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TREATMENT OF A PERIODONTALLY COMPROMISED PATIENT WITH MINI-IMPLANT ANCHORAGE

Background: Advanced periodontal disease and its sequelae are characterized by severe attachment loss, tooth mobility, and migration. This pathology often leads to compromised function and esthetics. A multidisciplinary approach combining orthodontic, periodontic, and restorative treatment is necessary to provide complete rehabilitation both in terms of function and esthetics with a satisfactory long-term prognosis. **Methods:** A simple and effective treatment of an adult patient with periodontally migrated teeth using mini-implants in the maxilla and mandible is described. Mini-implant placement was aided by a 3D surgical guide, which made the procedure exceedingly safe. **Results:** Gradual intrusion of the maxillary and mandibular anterior teeth was achieved with a relatively simple orthodontic force system. A significant profile improvement was observed during the 18 months of treatment due to the retraction and intrusion of the incisors in both arches. This intrusion was accomplished without any sign of apical root resorption. The mandibular incisors were uprighted 6.5 degrees, and their maxillary counterparts were uprighted 13.4 degrees. The 2-year follow-up examination revealed a stable result with an increase in periodontal attachment as well as esthetics and function. **Conclusion:** A combined orthodontic, periodontic, and restorative treatment approach with adequate patient motivation can lead to improved masticatory function, esthetics, and periodontal conditions. World J Orthod 2009;10:350–360.

Key words: mini-implant anchorage, periodontally compromised patient, adult orthodontics

Advanced periodontal disease and its sequelae are characterized by severe attachment loss, reduction of alveolar bone, marginal gingival recession, increased tooth mobility, and tooth migration.^{1,2} This condition will often lead to compromised function and esthetics.³ A combined orthodontic, periodontic, and restorative treatment approach can completely rehabilitate an affected patient both in terms of function and esthetics with a satisfactory long-term prognosis.^{4–7}

Periodontally migrated teeth can be orthodontically realigned after existing

inflammation is controlled and the periodontium is healthy.^{8,9} To obtain a significant intrusion, either J-hook headgear or intrusion wires are necessary. However, J-hook headgear is not an esthetic appliance and requires patient compliance; intrusion wire mechanics will often lead to a reactive extrusion, as well.¹⁰

Recently, mini-implants have become important in obtaining absolute orthodontic anchorage.^{11–17} Mini-implants are relatively inexpensive, easy to handle, and permit immediate loading.^{14–17} Initially, they were used to treat patients who were unwilling to wear extraoral

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Fig 1 Pretreatment facial and intraoral photographs of a 42-year-old female Class I patient with bimaxillary protrusion.

anchorage. Because these implants are small in diameter, they can be implanted between the roots of adjacent teeth, which makes the force system relatively simple.^{18,19}

This article describes a simple and effective approach to manage periodontally migrated teeth using orthodontic mini-implants.

PATIENT REPORT

A 42-year-old woman was referred for treatment to the orthodontic clinic of the Faculty of Dentistry, Chiang Mai University,

Thailand. She presented with a severely periodontally compromised dentition and pathologic migration of her anterior teeth. This resulted in a severe diastema of her maxillary and mandibular anterior teeth. Her chief complaint was the unfavorable appearance of her teeth, caused by their excessive extrusion. This led to a lack of self-confidence and a fear of smiling and talking to friends (Fig 1).

Initially, the patient was treated periodontally at the University Hospital. This included instruction in oral hygiene and a 6-month recall for professional scaling, root planing, and curettage. After the inflammation was adequately controlled

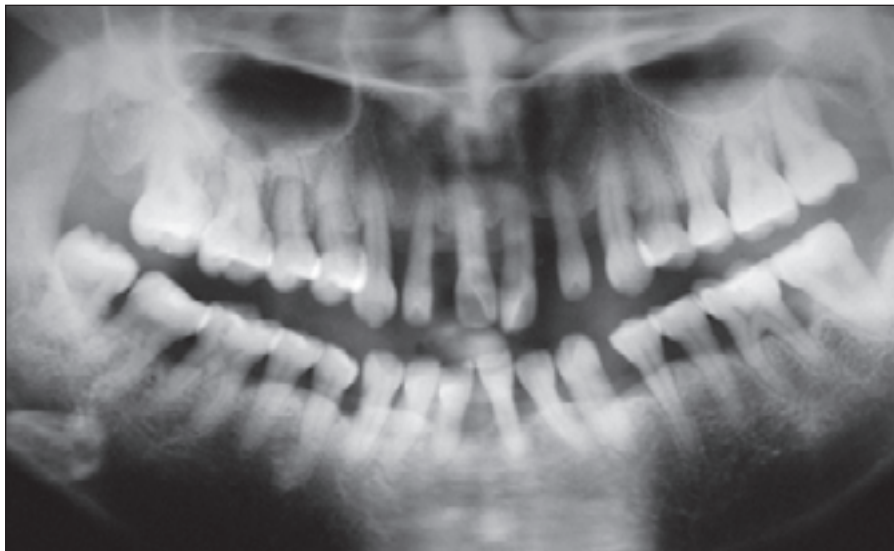
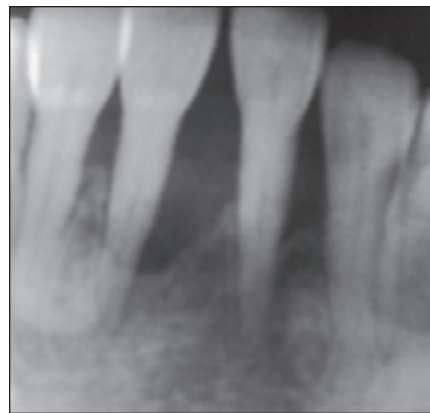
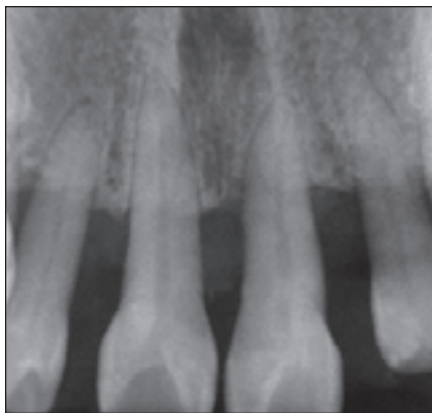


Fig 2 Initial panoramic and periapical radiographs and intraoral view of the incisor relationship.



and the periodontal tissue had recovered, the patient was referred to the orthodontic clinic for complementary treatment.


Pretreatment facial photographs showed a symmetric face with mild bimaxillary protrusion. Intraorally, the diastema in the maxillary and mandibular anterior regions were most prominent. Clinical examination revealed severe vertical bone loss in the anterior dentoalveolar areas of both arches, which was accompanied by excessive dental extrusion. All teeth were severely mobile, but pocket-probing depths were not greater than 3 mm. Because of the mobile teeth,

the patient's masticatory function was also compromised.

Radiographic examination demonstrated significant bone loss of the maxillary and mandibular anterior area (Fig 2). Cephalometric analysis showed that the maxilla and mandible were normally positioned relative to Thai standards (Fig 3). However, all incisors were protruded; the overjet and overbite were 6.5 mm and 4.0 mm, respectively.

Fig 3 Lateral cephalometric analysis. **(a)** Pre- and **(b)** posttreatment cephalometric values relative to adult Thai female standards.

	Mean	SD	a	b
Facial angle	89.1	2.7	86.4	85.9
Convexity	8.8	4.1	6.5	6.5
A-B plane	-4.2	2.3	-9.5	-7.1
Mandibular plane	22.0	4.6	30.2	28.0
Y-axis	63.2	9.5	64.0	64.5
Occlusal plane	6.8	3.6	13.2	9.2
Interincisal angle	121.3	7.1	95.5	122.3
LI to OP	29.7	7.9	42.1	28.2
LI to MP	96.8	5.1	99.6	93.1
UI to A-P plane	3.0	0.7	6.5	3.3
FMIA	61.2	4.5	50.2	58.8
FH to SN	7.7	2.1	9.5	9.6
SNA	85.0	3.5	83.1	82.6
SNB	81.2	2.8	78.4	78.9
ANB	3.8	1.8	4.7	3.6
UI to N-P plane	9.7	2.7	15.8	10.1
UI to FH	116.9	5.3	127.4	114.1
UI to SN	109.2	5.4	117.9	104.5
Gonial angle	114.6	5.0	119.6	117.8
Ramus inclination	6.0	3.8	1.6	2.1



TREATMENT PLAN

The treatment plan was to realign (intrude) the migrated teeth using light continuous orthodontic forces. Mini-implants were inserted in the maxilla and mandible to provide absolute anchorage for this intrusion. Intensive control of the patient's oral hygiene and a strict periodontal care regimen were planned throughout orthodontic treatment. For retention, an intracoronal splint connecting all maxillary incisors was planned.

TREATMENT PROGRESS

Orthodontic treatment was performed with a 0.018 × 0.025-inch preadjusted appliance. Leveling was initiated with 0.016-inch Sentalloy archwires for 2 months, followed by a 0.016 × 0.022-inch improved superelastic nickel-titanium (L&H Titan) archwire. After 3 months, mini-implants (diameter 1.6 mm, length 8.0 mm) were inserted into the buccal

alveolar bone between the maxillary and mandibular central incisors. This was aided by a 3D surgical guide (Y&B Products)¹⁹ to avoid root damage to the adjacent teeth (Fig 4). The extruded teeth were intruded with elastomeric ligatures (50 cN), which ran between the mini-implants and the incisors (Fig 5). At the same time, the maxillary anterior teeth were retracted with Ni-Ti coil springs, which again delivered a force of 50 cN.

Following the original plan, the teeth were stabilized for 3 months after treatment with an intracoronal splint to allow a preliminary remodeling of the underlying bone.

IMPLANT PROCEDURE

The 3D surgical guide was connected to the orthodontic wire and positioned as accurately as possible at the preselected mini-implant site (Fig 4). A periapical radiograph of this area was taken with the long-cone paralleling technique aided by

Fig 4 Mini-implants inserted into the buccal alveolar bone with the aid of a 3D surgical guide.

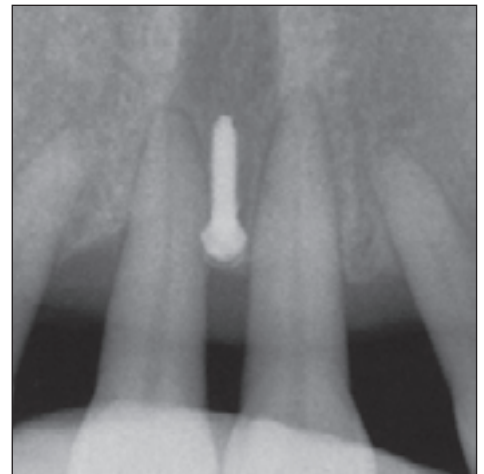
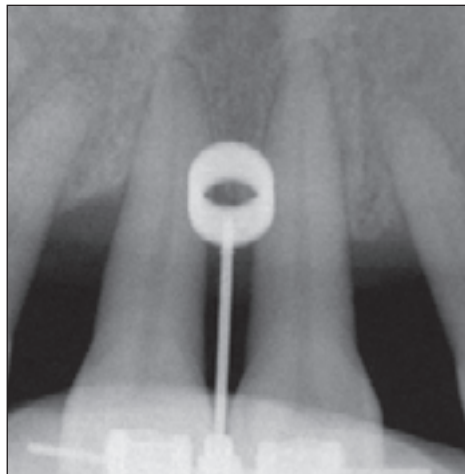


Fig 5 Elastomeric ligatures between the mini-implants and anterior incisors.

a film holder (Rinn XCP film holding system, Dentsply).^{15,16} During exposure, the patient bit into a bite registration made from conventional elastomeric impression material. Thus, a standardized series of radiographs of the implant site could be obtained throughout the

implant placement procedure. The long-cone technique reduced the distortion and standardized the film-x-ray tube distance (Fig 6).^{15,16} Radiographs were taken until a possible implant position was found that would not violate the neighboring tooth roots.

Fig 6 Film holder used to ensure precise mapping of the optimum implant site.



Minor adjustments of the position of the 3D surgical guide allow varying the recommended implant angulation to the long axes of the teeth. These angulation changes produce an increased surface contact between the implant and the bone.^{17,20,21}

After the optimum implant position was determined, a pilot hole was prepared with a manual drill under normal saline irrigation to avoid excessive heat and remove bone debris (see Fig 4).

The mini-implant was inserted into the pilot hole through the 3D surgical guide tube with a manual screwdriver to reduce the risk of a deviation during insertion and to assure the precise 3D placement into the preoperatively planned position. After insertion, an additional radiograph with the custom-made film holder was taken to confirm the proper position.

RESULTS

Significant profile improvement was observed during the first 6 months of treatment. After 18 months, the patient showed an acceptable occlusion with a Class I molar relationship (Fig 7). Although the maxillary and mandibular incisors were retracted and intruded, there was no sign of apical root resorption. The ANB angle was reduced from 4.7 degrees to 3.6 degrees. The proclined incisors were uprighted by 6.5 degrees and 13.4 degrees in the mandible and maxilla, respectively. Cephalometric superimposition demonstrated a bodily retraction of the maxillary anterior teeth with an intrusion of the incisors in both arches. The maxillary posterior teeth were uprighted, but no other significant movement was observed. The mandibular molars moved slightly mesially (Fig 8).

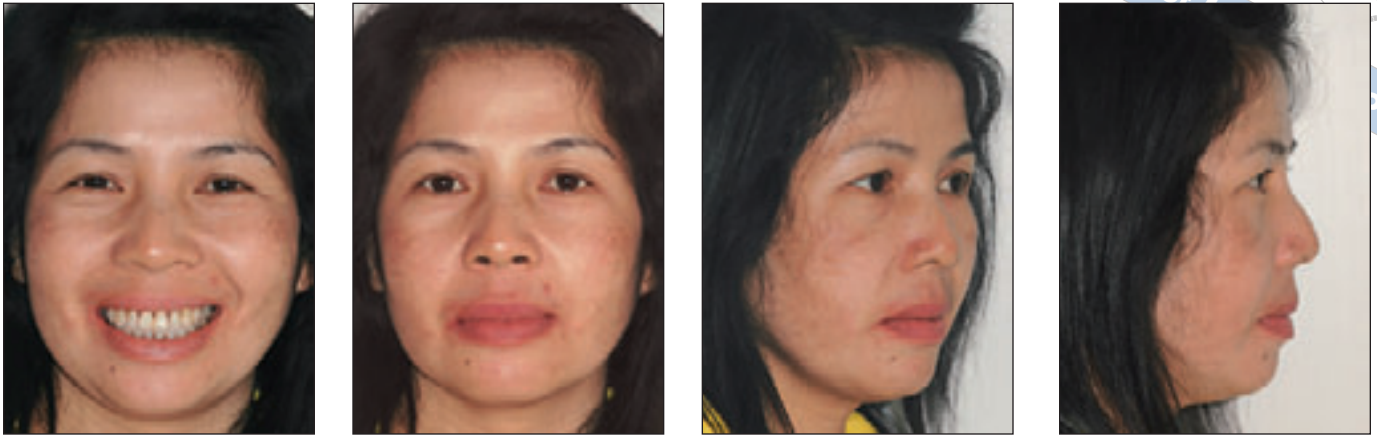


Fig 7 The patient's profile was significantly improved after 18 months of active treatment with retraction and intrusion of the maxillary and mandibular incisors.



Fig 8 Superimposition of cephalometric tracings (**black**) before and (**red**) after treatment showing controlled bodily retraction of maxillary anterior teeth without anchorage loss.

Fig 9 Final panoramic and periapical radiographs reveal gain of periodontal attachment. Frontal view and incisor relationship show good tooth alignment.

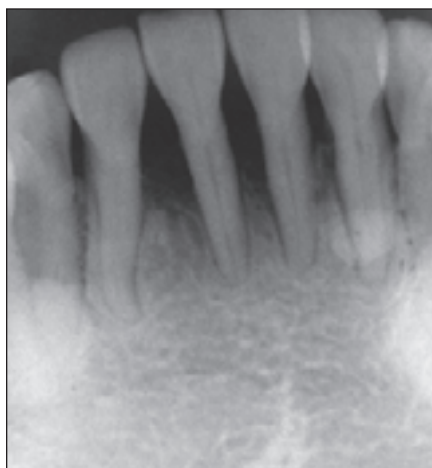
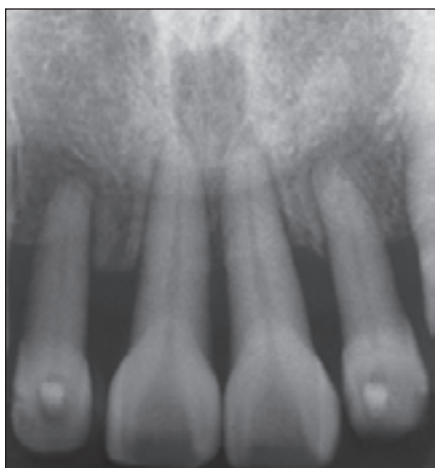
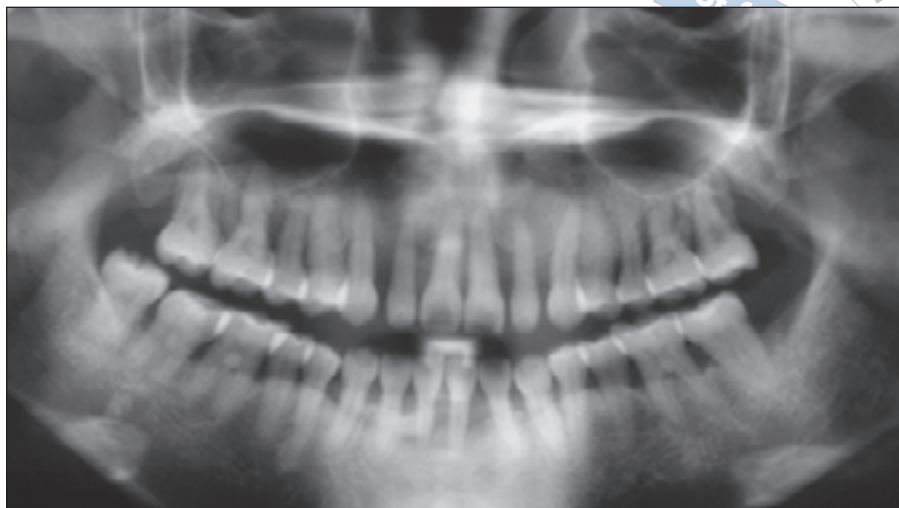


Fig 10 An intracoronal splint connects all maxillary incisors to avoid relapse and to improve esthetics.



General radiographic examination revealed an increase of periodontal attachment and bony support of the maxillary and mandibular anterior teeth (Fig 9).

Following active orthodontic treatment, instead of the originally planned bridge, an intracoronal splint for the four maxillary incisors was inserted to prevent relapse and improve esthetics and function (Fig 10).



Fig 11 Two-year follow-up photographs showing a successful esthetic and functional result.

A 2-year follow-up examination revealed no current tooth migration, more gain of periodontal attachment, and good esthetics and function (Fig 11).

DISCUSSION

Periodontal disease and its sequelae, such as pathologic tooth migration, diastema, and gingival recessions, often lead to compromised function and esthetics.¹⁻⁸

This article describes the treatment of a patient with a severe periodontal disease

and a disfiguring migration of her incisors that resulted in severe diastemata in both dental arches. To provide complete rehabilitation in terms of both esthetics and function with a satisfactory long-term prognosis, a multidisciplinary approach combining orthodontic-periodontic-restorative was essential.⁴⁻⁷

This treatment involved initial periodontal intervention to control the inflammation of the periodontium, followed by orthodontic treatment to realign and intrude the migrated teeth. Thus, all diastemas were closed, and an appropriate occlusal relationship re-established.

Several techniques have been described how to intrude periodontally migrated teeth.¹⁻⁸ These include the use of extra- and intraoral devices, such as J-hook headgear or specific archwire mechanics. However, these are not without limitations. Although J-hook headgear can provide an intrusive force to the dentition, it is not esthetically well-accepted and requires patient compliance. This could become a problem, especially for adult patients. On the other hand, the use of intraoral archwire mechanics to obtain true intrusion is again not without any problems. To obtain a true intrusion of the incisors, an archwire with an accentuated curve of Spee in the maxilla and a reversed one in the mandible is combined with intermaxillary elastics to prevent an undesirable labial tipping. However, these elastics may cause again an extrusion of the incisors. Moreover, such mechanics will likely extrude the posterior teeth.¹⁰

Mini-implants are employed to treat complex malocclusions, in which conventional anchorage would not be sufficient to obtain satisfactory results.²²⁻²⁴

In this patient, a relatively simple force system was used to deliver light and continuous intrusive forces to the anterior teeth. Because skeletal anchorage was used, undesirable dental effects were avoided. Instead, the light and continuous forces delivered by the springs and wires stimulated the formation of new bone attachment.

Previous reports have demonstrated that with adequate plaque control, teeth with reduced periodontal support can be successfully moved without compromising their periodontal condition.¹⁻⁸ In the present patient, the initial periodontal status was improved by scaling and root planing. The obtained result including the use of the mini-implants was similar to that presented by Melsen et al.⁸ However, Melsen et al needed complex orthodontic mechanics to obtain an adequate intrusion of the migrated teeth.

According to Melsen et al⁸ the gradual intrusion of periodontally involved teeth in adults with marginal bone loss is beneficial because new attachment is generated. However, these authors also pointed

out that prior to orthodontic treatment, the gingival inflammation must be eliminated, which includes adequate scaling of the root surfaces.

The radiographic images suggest a reconstruction of the periodontal ligament space. This is in accordance with Melsen et al⁹ who found in monkeys with controlled oral hygiene formation of new cementum and new collagen attachment after periodontal treatment and orthodontic intrusion.

CONCLUSION

With a multidisciplinary approach, combining orthodontic, periodontic, and restorative treatment together with adequate patient motivation and cooperation, masticatory function, esthetics, and the condition of the periodontium can be improved.

ACKNOWLEDGMENTS

The authors acknowledge the assistance of Dr M. Kevin O'Carroll, professor emeritus of the University of Mississippi School of Dentistry and faculty consultant at Chiang Mai University Faculty of Dentistry, in the preparation of the manuscript. Part of this study was supported by grant MRG5080347 from Thailand Research Funding.

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