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Case Report

"Adjunctive Orthodontic Treatment in an Adult Patient with Mutilated Dentition" – A Case Report On Multidisciplinary Orthodontics

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Abstract: A problem often confronting the orthodontist is that of missing upper incisors. In evaluation of the individual case, the decision as to space closure or space regaining and eventual prosthetic reconstruction can be perplexing. Various diagnostic criteria, such as skeletal relation, arch-length analysis, inclination of teeth, and dental esthetics, must be evaluated. On the basis of this diagnostic information, a treatment alternative is chosen to correct the malocclusion. The solution may be found in maintaining space, necessitating post-orthodontic prosthetic replacement, or closing space and thus avoiding the need for artificial teeth. This case report evaluates the management of a 28 year old female patient having a mutilated malocclusion with missing maxillary central incisors. It was managed by routine orthodontic treatment which involved creating space for the missing central incisors followed by aesthetic replacement with prosthesis. After the treatment, a marked improvement in patient's smile, facial profile and occlusion was achieved and there was a remarkable increase in the patient's confidence and quality of life. Excellent occlusion and correction of the mutilated malocclusion were achieved without tipping, rotation of the posterior teeth, or other problems. The profile changes and treatment results were demonstrated with proper case selection and good patient cooperation with fixed appliance therapy.

Keywords: Replacement of missing incisors, Adjunctive orthodontic treatment, Prosthesis, Adult patient, Mutilated dentition, Removable partial denture, Upper incisors missing, Fixed Orthodontic treatment, Missing maxillary central incisors, Orthodontic Camouflage, Interdisciplinary collaboration of Prosthodontics and Orthodontics.

INTRODUCTION

When a maxillary central incisor is lost, orthodontic replacement with lateral incisors would be an excellent treatment option if success were guaranteed. Stepovich [1] presented the possibilities of these methods without severe complications, such as root resorption and tipping of adjacent teeth. Roberts et al. [2, 3] used endosseous implants placed in the anterior area to close missing incisor spaces by mesial movement of the lateral incisors. In recent

years, orthodontic miniscrews, which are more convenient, simple, and cheaper than endosseous implants, have been used widely. Kyung et al. [4] reported a 9-mm mesial movement of mandibular second molars, and Nagaraj et al. [5] reported an 8-mm movement using miniscrews to close bilateral missing mandibular first molar spaces. Kravitz and Jolley [6] discussed problems, such as buccal proclination, during mandibular molar protraction with miniscrews. The management of missing central incisor requires an integrated multidisciplinary approach [7]. Generally the choice between space opening with tooth replacement and space closure with lateral incisor substitution relies on several parameters to be considered before treatment planning. Commonly the choice is related to occlusal relationship (i.e., overjet and overbite, molar relationship), facial typology and profile, arch length, and tooth size discrepancies. The morphology of the lateral incisor, in terms of size and shape, and its colour [8] also may address different treatment strategies. Finally, patient expectation and compliance can influence the treatment planning. In case of unilateral tooth agenesis, space opening is often recommended to improve the aesthetics of patients and preserve smile symmetry. On the contrary, in case of bilateral agenesis, space closure and space opening could be both performed with respect to the issues previously reported [9-11]. Space opening is advised in low-angle subjects, whilst in high-angle individuals space closure should be preferred to preserve arch anchorage and avoid clock-wise rotation of the lower jaw. Retruded profiles should be better treated with space opening and tooth substitution, in order to improve labial sagittal relationships[12-18]. This treatment strategy should be avoided in subjects with bimaxillary dental protrusion, in which it could result in worsening of the profile [19-24]. Molar relationship should be also considered. Molar class I or class III tendency should be better treated with space opening to preserve ideal occlusal anterior and posterior relationship (i.e., canine and molar relationship) and establish a solid angle class I [25-33]. In case of full cusp or partial molar class II, space closure should be preferred to facilitate orthodontic biomechanics and reduce treatment duration. A stable molar class II and canine class I am then obtained. However, in case of arch length discrepancies extractions in the lower arch should be considered, thus obtaining a molar and canine class I. Anterior relationship, that is, overjet and overbite, must be taken into account in terms of facilitation of biomechanics. Reduced overjet and increased overbite may easily be improved by space opening mechanics, whilst increased overjet and reduced overbite may benefit from space closure. Shape and size of lateral incisors affect the possible rehabilitation choice. Differently from cases with large lateral incisors, in which space opening is advocated, small lateral incisors can be easily transformed in central incisors by using porcelain veneers or composite materials. The original position of the lateral incisor should be considered. Teeth closer to the midline are best candidate for incisor substitution. Our patient had grossly decayed maxillary central incisors which needed extractions. Hence we decided to go about with this case by creating space in the maxillary anterior region and delivering prosthesis for the missing maxillary central incisors.

CASE REPORT

Chief complaint and etiology

A young female patient, aged 28 years 6 months, sought an orthodontic evaluation with a chief complaint of missing upper front teeth and also wanted to get a replacement for the same. The patient also complained of irregularly placed lower front teeth. The right and left maxillary central incisors had been extracted 2 months ago due to severe caries.

EXTRA-ORAL EXAMINATION

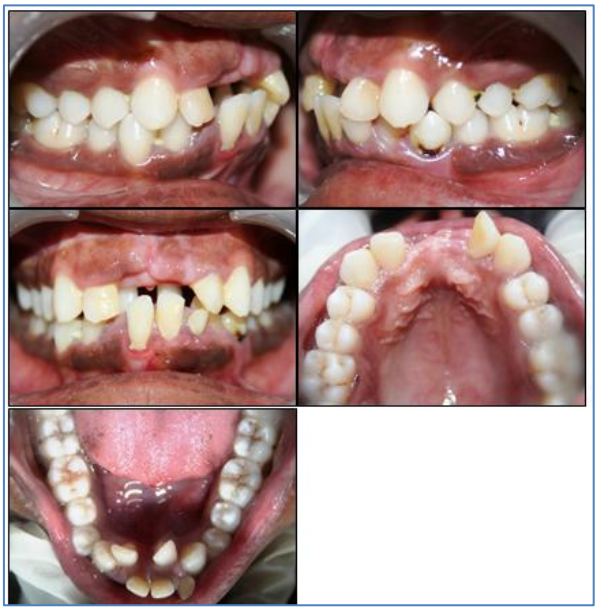
On Extra-oral examination, the patient had a concave facial profile, grossly symmetrical face on both sides, incompetent lips, moderately deep mentolabial sulcus and an acute Nasolabial Angle with loss of upper lip support and everted upper lip, a Leptoprosopic facial form, Dolicocephalic head form, average width of nose and mouth and slightly anterior divergence of face. The patient had no relevant prenatal, natal, postnatal history, history of habits or a family history. On smiling, there was absence of maxillary central incisors with a gummy smile, minimal buccal corridor space and a non-consonant smile arc.

Pretreatment extra-oral photographs

Intra-oral examination

Intraoral examination on frontal view showed presence of missing maxillary central incisors. On lateral view the patient showed the presence of a Class I Canine relationship and a Class I Molar relationship bilaterally. Both maxillary central incisors were missing, as they were extracted 2 months prior to orthodontic treatment due to

carious decay. On occlusal view, the upper arch showed presence of rotated lateral incisors and lower arch showed presence of crowding in the lower anterior region with presence of an over-retained deciduous left lateral incisor. The upper arch showed the presence of a" U" shaped arch form and lower arch showed presence of a "V" shaped arch form. To achieve a Class I incisor relationship, the upper edentulous spaces needed to be replaced with prosthesis and lower anterior crowding needed to be resolved with orthodontic intervention.



Pretreatment intra-oral photographs

Pretreatment cephalometric readings

PARAMETERS	PRE- TREATMENT
SNA	83°
SNB	82°
ANB	1°
WITS	0mm
MAX. LENGTH	78mm
MAN. LENGTH	98mm
IMPA	98°
NASOLABIAL ANGLE	89°
U1 TO NA DEGREES	-
U1 TO NA mm	-
L1 TO NB DEGREES	29°
L1 TO NB mm	4mm
U1/L1 ANGLE	-
FMA	29°
Y AXIS	75°

Diagnosis

This 28 year old female patient was diagnosed with a Class I malocclusion with an average maxilla and mandible and a vertical growth pattern, missing maxillary central incisors, moderately deep mentolabial sulcus , an acute Nasolabial angle , incompetant lips with everted upper lip, reduced lip strain , concave facial profile with loss of upper lip support and an unaesthetic non-consonant smile arc.

List of problems

1. Missing maxillary central incisors
2. Crowding in lower anterior region
3. Concave facial profile
4. Decreased Nasolabial angle
5. Incompetent lips
6. Everted upper lip
7. Reduced lip strain and lip support
8. Non-consonant smile arc

Treatment objectives

1. To replace the missing maxillary central incisors
2. To correct crowding in mandibular anterior region
3. To correct the anterior divergence of face
4. To correct the decreased Nasolabial angle
5. To increase the lip strain
6. To achieve competent lips and good lip support
7. To achieve a consonant smile arc
8. To maintain Class I canine and molar relationship
9. To achieve a Class I incisor relationship
10. To achieve a pleasing smile and a pleasing profile

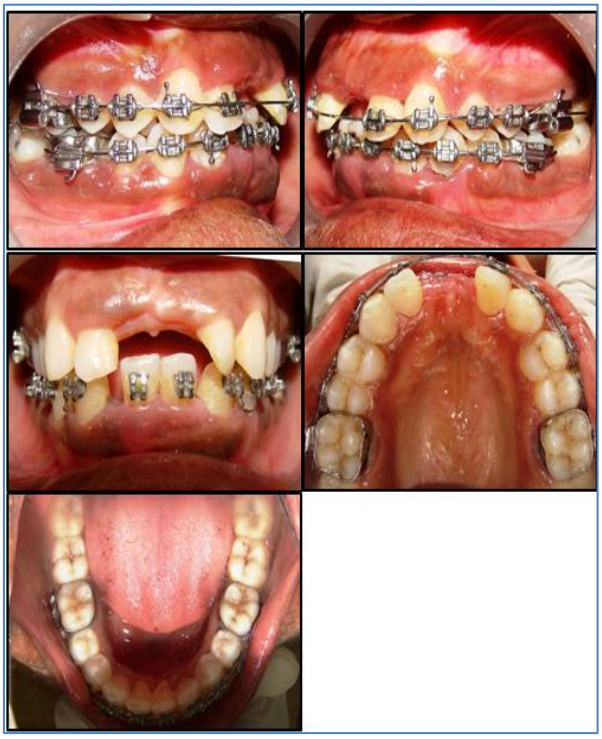
Treatment alternatives

Spaces caused by missing maxillary central incisors could be corrected by prosthetic bridges, dental implants, auto transplantation of lateral incisors, or mesial orthodontic movement of lateral incisors. Prosthetic bridges offered the advantage of short treatment time but must be accompanied by significant tooth preparation. Dental implants permit conservation of tooth structure but require surgery. Auto transplantation also required surgery, and successful transplantation could not be guaranteed. Our patient finally chose prosthetic replacement of the missing maxillary central incisors and correction of the severe mandibular anterior crowding with orthodontic intervention.

Treatment plan and treatment progress

After two months of extraction of carious maxillary central incisors, 2 in-standing lower lateral incisors and deciduous mandibular left lateral incisor, fixed appliance therapy was started which included banding of all molars and bonding 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 was done following sequence 'A' of MBT. After 6 months of alignment and leveling NiTi round wires were discontinued. Reverse curve of spee in the lower arch and exaggerated curve of spee in the upper arch was incorporated in the heavy

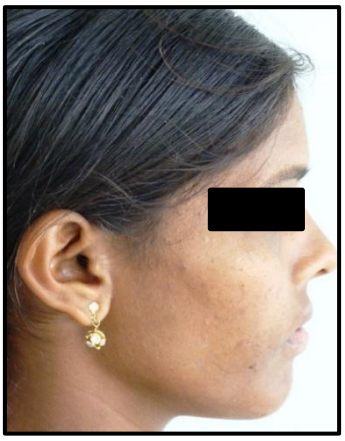
archwires to prevent the excessive bite deepening during retraction process and also to maintain the normal overjet and overbite in the lateral incisor region. Spaces in the maxillary anterior region were opened slightly more according to the space required for the prosthesis of maxillary central incisors. This was done with the help of open coil springs traversing from maxillary right to left lateral incisors. After alignment, retraction and closure of any residual created spaces was done using 0.019" x 0.025" rectangular NiTi followed by 0.019" x 0.025" rectangular stainless steel wires. 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. Final finishing and detailing was achieved with 0.014" round stainless steel wires. Retention was achieved by means of Begg's wrap-around retainers along with lingual bonded retainers in the upper and lower arch. Following the orthodontic phase, removable partial denture prosthesis was given to replace the missing maxillary central incisors.



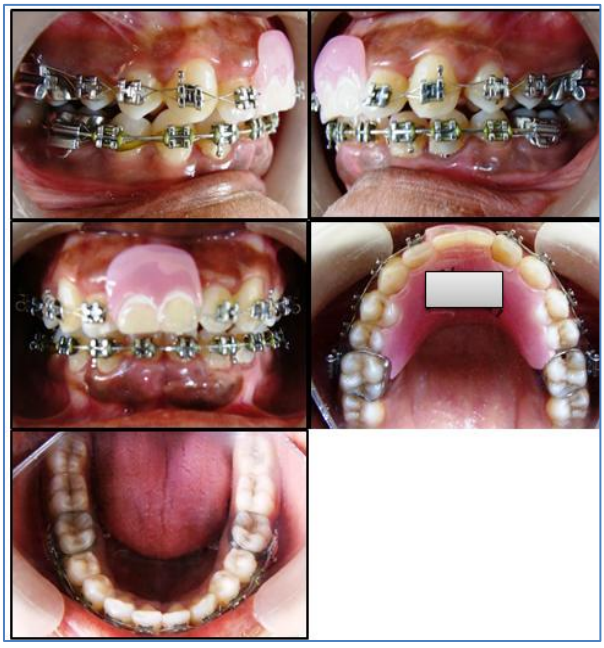
Mid treatment intra-oral photographs

Post treatment cephalometric readings

PARAMETERS	POST-TREATMENT
SNA	82°
SNB	81°
ANB	1°
WITS	0mm
MAX. LENGTH	77mm
MAN. LENGTH	97mm
IMPA	93°
NASOLABIAL ANGLE	106°
U1 TO NA DEGREES	27°
U1 TO NA mm	2mm
L1 TO NB DEGREES	24°
L1 TO NB mm	2mm
U1/L1 ANGLE	132°
FMA	29°
Y AXIS	74°



Post treatment extra-oral profile change



Post prosthesis intra-oral photographs

Treatment results

All of the original treatment objectives were achieved. The maxillary and mandibular arches were well aligned and coordinated without midline deviations. Normal overbite and overjet was achieved after delivering the prosthesis with missing maxillary central incisors. Class I incisor, canine and molar relationship was achieved bilaterally. The lower anterior crowding was completely unraveled by extraction of the in-standing lateral incisors The chief complain of missing upper front teeth and

irregularly placed lower front teeth was addressed. The anteriorly divergent face changed to orthognathic, the reduced nasolabial angle at pre-treatment was improved, lips changed from being incompetent to competent and lip strain increased significantly at the end of treatment with a good lip support and non-everted upper lip .Wire fixed retainers were attached to the lingual aspect of each tooth from the right to the left canines in both arches. The patient wore a Begg's wrap around retainer for 15 hours per day for the first 2 months, followed by another 10 months of nighttime wear.

DISCUSSION

Treatment of a mutilated dentition with missing maxillary central incisors 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 bi-maxillary dento-alveolar protrusion might have any number of a combination of the skeletal and dental component. Hence, identifying and understanding the etiology and expression of malocclusion and identifying differential diagnosis is helpful for its correction. The patient's chief complaint was missing upper front teeth and irregularly placed lower front teeth. 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. After analyzing the case thoroughly and reading all pretreatment cephalometric parameters along with evaluating the patients profile clinically, a decision was made to replace the missing maxillary central incisors with removable partial denture prosthesis and correction of mandibular severe anterior crowding with fixed orthodontic mechano-therapy. There was improvement in occlusion, smile arc, profile and Nasolabial angle at the end of the treatment. Successful results were obtained after the fixed MBT appliance therapy within a stipulated period of time. The overall treatment time was 18 months. After this active treatment phase, the profile of this 28 year old female patient improved significantly as seen in the post treatment extra oral photographs. Removable Begg's retainers were then delivered to the patient along with fixed lingual bonded retainers in upper and lower arch. Patient was very satisfied at the end of the treatment.

Comparison of pre and post treatment cephalometric readings

PARAMETERS	PRE- TREATMENT	POST-TREATMENT
SNA	83°	82°
SNB	82°	81°
ANB	1°	1°
WITS	0mm	0mm
MAX. LENGTH	78mm	77mm
MAN. LENGTH	98mm	97mm
IMPA	98°	93°
NASOLABIAL ANGLE	89°	106°
U1 TO NA DEGREES	-	27°
U1 TO NA mm	-	2mm
L1 TO NB DEGREES	29°	24°
L1 TO NB mm	4mm	2mm
U1/L1 ANGLE	-	132°
FMA	29°	29°
Y AXIS	75°	74°

CONCLUSION

The case report shows the interdisciplinary collaboration of Prosthodontics and Orthodontics in adjunctively treating an adult female patient with missing maxillary central incisors and crowded mandibular incisors. The planned goals set in the pretreatment plan were successfully attained. The missing maxillary central incisors were replaced with removable prosthesis and lower anterior crowding was unraveled with fixed orthodontic treatment. Good intercuspation of the teeth was maintained with class I incisor, canine and molar relationship. The maxillary and mandibular teeth were found to be esthetically satisfactory in the line of occlusion. Patient had an improved smile and facial profile. The correction of the malocclusion was achieved, with a significant improvement in the patient aesthetics and self-esteem.

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