Treatment of iatrogenic malocclusions using micro implants: A series of two case reports

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The term 'iatrogenic' is defined as that which is 'results from the activity of a health care provider, institution or health professional. Iatrogenic malocclusions are malocclusion resulting from previous dental and/or orthodontic treatment. This series of two case reports highlights the use of micro-implants in the treatment of such iatrogenic malocclusions. In the first case report a patient KB reported with forwardly placed upper front teeth. His previous dental treatment included root canal treatment of all the four incisors followed by coronal coverage to solve his chief complaint. The treatment plan included replacement of coronal coverage, extraction of all bicuspids and retraction and intrusion using micro-implants, followed by permanent coronal coverage. In the second case report the patient GC complained of poor esthetics due to forwardly placed upper front teeth. In her previous orthodontic treatment, all the first bicuspids were extracted but her extraction space was not opened and her esthetics was not improved. Her treatment plan included extraction of upper first molars, use of micro-implants to intrude and retract the upper arch and cause autorotation of the lower jaw, mesialization of upper second and third molars and reduction in the gummy smile.

Keywords: iatrogenic malocclusion, micro implants, re-treatment.

The term 'iatrogenic' is defined as that which 'results from the activity of a health care provider or institution, or any adverse condition in a patient resulting from treatment by a physician, nurse, or allied health professional'[1]. According to Segen's Medical Dictionary and Mcgraw-Hill Concise Dictionary of Modern Medicine, the term 'iatrogenic' may also refer to physical or mental condition caused by a physician or health care provider due to exposure to pathogens, toxins or injurious treatments or procedures[2,3].

Extrapolation of this term to 'iatrogenic malocclusions' signifies the malocclusion resulting from previous dental and/or orthodontic treatment. It may indicate that the treatment was incompletely and/or incorrectly diagnosed, planned and executed.This may result not only in a physical defect in the patient's dentition (malocclusion)but also affect the mental condition of the patient such that treating the patient once again which becomes all the more difficult. Treating iatrogenic malocclusions becomes more challenging as the patient loses faith in the treatment, becomes less cooperative, and expects quicker results. Hence iatrogenic malocclusions pose a unique problem to the treating orthodontist.

In this case series, two such case reports have been discussed where iatrogenic malocclusion was created due to previous dental and orthodontic treatment. Micro implants were used as a source of absolute anchorage to help bring about the desired orthodontic movements. The purpose of this case series is to offer an insight into the treatment of the mentioned iatrogenic malocclusions.

Case report 1:

Pre-treatment assessment :

KB, a 22 year old male presented with Cl I malocclusion with severe bimaxillary protrusion on a Cl I skeletal base with a decreased maxillomandibular plane angle. This was further complicated as all the four incisors were endodontically treated and were restored with individual crowns, which were dislodged at the time when the patient presented himself. Only the prepared surfaces on the crowns of the incisors were visible. The patient gave the history that he had presented himself to a dentist for forwardly placed teeth. As a treatment solution to his problem the dentist advised root canal treatment for all the upper incisors followed by coronal coverage. The patient had reported as all his crowns on the incisors had dislodged. This had a very debilitating effect on the patient as his esthetics were severely compromised esp. during smile and speech.

Extraorally he presented with a convex profile, incompetent and protrusive lips (wrt Rickett's E plane), lip strain was observed on obtaining oral seal, an acute nasolabial angle and an everted lower lip with a deep mentolabial sulcus(Fig. 1 Pre-treatment extra oral photos). Intraorally he presented with an Angle's ClI molar relation with proclined upper and lower anteriors and mild crowding in the lower arch. The incisive papilla showed signs of mild inflammation due to trauma from the lower anteriors during occlusion. Composite resin restorations were done interproximally between the lower right first molar and premolar but the anatomical contact and the embrasure were not established and restored. Mild fluorosis was seen on the cervical aspect of the teeth (Fig. 2 Pre-treatment intra oral photos). The pretreatment radiographs taken were the panaromic radiograph and the lateral cephalogram showing Cl I skeletal base with decreased maxillo-mandibular plane angle and increased facial height ratio and proclined upper and lower anteriors. (Fig. 3 Pre-treatment radiographs)

Diagnosis and etiology :

The patient presented with Cl I bimaxillary protrusion on a Cl I skeletal base with decreased maxillomandibular plane angle, a convex profile, incompetent and protrusive lips and mild crowding in the lower anteriors. This malocclusion can be considered as iatrogenic malocclusion resulting from previous dental treatment.

Treatment objectives :

- Improve profile and smile
- Correct proclination of upper and lower anteriors
- Correct mild crowding
- Coronal coverage for the upper incisors
- Achieve lip competency
- To achieve retention and stability of the results obtained

Treatment plan :

Pre orthodontic phase :

- Re-root canal treatment for upper incisors
- Coronal coverage for upper incisors with temporary crowns - (Fig 4 After cementing the temporary coronal coverage with heat cure acrylic resin)

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Fig. 1 Pre-treatment extra oral photos

Fig. 2 Pre-treatment intra oral photos

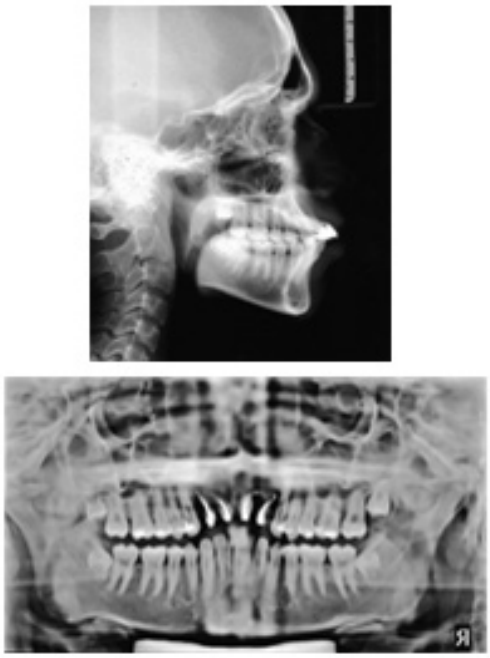

Fig. 3 Pre-treatment radiographs

- Re-restorations for molars to develop proper contact and embrasure anatomy

Orthodontic phase :

- Space gaining method by extraction of upper and lower first premolars
- Alignment, intrusion and retraction of upper and lower anteriors into the gained space
- Appliance used: 0.022 x 0.028" slot with MBT prescription.

Special anchorage considerations: Absolute anchorage with use of micro implants to utilize the complete extraction space for maximal retraction of anteriors. Placement of one micro implant per quadrant between the second premolar and first molar. (Fig. 5 End of levelling and alignment – intra oral photos, Fig. 6 Use of micro implants, Fig. 7 End of space closure)

Additional dental treatment :

- Extraction of all third molars

Retention protocol :

- Upper removable Begg's wrap around retainer to be worn full time for 6-8 months
- Lower permanent bonded retainer

Fig 4. After cementing the temporary coronal coverage with heat cure acrylic resin

Fig. 5. End of levelling and alignment – intra oral photos

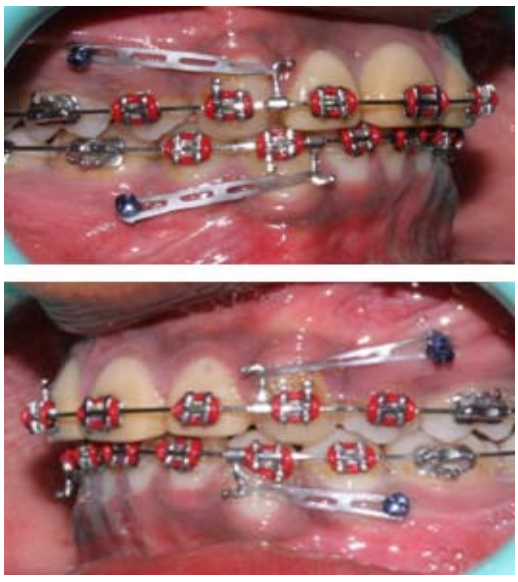

Fig 6. Use of micro implants

Post orthodontic phase :

- Replacement of temporary crowns of the upper incisors with permanent porcelain crowns

Treatment progress summary :

The treatment was started with 0.014"NiTi archwires in the upper and lower arches. The following wire sequence was followed after that in both the arches: 0.016 x 0.022" NiTi, 0.019 x 0.025" NiTi and 0.019 x 0.025"SS. After reaching the final wire, hooks of 3mm were crimped on the archwire and micro implants (1.3mm x 8mm) were placed between the second premolar and the first molar in each quadrant. The direction of force from the implant to the hook was such that the force vector travelled in a posterior and superior direction. This facilitated simultaneous intrusion and retraction of the anteriors. After the space closure was complete, brackets were repositioned to achieve root parallelism. During this finishing and

Fig.7. End of space closure

settling phase, all the third molars were extracted. After root parallelism(Fig: 8 Achieving root parallelism) was achieved then the lower permanent retainer was bonded (0.0175"coaxial wire), impressions were made to fabricate the upper removable retainer and then debonding was done and the Begg's wraparound retainer was delivered.

Fig 8. Achieving root parallelism

Complications encountered during treatment:

During the finishing phase, when the brackets were repositioned for the upper laterals and canines, the temporary crown on the lateral incisor was dislodged but it was cemented immediately in the same appointment.

Post treatment assessment :

Post treatment records show a remarkable improvement in the patient's soft tissue profile from retrusion of the upper and lower lips. As the teeth were retracted the lips followed, and resulted in achievement of lip competency, an obtuse nasolabial angle and a harmonious balance between the nose, lips and the chin. The dental corrections showed a significant intrusion and retraction of the upper and lower anteriors. The proclination of the upper and lower anteriors was corrected and an ideal overjet, overbite and coincident midlines were achieved (Fig. 9 Post treatment intraoral photos). A mutually protected canine guided occlusion was achieved. The patient was happy and very satisfied with this post treatment result. His esthetics during smile and speech improved drastically and a consonant smile arc was achieved (Fig. 10 Post treatment extraoralphotos). Pretreatment and post treatment cephalometric changes can be appreciated in Table 1 and in figure 11 Pre debonding radiographs andfigure12 Superimpositions.

Table 1. Case report 1: Cephalometreic values

Variable	Pre- treatment	Post treatment
SNA	85 deg	84 deg
SNB	84 deg	84 deg
ANB	1 deg	0 deg
WIT'S appraisal	+1mm	+0.5mm
U1-Max plane	151 deg	129 deg
L1- Mand plane	102 deg	92 deg
U1-L1	85 deg	118 deg
Max-mand plane angle	22 deg	21 deg
UAFH	49 mm	40 mm
LAFH	66 mm	53 mm
Facial Height Ratio	57.39%	56.98%
L1-A-Pog	8mm	3 mm
L1- E plane	+3 mm	0 mm

Case report2:

Pre-treatment assessment:

GC, a 19 year old girl presented with a chief complaint of forwardly placed upper front teeth and poor esthetics. She presented with Cl II malocclusion on a Cl II skeletal base with an increased maxillomandibular plane angle. This was further complicated as she gave a history of previous orthodontic treatment. She gave the history of orthodontic treatment with upper and lower first premolar extractions before 2-3 years and a retention phase for 8 months after completion of the active orthodontic treatment.

Theextraoral examination (Fig. 13 Pre-treatment extra oral photos) revealed a convex profile, incompetent and protrusive lips, lip stain on obtaining oral seal, an acute nasolabial angle, an everted lower lip, increased lower anterior facial height, a high clinical FMA, an average mentolabial sulcus.

Fig 9. Post treatment intraoralphotos

Fig 10. Post treatment extraoralphotos

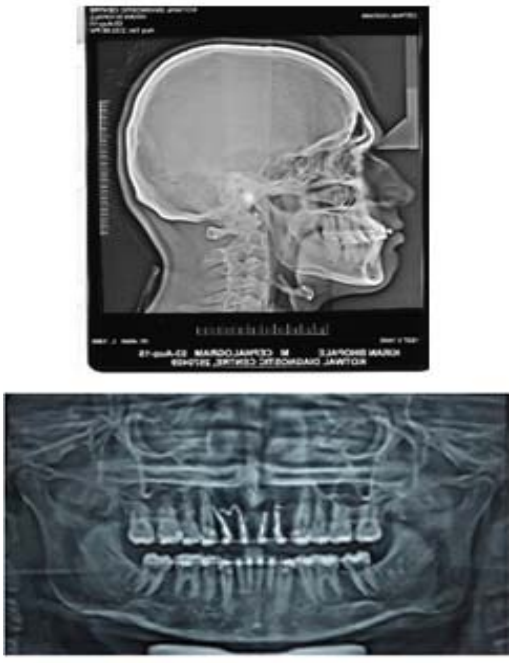

Fig. 11. Pre debonding radiographs

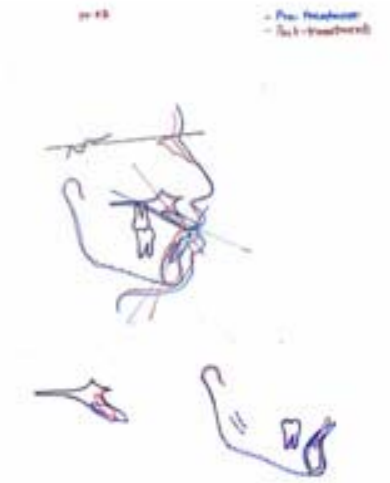

Fig. 12. Superimpositions

Fig 13. Pre-treatment extra oral photos

Fig 14. Pre-treatment intra oral photos

Intraoral examination (Fig. 14 Pre-treatment intra oral photos) revealed missing upper and lower first premolars, collaborating with the history of extraction during the previous orthodontic treatment. The upper anteriors were proclined with an increased overjet. She displayed a half cusp Cl II molar relation(distal end on molar relation) bilaterally, with crossbite of 27 and 28 wrt 37 and 38 and shift of lower midline to left by 1mm. There was no space opening in the first premolar extraction region. The left upper first molar was grossly decayed with history of root canal treatment. The upper right first molar and the lower first molars were restored with a silver amalgam restoration.The patient had mild gingival inflammation; however the periodontal status was fair.

Diagnosis and etiology:

The patient presented with a half cusp Cl II molars bilaterally withCl II canine malocclusion on an underlying Cl II skeletal base with vertical growth pattern, severely proclined upper and lower incisors with crossbite in the left molar region, convex profile, acute nasolabial angle, incompetent and protrusive lips. (Fig. 15 Pre-treatment radiographs)

This malocclusion can be considered as an iatrogenic malocclusion resulting from incomplete previous orthodontic treatment.

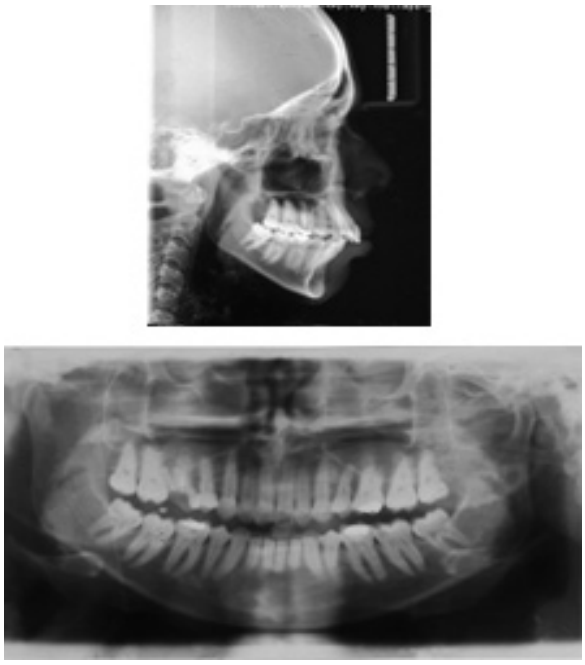

Fig 15. Pre-treatment radiographs

Treatment objectives:

- to improve profile and smile
- to achieve soft tissue balance and harmony
- correct proclination of upper and lower anteriors
- to establish normal Cl I buccal segment relationship with normal overjet and overbite
- to correct the vertical growth pattern
- achieve lip competency
- to correct the vertical maxillary incisor position
- to achieve retention and stability of the results obtained
- to achieve a consonant smile arc

Treatment plan:

The treatment plan devised for the patient was extraction of both the upper first molars, and utilizing the gained space to retract and intrude the upper anteriors. Micro implants were used to simultaneously intrude and retract the upper anterior segment and intrude and mesialize the posterior segment as well to bring about auto rotation of the lower jaw to enhance the chin prominence and improve the patient's profile. A high force vector from the micro implants was used to correct the gummy smile. Also the second and third molars were mesialized into the extraction space to correct the molar relation.

Additional dental treatments:

Restorations of other carious teeth and oral prophylaxis therapy.

Extractions of lower third molars

Retention protocol:

Upper and lower permanent bonded retainers. Upper Begg's wraparound retainer.

Treatment progress summary:

The appliance used for the patient was a 0.022 x 0.028" self-ligating appliance with a MBT prescription. The treatment was started with a 0.014"NiTi archwire in the upper and lower arch. The following sequence of wires was used: 0.016"NiTi, 0.016 x 0.022" NiTi, 0.017 x 0.025" NiTi, 0.019 x 0.025" SS and a 0.021 x 0.025" SS. A six micro implant system was used to bring about the intrusion of the entire arch. The implants used on the buccal side were 1.3 x 8mm and those used on the palatal side were 1.3 x 10mm. Two implants were placed on the buccal side and one was placed on the palatal side in each quadrant. The position of the buccal implants was as follows: both the implants were placed high in the vestibule, one between the canine and the second premolar and the other was placed between the second and the third molar. The palatal implants were placed in the vertical palatal shelf just distal to the second premolar(Fig. 16 Micro implants used in the upper arch). A bite raising composite resin was placed mid treatment to avoid locking of the upper molars occlusal to the lower molars during their mesialization. The lower third molars were extracted to avoid any premature contact with the upper third molars. Begg's brackets were bonded on the palatal surface of the second and third molars to facilitate a point of attachment for the elastic chains placed from the implants to the teeth. Hooks were crimped between the lateral incisor and the canine on the archwire labially. Elastic chains were placed from the micro implants to the crimped hooks anteriorly, to the third molar tubes posteriorly and to the Begg's brackets palatally. Thus a system was created that brought about intrusive force on the entire upper dentition and an intrusive and retractive force on the anteriors and an intrusive mesializing force on the posteriors. Post space closure, lateral incisor and canine brackets were repositioned to ensure root parallelism. After space closure was completed, upper and lower permanent lingual bonded retainers (0.0175"coaxial wire) were placed on the upper and lower anteriors. Begg's wraparound retainer was delivered to the patient for the upper arch to maintain the molars which have been mesialized.

Complications encountered during treatment:

The first challenge that was encountered was to convince the patient for the treatment plan to extract the upper first molars and the lower third molars, as during the previous orthodontic treatment all the first premolars were extracted.

There was loosening of maxillary right anterior micro implant and the palatal implant during the treatment. They were replaced immediately.

The patient had to be motivated for maintenance of oral hygiene repeatedly and oral prophylaxis had to be carried out at regular intervals.

Post treatment assessment:

Post treatment records show a remarkable improvement in the patient's soft tissue profile. Due to the entire arch intrusion that was achieved, there was auto rotation of the lower jaw and the patients chin became prominent. As the teeth were retracted the lips followed, and resulted in achievement of lip competency, an obtuse nasolabial angle and a harmonious balance between the nose, lips and the chin. The dental corrections showed a significant intrusion and retraction of the upper and lower anteriors. The proclination of the upper and lower anteriors was corrected and an ideal overjet, overbite and coincident midlines were achieved (Fig. 17 After space closure intra-oral photos). Further continual of the same mechanics to facilitate more intrusion of the upper arch and more auto rotation of the lower jaw could have been done, but the patient burnout was considered as this was the second time patient was undergoing orthodontic treatment. Hence evaluation was done with all the records and after all the parameters should improvement in the patient, debonding was done. A mutually protected canine guided occlusion was achieved. The patient was happy and very satisfied with this post treatment result. Her esthetics during smile and speech improved drastically and a consonant smile arc was achieved. (Fig. 18 After space closure extra-oral photos).Pretreatment and post treatment cephalometric changes can be appreciated in Table 2. Figure 19 shows Pre-debonding radiographs and in figure 20 shows Superimposition of pre and post treatment radiographs.

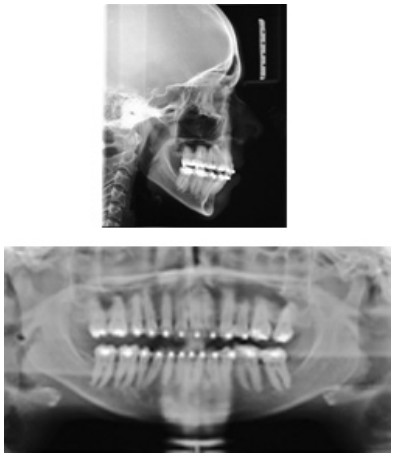

Fig 19. Pre-debonding radiographs

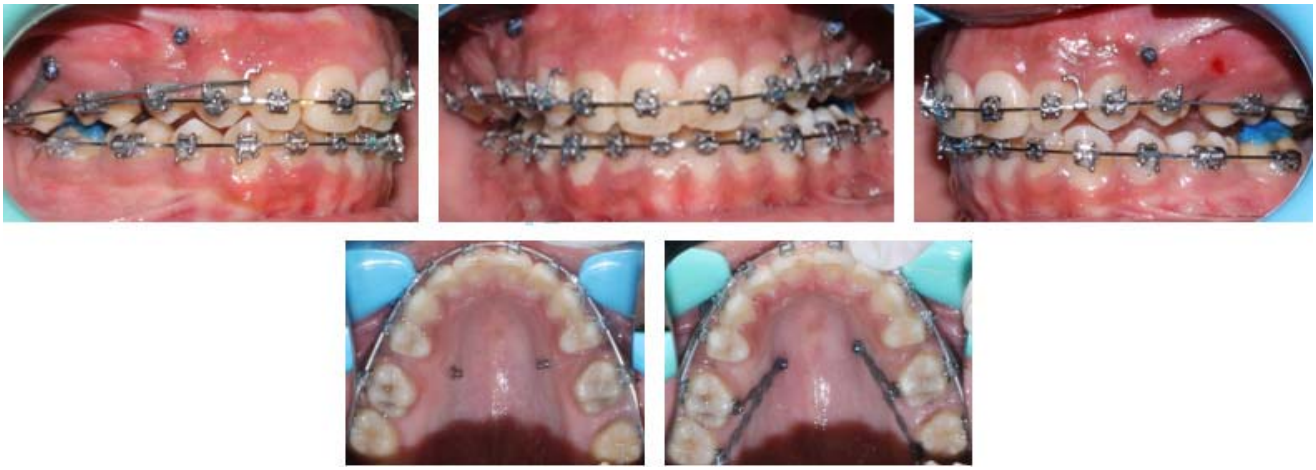

Fig 16. Micro implants used in the upper arch

Fig 17. After space closure intra-oral photos

Fig 18. Afterspace closure extra-oral photos

Table 2: Case report 2: Cephalometreic values

Variable	Pre- treatment	Post treatment
SNA	81 deg	80 deg
SNB	76 deg	76 deg
ANB	5 deg	4 deg
WIT'S appraisal	+7 mm	+4 mm
U1-Max plane	117 deg	100 deg
L1- Mand plane	104 deg	89 deg
U1-L1	105 deg	137 deg
Max-mand plane angle	34 deg	33 deg
UAFH	49 mm	52 mm
LAFH	71 mm	76 mm
Facial Height Ratio	59.16%	56.25%
L1-A-Pog	6.5 mm	3 mm
L1- E plane	+7 mm	1 mm

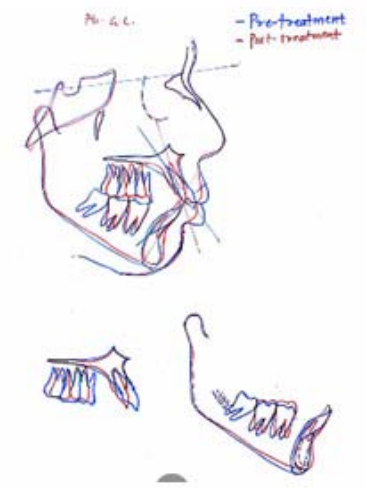

Fig 20. Superimposition

Discussion:

These two case reports presented offered an insight in the treatment of iatrogenic malocclusions. Both the case reports and their treatment planning were not related to each other, but their etiology was. In both the cases there was previous incidence of dental treatment which further challenged this corrective orthodontic treatment. In the first case report the endodontic and prosthodontic treatment offered by the dentist was not in synchrony with the patient's chief complaint and it complicated the treatment. In the second case report the treatment offered previously to the patient did not resolve the esthetic concerns of the patient. Hence a re-treatment was required which was much more complicated in view of patient expectations and burn out. Both the cases offered unique challenges not only for the orthodontic treatment point but also for the holistic management of the patient. Post orthodontic treatment, both the patients were satisfied with the treatment results and their concerns about esthetics and smile were completely resolved.

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