Invisalign® Treatment Monitoring & Finishing

Tips & Techniques Guide to Help Doctors Achieve Ideal Patient Outcomes
This Guide is intended to help the Invisalign practitioner address monitoring and finishing issues that may arise between receipt of aligners from Align to the completion of treatment. For a more comprehensive understanding of how to prevent these issues—please be sure to view the archived ATE Program:

Managing Aligner Tracking Issues: Tips and Techniques for Keeping Treatment on Course presented by Dr. Doug Brandt

The solutions in this Guide are considerations collected from your peers. These have not all been tested in clinical trials, but rather are tips and techniques from Invisalign-experienced colleagues.
# Treatment Management Issues Covered in this Guide

## During the Treatment
- Attachments Debonding
- Attachments Not Engaging
- Aligner Does Not Fit At All
- Aligner “Popping” Off
- Aligner Too Retentive
- Aligner Not Retentive
- Aligners Not Seating
- Tooth Not Rotating
- Tooth Not Extruding
- Unplanned Intrusion Occurring
- Root Movement Not Occurring

## Finishing Treatment
- Black Triangles
- Roots Tipped
- Premature Occlusal Contacts
- Posterior Open Bite
- Residual Spacing
- Residual Crowding
Using This Guide

To provide you with easy navigation and links to learn more, the following two components are included within this document:

1. **Document Outline**: An easy way to jump to a topic you want to see specifically—is to use the outline panel to the LEFT. By clicking on any topic in this outline—it will jump you to the first page of that topic’s content. Please note several sections have more than one page.
Using This Guide

To provide you with easy navigation and links to learn more, the following two components are included within this document:

2. “Learn More” Star: Jump easily to more information, instructions guides and help resources when you see the “star.”

   Click on the link in the document and it will show you more without leaving the page you are viewing in the resource guide.
Key Considerations for Using Invisalign Effectively

It’s helpful to understand some key concepts about Invisalign aligners and tooth movement before you begin to use this guide.

When monitoring treatments, from time to time your patient’s teeth may not track to plan. In these instances, it is good to generally keep in mind that this occurs for two fundamental reasons:

1. Insufficient Space
2. Insufficient Force
Insufficient Space

Teeth cannot collide into others to reach ideal tooth position
Insufficient Space

May Be Due To:

- Insufficient IPR
- Effect of insufficient force system/points of contact in the aligner and/or attachment
- Treatment plan that limits the success of creating space required
Changing the Invisalign Clinical Protocols in Your ClinCheck® Treatment Plan

NOTES:
If a doctor requests to remove or change a default attachment (for rotations, extrusions or anterior intrusion anchorage) that has been automatically placed according to the Invisalign Clinical Protocols, the tooth/teeth will be identified as blue or black and may require additional clinical skills and close monitoring.
Teeth need space to move

If interproximal contacts are too tight:

1. Tooth will not move
2. Incomplete seating of the aligner will occur
3. Active Forces increase
Insufficient FORCE

Sufficient force relies on sufficient aligner contact with tooth or attachment.

Are the necessary forces & points of contact present to ensure movement?

Incomplete seating of aligner means less points of contact with the tooth and subsequently unexpressed force.
Insufficient FORCE

May Be Due To:

• Doctor’s treatment plan – includes (blue/black) movements programmed that at times, benefit from additional techniques

• Lack of correct attachment-to-aligner engagement

• Insufficient time for the movement to express

Tooth Movement Assessment (TMA)
Information in patient’s ClinCheck treatment plan that provides guidance in identifying more significant movements present.
<table>
<thead>
<tr>
<th>1</th>
<th>Have patients arrive with the previous aligner stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>By having patients arrive with the previously worn aligner stage, you can evaluate and compare any fit or tracking concerns that may arise.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Review</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current aligner is a good fit</td>
</tr>
<tr>
<td></td>
<td>1. IPR Instructions (and record amount performed on form (kept in chart))</td>
</tr>
<tr>
<td></td>
<td>2. Condition and engagement of attachments</td>
</tr>
<tr>
<td></td>
<td>3. Evaluate for tight contacts with unwaxed floss and relieve with finishing strips if present</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>Compare to ClinCheck Treatment Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Check actual results versus ClinCheck treatment plan every 4-8 stages</td>
</tr>
</tbody>
</table>
Monitoring Aligner Fit

**Good fit**

- Aligners are seating well over the teeth
- No visible gaps or rocking
- All attachments are engaged properly

**Poor Fit**
Perform & Document IPR

- Perform IPR as recommended
- Print copy of form for patient’s chart
- Document amount
Monitoring Attachments

Standard attachment does NOT have full contact with attachment well

Rub articulating paper over standard attachments to help in evaluate attachment engagement
Monitoring Interproximal Contacts

Evaluate for tight contacts with unwaxed floss and relieve with finishing strips if present.
Using your best diagnostic and treatment planning tool(s) to help you stay on course
During the Treatment Period
## Attachments Debonding

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contaminated bond surface or not isolated</td>
<td>Replace under better isolation</td>
<td>Clean (pumice) the teeth and isolate</td>
</tr>
<tr>
<td>Use of bonding material and bonding agent not designed for attachment use</td>
<td>Replace using the attachment template and bonding materials designed for Invisalign attachments</td>
<td>The Invisalign Attachment Kit may be ordered through the Align Store</td>
</tr>
</tbody>
</table>

More Information on Attachments including video and guide for placing attachments: [http://learn.invisalign.com/attachments](http://learn.invisalign.com/attachments)

Recommended Attachment Composite Materials: [https://s3.amazonaws.com/learn-invisalign/docs/us/survey_and_testing.pdf](https://s3.amazonaws.com/learn-invisalign/docs/us/survey_and_testing.pdf)
<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonding to porcelain or gold crowns</td>
<td>Bonding to porcelain or gold can be difficult. Use a bonding product that minimizes failures for these surfaces or use a sand blaster</td>
<td>Review your ClinCheck plan to see if teeth with crowns or veneers have attachments and plan accordingly</td>
</tr>
</tbody>
</table>
## Attachments not Engaging (1st Aligner)

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess composite</td>
<td>Rebond the attachment using less composite and remove excess material</td>
</tr>
</tbody>
</table>
Active surface must be in contact with the aligner

* Difference in shape between the aligner and the bonded attachment.
## Attachments not engaging (during treatment period)

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of engagement, probably teeth are not moving according to the aligner</td>
<td>Remove and re bond the attachment</td>
</tr>
</tbody>
</table>

More information on re-bonding attachments mid-treatment: [http://learn.invisalign.com/attachments](http://learn.invisalign.com/attachments)
### Aligner Does Not Fit At All

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>At start of treatment: Sub-optimal PVS impressions have affected the fit</td>
<td>Take a new PVS impression</td>
<td>See: PVS Impression Inspection Checklist</td>
</tr>
<tr>
<td>Mismatch or incorrect stage given to the patient</td>
<td>Try next aligner first. Verify patient # imprint on aligner is correct patient</td>
<td></td>
</tr>
<tr>
<td>Check to make sure patient was given correct aligner</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PVS Inspection Checklist:  

PVS Impressions:  
[http://learn.invisalign.com/impressions](http://learn.invisalign.com/impressions)
# Aligner Is Not a Good Fit

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
</table>
| “Tracking” issue—where teeth are not moving or tracking as planned | Teeth do not move as planned based on two primary causes:  
1. Insufficient space  
2. Insufficient force | Review information available in ClinCheck software thoroughly before starting each treatment.  
**IPR instructions** help identify where collisions & binding are likely to occur.  
**The Tooth Movement Assessment** identifies teeth where increased forces from additional techniques may be required |
## Aligner Popping Off

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the start of treatment: sub-optimal initial PVS impression</td>
<td>Take a new PVS impression</td>
</tr>
<tr>
<td>Movements programmed into the aligner for expansion not occurring</td>
<td>Ask the patient to frequently “bite” to help seating and engagement. “Chewies” provide assistance in aligner seating. If no improvement, send a new impression (Midcourse/Progress)</td>
</tr>
</tbody>
</table>

PVS Impressions:

http://learn.invisalign.com/impressions
<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divergent path of insertion due to severely</td>
<td>Trim away aligner in undercut region with</td>
<td>Position of teeth affects aligner path of insertion/removal. Seat aligner</td>
</tr>
<tr>
<td>tipped, crowded or flarred teeth</td>
<td>trimming bur</td>
<td>starting with area of greatest crowding or undercut</td>
</tr>
<tr>
<td></td>
<td>Trim the distal of the terminal molars</td>
<td></td>
</tr>
<tr>
<td>Too many attachments</td>
<td>Smooth the edges of the attachments</td>
<td>Refrain from adding additional attachments outside of the Invisalign</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clinical Protocols</td>
</tr>
</tbody>
</table>
## Aligners Not Retentive

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short clinical crowns without undercuts (common with teens)</td>
<td>Use Detail Pliers to create retentive dimples for retention</td>
<td>Add posterior attachments (during ClinCheck review) when short clinical crowns are present</td>
</tr>
</tbody>
</table>

**Detail Pliers:**

## Root Cause

Amount of rotation required falls in the blue/black range (see TMA) where additional techniques may be required for full de-rotation

## Solution

- Buttons & elastic technique
- Invisalign Detail Pliers to assist with minor movements

## Prevention

Change ClinCheck treatment plan to remove blue/black movements and/or change treatment goal. May result in a compromised ClinCheck treatment plan

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**Buttons & Elastics:**
[http://learn.invisalign.com/buttons](http://learn.invisalign.com/buttons)

**Tooth Movement Assessment Form:**

**Detail Pliers:**
## Tooth Not Rotating

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding contacts (Insufficient Space)</td>
<td>Evaluate for tight contacts on teeth that are trying to rotate with unwaxed floss and relieve with finishing strips</td>
<td>Always monitor contacts with unwaxed floss during treatment whether IPR was prescribed or not</td>
</tr>
<tr>
<td>Variation in bone biology or tooth morphology (i.e. peg laterals where the surface contact of the aligner against the tooth is small)</td>
<td>Buttons &amp; elastics&lt;br&gt;Extend wear time of aligner stage&lt;br&gt;Use Invisalign Detail Pliers to assist with minor movements</td>
<td></td>
</tr>
</tbody>
</table>
# Tooth Not Rotating

## Root Cause

- Lack of overjet; teeth have no place to move without interference from the opposing arch
- Insufficient amount of IPR preformed in prior appointments

## Solution

- Wait for teeth to move out of the way in the opposing arch and re-evaluate progress
- 1. Perform recommended amount of IPR
- 2. Measure IPR
- 3. Record IPR in chart

## Prevention

- Have team member use highlighter on patient’s aligner packaging as a visible reminder IPR is planned at that stage

**IPR:**

[http://learn.invisalign.com/IPR](http://learn.invisalign.com/IPR)
## Tooth Not Rotating

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment not optimally engaged</td>
<td>Have patient bite into cotton rolls/ chewies frequently to help seating and engagement</td>
<td>“Chewies” by Glenroe Technologies</td>
</tr>
<tr>
<td>(slightly)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attachment not optimally engaged</td>
<td>• Use button &amp; elastic to facilitate movement</td>
<td></td>
</tr>
<tr>
<td>(significantly)</td>
<td>• Submit new impression (Midcourse/Progress)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Re-bond attachment using current aligner; Be aware movement is 1+ stages off. Address with Refinement</td>
<td></td>
</tr>
<tr>
<td>Root Cause</td>
<td>Solution</td>
<td>Prevention</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| Insufficient wear time (Patient Compliance) | • Extend wear time  
• Schedule patient for more frequent visits  
• Show patient pre treatment stage for motivation  
• Help patient understand any additional costs or fees that may occur for lengthy extensions to the treatment duration | • Use Assist/Teen options offering Compliance Indicators if you anticipate this might be a concern  
• Look for signs during treatment period:  
  • Isn’t wearing aligners during routine appointments  
  • Aligners very “clean”  
  • Reschedules or misses appointments often |
## Tooth Not Extruding

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
</table>
| Amount of extrusion required falls in the blue/black range (see TMA) where additional techniques may be required | • Buttons & elastic technique  
• Fixed sectional appliances  
• TADs | Consider relative extrusion vs. absolute extrusion in treatment plan to create the appearance of vertical changes |


# Tooth Not Extruding

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment not optimally engaged (slightly)</td>
<td>Have patient bite into cotton rolls/chewies frequently to help seating and engagement</td>
<td>“Chewies” by Glenroe Technologies</td>
</tr>
</tbody>
</table>
| Attachment not optimally engaged (significantly) | - Use button & elastic to facilitate movement  
- Submit Progress Impressions/MCC (product specific)  
- Re-bond attachment using current aligner; Be aware movement is 1+ stages off. Address with Refinement |
# Unplanned Intrusion

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
</table>
| Inadequate IPR (insufficient space), causing aligner to squeeze tooth apically | • Evaluate M-D space and any binding contacts with unwaxed floss and relieve with finishing strips  
• Buttons & elastics to extrude & get tooth back on track | Make sure sufficient interproximal space is present during rotations and extrusions |

Buttons & Elastics:  
[http://learn.invisalign.com/buttons](http://learn.invisalign.com/buttons)

IPR:  
[http://learn.invisalign.com/IPR](http://learn.invisalign.com/IPR)
## Incomplete Root Movements

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
</table>
| Amount of root movement falls in the blue/black range (see TMA) where additional techniques may be required | • Buttons & elastic technique  
• Fixed sectional appliances  
• TADs | Change ClinCheck treatment plan to remove blue/black movements and/or change treatment goal. May result in a compromised ClinCheck treatment plan |

### Buttons & Elastics:
http://learn.invisalign.com/buttons

### TMA:
## Incomplete Root Movements

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient undercut area for aligner to grab the tooth</td>
<td>Add attachments in Refinement as close to center of rotation of tooth as possible to upright the teeth</td>
<td>Expansion via buccal segment uprighting is more likely to be successful than bodily expansion of the entire segment</td>
</tr>
<tr>
<td>Skeletal component of expansion</td>
<td>Request buccal uprighting in Refinement to remove bodily movements</td>
<td></td>
</tr>
</tbody>
</table>
# Incomplete Root Movements: Crossbite

## Root Cause

Not enough time for movement to express due to variation in bone biology, tooth morphology or patient compliance

## Solution

- Extend wear time
- Add buttons and elastics

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**Buttons & Elastics:**
[http://learn.invisalign.com/buttons](http://learn.invisalign.com/buttons)
Finishing Treatment
# Black Triangles

<table>
<thead>
<tr>
<th><strong>Root Cause</strong></th>
<th><strong>Solution</strong></th>
<th><strong>Prevention</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unwanted tip between two teeth causing contact point to be occlusal</td>
<td>Upright the teeth with Refinement or additional techniques (buttons &amp; elastics or fixed appliances)</td>
<td>Pay special attention to anterior incisors with worn incisal edges. A request to “level” incisal edges can create unwanted tip in your ClinCheck treatment plan. Consider doing some enamel re-contouring pre PVS impressions</td>
</tr>
</tbody>
</table>

**Buttons & Elastics:**
[http://learn.invisalign.com/buttons](http://learn.invisalign.com/buttons)
### Black Triangles

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
</table>
| Due to shape of teeth, position of teeth, or lack of papilla once teeth are aligned | • IPR and move contact point gingivally and then close the space with Refinement or Detail Pliers  
• Restore  
• Connective tissue graft | Evaluate shapes of anterior teeth (especially when significant crowding & rotations exists). Inform patient before tx starts of the possibility.  
Be aware of the potential of black triangles in ClinCheck review, but note the simulated gingiva may not always accurately represent the patient’s gingiva. |

**IPR:**  
http://learn.invisalign.com/IPR
## Roots Tipped

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roots not moving</td>
<td>Buttons and elastics</td>
</tr>
</tbody>
</table>

**Buttons & Elastics:**
http://learn.invisalign.com/buttons
Premature Occlusal Contacts

**Root Cause**

All tooth movements planned during the treatment period were not fully expressed

**Solution**

- Use Refinement to move teeth out of contact
- Re-mount models & equilabrate

**Prevention**

Review your ClinCheck treatment plan to ensure it provides sufficient OJ and anterior coupling

**ClinCheck Review Tips:**

http://learn.invisalign.com/clincheck
# Posterior Open Bite

<table>
<thead>
<tr>
<th><strong>Root Cause</strong></th>
<th><strong>Solution</strong></th>
<th><strong>Prevention</strong></th>
</tr>
</thead>
</table>
| Anterior interference/insufficient leveling | • Refinement to relieve anterior interference by additional leveling (intrusion of upper and/or lower incisors) or by moving uppers forward, lowers back. IPR may be needed  
• Anterior equilibration to resolve interferences | Review your ClinCheck treatment plan to ensure it provides sufficient OJ and anterior coupling |

**ClinCheck Review Tips:**
http://learn.invisalign.com/ClinCheck
Posterior Open Bite

**Root Cause**

Transient intrusion of the posterior due to aligner material on the occlusal surface

**Solution**

Cut out premolar to molar region of aligners/retainer to allow for settling of the posterior
<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
</tr>
</thead>
</table>
| Not enough time for movement to express due to variation in bone biology, tooth morphology or patient compliance | • Extend wear time  
• Request virtual c-chain (overcorrection) aligners in Refinement |
| Excessive IPR                  | Request virtual c-chain (overcorrection) aligners in Refinement          |

**IMPORTANT NOTE:**

Use virtual c-chain aligners **one at a time**, on an “as-needed” basis.

If contacts are tight and virtual c-chain aligners continue to be dispensed, there is a high probability of inadvertent intrusion due to contacts becoming too tight.

IPR: [http://learn.invisalign.com/IPR](http://learn.invisalign.com/IPR)
### Root Cause

Residual space present in the doctor’s ClinCheck treatment plan when there’s no space to retract the teeth due to lack of overjet/tooth size discrepancy.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Restore</td>
<td>Review your ClinCheck treatment plan closely paying special attention to comments provided by the technician</td>
</tr>
<tr>
<td>• Request IPR in opposing arch with Refinement to close spaces</td>
<td></td>
</tr>
</tbody>
</table>

ClinCheck Review Tips:

http://learn.invisalign.com/ClinCheck
<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
</table>
| IPR ledge makes contact appear open (may be subgingival) | Remove ledge with IPR, close space with Refinement | • Smooth parallel lines with IPR is the goal  
• Stage IPR later during the treatment  
• Use hand strips to do the IPR |

**IPR:**
[http://learn.invisalign.com/IPR](http://learn.invisalign.com/IPR)
## Residual Crowding

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
</table>
| Not enough time for movement to express due to variation in bone biology, tooth morphology or patient compliance | • Extend wear time  
• Use Detail Plier to apply additional pressure points help correct minor in/out movements | Always monitor interproximal contacts to ensure teeth have space to move |

**Detail Pliers:**
## Residual Crowding

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Solution</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of OJ; Lower crowding can’t be resolved because lower teeth are contacting upper teeth (interarch interference)</td>
<td>Move interference out of the way with Refinement</td>
<td>Plan a different staging proclining upper and lower</td>
</tr>
<tr>
<td>Insufficient IPR preformed</td>
<td>Resolve remaining crowding with Refinement</td>
<td>During the treatment period</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Perform recommended amount of IPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Measure IPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Record IPR in chart</td>
</tr>
</tbody>
</table>

IPR: [http://learn.invisalign.com/IPR](http://learn.invisalign.com/IPR)
Prevent Relapse

Don’t forget retention

Vivera™ can accommodate fixed lingual wire retainers