

CASE REPORT

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## Slow Expansion In Cleft Patient With Quad- Helix

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### ABSTRACT:

The quad-helix appliance was developed with a vision to generate low force magnitudes. The treatment of posterior crossbite is routine in pediatric dentistry; thus, consensus over orthodontic and orthopedic changes occurring with the use of the quad-helix fixed appliance is of fundamental importance in primary dentition. The inclusion of four helical loops in the design led to increased appliance size, which in turn extended the range of the forces generated and improved the system's flexibility. The main advantages offered by the quad-helix appliance are that child or parent compliance with the treatment is not strictly necessary, and that the patient enjoys greater comfort and better adaptation. Moreover, the hygienic procedures involved are simple, total treatment times are short, and the activation forces needed are smaller as compared to other orthodontic appliances.

*Key words: Quad-helix, Slow-expansion, Mixed dentition*

### Introduction

Posterior crossbite is a transverse discrepancy of the dental arches. It affects primary and mixed dentition in children, with prevalence that varies from as little as 8% to as much as 80%.<sup>1-2</sup> The etiology of crossbite is complex, and has been related to genetic, congenital, and functional parameters. Several different kinds of posterior crossbite have been investigated, though it is known that in approximately 90% of cases the original problem is of functional and unilateral nature.

The correction of posterior crossbite in primary and mixed dentition aims to (i) profit from the bioelastic features of the bone; (ii) redirect permanent tooth germs; (iii) promote better skeletal interactions between the apical base; (iv) correct inappropriate temporomandibular joint patterns; (v) support normal mandible closing course; and (vi) contribute to the better self-esteem of the child patient.

Approaches to treat the posterior crossbite include the use of selective abrasion of primary

canines, the re-positioning of individual teeth with elastomer bands, and the expansion of the constricted maxillary arch.<sup>5</sup>

### History

The first of the Porter progeny for the lateral palatal development is the Ricketts version – quad-helix appliance.<sup>6</sup> This all wire “upper-only” appliance appears to be an offshoot of the Crozat philosophy on initial inspection. It derives its name from the four helical coil loops, which give it its active force. He modified it by placing helices anteriorly and posteriorly to increase flexibility. It is said to have evolved from the original coffin loop.

### Construction

It could be made from 1.2mm stainless steel wire though Ricketts originally prescribed 0.038 Elgiloy as it facilitates intraoral adjustment. It is designated to produce 500g of force effecting widening of the appliance by 3-8mm.

The quad-helix consists of a pair of anterior helices. The portion of wire between the anterior helices is called anterior bridge. The wire between the

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anterior and posterior helices is called the palatal bridge. The free wire ends adjacent to the posterior helices are called outer arms. They rest against the lingual surface of the posterior teeth and are soldered on to the lingual aspect of the molar bands.

The quad-helix can be used to expand a narrow arch as well as to bring about rotation of molars. It can be preactivated by stretching the two molar bands apart prior to cementation or by using three prong pliers after cementation. This brings about a slow dentoalveolar expansion. But when it is used in children during mixed dentition and early mixed dentition periods a skeletal midpalatal splitting can be achieved.

It has also been discovered that this appliance would not only expand the upper arch but also could be effective in certain cases for correction of mild class II malocclusion. As the upper molar teeth were spun surround their palatal root, the class II action was initiated. This appliance therefore became a basic starting appliance as it could accomplish several purposes. Because the appliance is made of preformed band with tubes previously mounted, it can be used for face bow attachment (after it has been de-activated).

Used passively and without activation, it can serve as holding appliance. However with arms usually expanded resting against the lingual surface of the crowns of upper canines or at the cervical margins of teeth, it is usually considered as an expansion appliance plus a rotation appliance.

Palatal bar when constructed forward and bent downwards in the mouth serves as a thumb sucking habit-breaking device. If light spikes are soldered on the bar and extended downward it can serve as an anti tongue thrust appliance.

It can be used as an anterior bite-jumping appliance, or as an appliance to ravel the anterior teeth when lighter palatal wires are extended to the anterior teeth. By placing 0.45 wire section in the headgear tubes of maxillary molar band, the appliance can be used in conjunction with a protraction facemask to advance maxilla. Anterior arm can aid in the eruption of anterior teeth. They can also be used to maintain space and augment anchorage when required.

### **Indications**

- All cross bites in which upper arch needs to be widened.
- Cases needing mild expansion in the mixed or permanent dentition which frequently exhibit lack of space for the upper laterals and in which long range of growth forecast if favorable.
- Cases of class II in which the upper arch needs to be widened effectively and the upper molars rotated distally.
- Class III conditions in which the upper arch needs to be widened and advanced with class III elastics.
- Thumb sucking or tongue thrusting cases with its various modifications.
- Cleft palate conditions either unilateral or bilateral.

### **Clinical Management**

The helices increase the range and springiness of the appliance. The lingual wire should contact the teeth involved in crossbite and extend no more than 1-2mm distal of the banded molars to eliminate soft tissue irritation. The lingual wire should remain 1-1.5mm away from the marginal gingiva and palatal tissue. After six weeks, activation can be performed intraorally with three prong pliers. Placing the plier directly anterior to posterior loop can do expansion in the anterior region. The anterior arms are adjusted independently of the molar activation by placing the plier anterior to the molar. Widening, contraction or uprighting the molar can be achieved by pinching between the anterior loops. Usually only a little activation is made on the anterior arms and if the wire is left out of contact from the anterior teeth, results in molar rotation.

### **Disadvantages**

- Excessive tipping of the teeth buccally.
- Movements are not excessive and hence are not retained long enough.
- Restriction of tongue space and hence tongue function is hampered.
- Intermittent forces.
- Frequent activations are required.
- Uncomfortable for the patient.

### Effect of maxillary quad-helix appliance expansion

A mean increase in maxillary molar width of 5.88mm, a mean increase in average molar relation of 2.95mm and a mean increase in maxillary intercanine width of 2.74mm. These increases were found to be stable through active treatment.

Frank<sup>7</sup> observed orthopedic changes included a 0.92mm mean increase in maxillary width. Also a 0.89mm mean increase was observed in average maxillomandibular relation. These increases were stable throughout active treatment. It was concluded that moderate orthopedic expansion is possible with quad helix but only slight orthopedic changes were consistently demonstrated. A 6:1 ratio of the amount of orthodontic movement to orthopedic movement was determined. Nasal width showed no significant differences from growth during treatment. No significant change in mandibular intermolar width was observed. A slight bite opening was observed on the lateral progress Cephalogram during the expansion phase of the treatment. The facial axis decrease was approximately 1 degree.

Müge Sandıkçıoğlu<sup>8</sup> studied Skeletal and dental changes after maxillary expansion in the mixed dentition and concluded that equal skeletal and dental results were obtained at the end of treatment with the quad-helix appliance. The most remarkable dental and skeletal effects were seen in the transversal plane, less in the vertical plane, and none in the sagittal plane.

### Clinical case

A patient N.B. came to the department of Orthodontics and Dentofacial Orthopedics with chief complaint of irregularly placed teeth. He had positive history of cleft lip and palatal surgery at the age of 3 and 12 years. Bone grafting was done during palatal closure. On intraoral examination unilateral posterior cross bite on right side was seen.

### Other findings were-

1. Missing 12 (lateral incisor)
2. Rotated 11 (central incisor)
3. Midline mismatch

4. Soft tissue growth near 12
5. End on molar relationship
6. 14 and 15 (first and second premolar) on right side and 23 (canine) were out of arch Palatally
7. Palatal fistula due to relapse of bone grafting was present
8. Problem in speech

**Treatment protocol followed was non-extraction with MBT appliance system. Quad-helix was used for slow expansion. With multidisciplinary approach treatment was completed in 26 month duration.**

### Conclusion

The quad-helix appliance promoted the opening of the midpalatal suture, nevertheless, the mean increase in intercanine and intermolar widths was significantly sharper due more to tipping than to suture opening, with a 6:1 ratio for the intercanine region and 10:1 ratio for the intermolar region.

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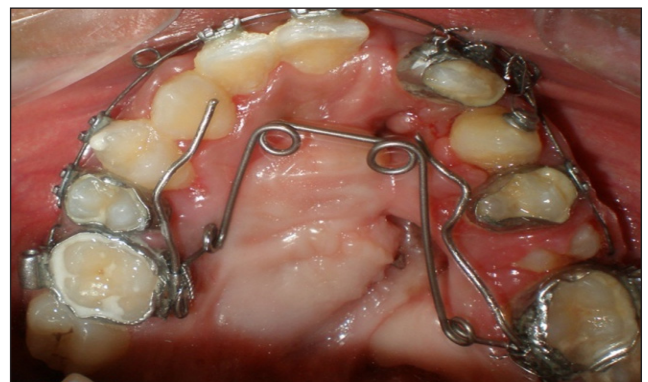
**Figure 1:** pre-treatment



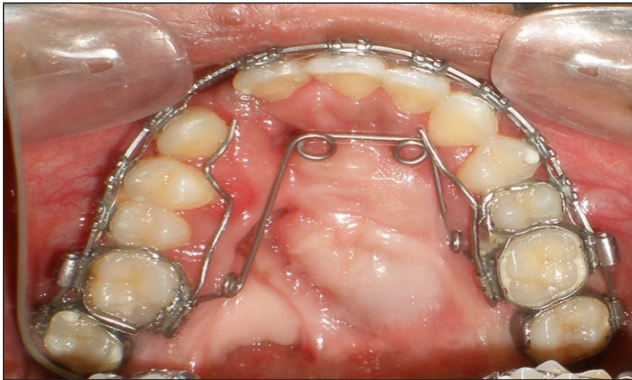
**Figure 2:** Quad- helix insertion



**Figure 3:** With rotation correction



**Figure 4:** After rotation correction



**Figure 5:** slow expansion



**Figure 6:** After complete correction



**Figure 7:** With Obturator



**Figure 8:** Post-treatment