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MANAGEMENT OF CROWDING IN MIXED DENTITION-A REVIEW

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ABSTRACT

Crowding is one of the most common malocclusion in the orthodontics. In the dental patients, the most common element of malocclusion are crowding and irregularity. Crowding refers to the discrepancy between the jaw size and tooth size leads to derangement of tooth row. If there is more tooth material or reduced arch length then it leads to crowding of teeth. One of the most common reason that the parents bring their child to the orthodontist is “CROWDING”. During transition from mixed to permanent dentition it is well known fact that the length of the arch is lost. This article aims to provide in short review of many treatment options for management of crowding in mixed dentition.

KEYWORDS: Crowding, mixed dentition , management

INTRODUCTION

The possibility of additional incisor crowding in the mixed dentition presents a constant challenge for the clinician. It would be preferable to determine if the mixed dentition's incisor crowding would become worse, remain mostly the same, or even get better in the secondary dentition. The degree of crowding shift throughout the mixed-dentition stage is difficult to forecast, as noted by Lee, Maj, Alleva, and Lucchese. As a result, they advise against "serial" or "planned" extraction procedures.[1,2] Compared to cases where the teeth are crowded or rotated, fixed orthodontic treatment can produce more stable outcomes when it is started with well-aligned incisors. Correction is required for both functional and aesthetic reasons. When teeth emerge into a crowded area, they increase the risk of subgingival plaque moving downhill and causing further damage as well as an early loss of attachment on neighboring teeth. The idea that "early" treatment of a child's malocclusion eliminates the need for subsequent orthodontic treatment is the root of many misconceptions regarding preventative and interceptive orthodontics.[3,4] There has been a noticeable rise in parent consultations in pediatric dentistry regarding the potential for their children to experience dental crowding in the future. This is most likely brought on by the rising standards of aesthetics in today's world and the widespread use of orthodontic treatment. For the purpose of early patient screening for dental crowding during the stage of permanent tooth eruption, more data is needed. At the primary dentition stage, this information would enable them to obtain appropriate guidance and preventive care.[5]An extra 1.6 mm on average was needed when the permanent mandibular lateral incisors erupted in order to ensure that the four mandibular incisors.6–8 The permanent incisors' labial placement in relation to the primary incisors, a tiny increase in intercanine breadth, and a slight backward shift of the canines into the primate space were found to be the solutions to this mild crowding.[6,7,8]

These techniques might not, however, be able to alleviate congestion that is more than 1.6 mm.[9] For the purpose of treatment planning, it is crucial to identify the variables that cause mandibular anterior crowding, particularly in the early stages of mixed dentition. A few researchers connected crowding and arch dimensions. McKeown discovered that there was a higher relationship between crowding and dental arch size than there was between crowding and tooth size.[10] Significant relationships between the degree of crowding and arch dimensions were reported by Radnzic.[11] However, some investigators found a connection between crowding and tooth size. The best time to begin treating crowding is when the patient is in the late stages of development of mixed dentition. This has a therapeutic relevance in that the first premolars are available for extraction therapy if necessary. About 75% of patients with crowding can have space for alignment if arch length preservation is chosen over extraction therapy.[12] Prompt diagnosis and treatment planning are more ad hoc, and regular evaluation is required.[13]

INDICATORS OF CROWDING IN MIXED DENTITION

The main sign that dental crowding is developing is larger primary teeth. When attempting to forecast dental crowding in the early mixed dentition, however, it is also important to take into account the lengths of the maxillary and mandibular dental arches as well as the dimensions of the cranial base, particularly the length of the posterior cranial base in the primary dentition. Also, another indicator is the mesiodistal size of deciduous maxillary canine.[5]

FACTORS FOR CROWDING IN MIXED DENTITION

For the sake of future treatment planning, identifying the potential causes of mandibular anterior crowding in the early mixed dentition is crucial. In their comparison of 54 patients with mild or no crowding and 50 subjects with severe crowding.[9] Howe et al. (2013) discovered that the mandibular arch widths of the non-crowded group subjects were substantially wider. They found that rather than reducing tooth mass, therapeutic methods that lengthen dental arches might be taken into account. After evaluating 120 boys between the ages of 13 and 15 and 11 months, Radnzic found that crowded arches were narrower than noncrowded or spaced arches. He proposed that while expansion would be helpful in certain situations in carefully chosen pediatric kids, properly thought-out extractions would still be a crucial component of treatment in most cases to relieve primary dental crowding.[14]

A few researchers investigated how crowding affects arch length. Children without crowding in their permanent dentition had greater space for their canines to erupt than children who did, according to Sanin and Savara.[15] Certain investigators discovered variations in tooth sizes between patients who had crowding and those who did not. Using correlation analysis, a number of researchers looked at relationships between crowding, arch dimensions, and tooth size. When designing a therapy plan, individual differences are crucial. However, in individuals with mandibular anterior crowding, it is important to pay attention to both arch length difference and transverse discrepancy. Because of this, early mixed dentition patients with anterior mandibular crowding may benefit from the insertion of a lingual arch or lip bumper.[9]

TREATMENT OF CROWDING IN MIXED DENTITION

(A)STRIPPING TECHNIQUE

It is a technique that involves the interproximal reduction of tooth enamel. There are many recognized indications for interproximal reduction. A ratio based on the mesiodistal width of teeth in the lower arch in relation to upper arch was created.[16] Peck and Peck reported that well aligned mandibular incisors significantly lower faciolingual indices than those crowded incisors.[17] The correction of discrepancies in the dental arch length may be accomplished by mesiodistal crown reduction of the lower anterior teeth.[18] Sheriden proposed (1987) proposed Air Rotar Stripping (ARS) technique grinding of interdental enamel was presented as an alternative to extraction procedures in cases of mild to moderate crowding.[19]

This technique becoming more popular in orthodontic practice, especially in combination with the use of removable aligners.[20] Interproximal reduction performed within the recommended guidelines may be used as a safe method to gain space for relief of crowding, to correct tooth-size discrepancies and to improve esthetics and long term stability in selected orthodontic patients.[21]

(B)MANDIBULAR EXPANSION

It is commonly recognized that a range of orthodontic procedures can result in the growth of dental arches.[22] Any detachable expansion appliance with one or more expansion screws is referred to as a Schwarz appliance.[23] It works especially well on children between the ages of six and nine. A Schwarz appliance is recommended in a patient with mandibular incisor crowding of three to four millimeters. The patient is advised to use the appliance once a week. Less than 1 mm of expansion happens with each month of wear, and about 1 mm of expansion was produced per 5 rotations. For a duration of five to six months, the appliance is worn continuously, including during meals. It should only be taken out to brush. By the end of this period, a propensity for lingual cross-bite is seen. When the appliance is turned off, there may be a slight residual crowding even after all arch length discrepancies have been resolved. This is especially true if the crowding is severe. Afterwards, a lingual retaining arch preserves the leeway space (about 2.5 mm each side) acquired during the mandibular second deciduous molars' transition to premolars. After the interim period, there is usually enough room to permit mandibular dentition alignment without the need for extraction or interproximal reduction.[22] A serial extraction approach is recommended for problems involving significant discrepancies in tooth size and arch length.[24] Because the Schwarz appliance is easier to control clinically and has a predictable treatment outcome, many physicians prefer it over lip bumpers in most cases.[22]

(C)THE EXTRACTION TREATMENT

If there is a 10mm or greater difference in arch length, orthodontic extractions are recommended. Non-extraction instances fall into the less than 4 mm discrepancy category, whereas borderline cases have a disparity of 5 to 9 mm.[25]

- **SERIAL EXTRACTION-**The early treatment approach of extracting primary teeth first, then permanent teeth, was originally documented in 1743 by the Frenchman Robert Bunon in his "Essay on diseases of teeth." In 1929, Kjellgren coined the phrase "serial extraction."[22] Typically, maxillary serial extraction In the upper arch, axial inclinations and spontaneous space closure are typically advantageous. However, because the deciduous and permanent teeth have a more advantageous size ratio, premolar extraction is frequently avoided, and incisor extraction may be necessary instead.[26] In the maxillary arch as opposed to the mandibular arch, the optimal sequence of serial extraction is more frequently the norm.[27] Dale JG (2002)recommended extracting the first primary molars and first premolars of all four deciduous canines simultaneously if the overall difference was 8 mm or greater. The second premolars may be excised if there is a 5 mm discrepancy; the earlier, the better. Additionally, he said that five months of therapy is usually needed to attain face balance in a case of mixed dentition.[28]
- **LOWER INCISOR EXTRACTION TREATMENT-**The idea of using incisor excision to address crowding issues is not new. Jackson (1904) had depicted a situation in which two incisors were removed. When studying Edward H. Angles' theory of extraction in orthodontics, Salzmann (1963) pointed out that Angle believed it was unacceptable to withdraw an incisor when the tooth was still in good condition. Angle had also cautioned that removing a single tooth would cause an irregular overbite of the incisors and an occlusal plane to get out of balance.[29]
- **SECOND MOLAR EXTRACTIONS IN THE LOWER ARCH-**One may argue that Dr. H.E. Wilson is the originator of second molar extraction theory. He noticed that the face and jaws could continue to develop naturally downward and forward, safeguarding the TMJ, while at the same time the posterior teeth may be distalized to relieve congested anteriors.[30] About 10 to 12 mm of space is left behind after the second molar is extracted. If the anterior teeth and bicuspids are not rearranged to occupy this space, the third molars will eventually erupt and shift forward to make close contact with the first molar.[31] The potential drawbacks could include excessive tooth material removal in class I malocclusions with mild crowding, extraction sites located distant from the area of concern in cases of moderate to severe anterior crowding, and potential third molar impactions.[32] For the lower arch, second molar extractions could be performed as early as age 10 or 11, and for the upper arch, as late as age 20.[31]Second molar extractions leave little room in the anterior section of the arch, however extraction between the ages of 14 and 16 may lessen the progression of lower incisor alignment degradation.[32]
- **LOWER FIRST MOLAR EXTRACTIONS-**In orthodontic therapy, first molar extractions are uncommon because they deepen the bite, create an extraction space where a second premolar may tip into it, and do not provide enough room to address incisor crowding. Mastication could also be impacted. A strongly filled tooth or a severely decaying molar may qualify for it. Since the bite tends to deepen after the first tooth is out, open bite situations may benefit from such extractions. Wilkinson recommended that all first permanent molars be extracted between the ages

of eight and a half and nine and a half. Such extractions are justified by the fact that third molar impaction can be prevented and caries is a major risk factor for first permanent molars.[22]

(D)THE LINGUAL ARCH

Since mixed dentition accounts for a significant portion of cases submitted for orthodontic treatment, the orthodontist typically advises delaying thorough treatment until the patient reaches the late stages of mixed dentition.[33] Nonetheless, if the arch length is preserved during the shift from mixed to permanent dentition by the use of passive lingual arch, it frequently helps to free up leeway space for incisor alignment and offers sufficient room to address incisor crowding.[34] It has been shown that 70% of patients have enough room to alleviate crowding following lingual arch therapy.

(E)THE MANDIBULAR LIP BUMPER

Lip bumper is a orthodontic device can be used to gain an incredible amount of space in the lower arch and in maintaining control of molars and incisor .[35,36] It consists of a stainless steel wire with a diameter of 1.1mm , inserted into lower molar bands, usually first permanent molars. This appliance is characterized by two adjacent loop and its activation produced the programme advancement of the labial portion.[37] It can gain and maintain the arch width, particularly in premolar and molar region. [38,39]A significant improvement of anterior dental crowding in patients treated with lip bumper appliances evidenced by various worker. [40,41,37]Lip bumper therapy has been shown to successfully increase the mandibular arch length through proclination of incisors and uprighting the first molar.[42]

CONCLUSION

In the field of orthodontics, crowding is one of the most prevalent malocclusions. "CROWDING" is one of the main reasons parents take their child to the orthodontist. It is common knowledge that with the shift from mixed to permanent dentition, the length of the arch is lost. The basic indication of dental crowding is bigger primary teeth. The mesiodistal size of deciduous maxillary canine is another indicator. Determining the probable reasons of mandibular anterior crowding in the early mixed dentition is important for treatment planning purposes in the future. This article aims to provide in short review of many treatment options for management of crowding in mixed dentition. The treatment options include stripping technique, mandibular expansion, extraction include serial extraction, lower incisor extraction, second molar extraction in lower arch, lower first molar extraction, lingual arch and mandibular lip bumper.

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