ISSN 2664-4177 (Print) & ISSN 2664-7931 (Online)
South Asian Research Journal of Oral and Dental Sciences
Abbreviated Key Title: South Asian Res J Oral Dent Sci

| Volume-3 | Issue-3 | May-Jun -2021 | **DOI: 10.36346/sarjods.2021.v03i03.003**

Case Report

"Correction of Spaced Dentition with Fixed Orthodontic Pre-adjusted Edgewise Bracket System" – A Case Report

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Article History
Received: 28.03.2021
Accepted: 15.05.2021
Published: 23.05.2021

Abstract: Enhancement of aesthetics of anterior teeth is one of the challenges of the dentist. Patient may present with teeth which may be discolored, fractured, malaligned or open space between the teeth. These open spacing or malalignment of teeth are due tooth material and jaw size discrepancy. These are usually corrected by orthodontic treatment, as it is the most natural means of correcting the spacing in dentition. The patient in this case presented with a Class Ii malocclusion and a spaced upper dentition with the presence of a midline diastema. The patient was in her mixed dentition phase and presented with multiple over-retained deciduous teeth. It was recommended to get all retained deciduous teeth extracted and guide eruption of the permanent dentition immediately thereafter. The case ended in a Class I incisor, canine and molar relationship at the end of the treatment, thus delivering a pleasant smile to the patient and addressing all her pre-treatment problems.

Keywords: Spacing, Midline Diastema, Spaced Dentition, Frenectomy, Pre-adjusted edgewise appliance, Fixed Appliance Therapy, Class II malocclusion, over-retained deciduous teeth, Aesthetic Improvement, Unaesthetic smile.

INTRODUCTION

In today's dental practice one of the biggest challenges of the dentist is to restore spacing in anterior teeth when orthodontic treatment is not feasible, because of increasing aesthetic concern and patient's expectation for natural looking smile. An unpleasant smile traumatizes the patient psychologically, loses the self-confidence and is a cause of social embarrassment. There are several treatment options available to enhance the aesthetic and beauty of smile like composite restorations, full veneer crown, laminates to more complex treatment involving surgical procedures. However fixed orthodontic treatment still stands as the most effective natural means of closing down the unaesthetic appearing spaced teeth. Orthodontists try to achieve desirable form and function by not only correcting the malocclusion but also by providing pleasant aesthetics [1]. Smile plays an important role in pleasant aesthetics. Most of patients presenting with the chief complaint of poor aesthesis present with spacing, thus being a major cause negatively affects millions of people. Imperfection in teeth alignment, wherein there is a gap between two teeth or many teeth is called spacing [2]. Spacing can be localized or generalized. People with spaced teeth find it difficult to stay in their own comfort zone when communicating publicly. Spacing can even make people pessimistic from smiling freely, a miserable fact that is bound to impact on their own mood as much as it affects other people's perception towards them. Spacing is an interesting

phenomenon resulting from a variety of causes from natural to behavioral. Deciduous teeth develop spacing as they grow up because their jaw is getting bigger and the deciduous teeth remain the same size [3]. Children may have temporary spaces as their deciduous teeth start to fall out. This is normal and should not cause any alarm. Spacing in adult teeth is referred to as diastema. Diastema appears most often in between the two upper central incisors, though they can occur between any two teeth and it can happen due to the result of discrepancy between the size of the jaws and size of the teeth. It may also be caused by missing teeth, microdontia, and large labial frenum or can be habitual such as excessive thumb sucking. Treatment of spacing improves smile as well as confidence. They will feel more at ease associating with people face to face, which will boost up everything from their social to personal life. Slight spacing that does not cause any pain, sensitivity and does not distract the appearance may not require special corrective treatment. If spacing occurs due to peg-shaped lateral incisors, dentist may recommend crowns, veneers or build up. Spacing due to missing teeth may need dental implant or orthodontic treatment [4, 5]. In an older child or an adult, orthodontic treatments are more helpful for closing the spaces. Latest orthodontic treatment is repeatedly used to close spaces between teeth and appropriate bite irregularities [6]. There and some of the most active options to solve spacing such as- Hidden braces, Conventional braces, Invisible braces, Clear aligners, Removable aligner [7]. Orthodontist will decide more suitable treatment plan for each individual patient after diagnosis. This case presents the correction of a Class II malocclusion in a female patient with spaced upper anterior teeth and presence of maxillary midline diastema by executing a non-extraction fixed orthodontic protocol. The Non-Extraction protocol shown in this case is indicative of how an unaesthetic smile can be converted into an aesthetic and pleasant one by routine fixed Orthodontic treatment without need for any extractions simply by utilizing the existing available spaces.

CASE REPORT

Extra-oral examination

A 26 year old female patient presented with the chief complaint of spaced upper front teeth and seeked treatment for the same. On Extraoral examination, the patient had an almost orthognathic facial profile, grossly symmetrical face on both sides, incompetent lips ,moderately deep mentolabial sulcus and an acute Nasolabial Angle, a Mesoprosopic facial form, Dolicocephalic head form and average width of nose and mouth. The patient had no relevant prenatal, natal, postnatal history, history of habits or a family history. On Smiling, there was presence of maxillary midline diastema and spaced maxillary dentition. The patient had a toothy smile, minimal buccal corridor space and a consonant smile arc. The patient was very dissatisfied with her smile.

Pretreatment extra-oral photographs

Intra-oral examination

Intraoral examination on frontal view showed presence of an increased overjet and overbite with presence of a maxillary midline diastema and spaced dentition. On lateral view, the patient showed presence of Class II division 1 incisor relationship, a Class II Canine relationship bilaterally and a Class II molar relationship bilaterally. On occlusal view, the upper and lower arch showed presence of retained deciduous canines and molars and presence of a “U” shaped arch form.

Pretreatment intra-oral photographs

Pretreatment cephalometric readings

PARAMETERS	PRE- TREATMENT
SNA	83°
SNB	81°
ANB	2°
WITS	1mm
MAX. LENGTH	88mm
MAN. LENGTH	113mm
IMPA	95°
NASOLABIAL ANGLE	95°
U1 TO NA DEGREES	27°
U1 TO NA mm	4mm
L1 TO NB DEGREES	26°
L1 TO NB mm	5mm
U1/L1 ANGLE	125°
FMA	26°
Y AXIS	72°
L1 TO A-POG	3mm
CONVEXITY AT PT. A	2mm
LOWER LIP- E PLANE	3mm
N-PERP TO PT A	0mm
N-PERP TO POG	-2mm
CHIN THICKNESS	12mm

DIAGNOSIS

This 26 year old female patient was diagnosed with a Class II malocclusion on a Class I Skeletal base with an average growth pattern, slightly proclined upper and lower incisors, spacing in the upper anterior region with presence of increased overjet and overbite, moderately deep mentolabial sulcus and a reduced nasolabial angle.

List of problems

1. Spacing in maxillary anterior teeth
2. Maxillary midline diastema
3. Increased overjet and overbite
4. Decreased Nasolabial angle

Treatment objectives

1. To correct spacing in maxillary anterior teeth
2. To correct maxillary midline diastema
3. To achieve ideal overjet and overbite

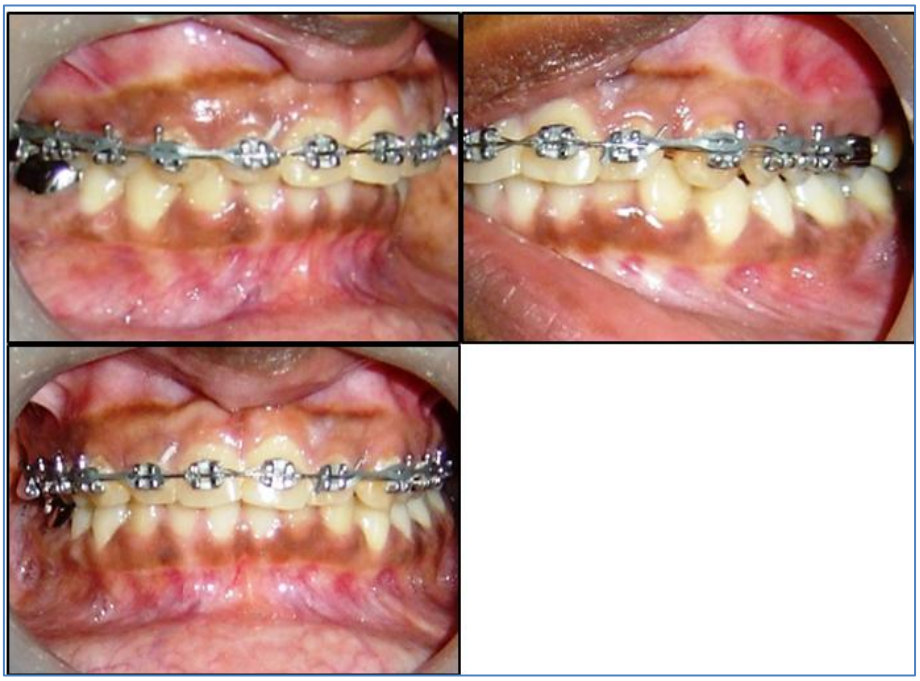
4. To correct the decreased Nasolabial angle
5. To achieve a Class I incisor, canine and molar relationship
6. To achieve a pleasing smile and a pleasing profile

Treatment plan

- Non Extraction protocol was followed with only extraction of over-retained deciduous teeth
- Fixed appliance therapy with MBT 0.022 inch bracket slot
- Initial leveling and alignment with 0.012", 0.014", 0.016", 0.018", 0.020" Niti arch wires following sequence A of MBT
- Retraction and closure of spaces by use of 0.019" x 0.025" rectangular NiTi followed by 0.019" x 0.025" rectangular stainless steel wires. Group A anchorage in the upper and lower arch to maintain a Class I incisor, canine and molar relationship
- Frenectomy in upper midline region for removal of fibrous band of tissues resulting in the midline diastema in the upper and lower arch
- Final finishing and detailing with 0.014" round stainless steel wires
- Retention by means of Hawley's retainers along with lingual bonded retainers in the upper and lower arch.

Treatment progress

All over-retained deciduous teeth were extracted thus promoting guidance for eruption of the permanent successors. Complete bonding & banding in both maxillary and mandibular arch was done, using MBT-0.022X0.028"slot. Initially a 0.012" NiTi wire was used which was followed by 0.014, 0.016", 0.018", 0.020" Niti archwires following sequence A of MBT. After 6 months of alignment and leveling NiTi round wires were discontinued. Retraction and closure of existing spaces was then started by use of 0.019" x 0.025" rectangular NiTi followed by 0.019" x 0.025" rectangular stainless steel wires. Reverse curve of spee in the lower arch and exaggerated curve of spee in the upper arch was incorporated in the heavy archwires to prevent the excessive bite deepening during retraction process. Anchorage was conserved in the upper and lower arch by using light retraction forces, thus constantly monitoring molar and canine relationship that was obtained after the mesial drift of the mandibular dentition. Group A anchorage was needed in the upper and lower arch to maintain a Class I incisor, canine and molar relationship. Retraction and closure of existing spaces was done with the help of Elastomeric chains delivering light continuous forces and replaced after every 4 weeks due to force decay and reduction in its activity. Frenectomy surgery was performed by the periodontist in upper midline region for removal of fibrous band of connective tissues resulting in the midline diastema in the upper arch. Final spaces were closed down after the frenectomy procedure. Finally light settling elastics were given with rectangular steel wires in lower arch and 0.012" light NiTi wire in upper arch for settling , finishing, detailing and proper intercuspation. The spacing and midline diastema was corrected with an ideal occlusion at the end of the fixed appliance therapy. The Nasolabial angle improved significantly at the end of treatment, thus improving the profile even further. There was improvement in occlusion, smile arc, profile and position of chin at the end of the treatment.



Mid treatment intra-oral photographs

Post treatment cephalometric readings

PARAMETERS	POST- TREATMENT
SNA	82°
SNB	81°
ANB	1°
WITS	0mm
MAX. LENGTH	87mm
MAN. LENGTH	110mm
IMPA	92°
NASOLABIAL ANGLE	106°
U1 TO NA DEGREES	24°
U1 TO NA mm	2mm
L1 TO NB DEGREES	23°
L1 TO NB mm	2mm
U1/L1 ANGLE	132°
FMA	26°
Y AXIS	73°
L1 TO A-POG	1mm
CONVEXITY AT PT. A	1mm
LOWER LIP- E PLANE	1mm
N-PERP TO PT A	0mm
N-PERP TO POG	0mm
CHIN THICKNESS	12mm

DISCUSSION

Biomechanical modifications made to accommodate orthodontic treatment of adult dentitions are generally minor and adhere to the basic laws of physics as they apply to orthodontic tooth movement. Some adult presentations necessitate changes in treatment strategy from what would otherwise be employed in adolescent patients to achieve similar goals. In other cases, objectives themselves may need to be modified because of lack of growth potential, constraints of treatment mandated by the patient or the presence of multiple missing or compromised teeth. By planning treatment and mechanotherapy taking into account the individual circumstances that may affect the patient's biological response to treatment, realistic goals of orthodontics can be mutually recognized and agreed on by both the provider and the patient before therapy is initiated, resulting in an immensely rewarding experience. A space between adjacent teeth is called a "diastema". Midline diastemas occur in approximately 98% of 6 year olds, 49% of 11 year olds and 7% of 12–18 year olds. The midline is very often seen to be a routine part of the developing occlusion, due to the natural position of teeth in their bony crypts, the eruption path of the cuspids, and increase in the size of premaxilla at the time of eruption of the maxillary permanent central incisors [13]. In Today's times, Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Class II malocclusion is the most prevalent malocclusion [8, 9].Over the last few decades, there has been an increase in the awareness about orthodontic treatment which has led to more and more adults demanding high quality treatment in the shortest possible time with increased efficiency and reduced costs [10-12]. There are many ways to treat Class II malocclusions, according to the characteristics associated with the problem, such as anteroposterior discrepancy, age, and patient compliance [14]. The indications for extractions in orthodontic practice have historically been controversial [15]. On the other hand, correction of Class II malocclusions in growing patients, with subsequent dental camouflage to mask the skeletal discrepancy, can involve either retraction by non-extraction means simply by utilizing the available spaces or by extractions of premolars. Lack of crowding or cephalometric discrepancy in the mandibular arch is an indication of 2 premolar extractions [16-19]. Fortunately, in some instances satisfactory results with an exceptional degree of correction can be achieved without extraction of permanent premolars [20-35]. The patient's chief complaint was spaced upper front teeth and seeked treatment for the same. The selection of orthodontic fixed appliances is dependent upon several factors which can be categorized into patient factors, such as age and compliance, and clinical factors, such as preference/familiarity and laboratory facilities. The most important point to be highlighted here is the decision to not extract the premolars. After analyzing the case thoroughly and reading all pretreatment cephalometric parameters along with evaluating the patients profile clinically, a decision was made of proceeding with the treatment without extracting the 1st premolars as the patient presented with spacing and the existing spaces would be enough to correct the spaced anterior teeth. This case could be managed by non-extraction and hence we proceeded with the same. All the over-retained deciduous teeth were extracted and this provided space for guidance of eruption of the permanent succedaneous teeth. Thus the lower permanent dentition erupted in a more anterior position, correcting the molar relation from a Class II to a Class I. The treatment and closure of existing spaces very efficiently improved the patients profile changing the Nasolabial angle from acute to

average at the end of the treatment. Successful results were obtained after the fixed Pre-adjusted Edgewise appliance therapy within a stipulated period of time. The maxillary midline diastema was closed towards the end of the treatment after performing frenectomy in the upper arch to excise the thick band of fibrous connective tissue. The overall treatment time was 13 months. After this active treatment phase, the profile of this 26 year old female patient improved significantly as seen in the post treatment extra oral photographs. Hawley's retainers were then delivered to the patient along with fixed lingual bonded retainers in upper and lower arch. Patient was very happy and satisfied with the results of the treatment.

Post treatment extra-oral photographs

Post treatment intra-oral photographs

Comparison of pre and post treatment cephalometric readings

PARAMETERS	PRE- TREATMENT	POST- TREATMENT
SNA	83°	82°
SNB	81°	81°
ANB	2°	1°
WITS	1mm	0mm
MAX. LENGTH	88mm	87mm
MAN. LENGTH	113mm	110mm
IMPA	95°	92°
NASOLABIAL ANGLE	95°	106°
U1 TO NA DEGREES	27°	24°
U1 TO NA mm	4mm	2mm
L1 TO NB DEGREES	26°	23°
L1 TO NB mm	5mm	2mm
U1/L1 ANGLE	125°	132°
FMA	26°	26°
Y AXIS	72°	73°

PARAMETERS	PRE- TREATMENT	POST- TREATMENT
L1 TO A-POG	3mm	1mm
CONVEXITY AT PT. A	2mm	1mm
LOWER LIP- E PLANE	3mm	1mm
N-PERP TO PT A	0mm	0mm
N-PERP TO POG	-2mm	0mm
CHIN THICKNESS	12mm	12mm

CONCLUSION

This case report illustrates the interdisciplinary collaboration of an Orthodontist and Periodontist for treatment of such a case. With proper case selection, planning and good patient cooperation, we could obtain significant results. This case report shows how a simple Class II spacing case can be managed without extraction of premolars by means of appropriate use of simplified fixed orthodontic treatment and efficient conservation of anchorage at the same time. The planned goals set in the pre-treatment plan were successfully attained. Good intercuspation of the teeth was achieved with a Class I molar, incisor and canine relationship. The maxillary and mandibular teeth were found to be esthetically satisfactory in the line of occlusion. Patient had an improved smile and profile. The correction of the malocclusion was achieved, with a significant improvement in the patient aesthetics and self-esteem.

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Citation: Bhushan Jawale *et al* (2021). "Correction of Spaced Dentition with Fixed Orthodontic Pre-adjusted Edgewise Bracket System" – A Case Report. *South Asian Res J Oral Dent Sci*, *3*(3), 45-53.