The Truth About Self-Ligating Bracket Systems

PART 1 IN A 3-PART QUANTITATIVE COMPARISON STUDY EVERY ORTHODONTIST NEEDS TO SEE

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Dr. Celestino Nobrega is director of ORTOGEO, an orthodontics school with over 20 years of experience bringing scientific research and cutting-edge technology to professionals and patients in the São Paulo region. As a consultant for manufacturers of interactive brackets, his lines of research are focused on two themes: "The improvement of interactive, self ligation clips" and "the development of new tooth movement technologies." He is an international speaker and has presented his research in countries like the United States, Canada, Mexico, Dominican Republic, Venezuela, Colombia, Ecuador, Uruguay, Chile, Brazil, Spain, Portugal, France, Italy, UAE and Lebanon.

AND ANTONINO SECCHI
DMD, MS

Dr. Secchi is Clinical Assistant Professor and Former Clinical Director of the Department of Orthodontics at the University of Pennsylvania. He received his DMD, Certificate in Orthodontics and Master's degree from the University of Pennsylvania. Dr. Secchi is a Diplomate of the American Board of Orthodontics and member of the Edward H. Angle Society of Orthodontists. At the University of Pennsylvania, he has developed and implemented courses on Orthodontic Treatment Mechanics, Straight Wire Appliance Systems and Functional Occlusion in Orthodontics for postdoctoral orthodontic residents. Dr. Secchi's research interests include, primarily, the relationship between self-ligating appliances, friction and treatment mechanics as well as orthodontics and functional occlusion. He has published in various dental and orthodontic peer review journals. He received the 2005 David C. Hamilton Orthodontic Research Award from the Pennsylvania Association of Orthodontists (PAO) and the 2010 Outstanding Teacher Award from the Department of Orthodontics of the University of Pennsylvania. Dr. Secchi is the founder of the "Complete Clinical Orthodontics" System. He lectures nationally and internationally. Dr. Secchi maintains an orthodontic private practice in Philadelphia, PA.

As self-ligating bracket technology advances, many systems claim to deliver some aspect of increased performance. Yet without a solid benchmark, or a way to quantify performance, these claims always suffer from a point-of-reference bias. Better only has meaning when you've got some empirical way to compare it to the competition.

That's exactly what Dr. Celestino Nobrega—a research director at Ortogeo in São Jose dos Campos, Brazil and Program Leader of the Linhart International Continuing Education program at NYU—set out to solve. His in-vitro comparison study provides clinicians a comprehensive understanding of how bracket systems truly perform in different situations. This gives professionals the parameters they need to choose the best interactive bracket system for their specific cases.

We sat down with Dr. Nobrega, as well as Dr. Antonino Secchi—founder of the Complete Clinical Orthodontics system, practicing Orthodontist and international lecturer from University of Pennsylvania—to discuss the findings of Nobrega's study. Dr. Secchi first met Dr. Nobrega in April of 2010 in Colonia, Uruguay, where both were speakers at an orthodontic conference. Secchi was highly impressed by both the quantity and quality of Nobrega's self-ligation research. They quickly became friends and remain in contact to this day. Together, Nobrega and Secchi gave us a comprehensive review of the research findings, providing their laboratory and clinical perspectives, respectively.

So, which bracket system performed the best in a series of controlled laboratory tests? Read on as Dr. Nobrega and Secchi share their insights into this ground-breaking quantitative comparison study of self-ligating bracket systems.

THE INTERVIEW

OrthoWorld:

It's a pleasure having you both available to discuss this exciting research. Dr. Nobrega, what inspired you to create this study?

Nobrega:

The idea stemmed from my own frustrations with how certain bracket systems performed in clinical applications. For example, some systems have clips that present loss of flexibility over time. Not only does this loss

of flexibility make initial tooth movement inefficient, it also has a significant effect when finishing and detailing. As a consequence, some orthodontists are forced to use metallic ligatures to override the system's deficiencies. I knew there must be a way to compare these systems on an objective basis.

Secchi:

That's very true. As a clinician, I immediately saw the value to Dr. Nobrega's research. Within the last decade, self-ligating active and passive became the choice for many orthodontists. Consequently, lots of new systems entered the market. Therefore, to know and understand the design, properties, advantages and disadvantages as well as the best way to improve the use of them becomes extremely relevant for clinicians.

OrthoWorld:

What aspects of bracket systems did you test, Dr. Nobrega?

Nobrega:

In order to give orthodontists a comprehensive and reliable comparison of these interactive bracket systems, I evaluated—and continue to evaluate—a number of clinical aspects. Initially, I focused on torque expression. Specifically, how much and how early the torque is reached by different bracket systems.

Secchi:

This greatly interested me as well. Every clinician can understand and appreciate the importance of torque expression. Its importance can be divided into three areas: facial esthetics, anterior coupling and posterior coupling. Allow me to explain:

For facial esthetics, an adequate amount of buccal crown torque of the maxillary incisors will assure lip support and give the clinician peace-of-mind in cases of demanding mechanics such as Class II div. 2 and extraction cases. Proper torque expression also ensures optimal coupling of anterior teeth, such as incisors and canines. This is important for function and stability. Optimal posterior coupling—many times underrated—needs torque expression to achieve proper arch coordination and therefore ideal intercuspation of posterior teeth.

Nobrega:

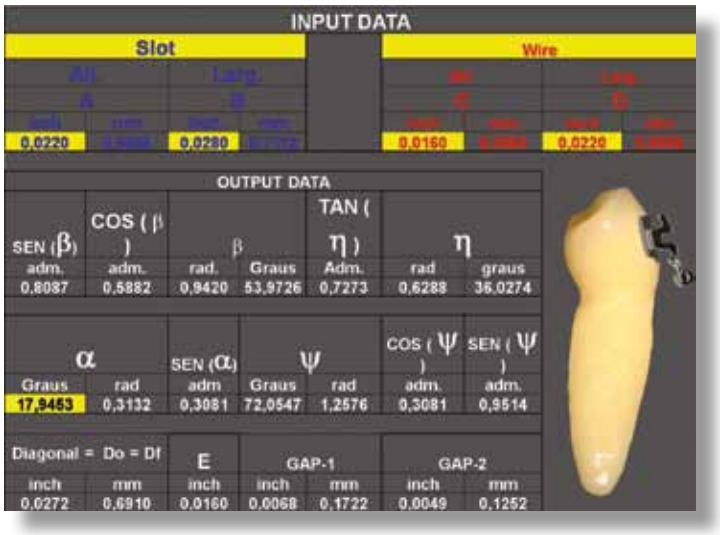
Exactly. I like the phrase "peace-of-mind." That is a good description for what I set out to provide. In orthodontics, there are an infinite number of clinical situations and individual variables almost impossible to isolate. This is why in my in-vitro study I wanted to achieve a controlled environment so I could fairly compare different interactive bracket systems to give orthodontists a comprehensive and reliable overview of them.

OrthoWorld:

How did you accomplish creating a controlled study environment, given there are so many variables that clinicians can face in their day-to-day cases?

Nobrega:

To start our set of trials, initial mathematic calculations were done in an Excel spreadsheet in order to simulate clinical situations.



At that point, we encountered an interesting problem — measurement. Before, it was almost impossible for a clinician to create a device accurate and sensitive enough to answer our clinical questions. To address this, we spoke to Dr. Geraldo S. Branco, a retired professional from the engineering field. This proved to be a fortuitous choice. Working together, we created a unique machine that made it possible to answer most of our questions.

OrthoWorld:

Can you describe this machine?

Nobrega:

Certainly. The apparatus is based on electromagnetic fields that create controlled resistance forces. This makes it possible to digitally measure force levels in three dimensions of space. It replaced the old, inaccurate wax-based models, typodonts and other inaccurate devices.

Secchi:

I was very impressed with the capabilities of their prototype. The versatility of this apparatus is astonishing. Dr. Nobrega and his research colleagues just touched the "tip of the iceberg" of what could eventually be done. It is certainly exciting.

OrthoWorld:

Tell us more about your torque study. Specifically, how much and how early the torque was reached by different bracket systems.

Nobrega:

This study* was conducted by Dr. Marcio Gick and featured four groups of 10 brackets [Roth prescription 0.022" x 0.028" slots, second lower premolars].

The first group featured Interactive Ligation with self-ligating brackets [In-Ovation® R]. The second group consisted of Passive Ligation with self-ligating brackets [Damon® 3MX]. The third group was Metallic Ligation with conventional brackets [Ovation®]. The final group was Elastic Ligation with conventional brackets [Ovation®]

The aim was to compare different types of bracket systems, with their different ligation systems, in regards to efficiency in controlling the third order movement, torque. These systems were chosen for testing because it was observed that the passive systems could offer less torque than the selected prescription could provide, suggesting that somehow the traditional system of brackets could work better than passive ones.

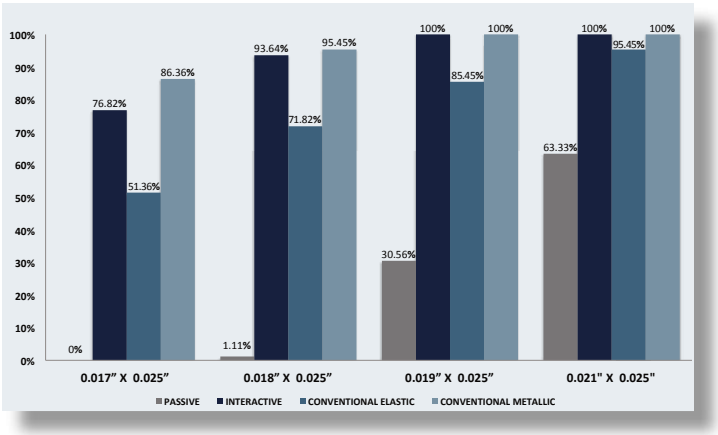
EDITOR'S NOTE: *In this study, torque expression was tested for the following SS archwires: 0.017" x 0.025", 0.018" x 0.025", 0.019" x 0.025" and 0.021" x 0.025".*

OrthoWorld:

What were the results to your torque study?

Nobrega:

In all situations, the results clearly showed the interactive ligation [In-Ovation R®] was more efficient than the passive system. In fact, for the 0.017" x 0.025" archwire, the passive system produced 0.00% of final torque, which confirms the previous Excel spreadsheet mathematical calculation. For the 0.018" x 0.025" archwire, almost 94% of effective torque was reached by the interactive brackets, while the passive [Damon®] showed only 1.11%. This difference reflects and reinforces what is clinically observed by many professionals that adopted the passive system.



Secchi:

After I read the results, I was not surprised to find out that the active brackets performed (in expressing torque) considerably better than the passive brackets. This has been previously reported** and more importantly, it has been observed in the clinical setting by many orthodontists. After more than a decade of having these systems in the market, we all know by now that the active SLB perform much better in every single way they could be analyzed.

What is very interesting and important about Dr. Nobrega's results is the fact that when using an active bracket such as the In-Ovation, full torque expression can be obtained with a .019" x .025" ss wire. This particular wire is the most popular working wire for most orthodontists, and this is why many prescriptions have overcorrected some torque values to achieve the same expression as if you were using a full size wire. The active clip makes the "play" between the .019" x .025" ss wire and the .022" slot to disappear, and therefore any overcorrection previously done to solve "play" problems becomes completely unnecessary. The CCO prescription was designed to take full advantage of active appliances achieving optimal torque performance with a .019" x .025" ss wire.

TO BE CONTINUED...

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*** Badawi et al. Am. Journ. Orthod. Dentofacial Orthop. 2008;133:721-8.*

COMING NEXT:

PART 2 OF 3, WHEREIN DR. NOBREGA AND DR. SECCHI DISCUSS THE NEXT SET OF RESULTS FROM THEIR QUANTITATIVE COMPARISON STUDY: HOW MUCH—AND HOW EARLY—ARE ROTATIONAL MOMENTS OF FORCE CONTROLLED BY DIFFERENT BRACKET SYSTEMS?