A new era in digital orthodontics

By Jeffrey T. Kozlowski, USA

A true straight-wire appliance would necessitate the patient-specific appli-
cances based on an individual's anatomy. Now, with advances in computer software and digital scanning and fabrication, that idea is a reality and a practical consideration for your prac-
tice. Customized Insignia™ is the first true straight-wire ap-
pliance. it involves two compo-
nents: customized appliances—
brackets, wires and placement gauges—and 3D real-time vi-
tual treatment planning soft-
ware. The 3D software enables clinicians to design the patient's final occlusion on-screen before initiating treatment, then pre-
scribes the fabrication of patient-
specific appliances to achieve the planned result. This con-
cept is quite different from how clinicians currently practice orthodontics. Traditionally, we choose appliances with specific torque values to have certain ef-
fects, then react to those effects by repositioning brackets and
making wire bends to guide the teeth into the desired positions. With Insignia, we begin with the end in sight and drive directly
towards the desired end result.

Over 20 years in development, customized Insignia appliances offer the only comprehensive
patient-specific solution avail-
able. The treatment planning process begins with accurate PVS impressions. New clinical methods and materials make this procedure quick and easy. From the impressions, the pre-
treatment malocclusion (T1) is digitized into a precise math-
ematical model of the patient's skull and dental anatomy and the proposed setup (T2) de-
signed (Fig. 1a-b).

See Dr. Craig Andreiko's discus-
sion. The setup is loaded to the
Insignia web portal where, used on clinical experience, func-
tional and esthetic preferences and intimate knowledge of the
patient's specific orthodontic
needs, the clinician can easily customize it using the Insignia
Approver software (Fig. 2). The
included software offers clini-
cians unprecedented control in determining accurate tooth
position and in their ability to
make changes directly to the 3D
models without relying on an
operator's interpretation of
instructions.

Insignia does not determine treatment mechanics nor pre-
scribe tooth movements and it
allows clinicians to use the me-
chanics and adjuncts of their
choice. As doctors modify the
desired final outcome in the Ap-
prover software, they can view
in "real time" how the changes
affect the opposing occlusion.

Once the clinician finalizes the ideal setup, the Insignia soft-
ware engineers the customized
brackets, wires and precision
bonding placement gauges to
the exact prescription required
to deliver the designed end re-
sult accurately and efficiently.

My experience with Insignia is
with both the customized pas-
sive self-ligating appliance (In-
signia custom SL) and Insignia
using stock Damon® System
appliances. The Insignia soft-
ware can be used to fabricate
patient-specific conventional
buck brackets and aligners as
well. You can also use Insignia
software with stock appliances (Orthos®, Inspire ICE™ and, as
I mentioned, Damon). The
difference between custom-
ized Insignia and Insignia using
stock brackets is the third-order
customization (torque) that is
engineered into the customized
brackets. This difference saves
considerable treatment time and
allows clinicians to relate what is designed in the
Insignia software to what is
being used in the clinical workspace. Insignia and Insignia using
stock Damon brackets, I can at-
test to the superior value of the
customized appliances.

The Clinical Evaluation
My initial experience with cus-
tomized Insignia SL began in
2007 when I conducted an ex-
tensive clinical evaluation by
treating 41 patients to comple-
tion. The only limitations on the
selection criteria were that pa-
tients have no missing or impact-
ed teeth, no pending restorative
needs, and must not exhibit poor
oral hygiene. The criteria were
limited in these ways simply because it wouldn't have been feasible for me to coordinate
the ancillary procedures from across the country. At the time, I was in the process of opening
my new office in Connecticut and the clinical evaluation was to be conducted at Ormco in
California—nearly 3000 miles away. For operator consistency, I played the roles of doctor and
assistant, performing the diagn-
oses, treatment planning, ini-
tial bondings and wire changes,
providing all mechanics for
100% of treatment. Full records
were taken of each patient, in-
cluding PVS impressions and
iTero scans (Imaging Sciences,
International, Hatfield, PA) for
diagnostics and treatment plan-
nung using the Insignia interac-
tive Approver software. Based
on my previous experience with
Damon System appliances, I es-
timated that treatment time for
the 41 patients would average
17.5 months.

While I wouldn't recommend selecting this many patients to begin treating with custom-
ized Insignia SL for the first time, I
am convinced that the best way to learn Insignia is to submit cases regularly. Regular case
submission allows the clinician to relate what is designed in the
digital environment to the clini-
cal experience and final results. This positive feedback loop of learning will help the clinician
design each successive Insignia

Solution with a chair mounted X-ray device

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Dentistry case with a higher level of understanding and accuracy and hence be more successful with its application. My experience has been that clinicians who repeatedly submit Insignia cases are more successful with it than those who start only a few cases and wait to see how they work out. My skills improved substantially through the first 10 to 20 cases, and like using any other new appliance, it takes a bit of time to learn the nuances. I also strongly recommend doctors initially select easier cases, and then add more challenging cases when they become familiar with the software and clinical protocols.

In late February, 2008, in a one-chair operator at Ormco’s Insignia manufacturing facility in Glendora, California, I bonded all 41 patients over a five-day period. This intensive week of bonding proved to be my first insight into the potential efficiencies of Insignia’s direct view/in-direct bonding process. After just the first few patients my bonding technique using the placement gauges significantly improved and during the balance of the week, the bonding appointments averaged less than one hour, including preparing the teeth, bonding the brackets, placing bite-tubes, engaging the wires, attaching the elastics and reviewing the patient instructions. And all without the help of a clinical assistant!

We all know the importance of placing brackets correctly, but few of us can consistently and quickly place each bracket precisely where it needs to be. With Insignia, you design the final occlusion and the customized appliances will be fabricated with custom torques, custom bases (in-out) and custom wires. You specify your bracket positioning preference (e.g., center of the tooth, more gingival or more incisal) so that the custom appliances are designed to your specifications; thus, it is possible for your Insignia SL appliances to clinically match the placement of your direct-bonded appliances.

To transfer the Approver-designed appliances to the mouth, Insignia provides customized placement gauges that place the brackets in the right spot without need for adjustment (Fig. 4). The precision built into the brackets is matched by the accuracy of the placement gauges that offer the benefit of a direct view with the precision of planned indirect bonding.

The major challenge in conducting this clinical evaluation was logistics. Managing treatment from so far away was a daunting experience at first; however, the process reinforced the importance of good clinical decision making and its impact on clinical efficiency. Gone was the luxury of shortening patients’ appointment intervals to accommodate case management alternatives when we need to make clinical decisions based on how a patient responds. It was thus incumbent upon me to create mechanical systems that would withstand the eight-to-ten-week appointment cycle of my West Coast trips.

At six months, the first patient finished treatment and by December 2009, after just 21 months, the 41st patient had his appliances removed. To determine the value of customized Insignia SL, for my own practice, I initially compared the results of this evaluation with my previous seven years of experience treating patients with direct-bonded Damon System appliances. This comparison helped me evaluate customized Insignia SL with what I used to do in my office—direct bonding. These 41 customized Insignia cases treated in an average time of 12.5 months—a full five months (26%) shorter than my estimate of 17.5 months (Fig. 5). I based the estimates on my previous seven years of experience with the Damon System appliance but before I had had any experience with Insignia. In my opinion, this difference alone attests to the efficiency of customized Insignia SL treatment. Another value indicator was the number of repositioned brackets needed to finish the customized Insignia SL cases, which was 50% less than my cases with direct-bonded stock Damon System appliances.

After completing the evaluation, I compared the results with comparable patients I later treated with Insignia using stock Damon appliances. This second comparison assisted me in placing a value on the patient-specific customized torques of the customized Insignia SL appliance. The 41 customized Insignia SL cases in the evaluation finished in 22% shorter treatment time (at 12.5 months) than the next consecutive 41 cases using Insignia with stock Damon brackets that I treated in my private practice (16.1 months). The average number of appointments for the 41 Insignia SL cases was 10.2 versus 8 appointments for the 41 customized Insignia SL cases.

In terms of quality, a subjective evaluation I grant you, I feel that my customized Insignia SL cases finish with quality that equals or exceeds my direct-bonded Damon System cases or my Insignia cases using stock Damon brackets yet in less time and with significantly less effort. I have felt confident enough with the customized Insignia case results to have shown them in presentations around the world and have been so pleased with the results that I now treat 70% of my cases with customized Insignia SL appliances. I still treat 30% of my patients with direct-bonded stock Damon appliances, primarily those who start treatment in late mixed dentition, but for all those cases for which customized Insignia SL applies, it is now my appliance of choice.

This article highlights a few of the patients I treated in the clinical evaluation, demonstrating the quality of the results and efficiency of treatment.

**Fig. 3.** The digital model of each patient’s lower occlusion shows the shape and size of the cortical limits of the mandibular bone.

**Fig. 4.** Insignia customized placement gauges offer the benefit of direct view bonding, putting the brackets in the right place without adjustment.

**Fig. 5.** Breakdown of 41 Cases in Clinical Evaluation

- Class I – 19 Cases
  - 3 were Class I, div 2
  - 2 were Class I, div 1
- Class II, div 1 – 11 Cases
- Class II, div 2 – 5 Cases
- Class III – 6 Cases
  - 3 were Class III with Class III tendency
  - 3 were full Class III

**About the Author**

Dr. Kozlowski obtained his DDS degree in 1996 and a certificate in orthodontics at State University of New York at Buffalo in 1998. His practice, Kozlowski Orthodontics, has locations in New London and East Lyme, Connecticut. He has lectured extensively all over the world, including for the AAO and its various constituent societies and universities and study clubs as well as annually at the US Damon Forum and European Damon Symposium. His topics include efficiency and excellence in orthodontics, early treatment and facial esthetics. He has also been published in several orthodontic journals, including Seminars in Orthodontics and the Journal of Clinical Orthodontics.

A fitness advocate, he has completed five Ironman Triathlons, more than a dozen Half-Ironman Triathlons and numerous marathons and endurance cycling events, including the grueling Mt. Washington Bike Climb seven times. He and his wife, Amy, a pediatric dentist, have two children: Amelia and Jake.