Case study

KSK APPPLIANCE- NOVEL METHOD OF REDEFINING SPACE

ABSTRACT:

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

Space loss is inevitable following longstanding proximal caries and early loss of deciduous tooth. In such critical conditions, orthodontic intervention plays a critical role, thereby promoting favorable developmental changes.

Space management, particularly space regaining, evokes challenges during early mixed dentition stage, the period marked by transition of incisors, creating clinical conundrum due to insufficient anchorage in the anterior region.[1,7]

Out of various etiologies behind the noneruption of teeth, prolonged retention of deciduous teeth and lack of space are considered as potential etiological factors.

Space shortage for eruption of permanent teeth is a problem caused by tooth size/arch size discrepancy that leads 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.

INTRODUCTION:

Crowding and irregularity remain a consistent problem for children. Management of space problems continues to play an important role in a dental practice. It also represents an area of major interaction between the primary provider and the specialists.

Space shortage 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.[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 ratio. Proximal stripping is carried out using of metallic abrasive strip, safe sided carborundum disk, or with 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 namely fixed or removable appliances, tooth extraction, distal movement of molar teeth, and reduction of mesiodistal widths of teeth.

Space gaining/opening is one of the most common procedures in orthodontics. Space gaining is generally required in malocclusion presenting with blocked out teeth both in maxillary and mandibular arch and mesially tipped molars. Various mechanics have been used for space gaining in the arch, for example, multiple loops, open coil springs, molar uprighting springs,and orthodontic separators for mild space creation.[1]

Air-rotor stripping (ARS) is one technique to create space by interproximal enamel reduction at areas with adequate enamel thickness during the mixed dentition period. This method was introduced by Sheridan as an alternative to tooth extraction for patients with mild to moderate crowding. He invented this technique 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 shortage 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 gained.[3]

Moreover, ARS is also used for achieving other treatment goals, i.e., obtaining an ideal interincisal distance in dental discrepancies. Stripping of incisors can also correct the crowding.

This technique is in fact a treatment modality for dental discrepancies without using orthodontic appliances and is usually 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 in using orthodontic appliances.[6]

Due to its preventive nature, ARS can have beneficial effects on reducing the incidence of possible discrepancies. However, enamel stripping may increase the susceptibility of teeth to caries and in some cases rate of demineralization in the stripped enamel significantly increases compared with intact areas. Thus, this technique is suggested for use in patients with good oral hygiene and low risk of caries.[3]

Proximal stripping [5,6]

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

Stripping is a method of resolving mild to moderate crowding by comprehensive interproximal reduction of enamel, primarily in buccal segments.

Indications

1) Mild to moderate crowding in anterior areas in patients with Class I malocclusion.

2) Patients with relapse of as much as 3mm in mandibular arch and 4mm in maxillary arch.

3) Low susceptibility to caries.

4) Appropriate tooth shape If the Bolton's analysis shows a mild tooth material excess in either of the arches, it is possible to reduce tooth material by proximal stripping.

Contraindications

1) Patients with poor oral hygiene, since they are at increased risk of developing interproximal caries.

2) Absolutely contraindicated in patients who have gingivitis.

3) Young patients, as they possess a large pulp chamber which increases the risk of a pulpal exposure.

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

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 teeth irt 61 and unerupted teeth irt 42 with space loss seen irt 42(figure-1). On intraoral examination it was found that patient had tongue thrusting habit. Radiographic evaluation was carried out, study model impressions were made, and 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 investigations, treatment plan was formulated which included

1.Extraction of retained deciduous teeth irt 61

2. Proximal stripping of primary canines and primary 1st molars

3.unilateral split labial bow appliance (modified Space regaining appliance - was given to serve the purpose of regaining space irt 42 and favour eruption of teeth.)

4. correction of tongue thrusting habit

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 1st primary molars obtaining a total of 6 mm space.

FABRICATION OF APPLIANCES:

1. unilateral split labial bow appliance(figure-2)

Impressions were made and fabrication of split labial bow was done using 22gauge stainless steel wire. C-clasp were fabricated on permanent 1st molars and for additional retention of appliance ball end clasps were given interdentally between 1st and 2nd 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 irt 42 (figure-3) once the space has been regained. Following this, Space regaining appliance was replaced with habit breaking appliance for correction of tongue thrusting.

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 (figure-4). Soldering and polishing of appliance has been done. Appliance has been cemented using type 1 Glass ionomer cement (GC Fuji) (figure-4). Patient has been kept on recall for every 3 months and after 9 months of treatment time, tongue thrusting habit has been resolved. (figure-5).

DISCUSSION:

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

Mesial stripping and interproximal enamel reduction of canine teeth had positive effects on correction of ≤3 mm crowding.

Sheridan and Hastings in their study reported that enamel stripping established excellent occlusal and interincisal relations in class I malocclusion patients.[3]

In another study, Germeç and Taner[4] 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, and mesial stripping significantly decreased the treatment time. In their study, enamel stripping was 0.4 mm in the posterior segment and 0.25 mm in the anterior segment. In

total, 1.5 mm of space was created, which was sufficient for the correction of 5.9 mm existing crowding.[5]

Before the introduction of full-arch bonding systems, the majority of mesial stripping techniques used to be 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 shortage in patients. For example, in cases with 3 mm of crowding, the amount of interproximal enamel reduction should be 3 mm. Space may be gained at any time and treatment may be done at any time in patients. Moreover, mesial stripping plays an undeniable role in improving the intercuspal space in patients.[5]

However, a hypothesis arises that stripping may cause tooth mass imbalance between the maxillary and mandibular arches. This issue was also discussed by Bolton. Nonetheless, 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.[4]

In the study by Sheridan and Hastings, the teeth were stripped in one jaw resulting in an optimal intercuspal relation.

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 in some cases, ARS should be necessarily performed in the opposing jaw as well due to differences in the mesiodistal widths of teeth.[6]

Despite the positive results of mesial stripping for elimination of mild and moderate crowding, some clinicians 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]

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 dentiton to achieve a stable function permanent dentititon.

REFERENCES:

1. Kulshrestha R, Parkar A, Vibhute PK, Chetan Patil UV, Chandurkar K. Methods of Gaining Space:-A Review. ES J Dent Sci. 2020;1(2):1012.
2. Verma S, Bhupali NR, Gupta DK, Singh S, Singh SP. Sleeve push technique: A novel method of space gaining. Contemporary Clinical Dentistry. 2018 Jan;9(1):142.
3. Nakhjavani YB, Nakhjavani FB, Jafari A. Mesial stripping of mandibular deciduous canines for correction of permanent lateral incisors. International Journal of Clinical Pediatric Dentistry. 2017 Jul;10(3):229.
4. Georgiadis AA, Darmanin P, Topouzelis N, Ioannidou-Marathiotou I. Indication and technical application of stripping. Balkan Journal of Dental Medicine. 2015;19(1):3-7.
5. Sharma NS, Shrivastav SS, Hazarey PV. Mastering interproximal stripping: with innovations in slenderization. International Journal of clinical pediatric dentistry. 2012 May;5(2):163.
6. Frindel C. Clear thinking about interproximal stripping. Journal of Dentofacial Anomalies and Orthodontics. 2010 Jun;13(2):187-99.
7. Gianelly AA. Leeway space and the resolution of crowding in the mixed dentition. Seminars in orthodontics 1995 Sep 1 (Vol. 1, No. 3, pp. 188-94). WB Saunders.

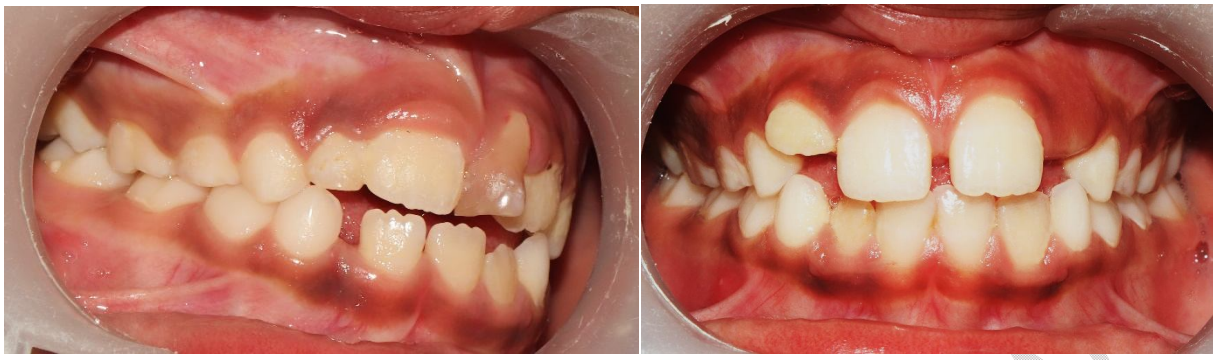

Figure 1 – Pre-operative photographs with retained deciduous teeth irt 61 and loss of space irt 42

Figure 2- removable unilateral split labial bow appliance

Figure 3 – eruption of teeth irt 42 after activation of removable appliance and proximal slicing of primary canines

Figure 4. Fabrication and insertion of blue grass appliance

Figure 5 – post operative after 15 months