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Case Report

Periodontally Compromised Bimaxillary Dento-Alveolar Protrusion - Esthetics Redefined

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Abstract

Objective: To evaluate the efficiency of orthodontic treatment with extraction of only maxillary first premolars in a periodontally compromised skeletal class II bimaxillary dentoalveolar protrusion malocclusion.

Methods: Treatment involved strap-up of a pre-adjusted edgewise appliance, Roth's prescription (0.022 X 0.028 - inch slot), with only maxillary first premolars extraction approach. The case was assessed at start of orthodontic treatment (T1) and end of orthodontic treatment (T2).

Results: At T2, the bimaxillary dentoalveolar protrusion was corrected and the canines were treated to a class I relation. The severe overjet and deep bite was corrected with the result that the periodontal health of the dentition improved considerably.

Conclusion: The periodontally compromised skeletal class II bimaxillary dentoalveolar protrusion malocclusion was effectively corrected and pleasing facial esthetics was accomplished with effective elimination of the lower lip trap.

Keywords: *Bimaxillary Dentoalveolar Protrusion; Lower Lip Trap; Periodontally Compromised Maloccusion*

Introduction

Adult patients with periodontally compromised malocclusion pose a greater challenge to the treating orthodontist. Effective correction of the malocclusion may encompass an interdisciplinary approach. An improvement in the overall facial esthetics is the primary motivating factor for such patients seeking orthodontic treatment [1,2].

Reduction of alveolar bone support and severe loss of attachment is a characteristic feature of advanced periodontal disease. Spacing, proclination, rotation, extrusion, pathologic migration of teeth, mobility, bone dehiscence, root fenestrations and gingival recession manifests as the various periodontal conditions that challenge the treating orthodontist [3]. Effective control of the periodontal disease and maintenance of a healthy periodontium is mandatory for optimal orthodontic tooth movement. It has been reiterated that improvement in the periodontal condition and the establishment of a healthy and well-functioning dentition is deemed possible with adequate orthodontic and periodontal treatment [4-6].

Bi-maxillary protrusion is treated with orthognathic surgery or with anterior segmental osteotomy with first premolar extractions depending upon the severity of the skeletal malocclusion [7]. Orthodontic treatment with extraction of premolars could be the other alternative orthodontic camouflage treatment approach [8].

Effective distalization of the whole dental arch can be done with infrazygomatic implants or implants in the maxillary tuberosity. It can also be done with the modified palatal anchorage plate approach [9,10]. Total arch distalization with temporary anchorage devices is yet another option. However, placing them in the interradicular space may obstruct the root movement of the posterior teeth leading to limited range of tooth movement [11].

This case report demonstrates a combined periodontic-orthodontic-prosthodontic approach of an adult female with severe skeletal Class II bimaxillary dentoalveolar protrusion with pronounced lower lip trap and compromised facial esthetics treated optimally with fixed orthodontic therapy with extraction of maxillary first premolars only.

Case Report

Diagnosis and etiology

A 34-year-old female presented with severe forward placement of the maxillary and mandibular incisors with spacing in between the maxillary incisors and difficulty in approximation of the upper and lower lips.

Extraoral assessment. The patient had a mesoprosopic face, convex profile, posterior divergence, incompetent lips, clinical low mandibular plane angle, with no signs of temporomandibular joint dysfunction (Figure 1a-1c).

Figure 1a: *Pre-treatment extraoral - Frontal.*

Figure 1b: *Pre-treatment extraoral - Right Profile.*

Figure 1c: *Pre-treatment extraoral - Left Profile.*

Intraoral assessment. Oral hygiene was satisfactory. The maxillary arch was average shaped, almost symmetrical with severely proclined maxillary incisors with excessive spacing in between them.The mandibular arch was also average shaped, asymmetrical with proclination and mild crowding of the mandibular dentition. The maxillary and mandibular skeletal and dental midlines coincided with each other. The molar relation was Class II on both the sides with the canine relation being Class II on right side and end-on on left side. 14 was in scissor bite with 26 periodontally compromised and 27 absent (Figure 1d-1h).

Figure 1d: *Pre-treatment intraoral - Frontal.*

Figure 1e: *Pre-treatment intraoral - Right.*

Figure 1f: *Pre-treatment intraoral - Left.*

Figure 1g: *Pre-treatment intraoral - Upper occlusal.*

Figure 1h: *Pre-treatment intraoral - Lower occlusal.*

Radiographic assessment. The panoramic radiograph confirmed the presence of all permanent teeth with the exception of missing 27 with alveolar bone loss in relation to 17, 18, 26, 36, 37, 38, 46, 47, 48 and in relation to the maxillary anteriors (Figure 2a).

Figure 2a: *Pre-treatment panoramic radiograph.*

Lateral cephalometric analysis revealed a skeletal Class II pattern, with an orthognathic maxilla and a retrognathic mandible, with a low mandibular plane angle and severely proclined maxillary and mandibular incisors with increased maxillary but decreased mandibular height (Figure 2b).

Figure 2b: *Pre-treatment lateral cephalometric radiograph.*

Treatment objectives

The main treatment objectives were to improve facial esthetics, soft tissue profile, lip incompetence and speech. Initial treatment was aimed at comprehensive periodontal therapy before initiation of orthodontic therapy. Since the maxilla was orthognathic and the mandible retrognathic, greater emphasis was laid on the correction of the increased bi-maxillary dentoalveolar protusion. Since the malocclusion was an Angles' Class II division 1 malocclusion on a skeletal Class II base and since the patient was not willing for orthognathic surgery an orthododontic camouflage of the skeletal Class II malocclusion was advised with extraction of only maxillary first premolars with a non extraction approach in the mandibular dental arch. A removable partial denture was recommended on completion of orthodontic therapy for the missing 27, as 26 and 28 were not periodontally sound for a fixed prosthesis.

Treatment alternatives

Anterior maxillary osteotomy or fixed appliance therapy with absolute anchorage with microimplants could have been the other treatment alternatives. The patient however opted for only fixed appliance therapy as she was apprehensive about microimplants and orthognathic surgery.

Treatment progress

Preadjusted edgewise brackets (Roth prescription, 0.022 x 0.028-inch slot) were bonded. Aligning and leveling was achieved with the initial 0.014 inch nickel titanium upper and lower archwires with subsequent upgradation to 0.016 inch nickle titanium, 0.016 x 0.022 inch nickle titanium and finally to 0.016 x 0.022 inch stainless steel archwires. Deep bite was corrected with 0.016 inch reverse curve nickle titanium upper and lower archwires. Extraction spaces in the maxillary arch were closed with the use of nickle titanium retraction closed coil springs. These springs from crimpable hooks positioned between lateral incisors and canines on 0.017 x 0.025 inch stainless steel archwire were then extended to the molar hooks. The final archwires used were 0.019 x 0.025-inch stainless steel archwires. Finishing and detailing was adequately accomplished.

Results

The patient showed remarkable improvement in the correction of the increased bimaxillary dentoalveolar protrusion.The proclined maxillary incisors and imbricated mandibular incisors were corrected and a Class I canine relationship with the maintenance of the Class II molar relationship was achieved with the fixed appliance therapy. The severe overjet was drastically reduced and the deep bite was corrected too. The lower lip trap was eliminated and a pleasing soft tissue profile was achieved (Figure 3a-3f).

Figure 3a: *Post treatment extraoral - Frontal.*

Figure 3b: *Post treatment extraoral - Right Profile.*

Figure 3c: *Post treatment extraoral - Left Profile.*

Figure 3d: *Post treatment intraoral - Frontal.*

Figure 3e: *Post treatment intraoral - Upper occlusal.*

Figure 3f: *Post treatment intraoral - Lower occlusal.*

Discussion

This case report describes the rationale and treatment approach of only maxillary first pemolar extractions in an adult patient with a skeletal class II bimaxillary dentoalveolar protrusion with compromised periodontal condition. It is a well-known fact that compromised esthetics is usually accompanied with functional discomfort in the maxillary anterior region [12,13]. This was the prime reason that the patient reported for orthodontic treatment. Satisfactory long term prognosis and improvement in function and esthetics of the periodontally affected dentition is attainable if the patient responds well to the initial periodontal therapy [14]. Hence, adult periodontal disease is not a contraindication for orthodontic treatment but could rather instead improve the periodontal condition and restore the deteriorated dentition. It should however be stated that only after the achievement of good control of the periodontal condition could one attempt orthodontic treatment of periodontally migrated teeth [15,16]. In tune with this tenet comprehensive periodontal therapy with scaling and root planing was done prior to initiation of orthodontic therapy with the instructions to maintain good oral hygiene during the course of the orthodontic treatment and later too.

It has been widely reported that severe bimaxillary dentoalveolar protrusion can be successfully treated with extraction of the maxillary and mandibular first premolars to improve the facial convexity and incompetent lips [17,18]. Extraction of two premolars of each quadrant of the maxillary arch as recommended by Schater and Schater [19] could also be done but may not be a recommended treatment modality due to periodontal problems arising out of approximal contact of first molar and canine. However, in the case reported orthodontic camouflage of the skeletal Class II malocclusion was attempted with extraction of only maxillary first premolars. A non extraction

approach of the mandibular arch was advocated to normalise the severe increase in overjet. Retraction and intrusion of the maxillary incisors improved the periodontal condition and contributed to an ideal smile arc. A reduction of 27 degrees in the angulation of the maxillary incisors (U1-NA) and a mild increase in angulation of the mandibular incisors (L1- NB) was evidenced with dramatic improvement in the interincisal angle. The mechanics were effective enough in not increasing the lower anterior facial height. (Figure 4a). The overall changes observed were reflected in the lateral cephalometric analysis (Table 1). Alveolar bone crest levels and parallelism of roots was maintained with no further resorption post treatment (Figure 4b).

Figure 4a: *Post treatment lateral cephalometric radiograph*

Figure 4b: *Post treatment panoramic radiograph*

Parameters	Standard	Pre treatment	Post treatment
SNA	82 ± 2^0	81	83.5
SNB	80 ± 2^0	75.5	75.5
ANB	2 ± 2^0	5.5	8
SN-FH	7^0	7	7
Wits Appraisal	AO coincides with BO	AO ahead of BO by 5 mm	AO ahead of BO by 9 mm
Convexity at point A	2 ± 2 mm	3	7
SN-MP	32 ± 2^0	24	28
SN-OP	14 ± 8^0	13	12
LAFH	66.7 mm	66	68
Maxillary height	25.7 ± 1.1 mm	33	34
Mandibular height	48.6 ± 2.4 mm	42	38
U1-NA (Linear)	4 mm	21	4
U1-NA (Angular)	22^0	45	18
L1-NB (Linear)	4 mm	12	12
L1-NB (Angular)	25 ^{0}	38	43.5
Interincisal Angle	131^0	92	110
L1- A POG	1 ± 2 mm	8	7
Lower Lip to E-Plane	-2 ± 2 mm	5	5
Nasolabial Angle	102 ± 8	70	94.5

Table 1: *Lateral Cephalometric Analysis.*

Movement of teeth in a horizontal direction without much attachment loss is achievable in a reduced healthy periodontium too [20,21]. Since tooth movement is performed with light forces in a periodontally compromised dentition and that alveolar bone is created ahead of the tooth in movement a reduction in vertical bone height is not a contraindication for orthodontic tooth movement [22,23]. In tune with this philosophy light forces were used to effect alignment, leveling and extraction space closure. The severe overjet of about 15 mm was reduced to 3mm and a normal overbite was achieved (Figure 5a, 5b and Figure 6a, 6b). In order to prevent the exacerbation of the already prevalent skeletal Class II malocclusion the mandibular first premolars were not extracted. However, the mandibular anteriors were mildly proclined and intruded to decrease and normalize the severe increase in overjet.

Figure 5a: *Pre-treatment - severe overjet - right.*

Figure 5b: *Post treatment - normal overjet - right.*

Figure 6a: *Pre-treatment - severe overjet - left.*

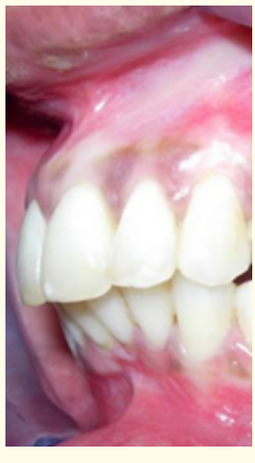

Figure 6b: *Post treatment - normal overjet - left.*

Kocadereli was of the opinion that extraction of premolars and retraction of incisors is a viable option to bring about a decrease in lip procumbency [24]. The lower lip to E-plane did not change much but there was a good improvement in the nasolabial angle to normal values post treatment thus contributing to the overall improvement in the soft tissue frontal and profile esthetics.

The best option for achieving a predictable outcome for an adult patient with complex clinical problems is undoubtedly an inter-disciplinary periodontic/orthodontic approach [25]. However, before commencement of orthodontic treatment a long healing period and radiographic evidence of bone apposition is mandatory [26]. These cardinal principles were strictly followed in the case reported. Permanent retention was advised with fixed lingual retainers bonded from 16 to 26 and from 34 to 44 to prevent relapse. A removable partial denture for the missing 27 was given to prevent supra eruption of 37. Facial harmony, balance and smile esthetics was adequately achieved (Figure 7a and Figure 7b). The already compromised 26 which was maintained throughout orthodontic treatment would be further kept under observation and if need be extracted later. A fixed prosthesis would then be contemplated for the missing 26, 27.

Figure 7a: *Pre-treatment extraoral - Smiling.*

Figure 7b: *Post treatment extraoral - Smiling.*

Conclusion

A severe skeletal class II malocclusion with a severe bimaxillary dentoalveolar protrusion with a periodontally compromised dentition was successfully treated with orthodontic treatment with extractions of only maxillary first premolars. Overall facial esthetics and periodontal health of the dentition improved dramatically that invariably led to a boost in the patients' morale and self-esteem.

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