INITIALLOY, BIO-EDGE, BIO-ACTIVE™

Japanese NiTi Archewires

The Secrets of an Inimitable Archwire

TOMY

Smile for the World

Since 1921

100 years of Quality in Dental

Pr. Fujio Miura

The Origin of GC Orthodontics Japanese NiTi Archwires

Japanese NiTi Archwires

In 1978, Professor Miura and Dr. Mogi, with the support of Furukawa Electric Corp., developed a shape-memory NiTi alloy, usable at oral temperature, known as Japanese NiTi alloy. It is currently marketed under the names INITIALLOY, BIO-EDGE, and BIO-ACTIVE™.

This wire is characterized by its superelasticity and shape-memory effect, which allows teeth to be moved with light and constant forces (recovery forces).

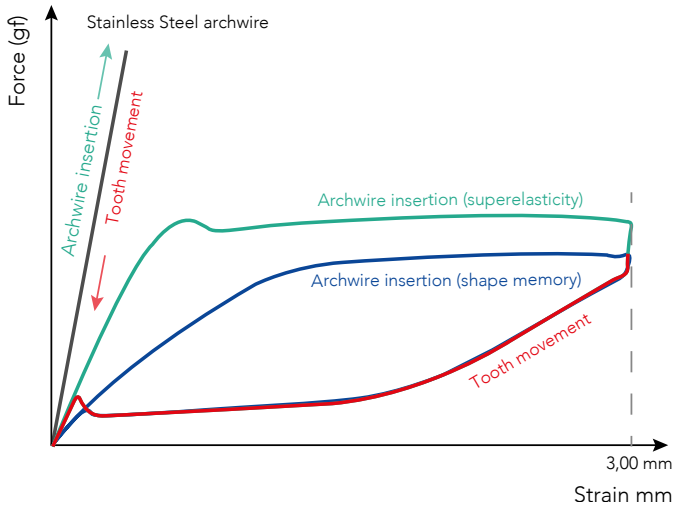
Prof. Miura, Chairman of the ODF department at the University of Tokyo (1962-1991), revolutionized the understanding of dental movement biology.

He demonstrated the real advantage of applying light, constant forces to move teeth and, with Dr. Jarabak, determined the ideal force levels for each arch sector.

In collaboration with TOMY Inc., they developed a series of superelastic and shape-memory arches now recognized as the best for periodontal respect (see Miura 1986).

Superelasticity

Under stress or deformation, the archwire changes its crystallographic structure (austenite ➡ martensite), this is the martensitic transformation. Superelasticity is characterized by unloading forces (which move the teeth) that are significantly lower than the loading forces (placing the wire in the brackets). The presence of a plateau during unloading demonstrates the near-constancy of the force that will be developed on the teeth to move them. This force depends on the NiTi alloy used. It is influenced, among other factors, by the strain intensity (DMD); the greater the strain intensity, the lower the force will be, despite a large wire cross-section.



Shape Memory

Another property of these wires is shape memory. When the wire is cooled (to -50°C using a refrigerant spray), it undergoes a crystallographic transformation (to martensite), becomes easily deformable, and can be easily inserted into the brackets. At oral temperature, the wire tends to return to its original shape and structure (austenite), exerting light and constent forces.

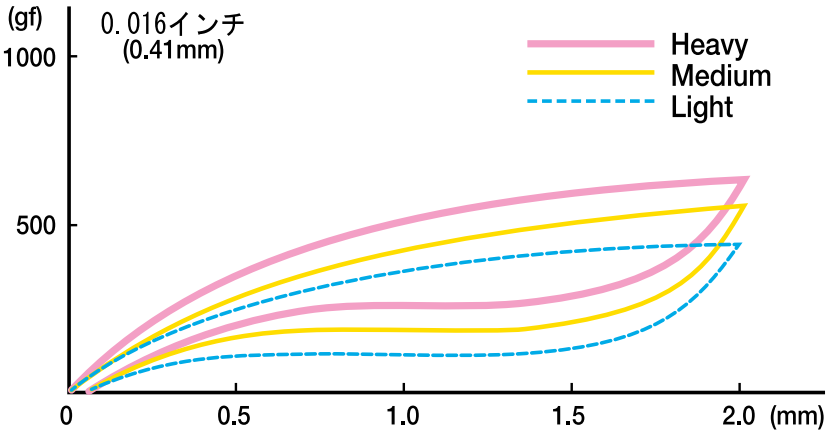
In orthodontics, these two properties can be used. The practitioner's experience will be different when inserting the wire into the brackets, but the tooth movement will be the same with light and constant forces (reverse transformation martensite -> austenite).

Pr. Laurence JORDAN (France)

«For over 20 years, I have been conducting reaserches on NiTi shape memory alloys and their applications in the medical field. TOMY NiTi archwires exhibit properties that are perfectly suited for orthodontic use.»

INITIALLOY:
Superelastic round wire with original properties.

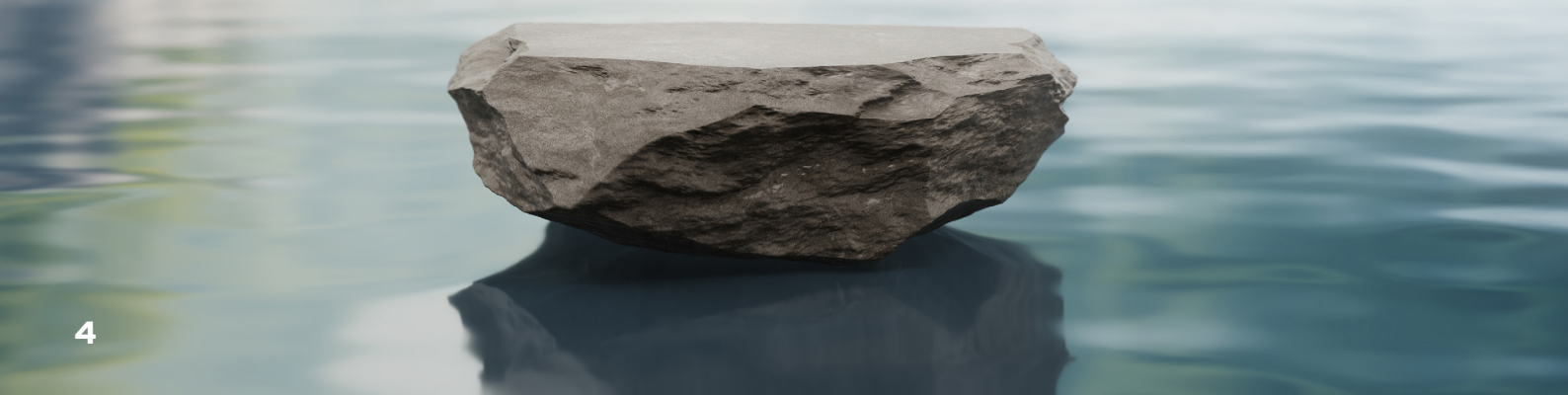
Different heat treatments give practitioners a choice of several force levels for the same wire cross-section: light, medium, heavy.



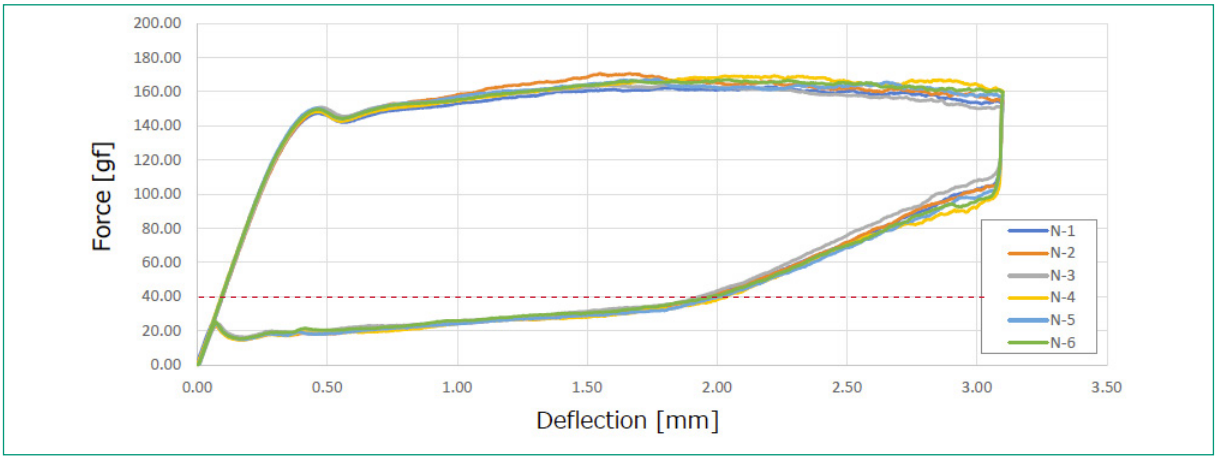
Comparison of unloading force levels for several .016" NiTi or Copper NiTi wires.

Tests performed under ISO158441:2014 dentistry-wires for use in orthodontics
Test temperature: 36°C
Test speed: 1.25 mm/min
Superposition of 6 samples from 6 different lots.

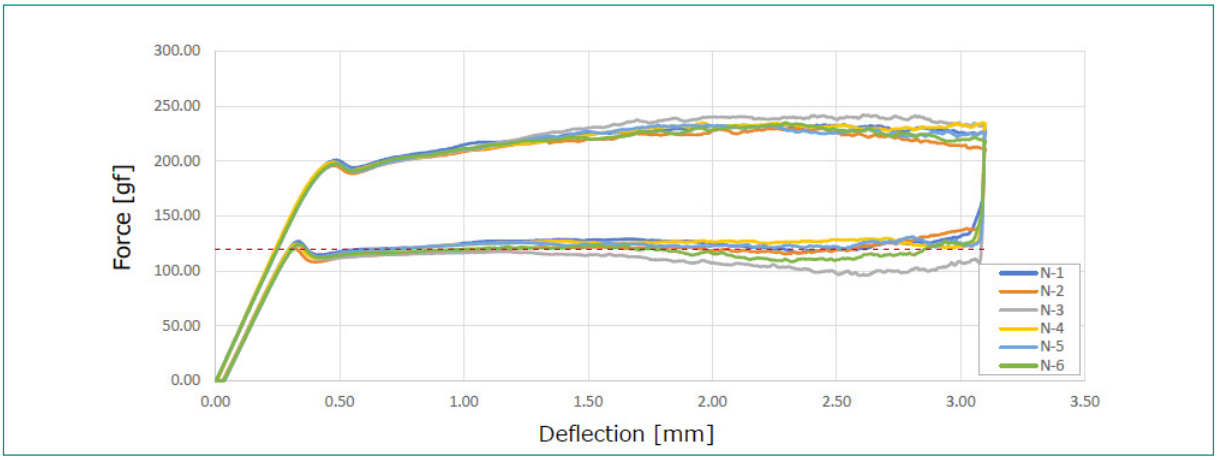
Red dotted lines indicate (for reference) the average force level exerted by the wire during unloading.



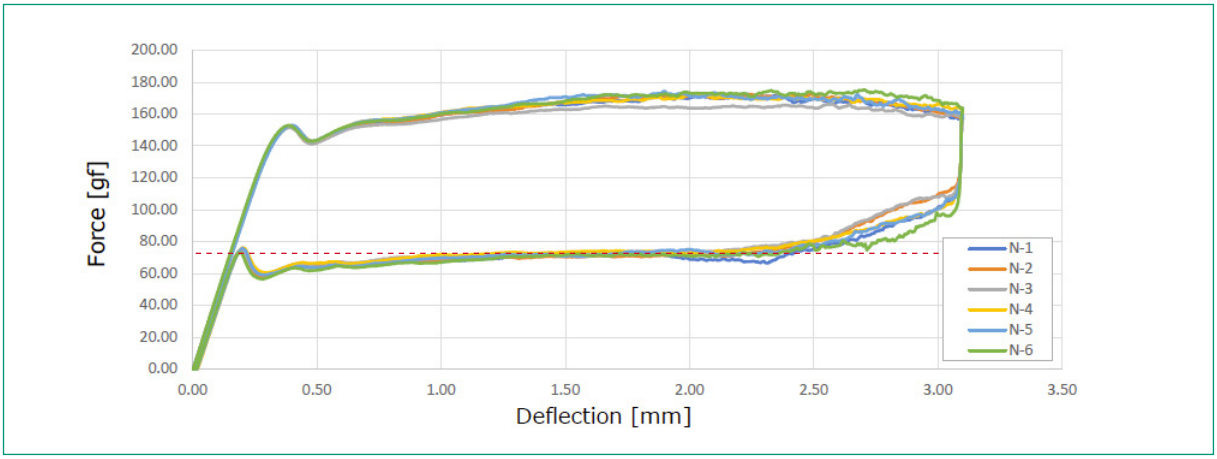
Comparison of unloading force levels for various .016" NiTi or Copper NiTi wires.



TOMY/ Initialloy Form A Upper - size: .016"
Item #: 71-A1U0-0016



AO/ TANZO Form III Upper - size: .016"
Item #: 827-3U-16



Ormco/ COPPER NI-TI 35° TRU-ARCH - size: .016"
Item #: 205-6412

BIO-EDGE:
For ideal tooth movement.

According to Professor Miura's research, histological tooth movement (involving the periodontium and roots) is achieved through light and continuous forces.

BIO-EDGE is a square or rectangular superelastic archwire with shape memory. You can select different force levels for the same wire size (e.g., BIO-EDGE .020"x.020", 100 gf, 200 gf, or 300 gf).

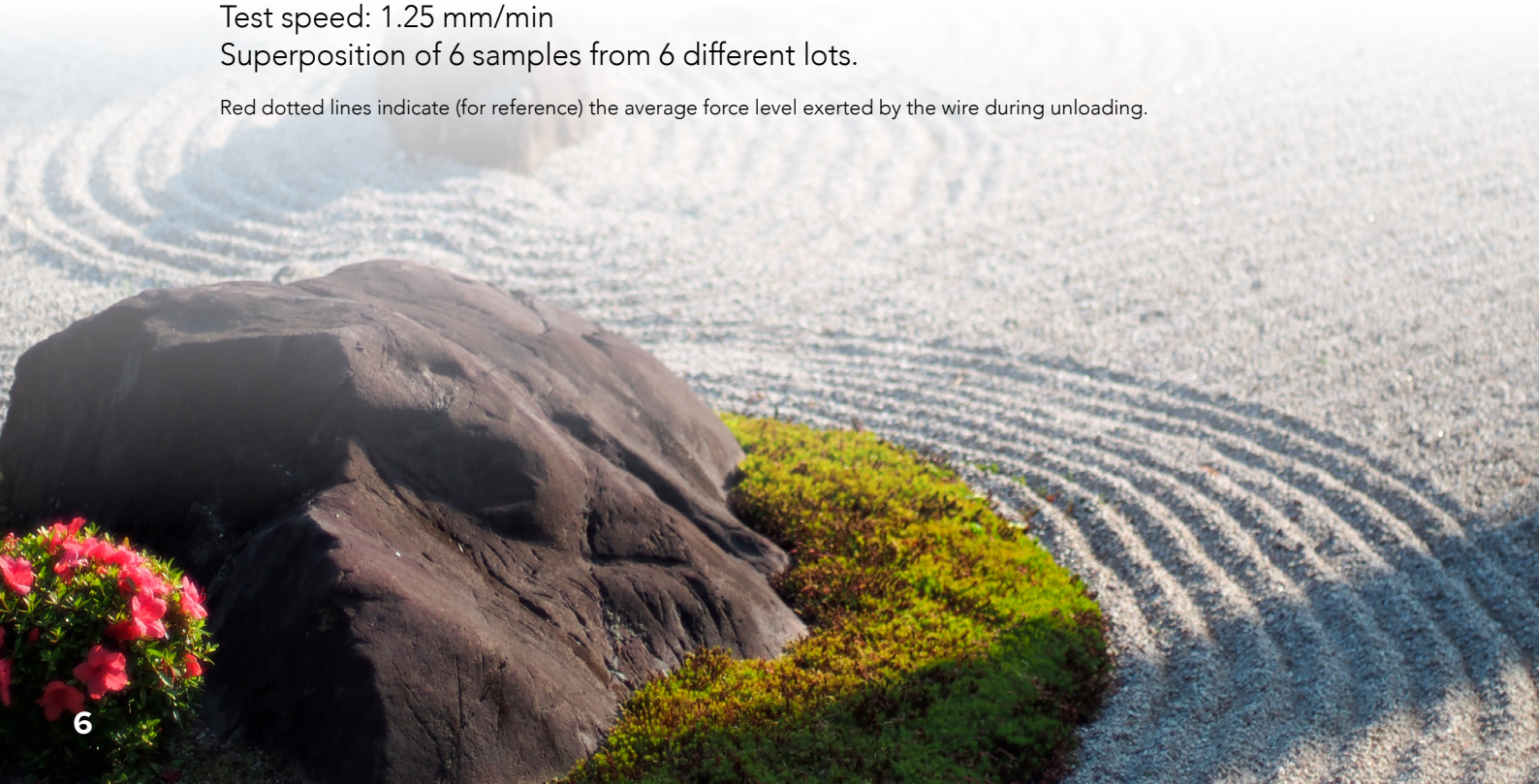
Shape Mem ory:

In cases of crowding or severe dento-maxillary disharmony (DMD), cooling the archwire or sections of it using cotton and a refrigerant spray allows for easier insertion of larger-sized archwires.

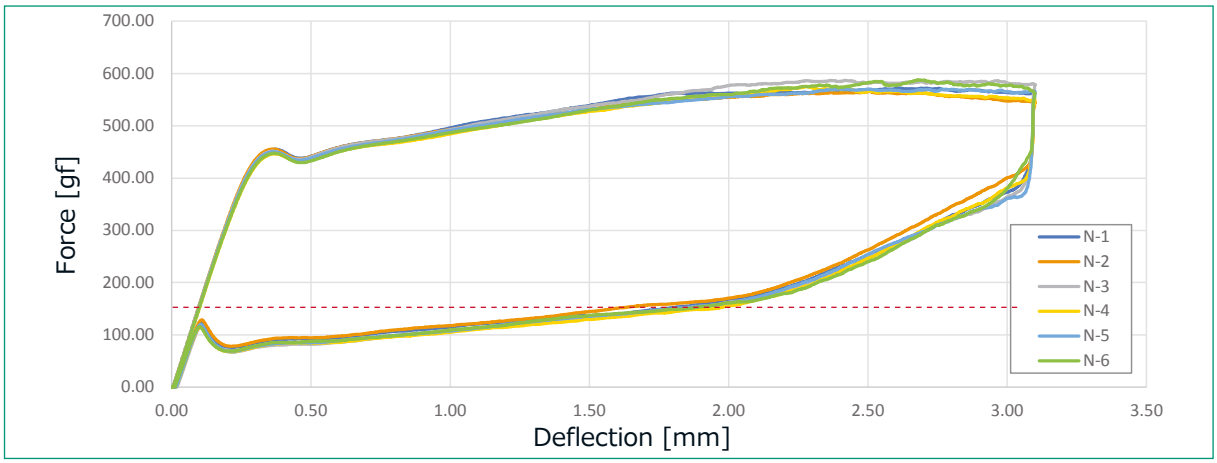
Comparison of unloading force levels for several .020" x .020" NiTi or Copper NiTi wires.

Tests performed under ISO158441:2014 dentistry-wires for use in orthodontics
Test temperature: 36°C
Test speed: 1.25 mm/min
Superposition of 6 samples from 6 different lots.

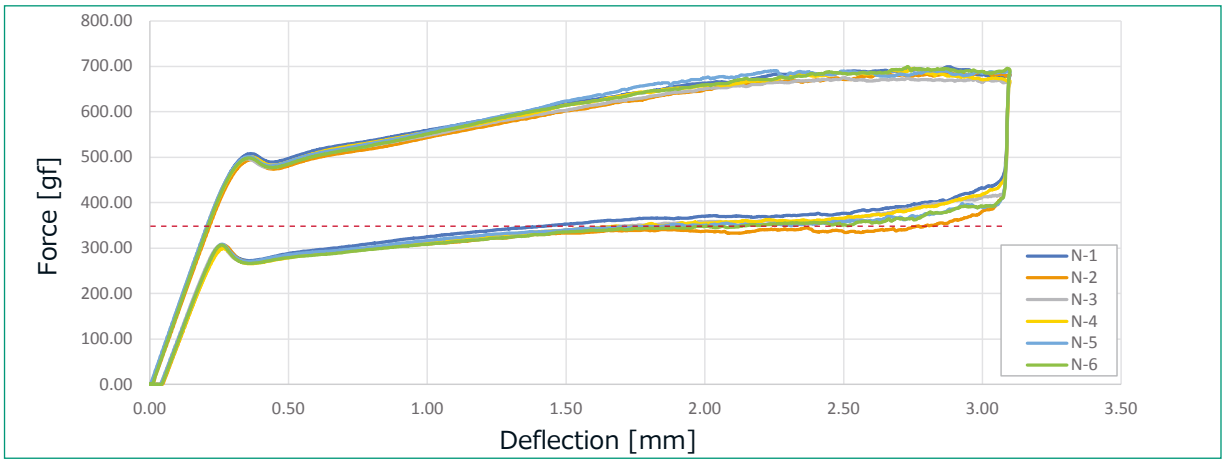
Red dotted lines indicate (for reference) the average force level exerted by the wire during unloading.



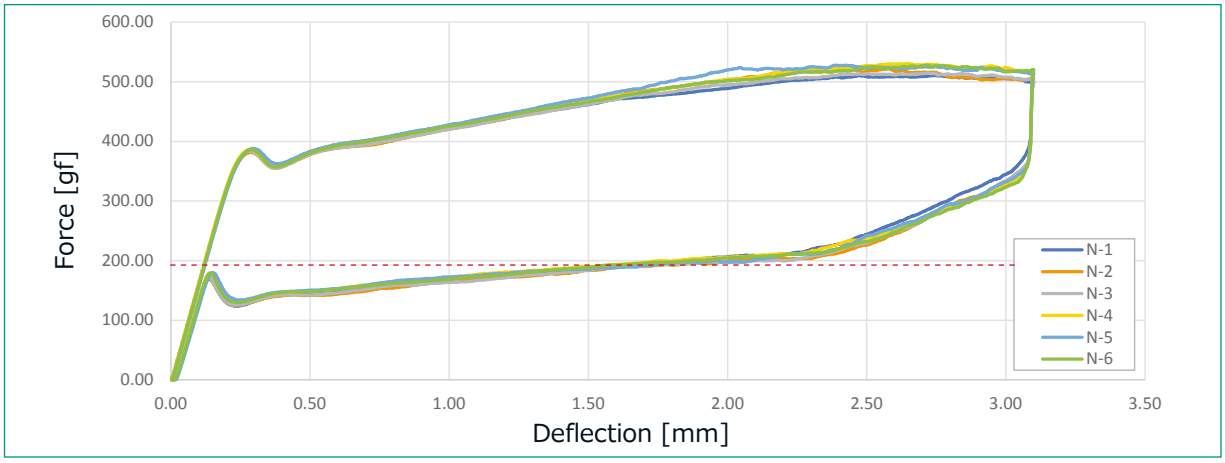
Comparison of unloading force levels for various .020"x.020" NiTi or Copper NiTi wires.



BIO-EDGE .020"x.020" 100 gf - .020"x.020"
: 72-A2U0-2020



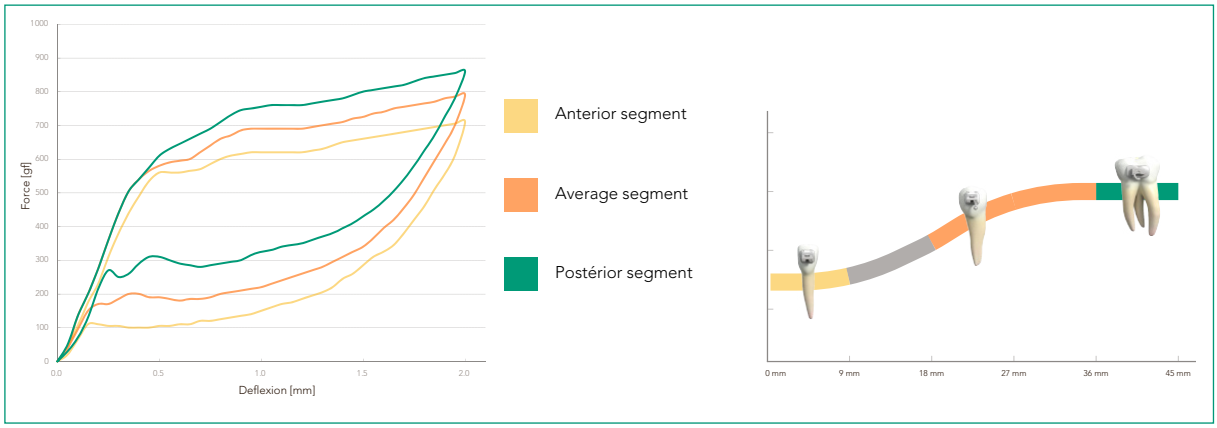
AO/Tanzo - Form III Upper - .020"x.020"
: 827-3U-2020



Ormco/Copper NiTi - 35°C TRU-ARCH - .020"x.020"
: 210-9212

BIO-ACTIVE™: The end of preconceived ideas.

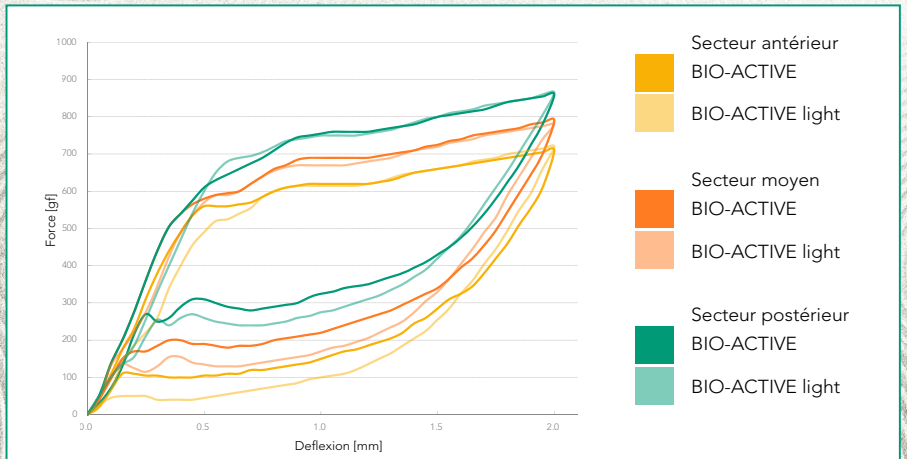
BIO-ACTIVE™ and **BIO-ACTIVE™** light are square or rectangular wires of the BIO-EDGE type that have undergone different heat treatments along the same archwire, giving them the unique ability to deliver forces tailored to each segment of the dental arch.



Forces generated by a BIO-ACTIVE™ archwire

BIO-ACTIVE™ light

In complex clinical situations (such as periodontal problems or severe dento-maxillary discrepancies), forces can be further reduced by using "light" wires. These wires exert lower forces during tooth movement compared to conventional **BIO-ACTIVE** wires. Their high control potential and minimal side effects are therefore major advantages.



Comparison of the forces generated by the two types of BIO-ACTIVE™ wire

Elastic Properties of Alloys

Flexural rigidity, is given by the product EI expressed in Newton x mm²:

- the chemical nature of the alloy (E: modulus of elasticity, in GPa)
- the shape and size of the cross-section (I: second moment of inertia, in mm⁴)

It is constant on conventional alloys regardless of the wire strain rate but decreases significantly on NiTi alloys depending on the wire strain rate (and thus the amount of martensite generated).

The formula

$$F/D = k\frac{EI}{L^3}$$

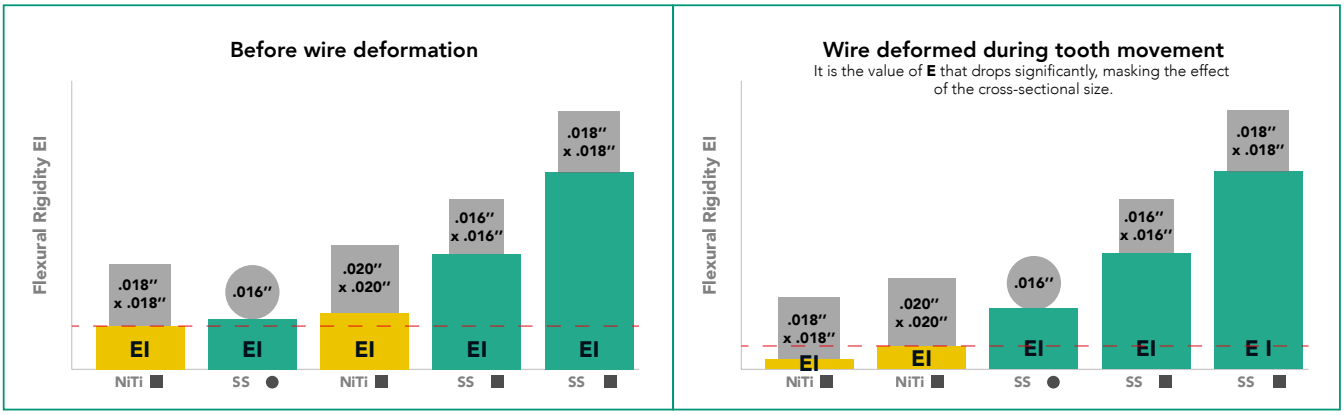
F/D: Load-to-flex ratio
E: Chemical nature of the alloy (modulus of elasticity)
I: Shape and cross-section of the archwire
L: Distance between brackets
k: Constant
EI: Flexural rigidity or total flexibility

The distinctive feature of **BIO-ACTIVE™** is that "E" is no longer constant and drops drastically during deformation. (*Evolution of flexural rigidity according to the cross-sectional dimension of a superelastic nickel titanium orthodontic wire. Prof. Laurence JORDAN*)

The forces that move the teeth depend on product EI:

High EI = high forces
Low EI = light forces

The more the archwire is deformed, the more "E" decreases. This explains the low force level even with larger cross-sections.



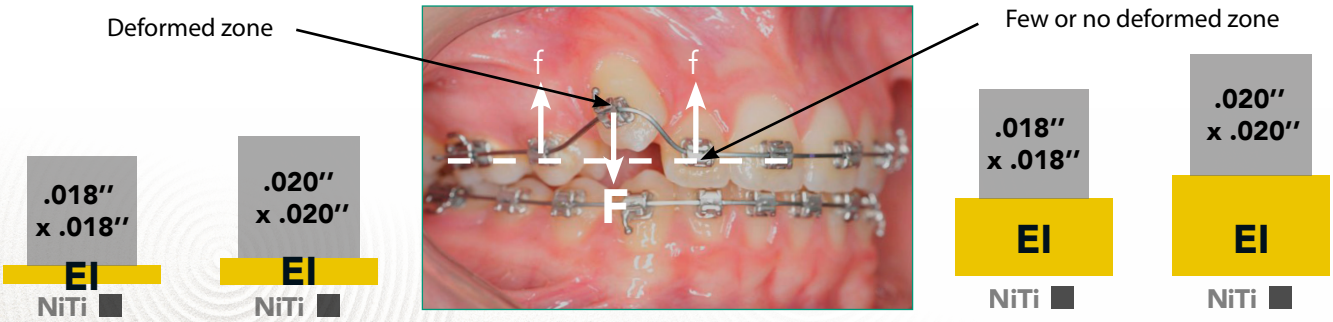
Evolution of flexural rigidity (EI) of archwires with different materials and cross-sectional dimensions before and after deformation

BIO-ACTIVE™ : The end of preconceived ideas.

Few or no side effects

For most alloys, "E" (modulus of elasticity) remains constant in all situations (whether the archwire is deformed or not).

BIO-ACTIVE™, with its shape-memory properties, exhibits varying flexural rigidity values along the same archwire depending on the degree of deformation. With this type of wire, there are few or no side effects because the undeformed zone acts as an anchor, countering unwanted movements.



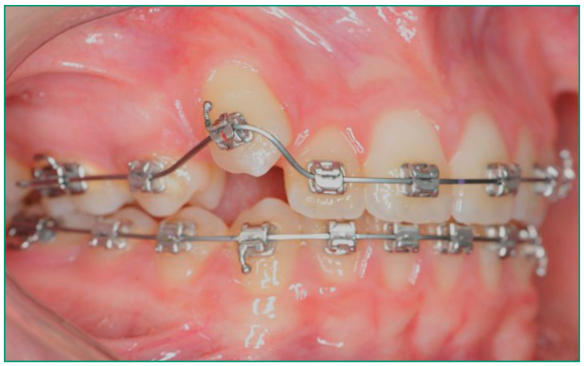
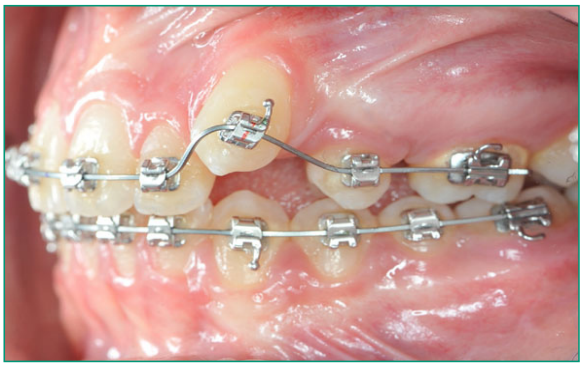
This property exists only if the archwire's cross-section is sufficiently large. If the section is too small, the rigidity of the wire in minimally or non-deformed areas will not be able to counteract unwanted movements.

Dr Christian Demange (France)

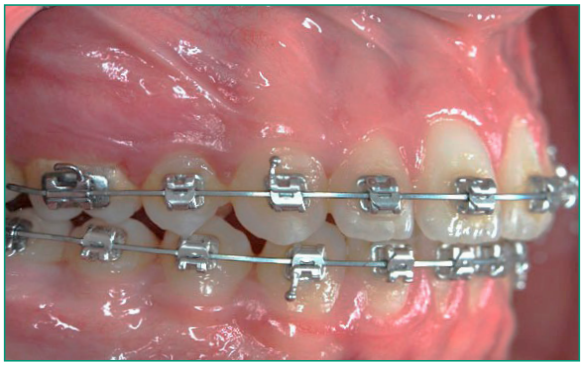
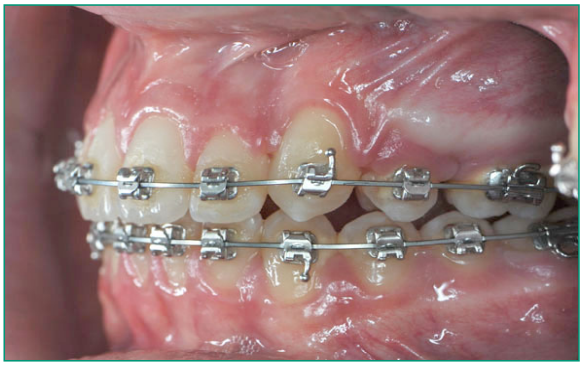
"I have used Tomy arches, especially BIO-ACTIVE™, since the early 2000s. These arches truly have properties I have never found in any other wire. It has revolutionized my way of working."

Placement of ectopic canines using **BIO-ACTIVE™** .020"x.020" archwire

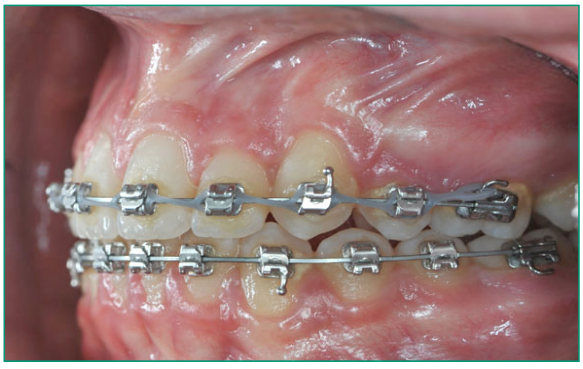
Dr. Christian Demange

Initial

After 3 months

After 6 months, with the same initial archwire

Case treated with 2 pairs of arches

Dr. Christian Demange

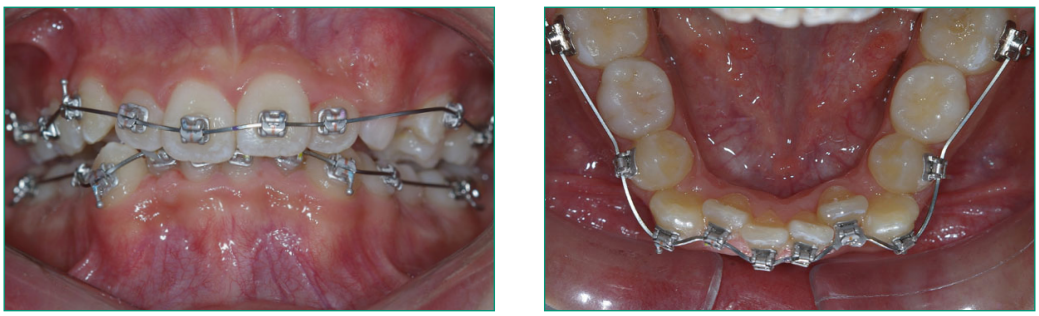
1st arch .020"x.020" BIO-ACTIVE – 10 to 12 months

2nd arch .019"x.025" Beta-Titanium – 6 to 12 months

End of treatment

BIO-ACTIVE Rhodium

For better aesthetics, these arches are available in rhodium to match our brackets with the same rhodium metal or ceramic finish.

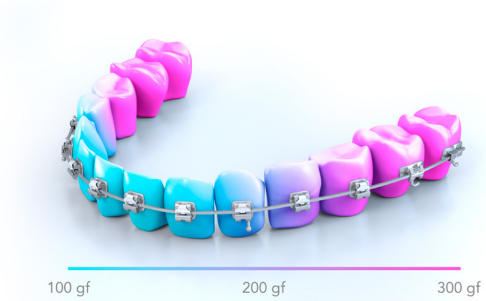


Brackets EXPERIENCE mini metal Rhodium and BIO-ACTIVE Rhodium. Dr Christian Demange

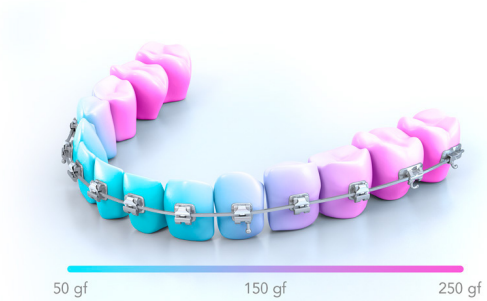
BIO-ACTIVE and BIO-ACTIVE™ light

BIO-ACTIVE is a shape memory archwire exerting progressive forces from the midline to the posterior region. Optimal force is adapted to the anatomy of the specific tooth to be moved. Force ranges include:

- Arches .016»x.016» and .016"x.022"
  from 80 g on incisors up to 240 g on molars
- Arcs .018»x.018» jusqu'à .021"x.028"
  de 100 g sur les incisives jusqu'à 300 g sur les molaires



- Arches ..018"x.018" and .020"x.020"
  from 50 g on incisors up to 250 g on molars in its light version



BIO-ACTIVE Square and Rectangular Archwires

ome archwires are available with a central V-Bend (or "dimple"). indicated by a letter "D" in the P/N.

	A		B	
	P/N		P/N	
Dimension	Maxillary	Mandibular	Maxillary	Mandibular
.016"x.016"	70-A0U0-1616	70-A0L0-1616	—	—
.016"x.022"	70-A0U0-1622	70-A0L0-1622	—	—
.016"x.022" "Dimple"	70-A0UD-1622	70-A0LD-1622	70-B0UD-1622	70-B0LD-1622
.018"x.018"	70-A0U0-1818	70-A0L0-1818	70-B0U0-1818	70-B0L0-1818
.018"x.018" "Dimple"	70-A0UD-1818	70-A0LD-1818	—	—
.018"x.025"	70-A0U0-1825	70-A0L0-1825	—	—
.019"x.025"	70-A0U0-1925	70-A0L0-1925	70-B0U0-1925	70-B0L0-1925
.020"x.020"	70-A0U0-2020	70-A0L0-2020	70-B0U0-2020	70-B0L0-2020
.020"x.020" "Dimple"	70-A0UD-2020	70-A0LD-2020	—	—
.020"x.025"	70-A0U0-2025	70-A0L0-2025	70-B0U0-2025	70-B0L0-2025

	C	
	P/N	
Dimension	Maxillary	Mandibular
.016"x.016"	70-C0U0-1616	70-C0L0-1616
.016"x.022"	70-C0U0-1622	70-C0L0-1622
.016"x.022" "Dimple"	70-C0UD-1622	70-C0LD-1622
.018"x.018"	70-C0U0-1818	70-C0L0-1818
.018"x.018" "Dimple"	70-C0UD-1818	70-C0LD-1818
.018"x.025"	70-C0U0-1825	70-C0L0-1825
.019"x.025"	70-C0U0-1925	70-C0L0-1925
.020"x.020"	70-C0U0-2020	70-C0L0-2020
.020"x.020" "Dimple"	70-C0UD-2020	70-C0LD-2020
.020"x.025"	70-C0U0-2025	70-C0L0-2025
.021"x.028"	70-C0U0-2128	70-C0L0-2128

	D BioZone
	P/N
Dimension	Universal
.014"X.025"	70-D000-1425
.016"X.022"	70-D000-1622
.018"X.025"	70-D000-1825
.020"X.020"	70-D000-2020

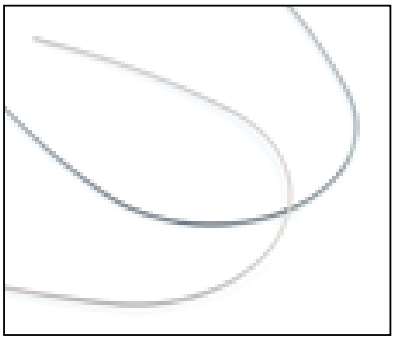
	M (Small A)	
	P/N	
Dimension	Maxillary	Mandibular
.020"x.020"	70-M0U0-2020	70-M0L0-2020

BIO-ACTIVE™ light

	A		C		D BioZone
	P/N		P/N		P/N
Dimension	Maxillary	Mandibular	Maxillary	Mandibular	Universal
.013"	—	—	—	—	70-D100-0013
.014"	—	—	—	—	70-D100-0014
.016"	—	—	—	—	70-D100-0016
.018"x.018"	70-A1U0-1818	70-A1L0-1818	70-C1U0-1818	70-C1L0-1818	70-D100-1818
.020"x.020"	70-A1U0-2020	70-A1L0-2020	70-C1U0-2020	70-C1L0-2020	70-D100-2020

INITIALLOY and BIO-ACTIVE Aesthetic Archwires

Using the same rhodium-coating as found on EXPIERENCE ceramic clips, these highly aesthetic archwires feature unrivaled properties making ceramic appliances less visible.



BIO-ACTIVE Aesthetic Archwires

	A		B		C	
	P/N		P/N		P/N	
Dimension	Maxillary	Mandibular	Maxillary	Mandibular	Maxillary	Mandibular
.016"x.022"	74-A0U0-1622	74-A0L0-1622	74-B0U0-1622	74-B0L0-1622	74-C0U0-1622	74-C0L0-1622
.018"x.018"	74-A0U0-1818	74-A0L0-1818	74-B0U0-1818	74-B0L0-1818	74-C0U0-1818	74-C0L0-1818
.019"x.025"	74-A0U0-1925	74-A0L0-1925	74-B0U0-1925	74-B0L0-1925	74-C0U0-1925	74-C0L0-1925
.020"x.020"	74-A0U0-2020	74-A0L0-2020	74-B0U0-2020	74-B0L0-2020	74-C0U0-2020	74-C0L0-2020

	D BioZone
	P/N
Dimension	Universal
.014"x.025"	74-D000-1425
.016"x.022"	74-D000-1622
.018"x.025"	74-D000-1825

Aesthetic BIO-ACTIVE™ light

	A		C		D BioZone
	P/N		P/N		P/N
Dimension	Maxillary	Mandibular	Maxillary	Mandibular	Universal
.013"	—	—	—	—	74-D100-0013
.014"	—	—	—	—	74-D100-0014
.0146"	—	—	—	—	74-D100-0016
.016"x.022"	—	—	—	—	74-D00D-1725*
.017"x.025"	—	—	—	—	74-D00D-1725*
.018"x.018"	74-A1U0-1818	74-A1L0-1818	74-C1U0-1818	74-C1L0-1818	74-D100-1818
.020"x.020"	74-A1U0-2020	74-A1L0-2020	74-C1U0-2020	74-C1L0-2020	74-D100-2020

* Dimple

INITIALLOY, BIO-EDGE, BIO-ACTIVE™

Japanese NiTi Archwires

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