Interdisciplinary Management of an Adult Patient with Class II Div 1 Malocclusion, Anterior Open Bite and Multiple Missing Molars

Rohit Mehrotra, Akshita Mehrotra, Manju Guhagarkar

ABSTRACT
This case report describes the esthetic and functional rehabilitation of a female patient in her mid-forties having Class II Div 1 malocclusion, anterior open bite and multiple missing molars, with orthodontics and implant prosthodontics. The patient had bilaterally missing upper first and third molars and lower first and second molars. Orthodontic treatment using skeletal anchorage was performed to retract and align the upper anteriors and correct the open bite. In the upper arch, first molar spaces were closed and no prosthesis was needed. In the lower arch, the anteriors and premolars were aligned and implants were placed bilaterally to replace the missing molars and provide proper occlusion with the upper posteriors. Significant improvement in the occlusion, smile and facial esthetics was achieved. This article highlights the importance of an interdisciplinary team approach for providing optimum treatment to many adult patients.

Keywords: Adult interdisciplinary therapy, Orthodontics, Skeletal anchorage, Implant.


INTRODUCTION
In the last two decades, treatment of adults has become an integral part of orthodontic practice. However, adult patients may present with several pre-existing conditions not commonly seen in adolescents, including periodontal disease, tooth loss, temporomandibular dysfunction and compromised tooth structure due to caries, attrition, abrasion or erosion. In most situations, successful rehabilitation of these patients requires an interdisciplinary approach, with an orthodontist, periodontist, prosthodontist, restorative dentist and/or oral surgeon working in close cooperation with each other.1,2 It is the orthodontist who often assumes the role of team leader and coordinates with other specialists for achieving the best and most suitable results for patients needing adult interdisciplinary therapy.

The orthodontic treatment of adults itself is very different than that of children and adolescents. Most adults seeking orthodontic treatment have a high level of internal motivation. However, the visibility of the appliance and the length of the treatment are major concerns with adults. While most children are recommended comprehensive orthodontics with achievement of ideal occlusion smile and facial esthetics, the same may be considered an overtreatment for many adults.1,2 In a significant number of adult patients, orthodontics is performed for limited goals, which are clearly specified and agreed to by the patient and the orthodontist at the beginning of treatment. Hence, acceptable adult orthodontic treatment may range from being purely adjunctive to facilitate restorative, periodontal or prosthetic dental treatment of the patient, have limited esthetic and/or functional enhancement goals, or involve comprehensive orthodontics with attainment of ideal occlusion and esthetics, often in conjunction with other dental specialties.

This case report highlights the interdisciplinary management of an adult patient in her mid-forties, having a Class II Div 1 malocclusion with anterior open bite and multiple missing posteriors with orthodontics, restorative dentistry and implants.

DIAGNOSIS
A 46-year-old female patient reported to our practice with the chief complaint of proclined upper anterior teeth (Figs 1A to H). She also complained of ‘difficulty in chewing food satisfactorily’ as multiple posterior teeth had been extracted due to caries, and desired replacement for the same. Her medical history revealed nothing significant.
Intraoral examination revealed that the upper first and third molars and the lower first and second molars were missing bilaterally, which was confirmed on the OPG (Figs 2A and B). She had an Angle’s Class II Div 1 malocclusion, with the canines and premolars in Class II relationship, increased overjet, anterior open bite, crowding in both arches and upper anterior protrusion. The lower third molars were carious and mesially inclined. The periodontal condition, as observed clinically and on OPG, was acceptable.

Extraoral examination showed convex profile, incompetent lips and acute nasolabial angle. On smiling, she had almost 100% incisal exposure but no gingival visibility.

Cephalometric analysis (see Figs 2A and B and Table 1) revealed skeletal Class II (ANB 7°, Wits AO > BO by 6 mm), high angle facial pattern (GoGn to SN 41°), with protrusive upper and upright lower incisors.

**TREATMENT PLAN**

In the upper arch, it was planned to use the space of the previously extracted first molars for retraction and alignment of the anteriors. Any remaining space was to be closed by protracting the second molars to eliminate the need of prosthesis in the upper arch. In the lower arch, the anteriors and premolars were to be aligned and implants were planned distal to the second premolars to achieve satisfactory occlusion with the upper posteriors.

**TREATMENT PROGRESS AND RESULTS**

Upper second molar to second molar and lower second premolar to second premolar 0.022" preadjusted labial appliance with ceramic brackets was placed and alignment initiated on round nickel titanium archwires. A soldered TPA
was placed to prevent extrusion of the upper second molars. Mini-implants (Dentos, Korea: CH-1213, 7 mm) were placed bilaterally just mesial to the upper second molars 3 to 4 mm above gingival margin (Figs 3A and B). The upper anteriors were ligated and chain elastics were placed from the upper canines to the mini-implants for *en masse* retraction of all ten teeth in the upper anterior segment thus utilizing the skeletal anchorage. Retraction was performed on 0.018” in stainless steel wire. The mechanics allowed for extrusion of the upper incisors as retraction progressed, enabling correction of the anterior open bite. When a near normal overjet was achieved, the mini-implants were removed and the upper second molars were protracted using the ten teeth in the anterior segment as anchorage to close the residual space. Lower arch levelling and alignment were completed using round stainless steel wires. Appropriate torque was established in both arches utilizing 0.019 × 0.025 in stainless steel archwires. The total duration of orthodontic treatment was 1 year and 8 months. Normal overjet and overbite, Class I canine and premolar relationship (Figs 4A to E) and significant improvement in facial and smile esthetics was achieved with increase in the nasolabial angle as the upper incisors were retracted enough to establish lip competency while maintaining adequate lip support.

Long-term retention was planned with upper canine to canine and lower first premolar to first premolar lingual bonded retainers. Additionally in the upper arch, an essix retainer was provided to prevent extrusion of the second molars.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Pretreatment</th>
<th>Post-treatment</th>
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<tbody>
<tr>
<td>SNA</td>
<td>83°</td>
<td>82°</td>
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<tr>
<td>SNB</td>
<td>76°</td>
<td>76°</td>
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<tr>
<td>ANB</td>
<td>7°</td>
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<td>Wits</td>
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<td></td>
<td>6 mm</td>
<td>4 mm</td>
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<tr>
<td>U1 to L1</td>
<td>110°</td>
<td>130°</td>
</tr>
<tr>
<td>U1 to NA</td>
<td>12 mm 34°</td>
<td>7 mm 16°</td>
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<tr>
<td>U1 to SN</td>
<td>117°</td>
<td>97°</td>
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<tr>
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<td>12 mm 30°</td>
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<td>IMPA</td>
<td>90°</td>
<td>91°</td>
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<tr>
<td>L1 to APog</td>
<td>6.5 mm 26°</td>
<td>7 mm 28°</td>
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<tr>
<td>GoGn to SN</td>
<td>41°</td>
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<tr>
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<td>14°</td>
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<tr>
<td>U lip to E-line</td>
<td>0 mm</td>
<td>–3 mm</td>
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<td>L lip to E-line</td>
<td>3 mm</td>
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molars and opening of the extraction spaces. In the lower arch, lingual bonded retainers were extended to include the second premolars to ensure no drifting of teeth took place into the bilateral edentulous areas until the implant prostheses could be placed.

The prosthetic phase was planned to be commenced 6 weeks after completing orthodontic treatment. However, the patient returned for prostheses after 2 years. She had been very inconsistent with the wear of the essix retainers which resulted in slight spaces opening up in the upper arch between the second premolars and second molars (now positioned to function as first molars). However, the upper anterior correction, the lower arch alignment, the improvement in occlusion and facial esthetics was fully maintained due to the lingual bonded retainers.

On the left side, a single implant (4.3 mm × 13 mm, Nobel replace select tapered, Nobel Biocare, Sweden) was placed to replace the missing 1st molar. On the right side, two implants (3.5 mm × 13 mm, Nobel replace select tapered, Nobel Biocare, Sweden) were considered necessary and placed, as a mesiodistally long occlusal table had to be restored and the ridge was narrow, allowing placement of only narrow diameter implants. Metal ceramic superstructure facilitated good occlusion with the upper posteriors (Figs 5A to C).

Post-treatment extraoral photographs display competent and adequately supported lips with good smile and facial esthetics (Figs 6A to C). A comparison of the pretreatment and post-treatment lateral cephalograms (see Table 1, Figs 7 and 8) revealed that the upper anteriors were retracted 5 mm and retroclined by 18° while the lower anteriors retained their pretreatment position anteroposteriorly, remaining upright over basal bone. Both the upper and lower lip were retracted by 3 mm into a more esthetically and functionally favorable position. The openbite was corrected primarily by extrusion of the upper anteriors. Follow-up OPG (see Figs 7A and B) revealed good root paralleling, no significant root resorption and osseointegrated implants in healthy condition.

DISCUSSION

If the patient had a full complement of teeth in the upper arch, the treatment of choice would have been extraction of upper first premolars bilaterally, this being a maximum
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However, if the upper second molars were used as anchorage to retract the ten teeth in the anterior segment, the resulting space closure would predominantly take place by mesial movement of the upper second molars and insufficient retraction of the anteriors. Conventional means of reinforcing and preserving anchorage, such as use of Nance’s button and sequential retraction of premolars, canines and incisors would prolong the treatment time considerably.

Thus, it was decided to use orthodontic mini-implants as temporary anchorage devices to retract upper anteriors and premolars enmasse. Skeletal anchorage not only expands the envelope of orthodontic treatment in mutilated dentition cases like this patient but also the enmasse retraction of all ten teeth in the anterior segment made possible by mini-implants drastically cut down on treatment time, which was a major concern for our patient, and holds true for almost all adult patients.4-7

Modern orthodontic treatment is based on the soft tissue paradigm, which states that both the goals and limitations of orthodontic and orthognathic treatment are primarily determined by the relationships and adaptations of the soft tissues of the face.1,8-10 As the face ages, lips become thinner and lip fullness decreases.11 The primary goal of retraction in adults is to produce lip competency while maintaining adequate lip support,2 which was achieved in this case. Moreover, vertical lip length increases as one ages, and many adults including this patient have long upper lips. The interlabial line also moves down with aging.8,11,12 These changes reduce the visibility of upper incisors in speech and smiling. Anterior open bites can be corrected by either anterior extrusion or posterior intrusion.13,14 This patient, skeletally, had a high
angle facial pattern. However, preoperatively, there was no excessive gingival display on smiling. The planned retraction of the upper anteriors would lead to lips retracting and becoming longer vertically, which would further reduce incisor visibility. Hence, we decided to correct the anterior open bite primarily by extrusion of the upper incisors. Use of ‘low pull’ mechanics and round stainless steel wires allowed the maxillary occlusal plane to rotate clockwise, and the maxillary incisors to tip back, become more vertical and extrude slightly while retracting. The anterior open bite was resolved and adequate incisor display was maintained to enable the patient to have a relatively youthful appearance during speech and smiling.

Restoring and mesializing the carious lower third molars with skeletal anchorage, though possible, was not a preferred treatment option. If the lower third molars had to be made functional, they would have to be uprighted, intruded and moved forward by almost two molar widths to close lower spaces, which was not considered practical due to the drastically increased treatment time, compromised status of the third molars and increased risk of root resorption and dehisences. On the contrary, the lower posterior alveolar ridges, though narrow with some resorption and remodelling, were of sufficient width and height for implants to be placed without extensive bone augmentation procedures. So, implant prosthodontics was considered the most suitable treatment option in the lower posterior edentulous area to provide satisfactory occlusion with the upper posteriors. However, the lower third molars were temporarily restored and their extraction was delayed till after the end of the orthodontic phase as their presence kept other treatment options open and, also prevented supraperuption of the upper second molars on the right side.

While modern restorative dentistry is capable of providing significant improvements in microesthetics in this case, keeping in view the patient’s requirements, treatment was restricted to bleaching, to reduce the internal staining and minimal contouring and restorations to improve the worn incisal edges.

CONCLUSION

The number of adults seeking orthodontic treatment is increasing worldwide. The treatment of adults, especially the ‘older’ adults, involves working with a ‘used’ and often mutilated dentition. The treatment planning and execution in many of these cases is best done by an interdisciplinary team approach wherein the orthodontist works in close cooperation with specialists of one or more other branches of dentistry to optimize benefit to the patient.

REFERENCES