



Research Paper

Closure of midline diastema and spaced dentition with help of fixed orthodontic mechanotherapy-a case report

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ABSTRACT: Maxillary midline diastema is one of the most frequently encountered esthetic problems in mixed and permanent dentition. Several causes have been attributed to the midline diastema, including developmental, pathologic or iatrogenic. It can also be seen as a transient malocclusion in which case any intervention is contraindicated. A wide range of possible treatments like restorative procedures, composite build up, surgeries (frenectomies) can be done, based on etiology. Thus, correct diagnosis of etiology and specific early intervention plays a major role in deciding the treatment plan. **Case report:** This case report evaluates the management of Class I malocclusion with spaced anterior dentition in a 22 year old male patient with maxillary midline diastema and a generalized spaced upper and lower dentition. The upper arch midline diastema can be attributed to presence of a thick band of fibrous tissue between the upper central incisors. The case was treated with routine fixed orthodontic therapy and frenectomy was performed at the end of the treatment just before closure of midline diastema space to prevent scar tissue formation **Conclusion:** Maxillary and mandibular arch spaces were closed down. The dental changes and treatment results were demonstrated. 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.

KEYWORDS: Fixed orthodontic mechanotherapy, Midline diastema, Spaced dentition, Generalized spacing, Class I malocclusion, Aesthetic improvement.

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I. INTRODUCTION:

A space between adjacent teeth is called a “diastema”. Midline diastema (or diastemas) occurs 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. In Today's times, Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Class I malocclusion is the second most prevalent occlusion after Class II malocclusion [2-3]. 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 [4]. There are many ways to treat Class I malocclusions, according to the characteristics associated with the problem, such as anteroposterior discrepancy, age, and patient compliance [5-6]. The indications for extractions in orthodontic practice have historically been controversial [7-9]. On the other hand, correction of Class I 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 [10, 11]. Lack of crowding or cephalometric discrepancy in the mandibular arch is an indication of 2 premolar extraction [12, 13]. Fortunately, in some instances satisfactory results with an exceptional degree of correction can be achieved without extraction of permanent premolars. This case presents the correction of a bimaxillary dentoalveolar protrusion with a Class I malocclusion in an adult male patient with generalized spacing and severely proclined maxillary and mandibular anterior teeth by executing a non-extraction 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

II. CASE REPORT:

Extra-oral examination: A 22 year old male patient presented with the chief complaint of forwardly placed upper and lower front teeth with spacing and excessive show of front teeth. On extra oral examination, the patient had a straightfacial profile, grossly symmetrical face on both sides, competent lips and an acute nasolabial Angle , a mesoprosopic facial form, dolichocephalichead form, average width of nose and mouth, minimal buccal corridor space, a non- consonant reverse smile arc and posterior divergence of face . The patient had no relevant prenatal, natal, postnatal history, history of habits or a family history. On Smiling, there was excessive show of maxillary anterior teeth. The patient had a toothy smile. On smiling he also showed the presence of spaced anterior dentition and an unaesthetic facial profile and smile. The patient was very dissatisfied with his smile.

Intra-oral examination: Intraoral examination on frontal view shows presence of an increased overjet and an average overbite with severe spacing in upper and lower anterior region. On lateral view the patient shows the presence of Class II Division 1 incisor relationship and a Class I Canine and molar relationship bilaterally. There was proclined and forwardly placed upper and lower anterior teeth with presence of upper and lower midline diastema.

Pre-treatment photos and cephalometric values



Parameters	Pre-treatment
SNA	84 ⁰
SNB	82 ⁰
ANB	2 ⁰
WITS	1mm
MAX.LENGHT	106mm
MAN.LENGHT	98mm
IMPA	110mm
NASOLABIAL ANGLE	87 ⁰
U1 TO NA DEGREE	34 ⁰
U1 TO NA mm	7mm
L1 TO NB DEGREE	30 ⁰
U1 TO NA mm	5mm
U1/L1 ANGLE	109 ⁰
SADDLE ANGLE	128 ⁰
ARTICULAR ANGLE	145 ⁰
GONIAL ANGLE	128 ⁰
FMA	24 ⁰
Y-AXIS	64 ⁰

Cephalometric evaluation:

1. Steiners analysis shows a slightly prognathic maxilla and mandible, Class I Skeletal pattern, an average to horizontal growth pattern, averagely inclined maxillary and mandibular anterior teeth and proclined upper and lowers lips
2. Tweeds analysis shows an average to horizontall growth pattern and averagely inclined mandibular incisors
3. Wits appraisal shows BO ahead of AO by 1 mm indicating Skeletal Class I pattern
4. McNamara analysis shows a prognathic maxilla and mandible, an average to horizontal growth pattern and averagely inclined mandibular incisors
5. Rakosi Jaraback analysis shows a horizontal growth pattern and average inclination of maxillary and mandibular incisors
6. Holdaway soft tissue analysis shows average maxillary and mandibular sulcus depth, protrusive upper and lower lips with increased strain in lips.

Diagnosis:

This 22 year old male patient was diagnosed with a Class I malocclusion with a slightly prognathic maxilla and mandible and an average to horizontal growth pattern, increased overjet and average overbite, proclined upper and lower incisors with lower midline shift to the left, spacing in the upper and lower anterior region with presence of midline diastema in upper arch, protrusive upper and lower lips with increased lip strain, competent lips and decreased nasolabial angle.

List of problem:

1. Proclined maxillary and mandibular anterior teeth
2. Spacing in maxillary and mandibular anterior region
3. Slightly prognathic maxilla and mandible
4. Increased overjet
5. Decreased Nasolabial angle
6. Non-congruent dental midlines
7. Increased lip strain

Treatment objective:

1. To correct proclined maxillary and mandibular anterior teeth
2. To correct spacing in the maxillary and mandibular anterior teeth
3. To correct maxillary and mandibular prognathism
4. To correct the increased overjet
5. To correct the decreased Nasolabial angle
6. To maintain Angles Class I Molar relationship
7. To maintain Class I Canine relationship
8. To achieve a Class I Incisor relationship
9. To achieve congruent midlines
10. To decrease the lip strain
11. To achieve a pleasing smile and a pleasing profile

Treatment plan:

Non Extraction protocol was followed

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 archwires 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.

Frenectomy in upper midline region for removal of fibrous band of tissues resulting in the midline diastema in the upper arch

Final finishing and detailing with 0.014" round stainless steel wires

Retention by means of Begg's Wrap-around retainers along with lingual bonded retainers in the upper and lower arch.

Treatment progress: 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 5 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 and also to maintain the normal overjet and overbite. Anchorage was conserved in the upper and lower arch by using light retraction forces, thus constantly monitoring molar and canine relationship. Anchorage preservation was done in the upper and lower arch to achieve a Class I incisor relationship and to maintain the Class I canine and molar relationship bilaterally. 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 increased overjet was corrected with an ideal occlusion at the end of the fixed appliance therapy. Patient had a pleasant and consonant smile arc on smiling along with significantly improved nasolabial angle. There was improvement in occlusion, smile arc, profile and position of chin at the end of the treatment.

Treatment results

All of the original treatment objectives were achieved. Maxillary midline diastema was corrected. Spacing in the upper and lower arch was closed. The maxillary and mandibular arches were well aligned and coordinated with corrections of the lower midline deviation. Normal overbite was maintained and normal overjet was achieved. Class I incisor relationship was achieved, Class I canine and Class I molar relationship was maintained. The chief complaint of forwardly placed upper and lower front teeth with spacing and excessive show of front teeth was addressed. Patient had a pleasant smile and a pleasant dentition at the end of the treatment which continued over 9 months.

Post treatment photos and cephalometric values



Parameters	Post-treatment
SNA	83 ⁰
SNB	82 ⁰
ANB	1 ⁰
WITS	1mm
MAX.LENGHT	104mm
MAN.LENGHT	97mm
IMPA	95 ⁰
NASOLABIAL ANGLE	99 ⁰
U1 TO NA DEGREE	26 ⁰
U1 TO NA mm	3mm
L1 TO NB DEGREE	24 ⁰
U1 TO NA mm	2mm
U1/L1 ANGLE	132 ⁰
SADDLE ANGLE	126 ⁰
ARTICULAR ANGLE	145 ⁰
GONIAL ANGLE	130 ⁰
FMA	25 ⁰
Y-AXIS	65 ⁰

III. Discussion:

It is important for an Orthodontist to consider contributing factors before determining an optimal treatment plan. These include normal growth and development, tooth size discrepancies, excessive incisor vertical overlap of different causes, mesiodistal and labiolingual incisor angulation, generalized spacing and pathological conditions. A carefully developed differential diagnosis enables the practitioner to choose the most effective orthodontic and/or restorative treatment. Restorative and prosthetic treatment is usually employed to treat Diastemas based on tooth-size discrepancies. The most appropriate treatment often requires orthodontically closing the midline diastema. A well-chosen individualized treatment plan, undertaken with sound biomechanical principles and appropriate control of orthodontic mechanics to execute the plan is the surest way to achieve predictable results with minimal side effects. Treatment of a Spaced Class I malocclusion without extraction of premolars is challenging. A well-chosen individualized treatment plan, undertaken with sound biomechanical principles and appropriate control of orthodontic mechanics to execute the plan is the surest way to achieve predictable results with minimal side effects. Class I malocclusion with Bimaxillary Dentoalveolar protrusion might have any number of a combination of the skeletal and dental components. Hence, identifying and understanding the etiology and expression of Class I malocclusion and identifying differential diagnosis is helpful for its correction. The patient's chief complaint was forwardly placed and spaced upper and lower front teeth with excessive show of front teeth . The case was of a clear bimaxillary dentoalveolar protrusion with severely proclined upper and lower anterior dentition. 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 execution of all 1st premolar extraction followed by Fixed appliance therapy could be executed for improvement in the patient's convex profile in this case. The most important point to be highlighted here is the decision to not extract the premolars. After

analysing 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 severe spacing and the existing spaces would be enough to correct the proclined anterior teeth. This case could be managed by non-extraction and hence we proceeded with the same. The treatment and closure of existing spaces very efficiently improved the patients smile 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 overall treatment time was 9 months. After this active treatment phase, the profile of this 22 year old adult male patient improved significantly as seen in the post treatment extra oral photographs. Upper and lower Hawleys's retainers were then delivered to the patient along with fixed lingual bonded retainers in upper and lower arch. One year follow up records were taken and did not reveal any drastic untoward changes in the patients smile and profile.

Pre and post treatment comparison of cheplaometric

Parameters	Pre-treatment	Post-treatment
SNA	84 ⁰	83 ⁰
SNB	82 ⁰	82 ⁰
ANB	2 ⁰	1 ⁰
WITS	1mm	1mm
MAX.LENGHT	106mm	104mm
MAN.LENGHT	98mm	97mm
IMPA	110mm	95 ⁰
NASOLABIAL ANGLE	87 ⁰	99 ⁰
U1 TO NA DEGREE	34 ⁰	26 ⁰
U1 TO NA mm	7mm	3mm
L1 TO NB DEGREE	30 ⁰	24 ⁰
U1 TO NA mm	5mm	2mm
U1/L1 ANGLE	109 ⁰	132 ⁰
SADDLE ANGLE	128 ⁰	126 ⁰
ARTICULAR ANGLE	145 ⁰	145 ⁰
GONIAL ANGLE	128 ⁰	130 ⁰
FMA	24 ⁰	25 ⁰
Y-AXIS	64 ⁰	65 ⁰

IV. Conclusion:

Maxillary and mandibular anterior arch spaces were closed down. The dental changes and treatment results were demonstrated. 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 Bimaxillary Dentoalveolar Protrusion with 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. Treatment of the proclined and forwardly placed upper and lower anterior teeth included the retraction and retroclination of maxillary and mandibular incisors utilizing the existing spaces with a resultant decrease in soft tissue procumbency and facial convexity. The profile changed from convex to orthognathic .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. The patient was very satisfied with the result of the treatment.

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