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UTILITY ARCHES IN ORTHODONTICS – CASE REPORTS

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ABSTRACT

Utility arches, originally designed by Ricketts as a part of his Bioprogressive therapy, are one of the most versatile auxiliary arch wires. They can be used for a wide variety of orthodontic tooth movements including protraction, retraction, intrusion and to hold teeth passively. They are also called as 2 x 4 appliances and can be used in both permanent and mixed dentitions. Their construction and applications are well illustrated with case reports.

KEY WORDS: Auxiliary, Bioprogressive Therapy, Protraction, Intrusion, Utility Arches.

INTRODUCTION

The utility arch is one of the most versatile auxiliary arch wires that can be used in various stages of orthodontic treatment in either mixed or permanent dentition. It was originally developed to provide a method of leveling the curve of spee in the mandible, according to the biomechanical principles described by Burstone.[1,2] Later, it has been adapted to perform many more functions and as a major component of Bioprogressive Therapy.[3,4]

Construction

The utility arch is a continuous archwire that extends across both buccal segments, but made of different wires for different uses and also based on which arch it is used in. It encompasses only six teeth viz., the two first permanent molars and the four incisors. Hence, it is also called as the 2 x 4 appliance. With a .018" appliance, the recommended wire for the mandibular arch is .016" × .016" or .016" × .022" Blue Elgiloy. For most maxillary arches, .016" × .022" Blue Elgiloy is recommended. With a .022" appliance, .019" × .019" Blue Elgiloy can be used in either arch.[4] When using utility arches in combination with full arch appliances, it is necessary to have auxiliary tubes in a gingival position on the first molar bands. In a pre-orthopedic phase of treatment when the buccal segments are not banded, the main buccal tube or bracket on the first molar can be used to anchor the utility arch posteriorly.[5]

Case Reports

Case 1: Passive Utility Arch

Any irregularities in the position of the anterior teeth are usually corrected with a sectional leveling arch before a utility arch is placed. The passive utility arch can be used for stabilization or space maintenance in either the mixed or permanent dentition. It is ideal in the mixed dentition, when it permits eruption of the canines and premolars. It allows maintaining arch length during the transition of dentition. It is also used in permanent dentition, primarily for the maintenance of anchorage. A passive utility arch by definition is not activated and should not move teeth in any direction.

A posterior vertical step, usually 3-4mm long is formed connecting the horizontal or vestibular segment. The anterior vertical step measures 5-8mm.[4]

A 10 year old male patient S.K. reported with the chief complaint of forwardly placed upper front teeth. His hand wrist radiographs showed he still had lots of growth left (stage 2 according to Julian Singer) (**Fig. 1**) .

Hence, it was decided to give a holding utility arch to hold the dentition of the upper arch anticipating the mandibular growth to catch up. An initial phase

Case report 1

Fig .1.**Pretreatment Intraoral Photographs**

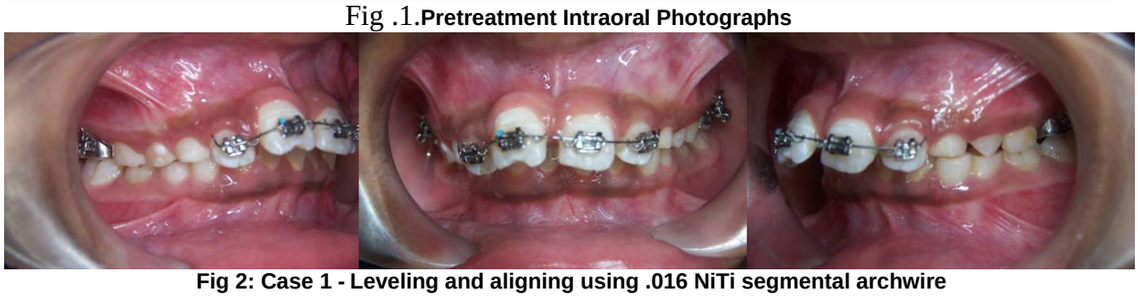

Fig 2: Case 1 - Leveling and aligning using .016 NiTi segmental archwire

Fig 3: Case 1 - Passive upper utility arch

of aligning was done using .016 NiTi archwire **(Fig. 2)**. A holding/passive utility arch was given in the upper arch **(Fig.3)** .

Case 2: Intrusion Utility Arch

The intrusion utility arch is designed similarly to the passive arch, but it is activated to intrude the lower anterior teeth.[5, 6] Any type of utility arch can be activated for an intrusive movement by placing an occlusally directed gable bend in the vestibular segment.

Engaging the utility arch will produce, by the long lever arm, approximately 20 - 25g of force on each of the lower incisors - a force level considered ideal for lower incisor intrusion.[3] The overall effect is an intrusion and possible torquing of the lower incisors, as well as a tipping back of the lower molars.[5]

A 20 year old male patient R.K. reported to the department with the chief complaint of missing upper front teeth and lower teeth striking upper gums. He had missing 11, 21 with Angle's class I molar relationship. **(Fig. 4)**

Hence, it was decided to give an intrusion utility arch to create clearance between the incisors and gums following the chief complaint of the patient. The upper arch was strapped up with a sleeve to maintain the space between 12, 22 **(Fig. 5)**. An intrusion utility arch with a gable bend of 30° on either side was given in the lower arch. The deep bite was corrected by 3mm within a period of six months. **(Fig. 6)**

Case 3: Protrusion Utility Arch

The protrusion utility arch is useful for proclining upper and lower incisors. It is most commonly used for flaring and intruding maxillary incisors in Angle's class II division 2 cases.

In contrast to the retraction utility arch, the posterior vertical step of the protrusion arch must be in flush with the auxiliary tube. When the protrusion utility arch is passive, the anterior segment should lie

Case report 2

Fig. 4. Case 2 - Leveling and aligning using .016 NiTi archwire

Fig. 5. Case 2 - Lower intrusion utility arch placed with 30° occlusal gable bend

Fig.6. Case 2 – After 6 months, 3mm of deep bite correction was achieved

approximately 2mm anterior to its expected position in the incisor brackets. An occlusally directed gable bend in the vestibular segment can be used for intrusion.[4]

A 26 year old patient by name K.R. reported to the department with the chief complaint of irregular upper front teeth and wearing off of the lower front teeth. He had Angle's class II division 2 malocclusion with retroclination of both the upper central incisors**(Fig. 7)**.

It was decided to give a protraction utility arch to procline both the upper central incisors so that they are in alignment with rest of the dentition in upper arch**(Fig.8)**. An initial segmental aligning phase was done using .016 NiTi archwire. The protraction utility was placed with initial activation of 2mm anterior to the incisor bracket slots**(Fig. 9)**. The protraction was achieved in six months**(Fig. 10)**.

Other Considerations

1. *Retraction Utility Arch:*

   The retraction utility arch can close interproximal spaces while intruding and aligning the upper anterior teeth. The archwire of 5-8mm is kept mesial to the molar tube and then the posterior vertical step of 3-4mm is placed. After a 5-8mm anterior vertical step, a gentle anterior contour is placed in the wire to simulate the arch form.

   As with the intrusion utility arch, there are two possible types of activation. First, a Weingart plier can be used to pull 2-3mm posteriorly and cinch. Second, an occlusally directed gable bend in the vestibular segment can be used.[5]

Case report 3

Fig 7: Case 3 – Pretreatment Intraoral Photographs

Fig 8: Case 3 - Upper Protraction utility arch placed

Fig 9: Case 3 – After 6 months of protraction

Fig 10: Case 3 – Pretreatment and post protraction comparison

2. Placing torque in the auxiliary tube so that the roots of the molars are tipped buccally into the buccal cortical plate - "cortical anchorage". [4]
3. Utility arches can be designed differently for extraction and nonextraction cases.[3,4]
4. Utility arches can be used - both in orthopedic and orthognathic surgical therapy - to move upper and lower incisors gingivally. [4]

CONCLUSION

The utility arch is an integral part of interceptive as well as comprehensive orthodontic treatment. It is efficient in intruding upper and lower incisors and is especially effective in protruding and retracting anterior teeth.

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