



# **KSK Appliance- Novel Method of Redefining Space**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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**Case Study**

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## **ABSTRACT**

The primary goal of preventive orthodontics is to maintain the integrity of the deciduous dentition until uneventful exfoliation of primary teeth for proper growth and development of dento-facial complex.

Space loss is unavoidable following longstanding proximal caries and early loss of deciduous tooth. In such conditions, orthodontic intervention plays a critical role, which promotes favorable developmental dento-facial changes.

Space management, particularly space regaining, present challenges during early mixed dentition stage, creating clinical conundrum in the anterior region due to insufficient anchorage.

Out of various etiologies behind the non/delayed eruption of teeth, prolonged retention of deciduous teeth and space shortage are considered to be potential etiological factors.

Space shortage for eruption of permanent teeth is a problem caused by tooth material/arch size discrepancy leading to decreased arch length and insufficient space for eruption of permanent teeth.

This paper introduces a new technique of space regaining using proximal stripping in conjunction with modified split labial bow appliance in a 8 year old child in her mixed dentition period to enable favourable eruption of permanent lower right lateral incisor i.e 42.

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## 1. INTRODUCTION

Crowding and irregularity remain a consistent problem in developing dentition of children. Management of space problems play an important role in paediatric dental practice.

“Lack of sufficient space usually manifests at an early age during the eruption of central and lateral incisors and the first signs of crowding often appear at this time; if not resolved, eruption of teeth in the following years will be impaired due to the lack of sufficient space” [1,2].

“Proximal stripping is routinely carried out to avoid extraction in borderline cases where space discrepancy is less and in cases where there is a discrepancy between the mesiodistal width of maxillary and mandibular teeth to satisfy Bolton’s discrepancy ratio. Proximal stripping is carried out using metallic abrasive strips, safe sided carborundum disk or using long thin tapered fissure burs with air rotor” [3].

Adequate space is required for leveling and aligning teeth in a crowded arch. After measuring the intercanine space and the sum of four anterior teeth, different treatment plans may be proposed to prevent crowding, mainly fixed or removable appliances, tooth extraction, distal movement of molar teeth and proximal stripping.

“Space re-gaining is one of the most common procedures in orthodontics. Space re-gaining is generally required for blocked out teeth both in maxillary and mandibular arch and mesially inclined molars. Various mechanics have been used for space re-gaining which includes multiple loops, open coil springs, molar uprighting springs and orthodontic separators for mild space creation” [1].

“Air-rotor stripping (ARS) is one technique employed to create space by interproximal enamel reduction during the mixed dentition period. This method was introduced by Sheridan as an alternative to tooth extraction for patients with mild to moderate crowding. This technique is done by placing a 0.2 mm thick wire in the interdental space to prevent pulp injury and enamel reduction by a tungsten carbide bur” [1].

“Mesial stripping of primary canines to eliminate space deficiency by 3 to 8 mm and correction of contact areas have also been proposed. In this

treatment, by mesial stripping of each canine tooth by 1.5 mm, 3 mm of space is re-gained” [3].

Moreover, ARS is also used for achieving other treatment goals, like obtaining an ideal interincisal distance in dental discrepancies and also to also correct the crowding.

“Due to its preventive nature, ARS have beneficial effects on reducing the incidence of possible dental discrepancies. However, enamel stripping increases the susceptibility of teeth to caries and increases demineralization in the stripped enamel significantly when compared with intact areas. Thus, it is suggested for use only in patients with good oral hygiene and low risk of caries” [3].

“This technique is in fact a treatment modality for treating dental discrepancies without using orthodontic appliances and is indicated when tooth extraction is contraindicated. Due to its simplicity, it can be easily used in children aged 6 to 7 years who may have less cooperation and compliance for using orthodontic appliances” [4].

### 1.1 Proximal Stripping [4,5]

Interproximal enamel reduction is a very simple technique to use in Orthodontics, contrary to other space re-gaining systems.

Proximal stripping is a method by which the proximal surfaces of teeth are sliced so as to reduce the mesiodistal width of teeth for resolving mild to moderate crowding.

### 1.2 Indications

- 1) Mild to moderate anterior crowding in patients with Class I malocclusion.
- 2) Patients with relapse of 3mm in mandibular arch and 4mm in maxillary arch.
- 3) Low susceptibility to caries.
- 4) Appropriate tooth shape and if Bolton’s analysis shows a mild tooth material excess in either of the arches.

### 1.3 Contraindications

- 1) Patients with poor oral hygiene
- 2) Patients with gingivitis.
- 3) Young patients, with large pulp chambers which increases the risk of a pulpal exposure.

## 1.4 Aim

Space regaining in relation to 42 using proximal stripping in conjunction with modified split labial bow appliance in a 8 year old child in her mixed dentition period.

## 2. PRESENTATION OF CASE

A 7 and half year old female child reported to the Department of Pedodontics and Preventive Dentistry of SVS Institute of Dental sciences, Mahbubnagar with a chief complaint of pain in the upper front teeth region of jaw since 2 weeks. General examination demonstrated that child was medically fit. Intraoral examination revealed retained deciduous tooth in relation to 61 and unerupted tooth in relation to 42 with space loss seen in relation to 42 (Fig. 1). On intraoral examination it was found that patient had tongue thrusting habit. Radiographic evaluation was done, impressions and study models were made. Mixed dentition space analysis (Arch Perimeter and Hixon and Oldfather) was carried out using study models, which indicated a space deficiency of 4 mm on the right side of the mandibular arch.

Based on the above findings, step wise treatment plan was formulated which included

1. Extraction of retained deciduous tooth in relation to 61
2. Proximal stripping of primary canines and primary 1<sup>st</sup> molars
3. Unilateral split labial bow appliance (modified Space regaining appliance - was given to serve the purpose of regaining space in relation to 42 and favour eruption of teeth).

4. Correction of tongue thrusting habit

## 2.1 Proximal Stripping

Proximal stripping was performed using airotor and interproximal cutting bur by 1 mm each on mesial and distal surfaces of mandibular primary canines and mesial surfaces of mandibular 1<sup>st</sup> primary molars obtaining a total of 6 mm space.

## 3. FABRICATION OF APPLIANCES

### 3.1 Unilateral Split Labial Bow Appliance (Fig. 2)

Impressions were made and fabrication of split labial bow was done using 22gauge stainless steel wire. C-clasp were fabricated on permanent 1<sup>st</sup> molars and for additional retention of appliance ball end clasps were given interdently between 1<sup>st</sup> and 2<sup>nd</sup> primary molars. Once the wire components were ready acrylisation of appliance has been done. Trimming and polishing of appliance has been done. Insertion and activation of appliance has been done after proximal stripping procedure.

The patient was recalled for follow-up visits scheduled after every 1month duration, and it was observed that within 6 months, 5mm of space was regained (measured on models which were prepared by taking impressions at monthly interval). There was also spontaneous eruption of teeth in relation to 42 (Fig. 3) once the space has been regained. Following this, Space regaining appliance was replaced with habit breaking appliance for correction of tongue thrusting.



**Fig. 1. Pre-operative photographs with retained deciduous tooth in relation to 61 and loss of space in relation to 42**

### 3.2 Blue Grass Appliance

Prefabricated Bands (3M ESPE) were fabricated on maxillary first permanent molars. Impressions were made and bands were transferred to the maxillary impression for the fabrication of habit breaking appliance. Wire component was fabricated using 20 gauge stainless steel wire and a Teflon roller was fabricated and inserted

into the wire component in the maxillary anterior region (Fig. 4). Soldering and polishing of appliance has been done. Appliance has been cemented using type 1 Glass ionomer cement (GC Fuji) (Fig. 4). Patient has been kept on recall for every 3 months and after 9 months of treatment time, tongue thrusting habit has been resolved (Fig. 5).



Fig. 2. Removable unilateral split labial bow appliance



Fig. 3. Eruption of tooth in relation to 42 after activation of removable appliance and proximal slicing of primary canines



Fig. 4. Fabrication and insertion of blue grass appliance



**Fig. 5. Showing eruption of tooth in relation to 42 and alignment of teeth**

#### **4. DISCUSSION**

“Non-extraction orthodontic treatments like ARS are becoming increasingly popular due to the existing controversies regarding the outcome of extraction based orthodontic treatments, problems of tooth extraction in adult patients and unsuccessful results of overexpansion in non-extraction orthodontic cases” [3].

Mesial stripping and interproximal enamel reduction of canine teeth helps in correction of  $\leq 3$  mm crowding.

“Before the introduction of bonding systems, mesial stripping techniques were performed in the incisors. At present, due to the availability of bonding systems, interproximal stripping of teeth can be done at different times” [3].

“The amount of interproximal stripping is directly correlated with the amount of crowding and space deficiency. Ex: cases with 3 mm of crowding, the amount of interproximal enamel reduction should be 3 mm. Moreover, mesial stripping plays a major role in improving the intercuspal relation in patients” [6].

“However, there are interpretations that stripping may cause tooth mass imbalance between the maxillary and mandibular arches which was discussed by Bolton. Bolton stated that mesial stripping should not be necessarily equal in the maxilla and mandible and these ratios may be changed in order to achieve acceptable intercuspal and intermaxillary relations” [6].

“Considering the fact that in our study mesial stripping was done in the mesial surface of mandibular primary canines, the intercuspal relation was not evaluated after the treatment. However, in order to improve the intercuspal relations, ARS should be necessarily performed in the opposing jaw also to balance the differences in the mesiodistal widths of teeth” [6].

“Sheridan and Hastings in their study reported that enamel stripping established excellent occlusal and interincisal relations in patients with class 1 malocclusion” [7].

“Germeç and Taner evaluated and compared the effects of extraction and nonextraction orthodontic treatments with ARS on patients with small crowding and reported that both techniques were suitable for correction of moderate crowding. In their study, 0.4 mm stripping was done in the posterior segment and 0.25 mm in the anterior segment. In total, 1.5 mm of space was created, for the correction of existing 5.9 mm crowding” [8].

“Despite the positive results of mesial stripping for elimination of mild and moderate crowding, some practitioners still have doubts and concerns regarding the removal of relatively significant amounts of interproximal enamel especially in the posterior segments. However, it should be noted that damage to the tooth structure or periodontium following stripping has not been clinically confirmed” [4].

#### **5. CONCLUSION**

The multistage approach involving timely extraction of deciduous teeth, novel design of Space regaining appliance and correction of tongue thrusting habit helps in guiding the children in mixed dentition to achieve a stable function permanent dentition.

#### **CONSENT**

As per international standard or university standard, parental written consent has been collected and preserved by the author(s).

#### **ETHICAL APPROVAL**

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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