ORTHONEWS

FALL/WINTER 2023
VOL 1 #43

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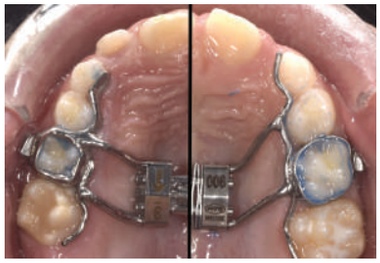

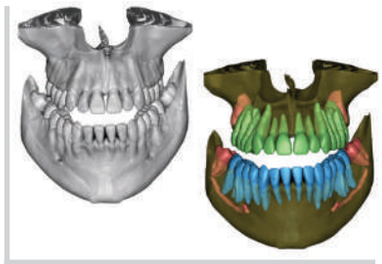

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RPE: ANALOGIC TO DIGITAL ADVANTAGES AND DISADVANTAGES OF DIGITAL WORKFLOW

Alvise Caburlotto
DDS, Orthodontics specialist in Venice, Italy

Translated from Italian:
Original article: RPE from analogic to digital. vantaggi e svantaggi della metodica digitale
Bollettino di Informazioni Leone 111-05/2023

In recent years we have increasingly witnessed a digital transformation in our profession. The impression taking technique with the use of intraoral scanners has facilitated and accelerated this revolution and has led us to design, plan and create orthodontic appliances completely digitally, without plaster or acrylic models. These changes, along with the introduction of new materials and the production of new materials processes, have led to the achievement of more specific and individualized therapeutic means for the patients, and have helped clinicians to simplify and speed the workflow and production processes.

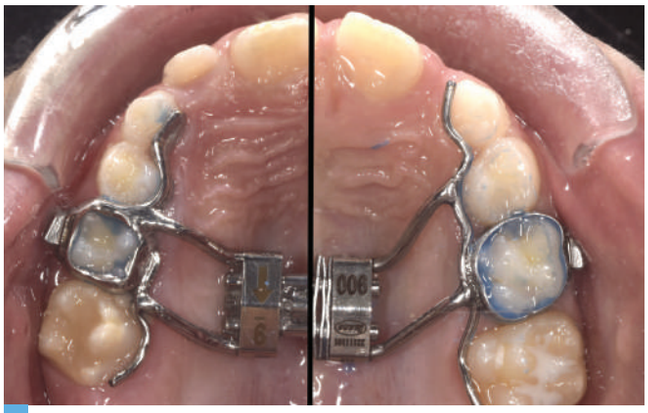


FIG. 1 - Comparison between traditional expander and digital expander

FIG. 2 - Customized appliance with Leaf Expander

Before the introduction of digital tools in the orthodontic world, producing fully analogic appliances needed the traditional bands, developing an impression with a plaster model, manually bending the wire, and the braze-soldering phase of different components by an experienced dental technician. The quality and the precision of the appliance in this analogic way is totally dependent on the dental technician's skills.
From a clinical point of view, the delivery of the device with traditional bands requires appointments for the test of the bands, analogical impressions, and appointments to insert elastic separators.

FIG. 3 - Visit to place elastic separators in a analogical workflow

Today, it is possible using a complete digital workflow, to receive a highly precise appliance from the intraoral scan without the need to print a physical model of the dental arch.
The intraoral scan that we usually make at the first appointment, generates an .STL file of the dental arch. This file is sent directly to the lab without having to take another impression and without using a courier, thus shortening the time and other necessary steps.

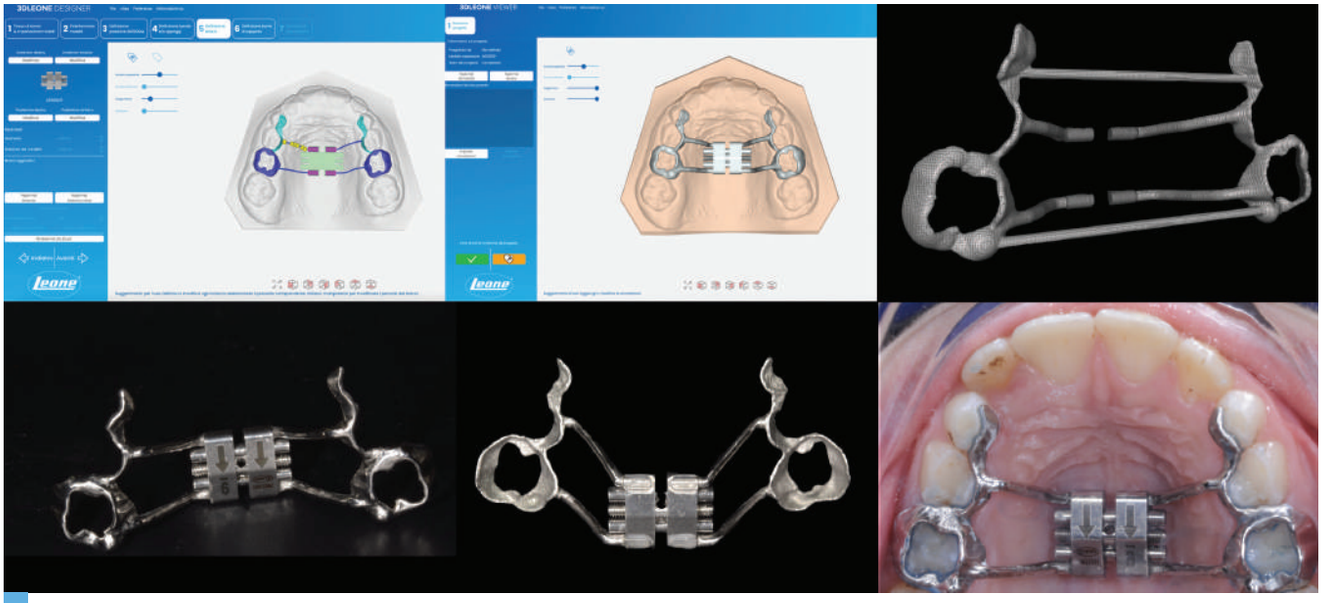


FIG. 4 - Digital design, approval through viewer, manufacturing of the appliance and delivery. From digital to reality

The framework of the final appliance is digitally designed through the 3DLeone Designer software. Following a workflow with easy driven steps including error detection options, the technician is able, in just a few minutes and with a few mouse clicks, to create an appliance that will adapt perfectly to the anatomy of patient's teeth and will preserve the soft tissues with extreme precision.
The 3D files of the active elements (expanders, tubes, TADs) are uploaded from the software digital library, which is continuously updated, to be added later in a second phase by laser welding.

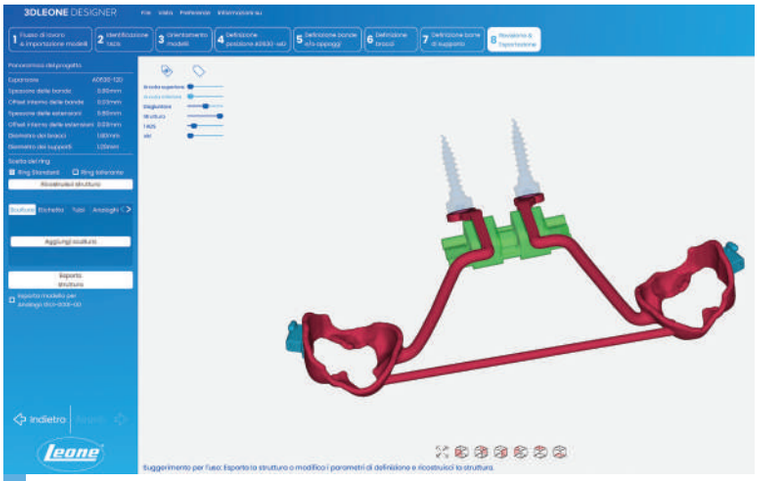


FIG. 5 - In the digital design is it possible to add components (screws and tubes) included in the library of the sw and assembled when the framework is ready

The default settings in 3DLeone Designer are helpful because they indicated the most proper area where to place the expander. The shape, extension of the arms and the customized bands are suggested automatically and eventual contacts with the soft tissue are clearly pointed out.
The final project is exported and printed out by the Laser Melting process, using Cr-Co alloy. This alloy is recognized in clinical studies as suitable for orthodontic use.
While the general offset for the whole band is automatically calculated by the software for the cementing phases at about 0.05 mm, the band thickness usually used is set at 0.7 mm.
Once the framework is printed it will be polished and placed inside the dedicated slots of the expander bodies to be laser welded. The chosen expander is perfectly designed to have a precise fit, is quick, and easy to assemble.
Personally, I have been using customized appliances since October 2018 and I would never go back, mainly for the advantages that this workflow offers for the doctor, the laboratory that develops this appliance, and the patient.
Below is a review according to my experience the advantages and disadvantages of a fully digital workflow.

ADVANTAGES

3D printing by laser melting or by a metal milling centre offers a lot of advantages in terms of patient comfort, clinical efficiency, precision, and design flexibility, as well as laboratory quality.

For clinicians, the advantages of adopting this fully digitalized process are:

1 - The use of an intraoral scanner and the application of a customized appliance eliminate the management of all impression materials and the stock of all impression trays; they also eliminate the need to have a band stock inventory for a trial appointment just to choose the ones that will fit better to the tooth anatomy.

2 - The customized bands are not placed in the interproximal space, consequently elastic separators are not necessary. Moreover, there is no need for an appointment to fit and place the bands, saving a lot of time at the chair.

3 - Digital design allows a better communication between orthodontist and dental technician, with the chance to see the digital project for the most complex appliances, and to be able to request some modifications before the real appliance is manufactured. The project can even be shared with other professionals for multidisciplinary cases.
Thanks to 3DLeone Viewer-free software it is possible to visualize the appliance, alone or placed on the digital model in 3D Graphic. Exchange and visualization of the digital project can occur, thus making it capable to be analysed in all the views. Furthermore, the Viewer software allows to make simple verification notes that can be sent directly to the laboratory. Thanks to all the features, the appliance design is not restricted by both skills and manual knowledge of a technician, or to a standard thickness of production materials. This workflow offers the orthodontist a greater flexibility and a straight active participation in the device structure design, which is not easy to do with a standard analogic workflow.

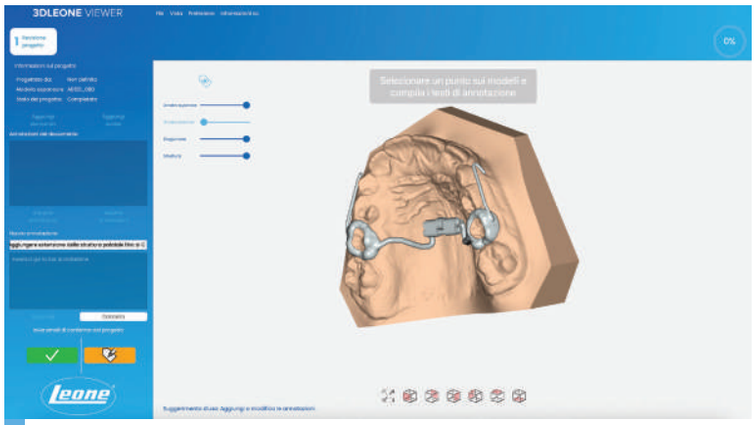


FIG. 6 - The free viewer allows a simple communication between the Doctors and the lab. It is possible to view the finished appliance in 3D, before the realization, not or on the digital model. The doctor can add notes to the lab and request edits.

4 - Since the bands are designed on teeth anatomy, the appliance is very precise. The whole surface area of the band is in contact with the tooth, and this avoids cement excesses which can cause band debonding.

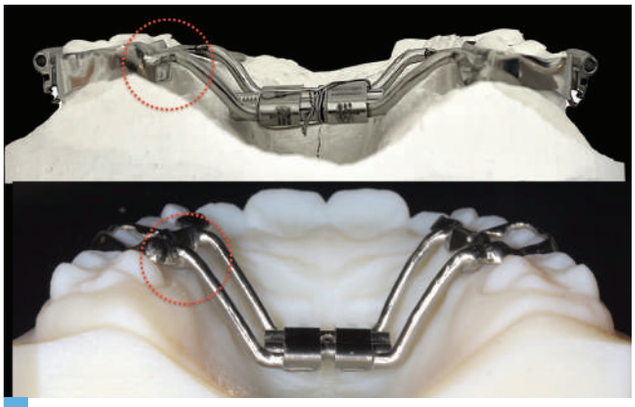


FIG. 7 - The pictures show that the analogical expander is limited by the material available on the market, while, with the digital workflow, it is possible to manufacture customized frameworks on the anatomy of the appliance

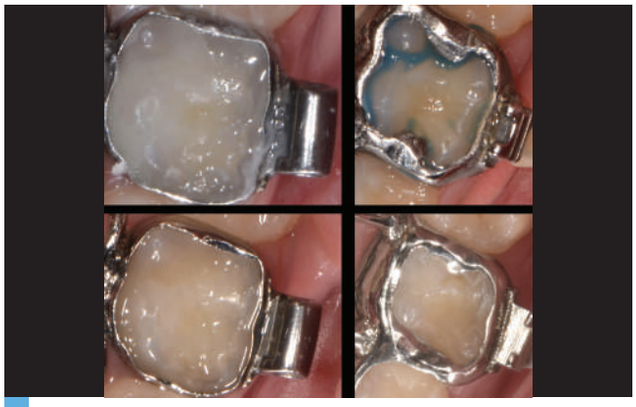


FIG. 8 - Comparison between traditional bands and digital bands

5 - The digital workflow allows to manage the one-visit protocol in case of MARPE (Mini-implant Assisted Rapid Palatal Expansion) appliances.

6 - Considering that customized appliances do not interfere the interproximal spaces the appliance positioning is not painful. Both young and older patients have a positive experience which will be transferred to the clinician in a good compliance by patients for future appointments and will be a good marketing action for the dental office.

Even **patients** will have some advantages if we choose to use customized appliance. First, the large amount of time saved for both total treatment duration, and a smaller number of appointments.
Comparing both the workflows (analogic and digital) starting from the first visit up to the end of treatment, it is highlighted that, with a fully digital workflow, the patient will be able to avoid at least 3 appointments for the delivery of a RPE, In particular:
- placement of the elastic separators
- bands placement and impression trial
- elastic separators for the next delivery.

Each of these appointments are time consuming and costly to both doctor and patient, especially for the ones that do not live close to the dental office. The capability to deliver an appliance, designed on the intraoral scan taken during documentation and data collecting appointment is a cost and time-saving deal for both patient and dental office.

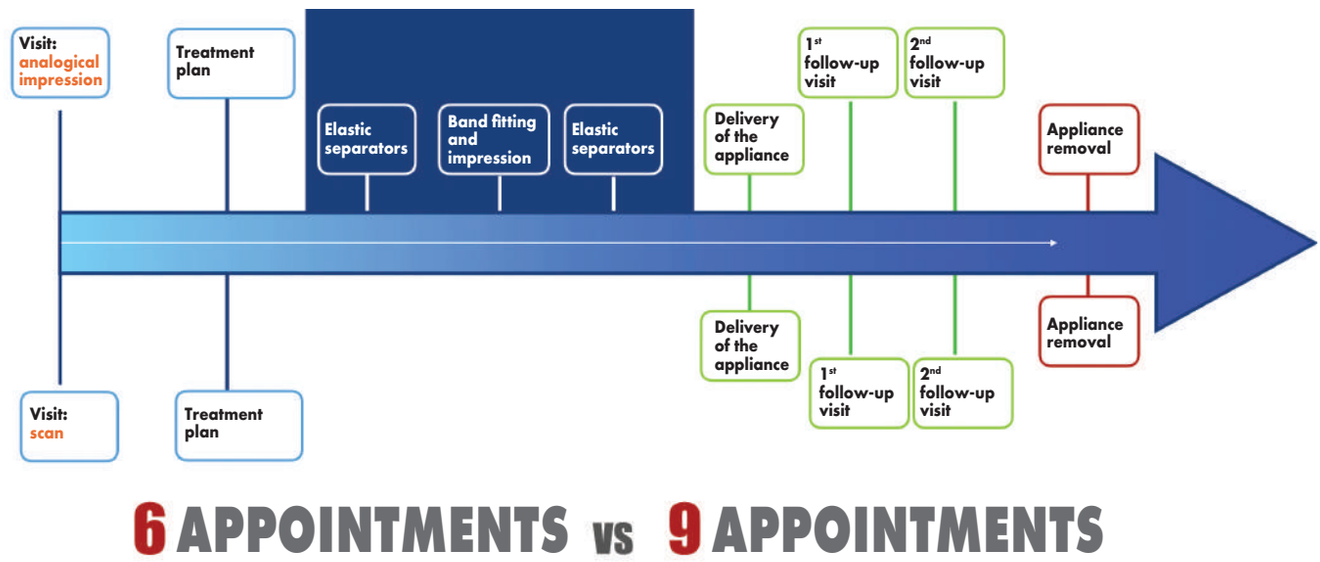
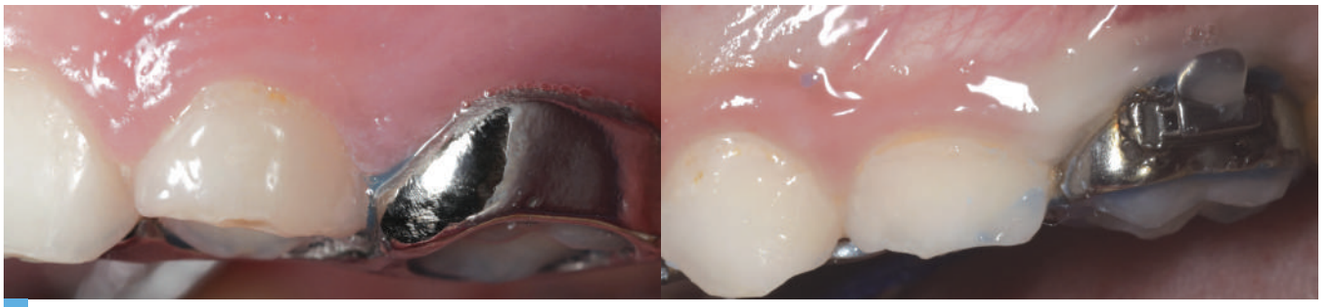


FIG. 9 - Comparison of the number of visits in traditional workflow vs. digital workflow

Another advantage for the patient on the clinical side is *comfort*.
There is no need for elastic separators (which can be annoying), neither for bands (which can be placed in the interproximal point) thus making the appliance placement visit more comfortable and faster. Furthermore, the customized band will match perfectly with the tooth crown anatomy, so it will not compromise gingival tissues and leave space for home cleansing, avoiding gingival pain.



FIGG. 10a-b - Comparison between traditional band and digital band. The digital band does not go under the soft tissue and it is more comfortable for the patient

The advantages for **the laboratory** are:

1 - The opportunity to have a driven, step-guided workflow to design the appliance, making the manual skills of a dental technician to bend the wire unnecessary, increases the quality and precision standard of the full range of manufactured appliances. It makes production more standardized and less operator dependent by decreasing the chances for mistakes with consequent precision decrease.

2 - The designs and appliances can become more easily manufacturable. The projects can be saved in a digital library on the computer to become templates for future appliances, simplifying the designing process.

3 - Decreased production times for same high level quality standard. For example: the software automatically and ideally places the expander on the upper arch, then it asks for some adjustments to be made to avoid any possibilities for contact with the soft tissues.

4 - Versatility: it is possible to add not only the base element of an appliance, but also other useful elements such as hooks, buttons, tubes and additional arms for facial masks, customizing the design for both shape and material thickness. The design is not limited to what the dental technician can manually shape yet is limited only by the imagination.

5 - Saving of materials since the acrylic model printing can be a superfluous procedure.

FULL DIGITAL METHODOLOGY

CLINICIAN PRO	LAB PRO	PATIENT PRO
- Chances to validate the project before final appliance manufacturing - Chances to share the project - No bands stock - Less appointments - Less chair times - Higher safety - More precise application - No pain marketing	- Less production times - Higher precision - Default setting for optimized designing of the software - Appliances standardization - More versatility	- Less appointments - Time savings - Higher visit comfort - Better treatment experience
CLINICIAN CONS	**LAB CONS**	**PATIENT CONS**
- Higher laboratory costs - No appliance adjustment at the chair or activations with pliers - Debonding procedure a bit more complicated	- Learning curve - Purchase of the SW - Higher costs	

FIG. 11 - Summary chart of pros and cons for lab, clinician and patient

DISADVANTAGES AND LIMITATIONS

As with any new technology there is a downside with some disadvantages and limitations.
Limitations are related to the few metal alloys available for printing. Chromium-Cobalt alloys are the most widely used materials; however, they end up being very rigid, thus do not forgive scan errors, design or printing mistakes; the risks are framework fracture or missing appliance delivery.
The stiffness of the material does not allow for any clinical modifications at the chair: adjustment bents in case of tooth exchange, for example, or activations performed by pliers are not possible without risking fracture; therefore, this material will not be suitable for appliances that need flexibility such as de-rotation bars or springs.
Furthermore, from the lab side, the laser melting process requires support structures during the manufacturing phases which, consequently, requires an additional step of removing and polishing after framework construction.

From a clinical viewpoint, appliances with customized bands can be difficult to remove using debonding protocols commonly used for a standard band appliance. Customized molar bands are too smooth and, on one hand, offer greater comfort for the patient, on the other hand they make detachment more complicated. This issue can be easily overcome by adding small detachment notches, palatal and vestibular during the design phases, so to also provide the band removing plier an additional point of contact.
In addition, due to the high precision of these bands and the tailored contact with the tooth anatomy, the appliances can have a very strong bond with the teeth, risking enamel fractures during the detachment phases, if these procedures (together with the cementation protocol) are not followed correctly. When there is too much resistance to detachment with the band removing plier, we strongly recommend using a “crown cut” bur instead to cut the vestibular side of the band and then facilitate detachment.

With this new technology, there is a slightly higher cost to implement, in comparison to the standard/analogic method. Additional training is necessary for the technician, the orthodontist, and dental office employees. Nowadays, the only indication to use standard bands is a reduced height of the dental elements. However, the reduced time and operating phases offer greater versability and better comfort for the patient. In addition to having technically perfect appliances, thanks to the use of the dedicated software, this digital workflow is effective, ergonomic, predictable in the results, and fully justifies a higher cost.

	ANALOG WORKFLOW	DIGITAL WORKFLOW
APPLIANCE INDIVIDUALIZATION	++	++++
TIME FROM THE IMPRESSION TO THE DELIVERY	+++	++
LEARNING CURVE	++++	++
COMPONENTS FLEXIBILITY	+++	+
MATERIALS BIOCOMPATIBILITY	++++	++++
COMMUNICATION BETWEEN TECHNICIAN AND CLINICIAN	+	++++
POSSIBILITY OF USING TITANIUM	-	++++
INTEGRATION WITH CBCT	-	++++
CHANCE TO CHANGE MATERIAL THICKNESS	-	++++
A.I. HELP	-	++++
BANDS PRECISION	++	++++
WIRE BENDING NEEDS	++++	-
SOFTWARE NEEDS	-	++++
MODEL PRINTING NEEDS	++++	-
MANUFACTURING COST	+	+++
CHANCE TO TAKE PRECISE MEASURES	++	++++
EXCEEDING MATERIALS	+++	+
CONTINUOUSLY UPDATING	-	+++
LASER MELTING PRINTING SERVICE NEEDS	-	++++

FIG. 12 - Summary chart of pros and cons of a digital workflow

CONCLUSIONS

In conclusion, customized appliances offer new opportunities in the orthodontic digitization process. We only hope that the manufacturing process will be simplified more and more, that the digital library will become even richer, and that we will be able to integrate and print out other types of materials. For example, flexible alloys such as Ni-Ti or alloys thermo-sensitive, suitable to make trans-palatal bars or springs.

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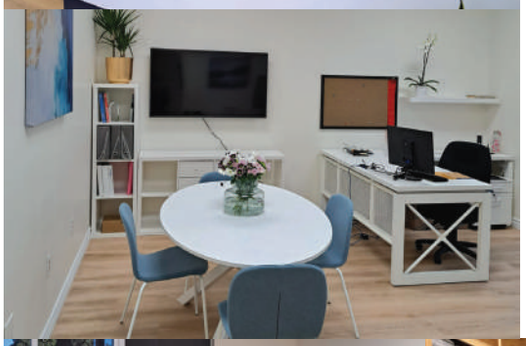
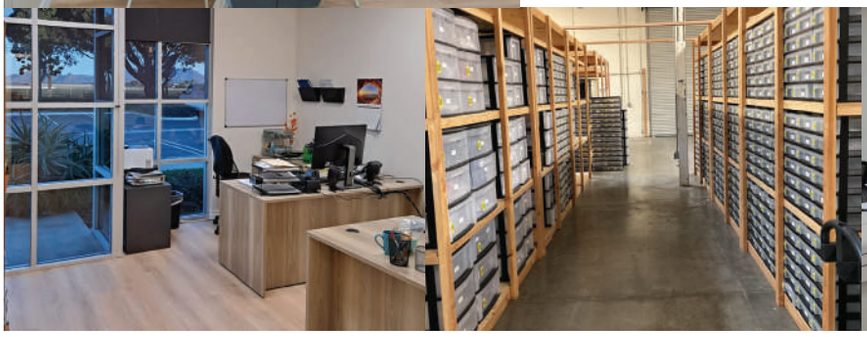
ON FEBRUARY 6th, LEONEAMERICA Dental Products INAUGURATED THE NEW HEADQUARTERS

LeoneAmerica Dental Products Inc. is the American company, founded in 2016, which sells the Leone orthodontic line in the United States, Canada and Puerto Rico.
From March 1st, 2022, it became sole property of Leone, who already held 60% of the shares since 2017, and from there it experienced a series of changes, which led to great satisfaction for the entire Group.



LeoneAmerica was born and continues to be based in Oxnard, a city on the West coast, about 60 miles north of Los Angeles. Despite the new building is around the corner, the move was an important turning point: besides highlighting the detachment from the past and providing a more modern working environment for the employees, the internal spaces of the new warehouse were designed to accommodate the future growth and development of the company.
This operation involved both the American team and part of the Italian one, who personally contributed to the optimization of logistics in order to make the customer service more efficient. Furthermore, important investments have been made, aimed to implement communication infrastructures between the parent company and the subsidiary.



The intense work was rewarded and, when the move was completed, there was no shortage of celebrations. After the official inauguration with the ribbon cutting ceremony and a thank you speech, all employees and collaborators were invited to a buffet lunch with Tuscan specialties cooked by Italians and lots of satisfaction!

Furthermore, in these transitional months, to emphasize these great changes and the renewed synergy between the manufacturer and the distributor, a new brand identity for LeoneAmerica has been designed. The marketing department of Leone S.p.A. together with LeoneAmerica's team looked to Leone's rich history for inspiration and created a custom typeface based directly on the forms of the old logo. The letters of the font are all set at the original angle of the "L", a forward tilt that suggests a sense of energy and excitement, reflecting the continuous need of moving forward and innovate. Mixing craft and heritage with modernity and innovation, LeoneAmerica's logo becomes part and parcel of the parent company's, reflecting the ideals that the company represents.

leone® america

We are eager to know what the future holds, but one thing is certain: today, as in 1934, the soul of our companies has not changed, and is committed to continuous product improvement and customer satisfaction.

Olivia Viti

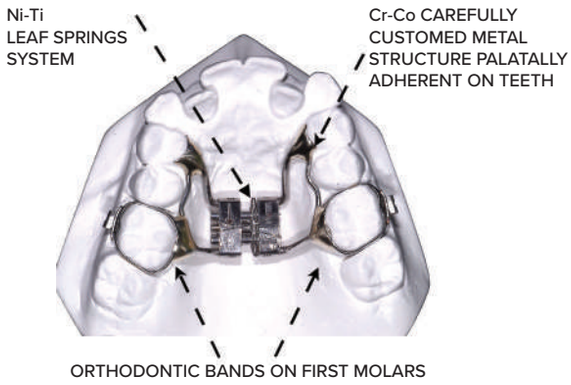
leone® america **Dental Products Inc.**
1641 S. Rose Avenue - Oxnard, CA 93033 (805) 487-9860
info@leoneamerica.com **leoneamerica.com**

TREATMENT OF A SEVERE TRANSVERSE DEFICIT AT THE END OF GROWTH: CASE REPORT

Nocco C., Matacena G., Sulaj I., Lanteri V., Grecolini M E.
Department of Surgical Science
Institute of Dentistry, Division in Orthodontics
University of Cagliari

The transverse maxillary deficit is a very frequent component of both dental and skeletal malocclusions generally accompanied by posterior cross-bite and/or the upper arch crowding. The possibility of maxillary skeletal expansion decreases with age and when patients are unwilling to accept TADs therapy, the only available alternative remains dentoalveolar expansion. An accurate diagnostic assessment allows the clinicians to classify patients' malocclusion according to the type of transversal deficiency and then to apply the most appropriate clinical protocols. Our purpose is to prove the effectiveness of the Leaf Expander in carrying out of a conspicuous dento-alveolar expansion. We will show the decisive effects of the Leaf Expander in the treatment of a clinical case with a patient at the end of growth.

The Leaf Expander structure is similar to that of rapid or slow maxillary expander, but the characteristics of the active component and the activation model are different. The screw does not directly act on the teeth but it compresses the Ni-Ti leaf spring; the Ni-Ti leaf Spring recovers its dimensions in the deactivation phase.



FIGG. 1, 2 - Leaf Expander Springs System

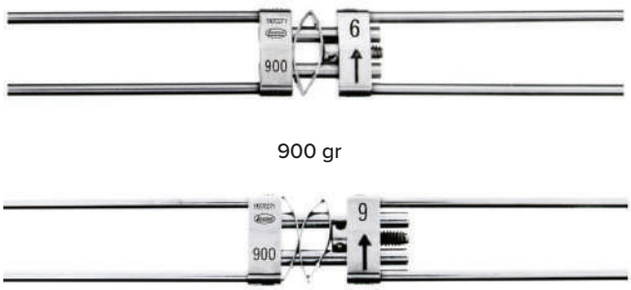


FIG. 2 - Number of Leaf spring determines maximum expansion capacity, hardness of Leaf spring determines strength level

The Leaf Expander with orthodontic bands on 16-26 and extension arms up to 14-24 is inserted. Once fitted, the Leaf Expander is pre-activated, this means that : the clinician extracts a key placed at the base of the springs and the device begins to release 900 gr of force and automatically will ensure a future gain of space equal to 3 mm. The successive activation of the device will be made according to a slow and specific protocol to perform a dento-alveolar expansion. The orthodontist will continue the device activation according to how much space is needed for the transversal correction, following the rule that each activation generates 0.1 mm of expansion. Then the bonding of the inferior dental arch is performed to begin the decompensation phase. After that (usually in the next appointment) the Leaf Expander is left in place and the multibrackets appliance is also bonded on the superior dental arch.

CLINICAL CASE

Caucasian girl aged 16 years and 4 months, hyperdivergent skeletal pattern, tendency of skeletal Class III, first molar and canine dental class with endoinclination of the posterior sectors, slight crowding of teeth, at the end of her growth and with a severe transverse deficit.

FIG. 3 - Initial records

FIG. 4 - Final records

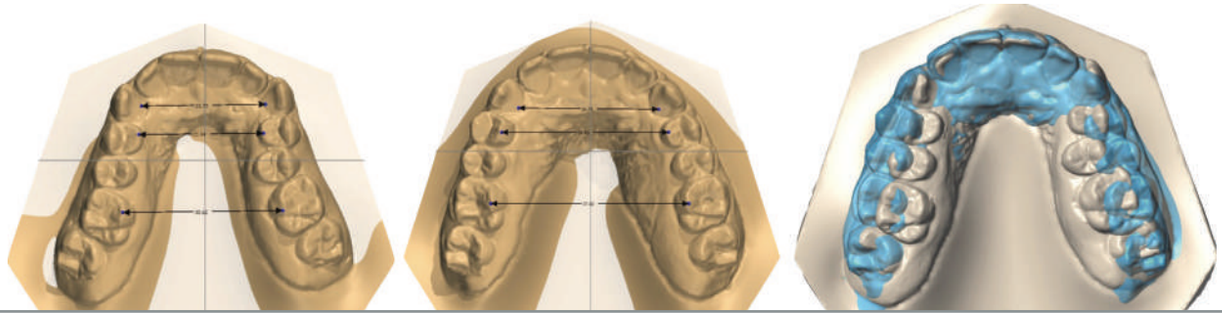


FIG. 5 - Pre-post digital models overlay

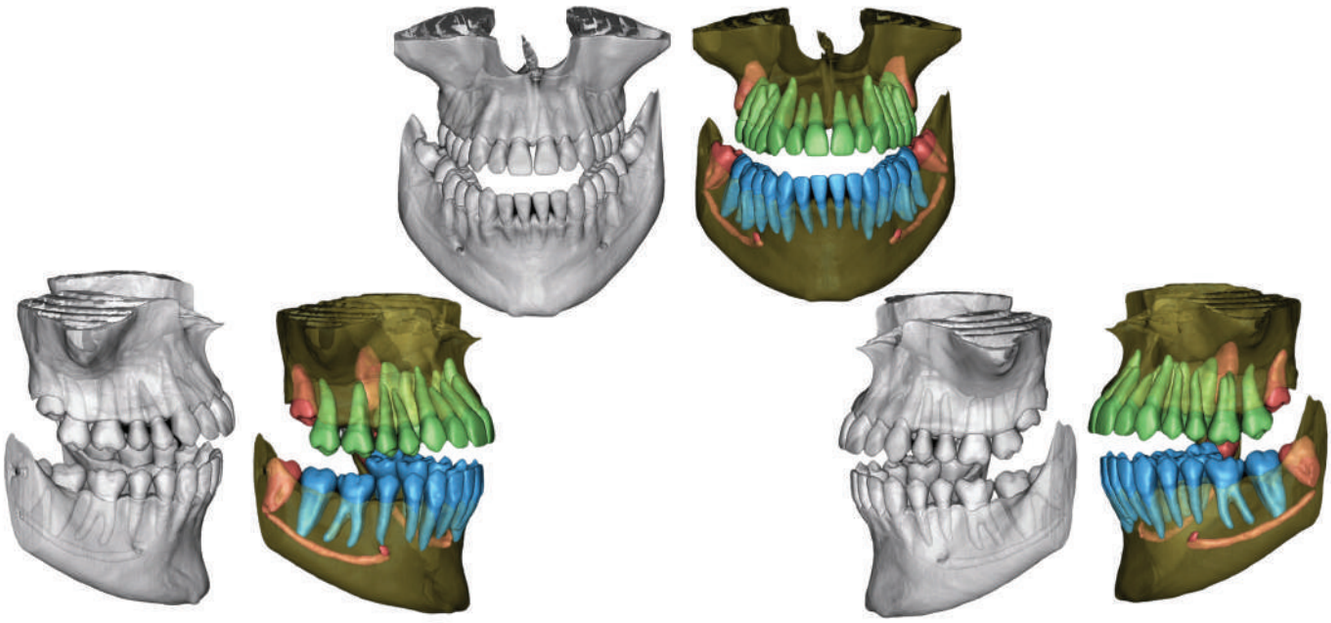


FIG. 6 - 3D Digital models

CONCLUSIONS

The Leaf expander is the ideal device to accomplish an orthodontic maxillary expansion, with use of well-calibrated and constant forces. This device creates a proper maxillary dento-alveolar expansion by means of bodily movements of the teeth; moreover the controlled movements of lateral and posterior maxillary sectors avoid the dental tipping phenomenon. Several are the advantages of using the Leaf Expander:

- VISUAL CONTROL OF ACTIVATION
- EASY ACTIVATION
- PREDICTABILITY OF RESULTS
- LIGHT CONSTANT FORCES
- SAFETY
- NO COMPLIANCE

The expansive action of the Leaf Expander is a therapeutic choice useful for the resolution of moderate or severe maxillary transverse discrepancy in skeletal Class I, II or III malocclusions. The Leaf Expander use is comparable to orthodontic devices like the rapid-maxillary expander, Quad helix, multi brackets appliance but it differs due to its advantages. In the presented case, the use of the Leaf Expander was fundamental for the treatment success.

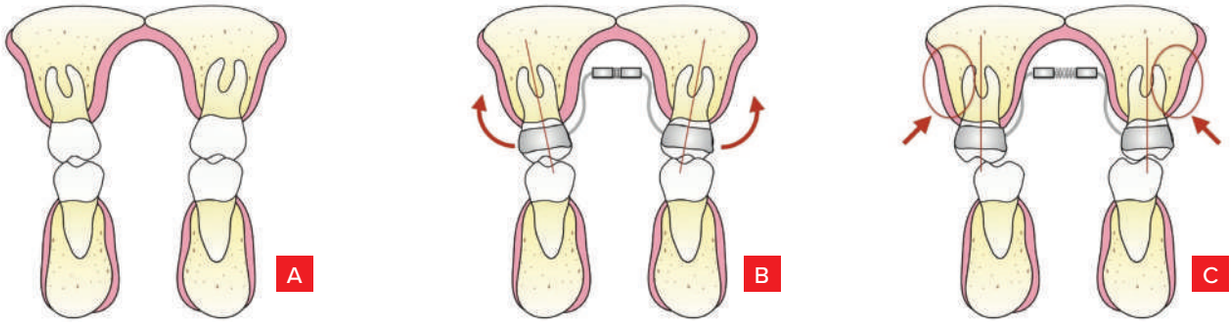


FIG. 7
A. Initial clinical state;
B. Representation of tip movement, not made by the Leaf Expander device;
C. Representation of the Leaf Expander: contemporary body movement with minimal movement of tip

NEW

RAPID EXPANDER TOOTH BORNE

The CAD-CAM Rapid Expander Tooth Borne screw is the optimized CAD-CAM version of the Leone's best seller expander: instead of the arms, it has four transversal housings with an ending stop on the bodies that allow a perfect oriented coupling with the digitally designed and SLM manufactured framework, thus assuring an optimal laser welding process.
It is recommended for the utilization on tooth borne appliances. This series of expanders keeps all the features and sizes of our worldwide famous expander, allowing doctors to smoothly switch to digital manufactured RPEs.
Expansion capacity in mm, directional arrow and lot number are laser marked on the body of the screw.

Supplied with:
- 1 stainless steel key (to be used only inside the lab)
- 1 blue swivel key with handle
- Instructions for the patients

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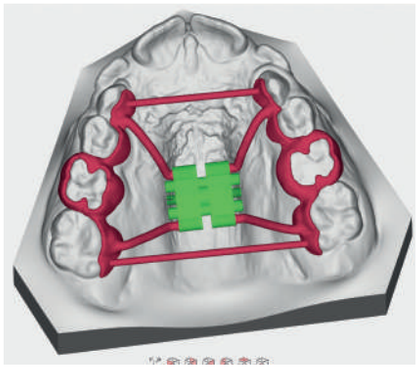

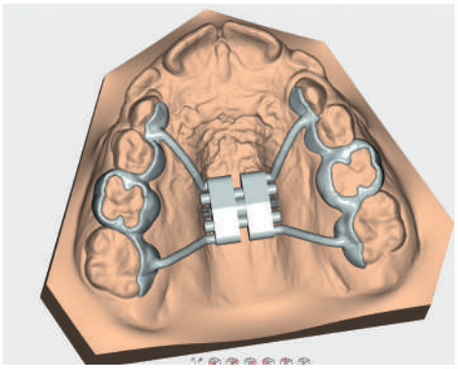

			CODE					activation turns
11 mm	4 mm				body mm	mm		*for maximum expansion limit*
front view		*back view*	**A0620D08**	2 mm	12 mm	8 mm	0.8 mm	35
front view		*back view*	**A0620D09**	2 mm	14 mm	9 mm	0.8 mm	40
front view		*back view*	**A0620D11**	2 mm	16 mm	11 mm	0.8 mm	50
front view		*back view*	**A0620D13**	2 mm	18 mm	13 mm	0.8 mm	60

NEW

EASY ACCESS MICRO EXPANDER TOOTH BORNE

This expander is the optimized CAD-CAM version of the Stealth Easy Access. Instead of the arms, it has two transversal housings with an ending stop on the bodies that allow a perfect oriented coupling with the digitally designed and SLM manufactured framework, thus assuring an optimal laser welding process. Thanks to the more visible screw holed-head, the micro expander A1621D allows an easier intraoral activation with the swivel key. It is recommended for dental anchored expanders. This series of expander keeps all the features and sizes of our classic worldwide famous expander, allowing doctors to smootly switch to digital manufactured RPEs. Expansion capacity in mm, directional arrow and lot number are laser marked on the body of the screw.

Supplied with:
- 1 stainless steel key (to be used only inside the lab)
- 1 swivel key with handle
- Instructions for the patients

Pack of 1

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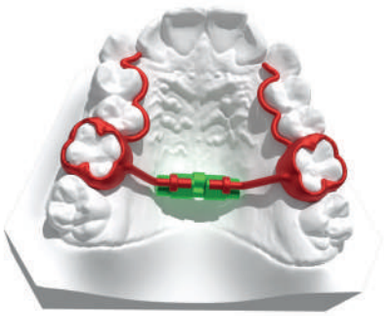

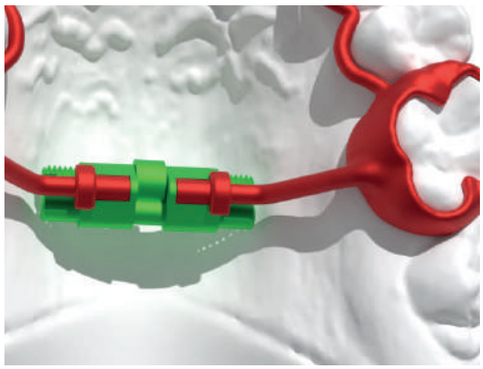

4,95 mm	4,05 mm		CODE					activation turns
				mm	body mm	mm		for maximum expansion limit
front view		*back view*	**A1621-08D**	2	12	8	0.8	35
front view		*back view*	**A1621-11D**	2	16	11	0.8	50
front view		*back view*	**A1621-13D**	2	18	13	0.8	60

NEW

EXPANDER LOWER ARCH TOOTH BORNE

The CAD-CAM expander for lower arch Tooth Borne is the optimized CAD-CAM version of the Torko lower screw. Instead of the arms, it has two transversal housings with an ending stop on the bodies that allow a perfect oriented coupling with the digitally designed and SLM manufactured framework, thus assuring an optimal laser welding process. The main characteristics are the same of the classic A0623 expanders, featuring a flat profile that reduces the overall bulkiness, particularly important since it is recommended for the use on lower jaw tooth borne appliances. Expansion capacity in mm, directional arrow and lot number are laser marked on the body of the screw.

Supplied with:
- 1 stainless steel key (to be used only inside the lab)
- 1 key with safety ring leash
- Instructions for the patients

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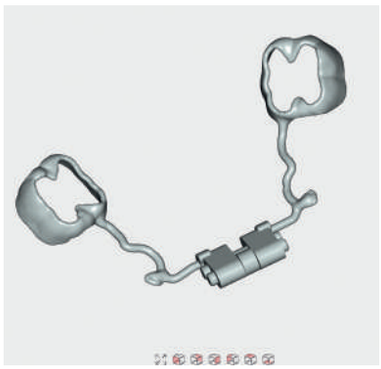

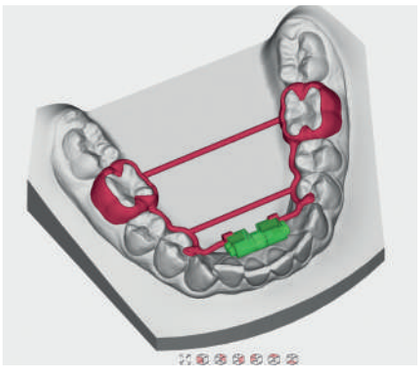

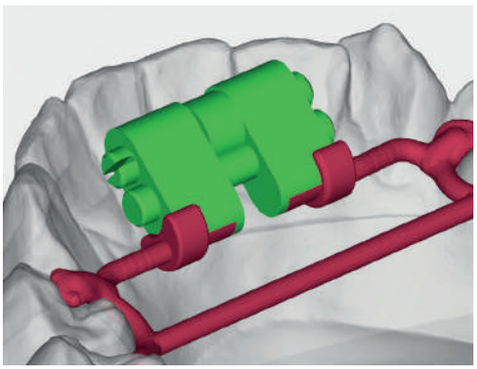

	7,5 mm	4 mm		CODE		body			activation turns
					mm	mm	mm		for maximum expansion limit
front view			back view	**A0623-08D**	2	12	8	0.8	35
front view			back view	**A0623-11D**	2	16	11	0.8	50

NEW

LEAF EXPANDER TOOTH BORNE

The CAD-CAM Leaf Expander is a spring loaded expander that, along with the male screw, has two or three MEMORIA Ni-Ti leaf springs that allow the release of calibrated and continuous forces to promote the expansion of the maxillary arch. It is a device optiamized for the CAD-CAM procedure, instead of the arms it has four transversal rounded slots on the bodies that allow a correct oriented coupling for the welding of digitally designed customized laser melted framework. The main features are the same as the standard Leaf expander series. It is recommended for the utilization on tooth borne appliances. This expander series keeps the efficiency of the classic expander while looking towards the future.

Supplied with:
- 1 stainless steel key (to be used only inside the lab)
- 1 swivel key with handle

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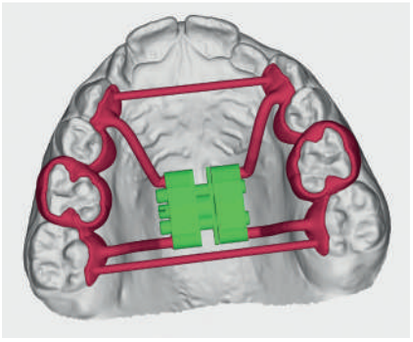
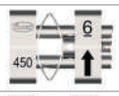
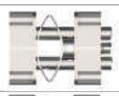
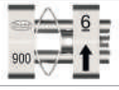
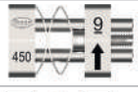
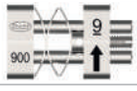


	11 mm	4 mm		CODE	mm	body mm	mm		activation turns for maximum expansion limit
front view			back view	**A2703-06D** 2 springs 450 g approx	2	12	6	0.4 mm	30
front view			back view	**A2704-06D** 2 springs 900 g approx	2	12	6	0.4 mm	30
front view			back view	**A2703-09D** 3 springs 450 g approx	2	16	9	0.4 mm	45
front view			back view	**A2704-09D** 3 springs 900 g approx	2	16	9	0.4 mm	45

EXPANDER ACTIVATION GUIDELINES	LEAF expander cementation		FIRST visit		SECOND visit		THIRD visit
6 mm **A2703-06D - A2704-06D**	spring activation 0 turns	after 6 weeks	10 turns	after 4 weeks	10 turns	after 4 weeks	10 turns
9 mm **A2703-09D - A2704-09D**	spring activation 0 turns	after 8 weeks	15 turns	after 6 weeks	15 turns	after 6 weeks	15 turns

NEW

LEAF SELF EXPANDER TOOTH BORNE

Leaf Self Expander is a spring loaded expander equipped with four or six MEMORIA Ni-Ti leaf springs that allow the release of calibrated and continuous forces to promote the expansion of the maxillary arch.
It is a device optimized for the CAD-CAM procedure: instead of the arms it has four transversal rounded slots on the bodies that allow a correct oriented coupling for the welding of digitally designed customized laser melted framework. The main features are the same as the standard Leaf expander series. It is recommended for the utilization on tooth borne appliances.
This expander series keeps the efficiency of the classic expander while looking towards the future.

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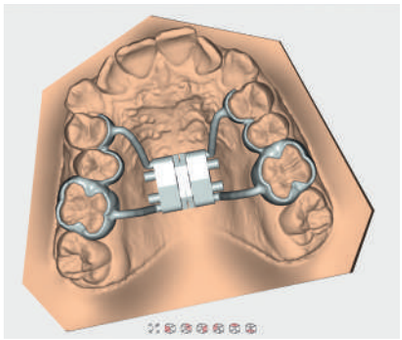
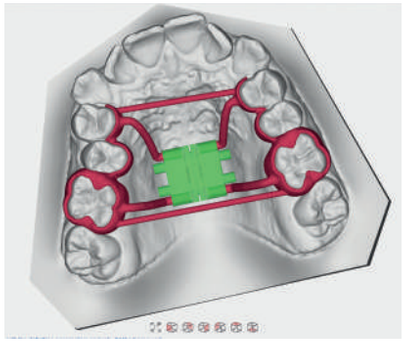
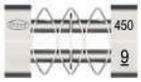
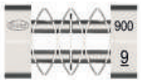




11 mm	4 mm		CODE	mm	body mm	mm
front view 		*back view*	**A2705-06D** 4 springs 450 g approx	2	11	6
front view 		*back view*	**A2706-06D** 4 springs 900 g approx	2	11	6
front view 		*back view*	**A2705-09D** 6 springs 450 g approx	2	15	9
front view 		*back view*	**A2706-09D** 6 springs 900g approx	2	15	9

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