How Successful is Invisalign for Treatment of Anterior Open Bite and Deep Overbite?

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Agenda
I. Mild to moderate Anterior Open Bite
II. Mild to moderate Deep Overbite

I. Mild to moderate Anterior Open Bite

1. Brief review of literature with conventional fixed treatment, orthognathic surgery, Micro implants (MI) and Invisalign in regard to Stability
2. Is open bite a health related functional issue?
3. Case reports (non-extraction and extraction)
   - Based on 42 consecutive patients -1 to 9 yrs post retention –no orthognathic surgery or Micro implants (will show 14 today)
   - For more information refer to Align Technology’s open bite video available at AlignTech Institute of Invisalign.com

Long-Term Stability of Mild to moderate Anterior Open Bite Treated with Clear aligners


Conclusions:
- Relapse is frequent (40 - 80%)
- Associated with increased mandibular plane angle
- Anterior tongue position may be most important variable for relapse
- Tongue habit reminders (MFT) are helpful (repositioning of tongue posteriorly)

How stable is posterior intrusion with micro implants to close an open bite?

- Beck et al. (Oct. 2010) AJODO –Some skeletal and dental relapse (17 %) in first year post-treatment, but good stability after 3 years
- Deguchi et al. (April 2011) AJODO -2 year post comparison of MEAW (Kim) to MI’s and bone plates (minor relapse)
  - More relapse with MEAW than plates or MI’s

But what if patient declines MI’s or plates?
Pre vs post (MI Case treated by Cheol Ho Paik and Judie Woo, Seoul, Korea)

Palatal MI and lower buccal MI's used for anchorage to intrude and retract posterior teeth to close an anterior open bite and bimaxillary protrusion

Pre vs post

Pretreatment
Posttreatment

2 years post-good stability with use of MI after first year

Does Orthognathic surgery provide stability of open bite correction?
- Studies show that for long term results (< 2 yrs retention), that if positive overbite is a main goal then 95 % to 52% of patients will not have positive overbite
- Also, patients may not accept surgery
Can Invisalign treated patients have acceptable long-term stability of anterior open bite?

- Only case reports
  - Boyd & Vlaskalic, Seminars in Orthodontics, Vol. 7 #4: 274-293, 2001

Open bite can frequently be a functional health related issue

- Leads to excessive wear of posterior teeth due to loss of anterior contact and resulting lack of anterior disclusion
- Less efficient mastication

Long-Term Stability of Mild to moderate Anterior Open Bite Treated with Clear aligners

Agenda

2. Is open bite as a functional health related issue?

3. Case reports (non-extraction vs extraction)
   - Based on 42 consecutive patients -1 to 9 yrs post retention –no orthognathic surgery or Micro implants

Does Invisalign have better long-term stability of anterior open bite?

Pre - 7 year old with thumb and tongue habit

Phase I – Thumb habit treatment
Phase II – full fixed appliances

Post Phase I – thumb habit stopped

Post Phase II – narrow laterals will be bonded – shallow overbite
One year post - Upper laterals restored but open bite develops – Decision to use Invisalign

Final aligners fit well

6 months Post Invisalign

2 years post treatment - good stability

11 year follow-up of open bite

Mild extrusion (< 2mm) with force pushing against attachment

- Extrusive force occurs from center of rotation with tipping and rotational movements (relative extrusion)
Superimposition - common finding is no opening of mandibular plane angle

How does Invisalign close the anterior open bite? (my hypothesis)

- Increased bite force on posterior teeth due to aligner thickness and arc of closure
- This creates an intrusive force on the posterior teeth
- Then incisors are slowly extruded with no eruption of molars
- Tongue is also blocked out during treatment and may move distally
Pre - Edge to edge bite with narrow arches (Does posterior expansion tend to open bite in the anterior?)

High mandibular plane angle and long lower 1/3rd facial height

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Pre , post. and 1 yr post

Pre (red) vs post (blue)

No change in mandibular plane angle

Pre , post. and 1 yr post

Six years post
Six years post

Pre - Mild open bite treatment with posterior crossbite - Previous fixed tx

No contact of incisors

Pre-Normal skeletal relationships

Pre vs post - treatment - Needed more deepening of overbite

Superimposition (No change in mandibular plane angle)

3 years post treatment - diastema opened but overbite was stable
Pre, post and 3 yr retention

Pre-planned for implant to replace #29 - 8 mm space is needed

Would fixed appliances to upright molars in an open bite cause some extrusion and increase the anterior open bite?

Comparison – Note closure of open bite

Comparison of pre and post

Pre vs post – Note increased space for implant for #29 to a premolar sized crown (3.5 to 8 mm)
Superimposition -No opening of mandibular plane angle

Posterior crossbite and moderate anterior open bite with 4 mm crowding and protrusion - steep mandibulat plane

Treatment

Pre vs post

4 years post treatment
8 years post

Class I open bite with posterior crossbite - history of two previous fixed treatments

final

Pre, 18 months and post

4 yrs post
Pre – Class II subdivision right, anterior edge to edge with posterior crossbite and high canines - Class II unilateral elastics used with Invisalign

Andrea A.

Post

One year post

New G3 hooks make treatment much easier for Class II elastics

Drag and drop feature on new software

Mesial Hook

Button Cutout

How well do new precision hooks work?

- Very well so far with some exceptions:
  - Short clinical crowns or short aligners = little retention and “lift off” esp. with opening

Solution is to make sure the clinical crown is not cut back (good impression) on ClinCheck and add attachments for retention on adjacent teeth

- Or just use buttons

Pre - Class II moderate open bite and severe occlusal wear (Had prior ortho twice)
Post
- Increased clinical crown lengths
- Left side has posterior open bite

1 Year Retention

Pre, post and 1 year Superimposition
- Note continued closure of mandibular plane angle

Class I open bite with crowding treated with premolar extractions and 8 months of segmental fixed

Pre, during and post
Pre - Anterior open bite with impacted canines
Ortho treatment with extraction of # 6 & 11 and lower first premolars

At transfer to me - 2 years of up and down elastics to close bite - Tx plan: Remove appliances, stop elastics and let settle for 8 months

Pre - After settling vs Post Invisalign

1 year post - No additional RR
Pre vs post - Tx
Invisalign with premolar extractions and lower fixed segments

Superimpositions

Pre vs 30 months post

2 ½ years post

Pre

Invisalign with premolar extractions
**Initial Ceph**

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*Mild class II, steep mandibular plane and open bite*

**Initial Panoramic Xray** _note lack of root parallelism – makes Invisalign more difficult_

**30 months – Place lower fixed for 5 months due to tipping into extraction sites**

**Pre and**

**Pre vs 6 months post**

**2 years post**
Severe open bite with crowding and one premolar extraction
Pre vs post

Pre
Post

Note how healthy the gingival tissue remains

8 Months post - Note further closure of open bite and bleaching

(Published in JCO 2007)

Severe skeletal - Significantly increased mandibular plane angle and long lower third facial height

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Pre vs post treatment

Pre
Post

8 Months post

Pre vs post treatment

Pre
Post

8 Months post

Superimposition

Initial
Final
3 1/2 years post treatment

50 yr old Hispanic woman with severe open bite, protrusion and crowding –Premolar extractions

7 yrs post treatment

15 months

29 months – 9 months of lower segmental fixed appliances to parallel roots

Post- 38 months treatment

Aligners with elastics for Class II correction - patient continued to wear elastics at night only with retainers
5 years post—good stability

32 yr old male with 7 mm open bite

Cephalometric Analysis
- Severe skeletal open bite (not in retention group yet)

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Progress 9 months into treatment
- Direction of force can be varied by placement of buttons and MI

G3 release has menu with preformed hooks for aligners

21 months—note facial and overbite changes
- Precision cuts used for elastics

3 degrees closure of mandibular plane angle from upper molar intrusion—mandible came forward 4 mm
Long-Term Stability with clear aligners for mild to moderate open bite

Summary (my opinions - not good evidence)
1. Transition to retainers easier for clear aligner patients as it is the same appliance (better long term compliance)
2. Open bite treatment may be more stable than fixed only

How Successful is Invisalign for Treatment of Anterior Open Bite and Deep Overbite?

Agenda
I. Mild to moderate Anterior Open Bite
II. Mild to moderate Deep Overbite

How well is deep overbite corrected? (JCO 1997)
Intrusion of upper central incisors to level gingival line and leveling of lower Curve of Spee

How is deep overbite corrected? Lower anterior intrusion to level lower curve of Spee. How stable is this correction?

Pre and post-Ortho solution was to intrude upper central incisors to gingival margins
Note intrusion of incisors to open bite

2 years post treatment - excellent retainer wear (bonded lower ant. wire usually needed)

How can efficiency of open bite correction be improved? (use soft Bite Ramps (turbos) to increase bite force on lingual aspect of aligner

- Also helpful for increased overjet cases to increase seating force of aligners (like a permanent Chewie!)
- Can increase bucal-ling. thickness up to 3 mm to get contact if overjet is present
- Place on all four upper incisors*
- The ramps should collide with the lower incisors (with the purpose of propping the bite open)

Bite Ramps (soft turbos) Protocol
- Special doctor request (place horizontally for most contact) of horizontal beveled attachments
- Do not fill with composite as with regular attachments
- Can be placed with Power Ridges but doctor must state they will not be filled with composite
- Cannot cover lingual Power Ridges

Bite Ramps in ClinCheck 3.1 Software

Visualize in Tx Overview & Attachment Interface

Root torque is also important!
- Stability is generally associated with an inter-incisal angle of about 130 degrees
- This requires lingual root torque on upper and lower incisors
- 100% of torque not generally observed (Align study showed 55 to 80% achieved in adults - can be higher in teens)
Power Ridges\textsuperscript{TM} change the shape of material to produce a torquing auxillary.

How do they work?

1. Lingual Root Torque is defined as rotation about the incisal edge.

2. Smaller opposing force to create a moment.

Power Ridges now available for lower incisors.

Clinical results of Power ridge testing -20 degrees torque requested:

Pre

Post

Would have benefited from lower incisor torque.

Clinical results of Power ridge testing -20 degrees torque requested:

-20 degrees torque requested

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Final Ceph - achieved 60% of requested torque (average is usually 55-70%).
Superimposition -12 degrees of torque achieved from 20 degrees requested

Initial 24y 7m
Final 25y 9m

Final Panoramic X-ray
- No noticeable root resorption (agrees with FI and USC studies)

How well do bite turbos work to hold correct a deep bite in a brachycephalic adult?

Deep overbite, mild crowding, retro-inclined incisors

Daniel Z.

1 year Post tx

Soft turbos and deep bite - Comparison

Pre
Aligner fit
Post-bite opened 3 mm + improved torque

Note absence of posterior open bite
Superimposition

Note Upper incisor inclination, deep overbite and retro-inclined lower incisors

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PROGRESS 6.14.2011 (10 mon)

PROGRESS 11.22.2011 (15 mon almost final)
- Why posterior open bite if turbos work?
Initial vs end of aligners

Pre vs Post PANO - No Root resorption

CEPH COMPARISONS

CEPH SUMMARY - requested 30 degrees of torque and 15 degrees received

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Example of my current doctor time with one set of aligners

- Consult (10 min)
- Clincheck and case presentation (10 min)
- Five 5 min min adjustment visits (30 aligners)
  (Staff take records, intraoral scans, place and remove attachments)
- 50 min total scheduled Doctor time
Deep bite and unilateral Class II treated before G3 or 4 main difference is treatment efficiency.

1 Yr post - Deep bite and unilateral Class II - Post tx needed more torque and bite opening.

What if overjet is present?
Place bite turbos on canines (Bill Gerie).

34 yr old Chinese-American with severe periodontitis and complaint of “teeth stick out”.

Extremely deep overbite due to bone loss - Can generalized advanced periodontitis patients be treated with Invisalign?

Must have initial control of disease activity and 3 month perio recalls.
Pre, during & Post treatment-Note shortening of crowns by selective grinding to improve C/R ratio and aid in bite opening

Pre vs Post treatment

Four years later

Four years later

Radiographs

Pre-Tx

Progress

4 yr Post-Tx
How Successful is Invisalign for Treatment of Anterior Open Bite and Deep Overbite?

Summary

I. Mild to moderate Anterior Open Bite - **Good results with better stability than fixed**

II. Mild to moderate Deep Overbite
   - **Better results today because of Power Ridges, bite turbos and applying overcorrection**
   (but how much actual work? – if you like to work hard, don’t do Invisalign)

Thanks!

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