Quad Helix—A Versatile Appliance in Pedodontist’s Arsenal: A Case Series

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Abstract
This case series aims to elaborate and discuss the use of the quad helix, a type of slow maxillary expansion appliance in the mixed dentition period in three different clinical scenarios. Especially, in the field of pediatric dentistry, mixed dentition is the most critical stage in the development of occlusion and any malocclusion that can be corrected by the simple appliance in this stage is recommended. The appliance selection is one of the most important steps in the process of treatment planning to obtain the desired result.

Keywords: Interceptive orthodontics, Quad helix, Slow maxillary expansion.

Introduction
A well-aligned and disease-free dentition adds to the personality and significantly improves the radiance of a smile. The growth of the craniofacial complex undergoes skeletal, dental, and soft tissue changes from birth to childhood and adolescence along with the transition from deciduous to mixed and permanent dentition. Any imbalance of intrinsic and extrinsic growth factors during this period leads to a discrepancy in occlusion which manifests in form of crowding, spacing, and proclination which warrants either removable or fixed orthodontic therapy.

The Quad Helix appliance, as described by Ricketts in 1975, is a modification of the transpalatal Coffin spring.1–4 It has four helical loops, two incorporated in the posterior region and two introduced in the anterior part of the arch. This helps in providing continuous action during expansion because of a greater range of activation provided by the longer wire.5 The appliance is constructed of 0.038˝ (0.975 mm) stainless steel wire and soldered to bands that are cemented to the maxillary first permanent molars or the deciduous second molars, depending on the age of the patient.

This case series describes the application of quad helix in multiple clinical scenarios as follows.

Case Descriptions
Case 1
A 9-year-old girl presented to the Department of Pedodontics and Preventive Dentistry, with a chief complaint of irregularly arranged upper and lower front teeth. Figures 1A to C show the intraoral examination of retained 52, 62, 72 with palatally erupting 12, 22 and lingually erupting 32, 11, 21 were mesiopalatally and 42 was distolingually inclined with class I molar relation on both sides.

Treatment Plan
Bandaging was done on 16 and 26, quad helix was fabricated and cemented with glass ionomer cement represented in Figure 1D. Fixed orthodontic treatment was initiated simultaneously. Figures 1E and F reveal posttreatment effect, after 7 months of quad helix activation and sequential changing of NiTi archwires 0.14˝, 0.16˝, and 0.18˝ favorable esthetic outcome was achieved which was revealed in Figures 2E and F. The patient is in regular follow-up.

Case 2
A 9-year-old girl presented to the Department of Pedodontics and Preventive Dentistry, with a chief complaint of unevenly arranged upper front teeth. On extraoral examination, the patient had a concave profile. Figures 2A to C show intraoral examination revealing anterior crossbite in relation to 11, 12, and 21. Cephalometric analysis revealed skeletal class III.

Treatment Plan
Figure 2D represents the cementation of a fabricated quad helix on 16 and 26. Fixed orthodontic treatment was initiated simultaneously. After 6 months of activation of the quad helix and sequential changing of NiTi archwires 0.14˝, 0.16˝, and 0.18˝ esthetic outcome was achieved which was revealed in Figures 2E and F. The patient is in regular follow-up.

Case 3
A 9-year-old girl presented to the Department of Pedodontics and Preventive Dentistry, with a chief complaint of the collapsed upper arch. The patient was referred by a plastic surgeon for the orthodontic correction of irregular upper teeth and orthopedic expansion of the upper jaw. The patient had unilateral cleft lip and palate (CLP) on the right side, and which was operated on at the age

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of 1 years and 2 years, respectively. On intraoral examination, the patient showed unilateral crossbite in the region of 53, 54, and 11. 22 was palatally erupted and 55 was distopalatally inclined. Dehiscence was not appreciated in the palatal region revealed (Fig. 3).

**Treatment Plan**

Bandling was done in 55 and 65, quad helix was fabricated and cemented. After 5 months of activation, arch expansion was achieved with a moderate widening of the defect in the palatal region. The patient was advised to undergo a secondary bone graft which is very important during the eruption of lateral incisors. After the surgery retentive appliance in the palatal region should be provided to prevent the collapse of the upper arch that might result in crossbite. The patient is in regular follow-up.

**Discussion**

The quad helix may be activated extraorally or intraorally. Extraoral activation is done by opening the helices where activation of anterior helices increases intermolar width and adjusting posterior helices caused lateral arm expansion which counteracted mesial rotation of anterior helices activation. Extraoral activation allows the amount of activation to be clearly seen and is the preferred method despite the extra work involved in removing and recementing the appliance. The intraoral method was criticized by Chaconas and de Alba Levy (1977) in that each bend produced a progressive decrease in the force originally placed in the appliance.

Intraoral activation is made with the triple peak plier by making three bends. The first bend is made in the anterior bridge by placing
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In the presented cases, slow maxillary expansion with a quad helix appliance was done using the intraoral activation method. At the end of treatment, normal overjet and overbite were achieved. Adequate dental alignment and leveling, as well as maxillary and mandibular midline symmetry, were also established.

Several complications have been seen with the QH appliance; these included dental tipping, ulcerations at the area of the helix, loose bands, and breakage of the appliance. However, most of the complications are easily avoidable by careful chairside and laboratory practices such as proper band pinching and adaptation, an adequate adaptation of the wire components of the appliance, and an appropriate selection of wire gauges.

Clinical Importance of This Article

• In pediatric dentistry, correction of malocclusion in the mixed dentition period is very important and it also reduces the further complicated treatment.

• To elaborate the usage of the quad helix in three different scenarios which the pedodontist commonly comes across in day-to-day practice.

• A simple appliance that can change the complete vision of the pedodontist on the developing class III cases where chin cup is regularly advocated.

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