

MINIMALLY INVASIVE TECHNIQUE FOR ANTERIOR MAXILLARY RETRACTION & INTRUSION - A PROSPECTIVE STUDY ON A CASE WITH 1 YEAR FOLLOW-UPSALIVARY

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ABSTRACT

The conventional treatment for vertical maxillary excess due to Skeletal class II base, is surgical reduction and rigid fixation which has decreased patient acceptance. However, intrusion of some selected MVE cases can be achieved with minimal intervention using mini plate anchorage, thus expediting and simplifying their management. A 15 year old female patient came with a complaint of forwardly placed teeth in the upper front tooth region of the jaw. Intraoral examination showed class II molar occlusion on both sides with increased overjet and overbite. The cephalometric analysis showed class II skeletal relationship with vertical maxillary excess. The treatment plan included Fixed appliance with extraction of 14,24,35, then miniplates and mini-implant assisted anterior maxillary retraction and intrusion. At the end of the treatment anterior maxillary retraction and intrusion was achieved. Thus the hypothesis was accepted as retraction and intrusion using mini plates is an easy, efficient, safe and cost- effective option in the management of VME. It is less invasive with acceptable clinical and radiographic outcome, while avoiding surgery under GA with its risk and complication. Careful case selection is needed for achieving satisfactory result and smile.

KEYWORDS: Maxillary vertical excess (MVE), Maxillary retraction, Skeletal Anchorage, Miniplate anchorage, Minimally invasive intrusion.

INTRODUCTION

A smile is a best way to get away with troubles - Masashi Kishimoto. Sometimes, a unesthetic smile becomes the reason for one's troubles. Maxillary vertical excess (MVE) is one of the etiologies for unaesthetic gummy smile¹. The treatment outcome for MVE may not always be successful with conventional orthodontic treatment alone. It usually requires surgical intervention such as Lefort I superior repositioning or anterior maxillary osteotomy to achieve satisfactory result^{1,2} But surgical therapy under general anesthesia is not always an acceptable treatment of choice for every patient. Moreover, surgical procedure is associated with various complications like hemorrhage, pain, paresthesia, soft tissue injury, fracture of dentoalveolar components

and loss of tooth vitality. The poor compliance of the patients for surgical treatment leads to the quest for an alternate treatment modality. Recently, the mini implants have emerged as an 'absolute' stable skeletal anchorage for precised and controlled tooth movement^{3,4} These mini implants includes mini screws, mini plates and micro plates have been used successfully for space closure, anterior retraction, posterior intrusion, molar up righting, occlusal cant correction and even maxillary dental arch distalization⁴⁻⁶.The placement of mini implants was independent of patient compliance and it can be done as a chair side procedure under local anesthesia. The development of mini implants has triggered various novel techniques for treating gummy smiles also. Kim et al⁷ intruded the maxillary anterior teeth to correct gummy smile using mini screw at the anterior

nasal spine assisted by segmental arch wire.

Mini plates and micro plates were more stable when compared to mini screws. A systematic review by Schatzle et al⁸ indicated that the failure rate for orthodontic mini plates was 7.3% and that for mini screws was 14.1%. The surgical approach required for a mini and micro plate is more invasive than the simpler insertion and removal of mini screws; however, mini and micro plates allow greater versatility of force vector design. Micro plates which are smaller in dimension when compared to mini plates are in use for osteosynthesis since 40 years.⁹ Micro plating system has excellent pull out strength similar to mini plates⁹. Thus, micro plate anchorage is still useful if extensive orthodontic treatment is required. The proposed hypothesis of this prospective study is anterior maxillary retraction and intrusion using microplate anchorage is less invasive with acceptable clinical and radiographic outcome.

CASE REPORT

A 15 year old female patient came with a complaint of forwardly placed teeth in the upper front tooth region of the jaw. She had a symmetric face, convex profile, incompetent lips, high smile line, convex profile, and protrusive upper lip. On intraoral examination, she had good oral hygiene, and the periodontal tissues were healthy. Buccal segments were in class II molar occlusion on both sides. She had increased overjet of 10 mm; overbite of 6 mm and a proclined maxilla. The lower midline was shifted to right. According to the pre treatment lateral cephalometric analysis she had Class II skeletal relationship with vertical maxillary excess and proclined upper and lower incisors. The pretreatment panoramic radiograph revealed that upper and lower third molars were present.

TREATMENT OBJECTIVE

The treatment objectives for this patient were to improve facial and dental aesthetics, to retract and intrude the anterior maxilla, correct dental and skeletal relationship, and achieve ideal overbite and overjet.

SURGICAL PROCEDURE

Complete history was taken and clinical evaluation was done. Routine blood investigations, photographs (figure 1,2), panoramic radiograph (OPG) and lateral cephalogram (figure 3) were taken. The extent of

dentoalveolar excess and the required amount of intrusion were calculated using manual cephalometric measurements. Initial orthodontic alignment was done using 19 x 25 NiTi wire in maxilla and O12 Niti wire in mandible. Later on, the patients were prepared for the surgical procedure of miniplate placement.

Under aseptic condition, Local anesthesia with adrenaline (1:80,000) was infiltrated along the posterior maxillary buccal vestibule. Incision of about 1 cm length was given in the maxillary buccal vestibule along the zygomaticomaxillary buttress region bilaterally. The flap was elevated and a customized three hole regular stainless steel mini plate which has a loop in aproximal hole was used to fix bilaterally at the zygomaticomaxillary buttress with two 1.5x6 mm stainless steel screws on the distal end of the plate (figure 4). A 9mm Stainless steel closed coil spring was tied to the proximal screw hole and hook attached to the arch wire in relation to lateral incisor (figure 5). The Coil was activated immediately by 150 grams on each side with the retraction rate of 1mm/month. The plate was completely submerged in the soft tissue and the surgical site was closed primarily with 3-0 silk. Thus, only the coil was visible through the soft tissue. Antibiotics and analgesics were prescribed for 5 days. The patient was advised to maintain proper oral hygiene and to use 0.12% chlorohexidine mouth rinse twice a day. The patient was recalled after a week to review soft tissue healing and sutures were removed. Lateral cephalogram and panoramic radiographs were taken. The patient was recalled every month to check the amount of retraction and reactivation of the coil. The activation of the coil was stopped when there was clinically 4mm of overjet which was considered as youthful and esthetically acceptable.¹⁰

Later, intrusion of maxillary anterior teeth was done using 19x25 SS wire and 9mm closed coil spring. Under local anesthesia, Mini implants of size 6mm were placed in relation to labial cortex of lateral incisors bilaterally. Ligature wires were used as a suspension wire from the mini-implant to the arch wire (figure 6). The length of the suspension wire from plate to arch wire was measured in millimeter and documented as a base line value.

In this case, there was a need for space, so extraction of maxillary first premolars and mandibular left second premolar were done. During finishing stage, a functionally stable occlusion with proper anterior

guidance was achieved.

RESULT

The active treatment time was 15 months. At the end of treatment, the profile, vertical and sagittal relationship were improved and the anterior overjet was corrected (figure 7,8). Class I canine relationship with normal overbite and overjet were achieved. The post treatment extraoral photographs displayed a pleasing smile. The post treatment lateral cephalometric analysis and superimpositions showed skeletal changes, decrease in the vertical maxillary height. In the post treatment panoramic radiograph, no sign of apical resorption was seen.

DISCUSSION

The uncertainty in the management of gummy smile is wide spread in the literature. The treatment should largely be customized on the etiology. According to Schendel et al¹¹ gummy smile may be due to 1. soft tissue etiology like short upper lip, 2. dentoalveolar type - anterior maxillary vertical excess (AMVE), and 3. skeletal type with its five variations like total maxillary vertical excess, clockwise and counter clockwise rotation of palatal plane, posterior vertical maxillary excess and maxillary excess with premaxillary elevation. The skeletal type is usually found in patients with long-face syndrome and associated with mandibular deformity.¹¹ If detected at early age, it can be managed with orthopaedic appliances and growth modifications.

In Adults, orthognathic surgery is generally required to treat this kind of skeletal deformities^{2,11}. However, in some dentoalveolar deformities, orthognathic surgery might end up with unfavorable results like hemorrhage, pain, paresthesia, loss of tooth vitality, dentoalveolar fracture and relapse. Surgical procedure to intrude the maxillary anterior dentoalveolar complex in AMVE has a significant effect on the soft tissue components like widening of the alar base and change in upper lip posture.

Despite safety and reliability, modern general anaesthesia (GA) disrupts the patient physiology and cause metabolic stress. The incidence of postoperative nausea, vomiting, drowsiness and the need for hospital stay are high in GA.

Some AMVE are camouflaged by orthodontic

treatment and mucogingival surgery¹; however the outcome is suboptimal with its own risk and complications like anchorage loss, root resorption, loss of tooth vitality, tooth mobility, insufficient intrusion and relapse. A successful orthodontic treatment needs a good anchorage either skeletal or dental. Dental anchorage is easy to achieve but there may be loss of anchorage control, tipping of molars and the amount of intrusion is not effective.^{12,13} Recently skeletal anchorage came in to the focus of attention due to more stable results. Skeletal anchorage using mini plates, micro plates and mini screws have better anchorage than headgears and lessen the use of orthopedic appliances now a days.^{14-17,18} Mini and micro plates provide more stable anchorage when compared to mini screws and allow great versatility of vector force design and mainly indicated for Intrusion and distalization.^{18,19} Micro plates were extensively used for maxillary protraction procedures, cleft segment expansion and stabilization, and tooth movement into narrow alveolar cleft sites where the availability of bone is less.²⁰ In this case, the authors made an effort to find an improved treatment option for MVE which offers optimum outcome than conventional orthodontics and less risk when compared to surgery. The procedure presented in the current study, reduces the treatment of MVE in any age group to a minor procedure with less operating time and acceptable outcome.

It is indicated to place the mini plates at the buttress region in maxilla which has dense cortical bone for anchorage and provide high primary stability¹⁸; which in turn allows immediate loading and activation without any latency period. In our study we used zygomaticomaxillary buttress as a site for anchorage where the force can be directed more anteroposteriorly and vertically. Thus more amount of expected retraction can be achieved. Usually the skeletal anchorage devices are exposed to oral environment leads to difficulty in maintaining oral hygiene and cause inflammation and infection around the mini screws heading to screw loosening and loss of anchorage. In this case, the plates were completely submerged in the soft tissue and only the wires were exposed to facilitate proper oral hygiene maintenance. The mean duration of intrusion was only five months and the intrusion time was decreased in young patients when compared to aged patients. This could be because the resilient natures of bone in younger individuals yield more to the given force than elder ones. The rate of intrusion was declining

with time, based on our clinical observation. In this case, maximum amount of retraction and intrusion achieved was 6 mm and 4 mm respectively.

Controlled gradual movement by mini plate anchorage has more effect on lip posture and alar base. Lip length is one of the determinant factors for successful intrusion. Short upper lip may give a false appearance of inadequate intrusion 21; therefore careful case selection is mandatory to get expected result. No complications like infection, root resorption, plate loosening and loss of tooth vitality were noted in our study. In our study, there is no noticeable relapse either clinically and radiographically in 1 year follow up, which could be attributed to the slow, gradual retraction, intrusion and passive retention using the suspension wire, which was left in situ till the completion of orthodontic treatment.

CONCLUSION

Intrusion of dentoalveolar complex to correct MVE can be successfully achieved with mini plate anchorage at the zygomaticomaxillary buttress. There will be sufficient changes in the soft tissue components like alar base, lip posture when compared to surgical procedure. Thus the hypothesis was accepted as retraction using mini plates is an easy, efficient, safe and cost-effective option in the management of VME. It is less invasive with acceptable clinical and radiographic outcome, while avoiding surgery under GA with its risk and complication. However, careful patient selection is needed for achieving satisfactory result and smile.

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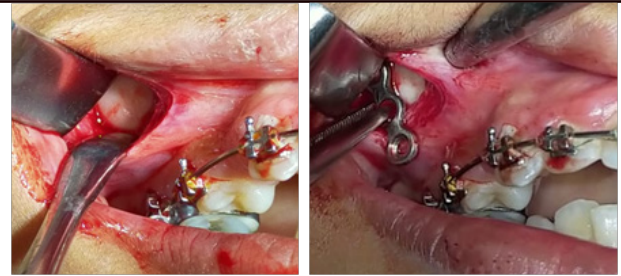


Figure 3. Preoperative lateral cephalogram

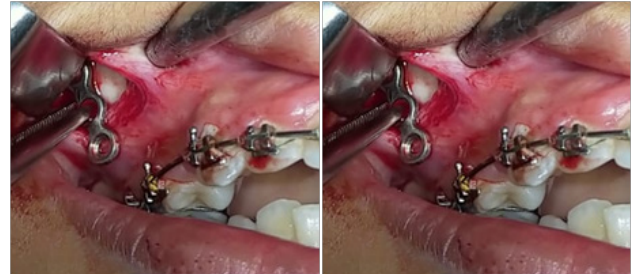


Figure 4. Surgical procedure – A) Incision
B) Miniplate adaptation C) Plate fixed at zygomaticomaxillary buttress D) Proximal hook alone exposed and suturing done.



Figure 1. Pre-operative frontal view



Figure 2. Preoperative bite



Figure 5. Coil tied to the arch wire
Figure 6. Mini-implants placed and ligature wire suspended to the arch wire
Figure 7. Post Retraction and Intrusion
Figure 8. Post-operative frontal view

