distal slot, the tooth (21) can freely tip distally (Figs. 8 & 9). Limited distal tipping results if the archwire is tied loosely to the mesial slot (Fig. 10). If the tooth is upright and the archwire is tied from the mesial to distal of the bracket, or is pinned or tied to both the slots, bodily movement takes place (Fig. 11). A tipped tooth can be uprighted with the bracket without using an uprighting spring by tying the archwire tightly to both the slots (Fig 12). Once a tooth is upright, it can be held upright as long as it is tied to both the slots. This way the tooth can serve as a good anchor. The second premolars can reinforce the anchorage in this manner in first bicuspid extraction cases. As it is evident, some teeth can be uprighted early and other teeth can be allowed to tip as desired in both the mesial as well as the distal directions.

The URA bracket allows free tipping in labiolingual direction with a round archwire, torquing is possible with a rectangular archwire as it is with other brackets and systems. Precise finishing is obtained with the URA Appliance using a rectangular arch wire. Since the rectangular arch wire is used in ribbonwise mode, the stiffness of the wire is less, so lighter forces are exerted as compared to those exerted by edgewise arch wire.

Two cases treated with this appliance are presented here. The brackets are not preadjusted. They were hand-made by joining two Begg brackets. The slots were compressed to 0.018" slot over a wire template. The molar tubes are combination tubes from T.P. Laboratories*. The rectangular tube is 0.025" x 0.018" and the round tube is 0.036" in diameter. The round tube was kept gingival for the lower molars to avoid occlusal interference. However, the round tubes were not used

* TP Laboratories, La Porte, Indiana, USA.

throughout the treatment as ribbon-wise rectangular tubes provide better control by preventing rolling of the wire in the tubes.

Case I (V.B.)

The patient was an adolescent, 15 years old, with a skeletal Class II relationship. The profile was slightly

convex and the lips were incompetent (Fig. 13 A,B,C).

Clinical examination showed crowding in the anterior region and the molar relationship tending to Class II. The first molars on the right were in cross-bite. The upper right cuspid was impacted and the lower left canine was placed buccally. The midline was shifted (Fig. 13 D,E,F).

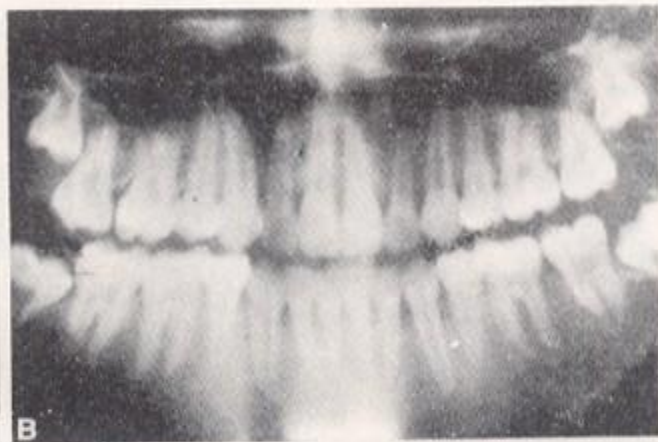
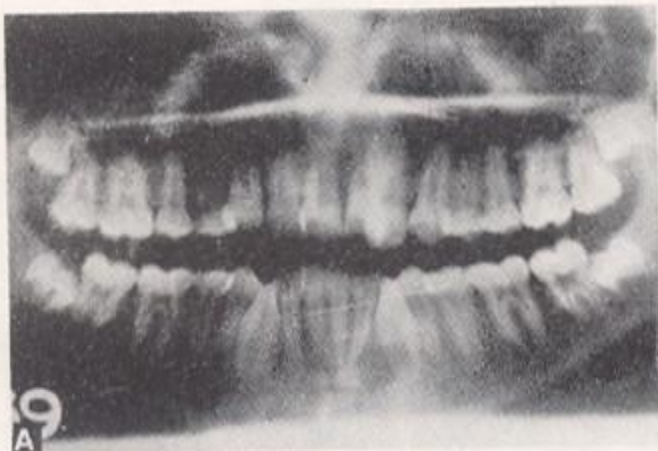
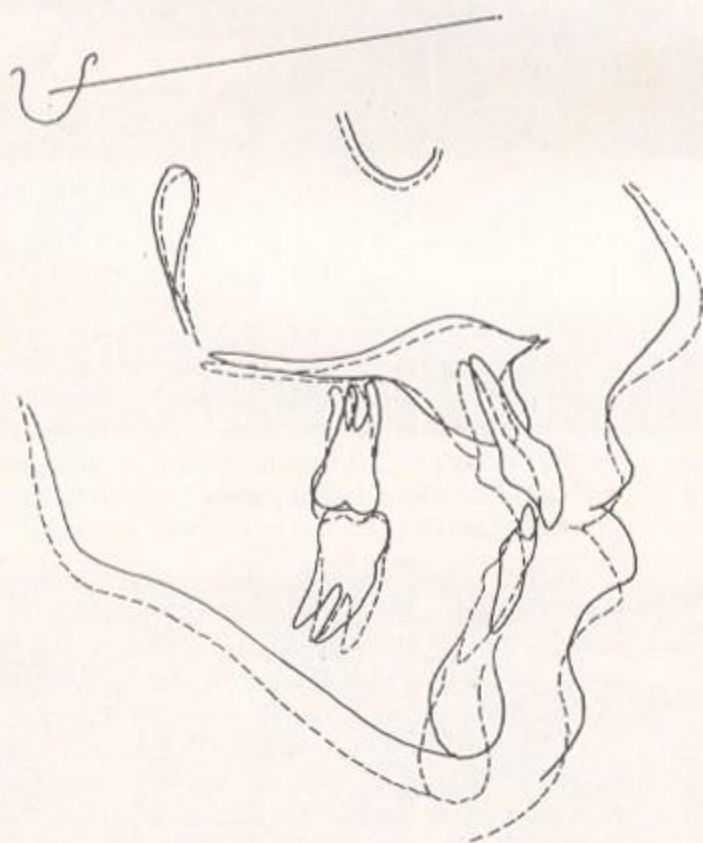


Fig. 25 A,B : Pre and Post-treatment Panoramic Views of Case N.D.



Case II N.D. Pretreatment _____
Posttreatment - - - - -

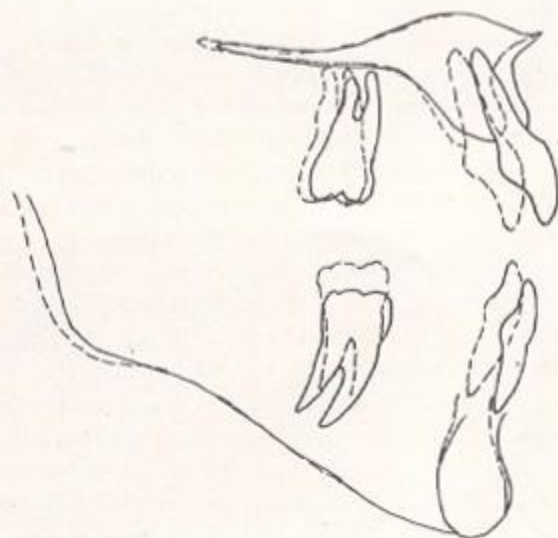


Fig. 26 : Pre and Posttreatment cephalometric tracing in case N.D.

Cephalometric study showed SNA 83°, SNB 78°, ANB 5°, Interincisal angle 114°, Lower incisor to APog 7 mm, FMA 30°, FMIA 53° and IMPA 97°. Bjork's Analysis showed clockwise growth trend.

Since there was a severe arch length to tooth size discrepancy it was decided to extract all the first bicuspids.

The upper right cuspid was surgically exposed at the time of extractions.

The appliance was fitted and Nitinol 0.016" archwires were given initially for alignment. The wires were tied indirectly to the brackets wherein the wires could not be engaged. The wires were engaged into the slots in subsequent visits and upper right canine ties were tightened. A transpalatal arch was given to reinforce the anchorage and to expand the molars. In three months time the upper canine bracket could be engaged directly and the molar cross-bite was corrected.

Next, 0.016" S.S. wires with loops mesial to the molar tubes were given. The loops were tied back. Canine retraction was started with power chains. The canine brackets were tied distally to allow free tipping. The premolar brackets were also tied distally to prevent their mesial tipping (Fig. 14 A,B,C). As the canines were tipped and not bodily translated, there was minimal friction between the wire and the brackets. Very light forces were required to retract the canines.

After canine retraction, 0.016" x 0.016" S.S. rectangular archwires with retraction loops were given for the retraction of incisors. The wires were cinched back periodically to activate the loops. Since the incisors were retracted with loops, friction between the wire and the brackets or the molar tubes was eliminated thus reducing the forces required for the retraction (Fig. 15 A,B,C).

After all the spaces were closed 0.025" x 0.017" multistrand rectangular archwires were given for precise setting of the teeth. The lower second molars were banded to improve the distal tipping of the first molars. Box elastics were given to settle the occlusion in the canine and premolar regions (Fig. 16 A,B,C).

At the end of treatment the teeth were well aligned and in good occlusion. The midline was corrected (Fig. 17 D,E,F,G,H).

Extraoral examination showed a considerable improvement in the profile and a pleasing smile (Fig. 17 A,B,C).

The cephalometric analyses showed SNA 82°, ANB 78°, ANB 4°, Interincisal angle 123°, Lower incisor to APo 4 mm, FMA 32°, FMIA 58° and IMPA 90°. The patient grew through the treatment period as seen in Fig. 19.

Case II (N.D.)

A 12 year old boy presented skeletal Class I relationship. The profile was almost straight. The lips were incompetent (Fig. 20 A,B,C).

Clinical examination showed crowded anteriors and the molars tending to Class III relationship. The bite was deep and the upper left lateral incisor was in cross-bite. The lower left canine was placed buccally. Midline discrepancy existed (Fig. 20 D,E,F).

The cephalometric study showed SNA 83°, SNB 82°, ANB 1°, Interincisal Angle 138°, lower incisor to APo 5 mm, FMA 37°, FMIA 61°, IMPA 82° and Bjork's analysis showed clockwise growth trend.

Since a severe archlength to tooth material discrepancy existed, it was decided to extract all the first premolars.

The upper anteriors were bonded except the left lateral incisor as it was in cross-bite. Molar bands were cemented and 0.016" Niti wire was engaged. After a short while a bite plate was given to relieve the interference to the left lateral incisor and a bracket was bonded onto the tooth and tied indirectly. During subsequent visits the wire could be engaged directly to the bracket. After four months of treatment, the lower anterior brackets were bonded and a 0.016" Niti wire was given. A lower lingual arch was placed to reinforce the anchorage.

The second premolar brackets were bonded and the bite plate was discontinued after the anterior teeth were aligned. 0.016" S.S. archwires were given in both the arches. The canines were retracted with powerchains (Fig. 21 A,B,C). Subsequently a 0.016" x 0.016" square archwire with loops was engaged in the upper arch to retract the incisors. The spaces in the lower arch had closed earlier (Fig. 22 A,B,C).

Then 0.025" x 0.017" multiflex rectangular arch wires were given to settle the teeth in their proper axial inclinations. Second molars were banded to correct distal tipping of the first molars (Fig. 23 A,B,C).

At the end of treatment, the teeth were well aligned

and in good occlusion. The midline was corrected (Fig. 24 D,E,F,G,H).

Extraoral examination showed a good profile and smile line (Fig. 24 A,B,C).

The cephalometric analyses showed SNA 81.5°, SNB 80°, ANB 1.5°, Inter incisal angle 131°, lower incisor to APo 3 mm, FMA 40° FMIA 55°, IMPA 85°. The treatment changes are seen in (Fig. 26).

SUMMARY

A new fixed orthodontic appliance is presented which promises to fulfil the requirements of contemporary orthodontic practice.

The advantages of the Universal Ribbon-Arch (URA) Appliance are :

1. The bracket allows free tipping, limited tipping or bodily movements of teeth as desired by the operator
2. It allows rapid differential movements with light forces
3. The anchorage control is better
4. Precise finishing can be obtained with rectangular archwires

5. Mesial movement of posterior teeth is easier as the anterior teeth can provide better anchorage
6. The bite opening is effective
7. Use of headgear for growth modification is possible
8. Minimal patient co-operation is required as the use of elastics is less
9. Bio-progressive and Segmented Arch Technique concepts are applicable as rectangular archwires can be used with this appliance
10. Optimal results can be obtained in all types of cases.

Two cases treated with this appliance have been presented. Some more cases are being treated and the results will be published in due course of time.

The appliance is in the process of being manufactured and will be marketed in due course of time. Queries and suggestions regarding the appliance are welcome from the readers.

REFERENCE :

1. Vashi N.S.; Begg Ribbon Arch combination system (BRACS) A new approach, *J. Ind. Orthod. Soc.*, 1991, 22 : 30-32.

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