Open bite treated by intruding posterior teeth; Methods, outcomes, stability and guidelines

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Description:
From more than 15-year clinical experience of intruding molars by using mini-implants, this lecture will provide
1) method of intruding posterior teeth
2) step-by-step procedure to treat open bite with cases
3) stability of intruded molars, and
4) suggestions for long-term stability of outcomes.

Learning Objectives:
- perform open-bite treatment by intruding posterior teeth.
- recognize and manage the factors of relapse in open-bite cases.
1. Method of intruding posterior teeth + Cases
2. Clinical tips
3. Stability of the results?

Today, I would like to present very practical contents, which I couldn’t cover at AAO 2013.

Three cases treated by the combination were introduced last year. All of them were treated extraction of upper second molars.
Mini-implant

Method 5 : Use a mid-palatal mini-implant

System of Method 5 is as follows;
1. Place a mid-palatal mini-implant(1.6 mm x 6 mm), as far distally as possible (usually between 6 and 7).
2. Use a TPA with hooks.
3. Insert an 019x025" ss archwire.
4. Apply a power chain tightly.
Structure

This figure shows the structure schematically.
A combination of mini-implant and MEAW

In three cases, all of upper second molars were extracted.
A combination of mini-implant and MEAW

Then the center of resistance moves anteriorly.

A combination of mini-implant and MEAW

In the mandible, MEAW was applied and up-and-down elastics, 3/16” 6oz were used.
Without extraction of upper second molars, the intrusion rate will be slowed down. But it worked very well. In these cases. After closing the open-bite, please, check how the excessive overjet was resolved in Class II cases.

1. Method of intruding posterior teeth + Cases
2. Clinical tips
3. Stability of the results?

Today, I would like to present very practical contents, which I couldn’t cover at AAO 2013.
Clinical Tip 1 for a mid-palatal mini-implant

• There should be some space between the TPA and palatal tissue, which prevents the palatal bar to impinge the palatal tissue as the molars are being intruded.

Clinical Tip II for a mid-palatal mini-implant: How to ligate the power chain

Method 1 using an undercut
Big screw head

Method 2 using a hole
Hole

Rocky Mountains
JA type
Prepare a long ligature wire and elastic module (with even number of holes).

Insert the ligature wire into the second holes from the center of the power chain.
Put the center ring around the screw neck.

Pull the ligature wire with a hemostat.
Hook the ligature wire around the neck of screw.

Twist the ligature.
Cut the ligature and bend the remaining portion around the neck.

Stretch the power chain tight and hang it up to the hook of TPA.
Clinical Tip 3 for a mid-palatal mini-implant

Use a long shank wrench. Please, give a 6 mm space between the bottom of the handpiece and the incisial edge. If the bottom of the angle touches the incisal edge, it will be impossible to remove or insert the screw anymore.

Clinical Tip 4 for a mid-palatal mini-implant;
Please take a CT.

In every patients, please take a CT and measure a mid-palatal bone thickness. A mid-palatal mini-implant, 1.6x6mm, is used.
In a case (#674361), nasal airway problems like narrowing and septal deviation, and maxillary sinusitis were found. Cause of mouth breathing and open-bite can be screened.

Palatal bone thickness was measured in female and male adult samples. White and yellow areas are thick enough to place mini-implants safely.
Clinical Tip 5 for a mid-palatal mini-implant; Place the mini-implant more distally!

| In the left case, open-bite was closed efficiently. | In the right case, intrusion of total dentition was obtained. |

Clinical Tip 6 for a mid-palatal mini-implant; Attach the hooks distally and gingivally.

Then, 1) we will get greater vertical intruding vector than horizontal constricting vector. 2) It will be more efficient for intruding the second molars.
Clinical Tip 7 for a mid-palatal mini-implant;
Extract the upper third molars or second molars to remove the wedging effect and to provide the space for intrusion.

Clinical Tip 8 for a mid-palatal mini-implant

• Usually, I place a mid-palatal mini-implant without drilling. But if the insertion torque is higher than 30Ncm, the “Orthonia” stops automatically. Then, remove the mini-implant and drill a hole before inserting a mini-implant.
Problems experienced in mid-palatal mini-implants

I experienced mini-implant fracture in two cases. In these cases I felt that their bones were much harder than usual. My fault was that excessive torque was applied more than 50Ncm by using implant engine. (In most of cases, less than 30Ncm is enough to place mid-palatal mini-implants without drilling.) Orthonia is good because it stops automatically at 30Ncm. If it stops, remove and drill. Then we can avoid fracture of a screw.

How to remove the fractured tip

Implant Trephine kit

Trephine (ϕ=2 mm) adequate to the size of fractured tip was selected.
1) Apply a semilunar incision. Expose the fractured tip after retracting a flap.

2) Reposition the flap and suture.

1.6x6mm

Clinical Tip 9 for a mid-palatal mini-implant; Manage the constriction.

Method 5

If upper arch shows a side effect of constriction,
1) Expand the TPA a little.
2) Expand the arch wire of 019x025 ss with a slight crown buccal torque.
Clinical Tip 10 for a mid-palatal mini-implant; How to control 2nd molars

Sometimes, upper 1st molars are intruded but 2nd molars don’t follow.

1) Solder hooks to intrude 2nd molars palatally
2) Add a L loop with an intrusion step between 6 and 7 to intrude 2\textsuperscript{nd} molars \textit{buccally}

019x025 ss with a L loop + intrusion step + tip-back bend 5~10\textdegree
Clinical Tip 11 for a mid-palatal mini-implant

1) Monitor the extrusion of lower molars

Lower molar extrusion prevents mandible from rotating counterclockwise.

2) If lower molars extrude, then apply the mechanics of lower molar intrusion.

This is the method using a Burstone lingual arch with lingual crown torque and a buccal mini-implants to intrude the lower molars. Crown lingual torque is applied slightly to counteract the buccal tipping by the intruding force from the power chains.
Method 6
1) Mini-implants are placed between 5 & 6.
2) Burston Lingual Arch is placed with lingual torque.

Apply a power chain tightly.
Clinical Tip 12 for a mid-palatal mini-implant; Intruding force should be strong enough.

There was no bite closing.

Power chain was too loose to intrude.

There was bite closing.

Stretch the power chain to apply a strong force.
Clinical Tip 13 for a mid-palatal mini-implant; Retain the TPA and mid-palatal mini-implant during the finishing stage.

Some extrusion of upper molars during the detailing stage is inevitable to settle down the molar interdigitation. Then, initial counterclockwise rotation of mandible relapses. Extrusion of upper molars was a cause of the changes. It is recommended to retain them as long as possible during the finishing stage.

Clinical Tip 14 for a mid-palatal mini-implant; Fixed retainer + Labial buttons + U/D elastics

How to retain the result after debonding?
1. Monitor the causes: TMJ pains, tongue thrust & mouth breathing.
2. Instruct patients to chew many times during eating meals (to increase muscle tonicity).
3. Use Fixed retainers(4-4).
4. When a relapse tendency found, apply labial buttons (22/33) with u/d elastics 3/16" 6 oz.
How to make labial button?

1) Etching
2) Drying

3) Primer application
4) Curing
5) Place a Separator ring on cervical area

6) Inject Flowable resin in the ring.

7) Curing

8) Remove a Separator
9) Polish and check the undercut.

Fixed retainer (4-to-4)

3M Unitek 0.8mm Twist wire, REF 260-0321

2014.1.15
1 year after debonding
3M Unitek Twisted wire 0.8mm REF 260-032
Clinical Tip 15: How to correct the Antero-posterior relationship after obtaining positive incisal overlap.

- Distraction of condylar head is not expected.

- There is a possibility of distraction of condylar head.

**Multiloop Edgewise Arch Wire (MEAW)**

- 018x022 stainless steel

MEAWs are made of 018x022 ss wire.
An 043-CK plier is used to make a MEAW.
First, anterior curvature is bent with a turret.

Between #2 and #3, the first L loop is made.
Between #2 and #3, the first L loop is being bent.
Sequentially, upper L loops are being made.

The final upper and lower MEAWs were made.
Upper and lower MEAWs showed a good coordination.
To avoid gingival impingement or cheek mucosa irritation, L loops have a buccal tipping. The angle increases progressively distally.

But the upper and lower MEAWs don’t have torques.
Lower

The arch is made flat.
Tip back bends
- Provides reverse curve of Spee

Tip back bends are applied to each loops, 3° to 5°. Finally, the upper arch has a compensating curve and the lower arch has a reverse curve of Spee.

“Rocking Chair”

1. Extrusion of anterior teeth is the main effect.
2. Very slight intrusion of posterior teeth is also secondary effect, “Rocking chair effect”.

Up & Down elastics
• Class II correction
  • U: MEAW
  • L: Ideal arch wire

• Class III correction
  • U: Ideal arch wire
  • L: MEAW

• Closing anterior open bite
  • U: MEAW
  • L: MEAW

MEAWs can be used to correct Class II relation, Class III relation and open bite. To close the anterior open bite, MEAWs are used both in upper and lower arches.

• Class II correction
  • U: MEAW, L: Ideal arch wire
  • 5/16” Class II elastics

To correct Class II relationship, MEAW is applied in the maxillary arch and Ideal arch (019 x 025ss) is used in the mandibular arch. Class II 5/16” 6oz elastics are applied.
**Class III correction**
- U: Ideal arch wire, L: MEAW
- 5/16” Class III elastics

To correct Class III relationship, MEAW is applied in the mandibular arch and ideal arch (019x025ss) is used in the maxillary arch. Class III 5/16” 6oz elastics are applied.

**Openbite correction**
- U: MEAW, L: MEAW
- 3/16” up/down elastics

To close the anterior open bite, MEAWs are used both in maxillary and mandibular arches. 3/16” 6oz elastics are applied from the first upper loop to the first lower loop.
1. Extrusion of anterior teeth is the main effect.

2. Very slight intrusion of posterior teeth is also a secondary effect, "Rocking chair effect".
1. Extrusion of anterior teeth is the main effect.
2. Very slight intrusion of posterior teeth is also secondary effect, “Rocking chair effect”.
3. Distal tipping contributes to the correction of molar relationship.

This effect is increased by Class II elastics (In Class III, by Class III elastics).
“Molar movement in open-bite”

Very slight intrusion + Distal tipping

Reasons why I use MEAWs instead of curved TMA or NiTi wires?
Distal tipping or intrusion of a molar can be controlled very accurately and effectively with a stiff stainless wire. And also the load-deflection rate is decreased well with the L loops.

1. If the handle is made of a **flexible** material, it would not be easy to control well (tip-back and intrusion) and
2. it would be hard to adjust the wires (vertical or in-&-out steps) for compensating the minute errors of bracket positioning.
1. Method of intruding posterior teeth + Cases
2. Clinical tips
3. Stability of the results?

Open bite has two key characteristics.

- Difficult to finish
- Sometime it goes back!

Post-retention Changes = Orthognathic surgery + Orthodontic treatment + TMD

Extrusion of molars

Kwang Hyo Choi
Tae-Woo Kim
AJODO (submitt ed)

Jung-Woo Han
Tae-Woo Kim
KJO 2010: 40(6):398-410

Master thesis (Dr. Joo-Hyung Kim) 2011

Post-retention change is a combination of relapses from each treatment modalities; although this surgery can be designed against it, the clinical stability of open bite is hard to predict long-term stability worse.
Stability of anterior openbite treatment by upper molar intrusion with skeletal anchorage

Joo-Hyung Kim, D.D.S.
(Directed by Prof. Il-Young Chang)

Department of Orthodontics, Graduate School, Seoul National University

One master thesis from my department will be introduced.

Purpose of this study

• To analyze the treatment effect of upper molar intrusion in female adult anterior openbite patients
• To evaluate at-least-1 year stability of upper molar intrusion

• To find out correlation of
  1) treatment changes (esp. lower molar extrusion) with pretreatment variables and treatment changes
  2) relapse rates (dentoalveolar height of posterior teeth, anterior facial height, overbite) with pretreatment variables and treatment changes.
Sample selection - Inclusion criteria

- Achieved upper molar intrusion without an attempt to intrude lower molars.
- Pretreatment negative overbite
- **Female patients older than 20 years at the end of treatment**
- **Skeletal Class I or II (ANB > 0.6°)**
- Normodivergent or hyperdivergent pattern (SN-GoMe > 28.3°)
- Presence of lateral cephalographs at beginning of the treatment, completion of the treatment and at least 1 year after the treatment.
- No history of craniofacial surgery
- No craniofacial anomalies nor neuromuscular diseases.
- No recurrent nor severe temporomandibular symptoms.
- No use of overlay retainer

Sample selection

- **20 female adult open-bite patients treated by upper molar intrusion with skeletal anchorage were selected.**
  - The half of them had undergone the treatment at Department of Orthodontics, Seoul National University Dental Hospital
  - and the other half had undergone the treatment at 4 other local clinics
- **12** had 1st PM Ext., **2** had 2nd PM Ext., **4** had 2 mm or more distalization and the rest **2** were treated without *drawbridge* effect.
- The mean age at beginning of the treatment: 23.5 ± 5.0 yrs. (18.0 -38.6 years.)
- The mean treatment period: 30.5 ± 11.3 months. (13-62)
- The mean retention period: 25.9 ± 11.8 months. (11-55)
- All of the patients were given the circumferential or Hawley retainers. (no overlay nor bite block-type retainer)
Treatment mechanics

A: TPA with a mid-palatal mini-implant

B: buccal and palatal inter-radicular mini-implants (Tae-Woo Kim, 2008)

Cephalometric analysis

- Lateral cephalographs were taken at the beginning of the treatment (T1), completion of treatment (T2) and at least 1 year after the treatment (T3).

- The magnification rates were either 110.0% or 115.0%
- Lateral caphalograms of each subject were traced by a single investigator (J-H.K.)
- 3 sets of tracings of each patients were superimposed and digitized with graphic digitizer (Intuos 2 Grapgic Tablet; Wacom Technology Co., Vancouver, USA).
- Digitized data were analyzed by V-Ceph 5.3 (Osstem, Seoul, Korea) software.
Results

<table>
<thead>
<tr>
<th></th>
<th>U6M (mm)</th>
<th>L6M (mm)</th>
<th>LAFH (mm)</th>
<th>OB (mm)</th>
<th>PFH (mm)</th>
<th>SN-GoMe (°)</th>
<th>SNB (°)</th>
<th>Pog-Nper (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\Delta T2-T1)</td>
<td>-1.75</td>
<td>0.92</td>
<td>-1.72</td>
<td>4.93</td>
<td>-0.68</td>
<td>-0.84</td>
<td>-0.20</td>
<td>0.61</td>
</tr>
<tr>
<td>(\Delta T3-T2)</td>
<td>0.31</td>
<td>-0.01</td>
<td>0.48</td>
<td>-0.43</td>
<td>0.14</td>
<td>0.26</td>
<td>-0.06</td>
<td>-0.18</td>
</tr>
<tr>
<td>Relapse rate (%)</td>
<td>18</td>
<td>1</td>
<td>28</td>
<td>8.7</td>
<td>21</td>
<td>31</td>
<td>-33</td>
<td>30</td>
</tr>
</tbody>
</table>

- Amount of U6 intrusion was 1.75mm. Amount of relapse was 0.31mm, which is 18 in percentage.
- L6 was extruded 0.92mm, and relapsed 0.01mm.
- Overbite was increased 4.93mm, and relapsed 0.43mm.

Stability of molar intrusion

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</thead>
<tbody>
<tr>
<td>Number of subjects</td>
<td>9 (M 2, F 7) 19.3 Yrs. (13.3 – 28.9)</td>
<td>11 (M 1, F 10) 23.3 Yrs. (18.2 – 31.1)</td>
<td>9 (M 1, F 8) 23.7 Yrs. (18.3 – 31.1)</td>
<td>20 (F only) 23.5 Yrs. (18.0–38.6)</td>
</tr>
<tr>
<td>Extraction</td>
<td>Unclarified</td>
<td>Unclarified</td>
<td>3 of 9 pts had PM extraction</td>
<td>14 of 20 pts had PM extraction</td>
</tr>
<tr>
<td>Treatment modality</td>
<td>Miniplate Lower molar intrusion</td>
<td>Mini-screw Upper molar intrusion</td>
<td>Mini-screw Upper molar intrusion</td>
<td>Mini-screw Upper molar intrusion</td>
</tr>
<tr>
<td>Intrusion / Relapse</td>
<td>1.7mm (M2: 2.8mm) 0.5, 0.9mm (27, 30%)</td>
<td>2.2mm 0.23mm (10%)</td>
<td>2.4mm 0.45mm (19%)</td>
<td>1.94mm 0.32mm (17%)</td>
</tr>
<tr>
<td>Overbite increase / Relapse</td>
<td>4.9mm 0.9mm (18%)</td>
<td>5.5mm 1.0mm (18%)</td>
<td>5.6mm 1.2mm (21.5%)</td>
<td>4.93mm 0.43mm (8.7%)</td>
</tr>
<tr>
<td>Retention period</td>
<td>Unclarified (at least 1 yr.)</td>
<td>17.4 months (12 – 27)</td>
<td>41 months. (36 – 51)</td>
<td>25.9 months (11–55)</td>
</tr>
<tr>
<td>Retention method</td>
<td>Unclarified routine Circumferential retainer</td>
<td>routine Circumferential retainer</td>
<td>routine Circumferential retainer</td>
<td>Circumferencial or Hawley retainer</td>
</tr>
</tbody>
</table>

In this research, more cases were included. The result was similar with others.
The title was ‘Longitudinal cephalometric study of non-orthodontically treated female patients with TMJ disk displacement’. My resident retrieved the adult female patient files including MRIs.

Material and method

1) The number of adult female patients who had both lateral ceph and TMJ MRI was 429.
2) Among them, only the cases who had bilateral disc displacement and no orthodontic treatment were selected. Average of age was 18.1.
3) All of them were called to visit my department. We could take lateral cephs (T2) for twenty five patients.
4) Observation period was average 3 years.
Result

Coefficient of Correlation was -0.660 (p<0.01).

FMA 1°↑ = SNB 0.43°↓

No or negligible change

Correlation coefficient = -0.66 (p<0.01)

Result

Coefficient of Correlation was -0.660 (p<0.01).

FMA 1°↑ = SNB 0.43°↓

Clockwise rotation of Mandible

Correlation coefficient = -0.66 (p<0.01)
Result

Coefficient of Correlation was \(-0.660(p<0.01)\).

FMA \(1^{*+} = \text{SNB} 0.43^{*}\)

Correlation coefficient = \(-0.66 (p<0.01)\)

Backward shift of mandible

Atrophy of Masticatory muscles

Anterior disc displacement

Condylar resorption

Pain in Movement

TMD symptoms

Weak bite force

Open bite

Vicious cycle
• ADD causes condylar resorption. ADD and/or condylar resorption makes open bite.

• In open-bite cases, bite force decreases. Because occlusal contact area decreases, they cannot bite strongly.

• Other TMD discomfort and muscle pain also makes the bite force weaker.

• The weaker is the bite force, the severer becomes the open bite. This makes a vicious cycle.
Other two etiologic factors like ‘Mouth breathing’ and ‘Tongue thrusting’ also cause the open bite. Mouth breathing patients are referred to ENT doctors.

All of open-bite patients have ‘tongue thrusting’. Some of them have ‘active’ tongue thrusting habit as a cause of the open bite. It should be trained before finishing the cases.
Summary

• Combination of a MEAW with a mid-palatal mini-implant
  – produces intrusion of upper posterior teeth and extrusion of anterior teeth at the same time. And this may close open bite very rapidly just after extraction of 2nd molars.

• Clinical tips were shared.

• Stability after intrusion of molars was reviewed.

Thank you very much for your attention!
taewoo@snu.ac.kr
Incidence of openbite is greatest with ODI values below the mean (74.5°), and the incidence of deep overbite is greatest with higher ODI values.


Why was the extraction of four 2nd molars delayed until the open bite was ready to be closed?

• To utilize the effect of Regional Acceleratory Phenomenon (RAP)
• To maximize the intruding rate by using RAP
Why four 2\textsuperscript{nd} molars were extracted?

1. To eliminate the \textit{wedge effect}
2. To solve the \textit{posterior crowding}
3. To \textit{upright} the mesially inclined 1\textsuperscript{st} molars