

Review Article

Quad helix-A review of literature

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ABSTRACT:

Maxillary quad-helix appliance is a usually used method for treatment of maxillary arch constriction and/or posterior crossbite. The quad-helix expansion was accomplished with a prefabricated .036" quad-helix soldered to bands on the maxillary molars. Along with the utility arch and sectional mechanics, the quad helix appliance has become an integral part of the bioprogressive technique. This review article discusses about clinical course and effects of maxillary expansion using the quad-helix appliance.

Received: 22 May, 2021

Accepted: 24 June, 2021

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This article may be cited as: Ayyapillai A, Jayakumar P. Quad helix-A review of literature. J Adv Med Dent Scie Res 2021;9(7):71-73.

INTRODUCTION

Functional posterior cross-bites are supported by a lateral shift of the mandible to evade occlusal interferences. The mandibular shift produces a midline deviation, a unilateral cross-bite involving multiple teeth, and a condylar rotation toward the cross-bite side^{1,2}. Consequently dental, skeletal, and neuromuscular adaptation results in a constricted maxillary arch of insufficient width to encompass the mandibular arch in a normal closure pattern^{3,4}. The functional posterior cross-bites correcting earlier has been optional to allow normal closure patterns and use dynamic growth periods to achieve beneficial changes. The correction is accomplished by eliminating the occlusal interferences and increasing the maxillary arch width to allow normal vertical closure⁵⁻⁷.

Haas and Wertz, two authors have explained that rigid jackscrew palatal expander create an orthopedic separating force that lies in the range of 3 to 10 lbs. This quite heavy orthopedic force is able to create a midpalatine separation of 10 to 15 mm^{8,9}. A review of clinical and animal studies indicates that lingual arch wire appliances may produce material orthopedic effects in combination with orthodontic movements during maxillary expansion procedures, particularly in younger age groups. Increased maxillary arch width may be treated by rapid palatal expansion with jackscrew appliances or by fixed lingual arch wire appliances using low, continuous force application.

Rapid palatal expansion increases maxillary arch width by a combination of orthopedic movements (bony separation and remodeling at sutural articulations) and orthodontic movements (tooth tipping, bodily translation).

Fixed lingual arch wire provide advantages such as increased anchorage and retention, minimal effects on speech, continuous action over a period of time, and removal of adjustment responsibility from the patient and parents. The four helical loops was incorporated into the standard W arch design created the quad-helix effect. It helps to increase the range of force application, allow increased flexibility, increase molar rotational ability, and refine adjustment capability. This current review article explain in detail about Quad helix.

QUAD HELIX

The quad helix appliance with presence of four helical loops is a modified version of transpalatal Coffin spring. Every helical loops adds an additional 25 mm of wire to the appliance which lightens the force magnitude, rendering a more continuous action due to the greater range of activation provided by the longer wire. The quad helix appliance was illustrated by Ricketts in 1975, or the earlier "W" appliance were both used with great achievement for cleft palate in where lateral maxillary segments had collapsed.

The quad helix appliance action is to buccally expand and to distally rotate the maxillary molar teeth and then, because the extended arms have a fan-like sweeping action. They can be used to expand the maxillary bicuspid and cuspid teeth. A quad helix appliance that is activated to derotate a maxillary molar on one side of the arch provides a distalizing force at the molar on the opposite side of the same arch. This reciprocal force system enables orthodontists to activate the arms of the quad helix to offer the desired forces at individual teeth. The extension of the palatal arms of the appliance on one side, it can involve more teeth on that side to act as anchorage in the distal movement of a single molar on the opposite side of the arch.

In the narrow restricted maxillary arches, the quad helix appliances tip the maxillary molar teeth and their alveolar sockets buccally, and that this tipping results in a warping of the alveolar ridges. The molar derotation is best treated by leaving the anterior arms of the quad helix away from the lingual surfaces of the cuspid teeth. As the molar teeth derotate, the anterior arms will come to push against the cuspid teeth and they will then expand together with the rest of the maxillary teeth.

DESIGN OF THE APPLIANCE

The design of this appliance is prefabricated quad helices generally come in four different sizes and they may be made-up from 0.38" round stainless steel or blue Elgiloy wire (Rocky Mountain Orthodontics, Inc, Denver, CO)¹⁰. The amount of expansion force exerted by a particular quad helix depends on the amount that it is expanded before insertion. The quad helix that seems to fit many if not most patients, delivers 370 to 420 g of expansion force when activated 10 to 15 mm. The magnitudes of dental expansion that can be achieved with quad helix appliances are illustrated in table 1.

The maxillary molar teeth require derotation, expansion force will be intended for at these molars in the initial stages of treatment. As the maxillary molar teeth are derotated, the palatal arms of the appliance will connect the teeth in the buccal segments of the arch and the expansion force on the molar teeth is reduced. In many circumstance, the molar derotation effected by the quad helix appliance causes sufficient molar distalization to resolve most minor Class II end-to-end molar malocclusions. The amount of 3 to 5 mm of arch length is gained as the molar teeth are rotated buccally and distally.

Table 1. Forces created by the Activation of the Quad Helix Appliance

Activation Expansion	5 mm	10 mm	15mm
Size 1	370gm	720 gm	
2	350 gm	490 gm	
3	310 gm	440 gm	480 gm
4	260 gm	370 gm	420 gm

The expansion of the maxillary arch results in a "passive" expansion of the mandibular widths. Other words, it is advantageous to place a bi-helix appliance in the mandibular arch to get and continue a balance in the dimensions of the maxillary and mandibular arches. After cementation, it is possible to activate a quad helix after it has been cemented to the teeth and complex activations are required, it may be sensible to remove the appliance and then to activate it before recementation.

MODIFICATION OF QUAD HELIX

As a result of placing .045" wire sections in the headgear tubes of the maxillary molar bands, the appliance may be used in combination with a protraction face mask in the direction of advance the maxilla. The anterior bar of the quad helix appliance may be modified to control the eruption of anterior teeth. This appliance may also be used to maintain space and to augment anchorage when required.

ADVANTAGE

The activating the quad helix appliance in this manner lies in the fact that the maxillary teeth are expanded in a differential manner that "sweeps" them into the ovoid arch form of the final occlusion.

CONCLUSION

The patient age, rate of expansion, magnitude of applied transverse force, appliance design, and retention protocol are variables affecting treatment time. Current evidence appears to support a treatment rationale of early correction using a slow expansion procedure, individual variables must be considered in determining an expansion protocol that will affect the quantity and quality of the expansion changes.

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