Will custom orthodontic appliances replace traditional orthodontic appliances?

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Introduction

Damon (Ormco)
Individual appliance


Wire selection

Early full size wires

My first individual appliance: Hero-System

1-3 >Torque Control

4-7 >Sliding
Dual activation + bi-dimensional

- Empower (American Orthodontics)


Dual activation

- Ormco
- 3M Unitek
- Victory SL

- Damon Q
- Gemini
- Prodigy
- 3M Unitek

Radboudumc
Individually selected torque values

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>+17°</td>
<td>+10°</td>
<td>+7°</td>
</tr>
<tr>
<td>Standard</td>
<td>+12°</td>
<td>+5°</td>
<td>+9°</td>
</tr>
<tr>
<td>Low</td>
<td>+7°</td>
<td>+5°</td>
<td>+3°</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Lower Anteriors</th>
<th>Lower Cusps</th>
<th>Lower 1st Bicuspids</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>N/A</td>
<td>-7°</td>
<td>-5°</td>
</tr>
<tr>
<td>Standard</td>
<td>-1°</td>
<td>0°</td>
<td>-12°</td>
</tr>
<tr>
<td>Low</td>
<td>-6°</td>
<td>+2°</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- Andrews LF. The six keys to normal occlusion.1972

Straight wire appliance?

Andrews’s Study of 120 Optimal Occlusions

<table>
<thead>
<tr>
<th>Maxillary Tooth</th>
<th>Optimal Torque</th>
<th>Average Torque</th>
<th>Range</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>+7°</td>
<td>+6.1°</td>
<td>-7° to +15°</td>
<td>+/-4.0°</td>
</tr>
<tr>
<td>Lateral</td>
<td>+3°</td>
<td>+4.4°</td>
<td>-6° to +17°</td>
<td>+/-4.4°</td>
</tr>
<tr>
<td>Canine</td>
<td>-7°</td>
<td>-7.3°</td>
<td>-17° to +10°</td>
<td>+/-4.2°</td>
</tr>
<tr>
<td>1st Premolar</td>
<td>-7°</td>
<td>-8.5°</td>
<td>-20° to +5°</td>
<td>+/-4.0°</td>
</tr>
<tr>
<td>2nd Premolar</td>
<td>-7°</td>
<td>-8.8°</td>
<td>-20° to +3°</td>
<td>+/-4.1°</td>
</tr>
<tr>
<td>1st Molar</td>
<td>-9°</td>
<td>-11.5°</td>
<td>-25° to +2°</td>
<td>+/-3.9°</td>
</tr>
<tr>
<td>2nd Molar</td>
<td>-6°</td>
<td>-8.1°</td>
<td>-25° to +12°</td>
<td>+/-5.6°</td>
</tr>
</tbody>
</table>

- Andrews LF. The six keys to normal occlusion.1972
Individual fixed appliance system

• Bracket selection (active/passive)
• Slot selection (0.018" vs 0.022")
• Torque selection
• Wire selection
• Indirect bonding

Need for custom appliances

<table>
<thead>
<tr>
<th>Mandibular Tooth</th>
<th>Optimal Torque</th>
<th>Average Torque</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Incisor</td>
<td>-1°</td>
<td>-1.7°</td>
<td>-17° to +16°</td>
</tr>
<tr>
<td>Lateral Incisor</td>
<td>-1°</td>
<td>-3.2°</td>
<td>-19° to +15°</td>
</tr>
<tr>
<td>Canine</td>
<td>-11°</td>
<td>-12.7°</td>
<td>-26° to +2°</td>
</tr>
<tr>
<td>1st Premolar</td>
<td>-17°</td>
<td>-19.0°</td>
<td>-35° to -1°</td>
</tr>
<tr>
<td>2nd Premolar</td>
<td>-22°</td>
<td>-23.6°</td>
<td>-45° to -3°</td>
</tr>
<tr>
<td>1st Molar</td>
<td>-30°</td>
<td>-30.7°</td>
<td>-55° to -9°</td>
</tr>
<tr>
<td>2nd Molar</td>
<td>-35°</td>
<td>-36.0°</td>
<td>-60° to -9°</td>
</tr>
</tbody>
</table>

*Numbers rounded to three significant figures

Andrews LF. The six keys to normal occlusion. 1972
Bracket selection

CUSTOM APPLIANCES


Custom diagnosis and treatment
Virtual treatment planning in 3D

Ludlow JB and Walker C. Assessment of phantom dosimetry and image quality of i-CAT FLX cone-beam computed tomography. AJODO 2013.

Virtual treatment presentation in 3D

• Anatomage (In Vivo)  
  Dolphin  
  Radboudumc
Fabrication of custom appliances

- Digital dental models
  Heat N Bite (Ormco)

Intra oral scanning

- iTero scanner (Cadent)
The dentition on CBCT’s

- AnatoModels (InVivo dental)

Accuracy of digital dental models

scans are more accurate

I Tero scan

CBCT

Accuracy of digital dental models

- SureSmile models were the most accurate, and reproducible
- emodels were significantly faster than those taken on the other models

Scans of models are more accurate

Intra oral scanner + software

- Trios scanner (3Shape) Ortho Analyzer software
- Ortho Insight software and Facial Insight software
Digital set up

Set up    Insignia    3Shape

Custom appliances

WILL PATIENTS PAY FOR CUSTOM APPLIANCES
Claims of custom appliances

- Shorter treatment
- Improved results

Custom buccal appliances

<table>
<thead>
<tr>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.5</td>
</tr>
<tr>
<td>10.8</td>
</tr>
<tr>
<td>8.8</td>
</tr>
<tr>
<td>5.4</td>
</tr>
<tr>
<td>-0.0</td>
</tr>
<tr>
<td>-11.7</td>
</tr>
</tbody>
</table>

Insignia (Ormco)
*Pyamide of evidence for Insignia*


**Literature on efficiency of Insignia**

- Final PAR scores, were not significantly different
- The Insignia group had a lower average ABO score
- Treatment time was significantly shorter
- On average 7 fewer appointments needed

Selection of appliance

- **Shorter treatment**
- **Improved results**
- **Invisable**

Pyramide of evidence for Suresmile
**Literature on Suresmile**


Some of the articles are biased

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**Suresmile**

- **Treatment time** for the Suresmile patients was significantly shorter 31% (7.2 months) and the **result increased** with 11% to conventional fixed appliance treatment.”

Custom wires for invisible appliances

Custom lingual bracket systems

- Suresmile
- Incognito, Harmony, E braces, etc.
Pyramide of evidence for Incognito

They concluded: “These fully customized lingual orthodontic appliances were **accurate** in achieving the goals planned at the initial setup, except for the full amount of planned expansion and the inclination at the second molars.”

Aligners

• **Shorter treatment**
• **Improved results**
• **Invisable**

Pyramide of evidence for Invisalign

Conclusions

Lagravère 2005 - Unable to draw strong conclusions
Djeu 2005 - Deficient in its ability to correct large anteroposterior discrepancies and occlusal contacts
- Finished 4 months sooner
Kravitz 2009
Bushang 2013 - To learn regarding the biomechanics
- Less visits needed (4)
- Shorter treatment duration (5.5 months)
- More expensive

Custom aligners

- Aligners on printed dental models
Attachments for aligners

Retention pads

Dimples

Scientific proof of efficiency and efficacy

Custom Aligners

Custom wires

Custom brackets and wires

There is some evidence
Follow up during treatment

SIDE EFFECTS OF MECHANICS

- 3D Tero scanner

Follow up during treatment

FOLLOW UP SET UP AND FOLLOW UP APPLIANCES SHOULD BE PART OF A CUSTOM SYSTEM
Main advantage of custom appliances

- More predictable treatment
- Improved communication with the patient
- More delegation possible
- Shorter treatment time?
- Improved results?

Main disadvantage of custom appliances

- Digital planning is time consuming
- Custom appliances are more expensive

10 take home messages

- Individual appliances
- Indirect bonding
- Early full size wires
- Reduced radiation for CBCT’s
- Intra oral scanners, the orthodontist should have the STL files
- Setup in the orthodontic office
- The orthodontist corrects the initial set up
- Patient selects the appliance
- The orthodontist selects the company who will make the appliance
- Follow up appliances are needed (Finishing appliances)
ORTHODONTICS IS MY PASSION...

“That’s why I support the AAOF.”

AAOF CASE PARTNER

Contribution to the AAOF is a contribution to our future.

THANK YOU!

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