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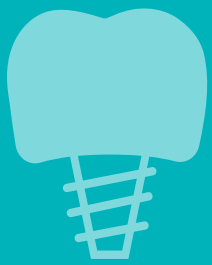

DENTAL IMPLANTS

AISER is a Swiss medical devices manufacturer that developed its technologies in partnership with Université de Genève.
AISER dental implants are the result of continuous technical research, top-level quality control and advanced clinical research and trials.

All of that is aimed at solving the daily problems professionals have to face in the practice, delivering cutting-edge technologies capable of the best biological results

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AISER's groundbreaking titanium surface treatment. The treatment guarantees a stable, oxidized, hydrophilic, nanoporous surface, with astonishing biological and mechanical properties. Surface high roughness profile, and implants design allow to achieve optimal primary stability. Superior Bioactivity features assure fast and high grade secondary stability and osseointegration.

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The Unique Traceability Document (UTD) is how we can trace back the logistics and all the production stages of our products.
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Davide Malacrinò
Research and Development Manager
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AISER® Implant System is not designed to compromise • Mechanical reliability of Top Class Titanium Astonishing bioactivity performance of AISER® Biosyn-D surface • Reliability and Innovation, to provide professionals simply the best AISER® Implant System is designed to provide reliable implants to address all clinical needs • AISER® Implant System consists of three implant lines: AISER® Tytan, AISER® Themys, AISER® Ceos.

TYTAN®

Tytan implant line is designed to treat D1, D2 mandibular bone tissue.
The dual-coil design allow high grade overall stability containing the attrition on the ridge.

THEMYS®

Themys implant line is designed to treat D2, D3, D4 maxillary bone tissue.
The single-coil, wide pitch, wide thread design allow a neat cutting performance, avoiding tissue compression.

CEOS®

Ceos implant line is designed for the extrasinus zygomatic surgery.
Implant apex is treated with AISER® Biosyn-D technology to allow a reliable osseointegration. The tip of the implant is hollowed, as for all AISER implants, to allow a safe insertion.

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B&B Dental

1to3 solution the easy and fast way to surgery

Guided surgery in dentistry is becoming a stronger branch in the field of implantology as it is an increasingly frequently applied practice.

Before entering into the merits of guided surgery, it is worth anticipating, **thanks to a market research organized by B&B Dental through Key-stone**, two thirds of the clinics involved in the research declare that they use guided surgery. *The average of the total surgeries is 9% of cases. One third of the users carry out the complete case from planning to implant placement, one third refer to the production of the provisional before the surgery, and the rest for planning with traditional surgery only.*

But what are the difficulties that are generally reported by doctors who decide not to adopt this technique?

According to the research carried on a sample of Italian clinics questioned on guided surgery, the most common objections are:

- excessive costs compared to the possible benefits
- little aptitude for the use of digital systems
- lack of system accuracy
- lack of support from the implant house.

The costs that are attributed to guided surgery concern all the additional steps and times. The **clinical data have to be recorded, analyzed, studied and digitalized** to design and print the surgical guide, the device that allows the surgery. This time will be optimized in terms of time and costs, in multi-implant cases but with a smaller number of implants the total time can be even longer.

This must be measured by giving weight to less tangible factors:

-the patient who undergoes a guided surgery procedure will have **less pain in the post-operative period and the operating times themselves will be significantly shorter**;

-the ease with which **immediate loading** can be planned in the same surgical session has to be considered;

-the comfort of the clinician who can focus on the patient's well-being and on the correct management of the surgery will be perceived by the patient as attention and care towards them.

These factors add up and become an **excellent word of mouth** topic among patients who report a generally more relaxed and innovative experience, especially if associated with a digital impression. It is from here in fact that with few cases the balance of costs will begin to tilt in favor of the dental practice.

The other difficulty is represented by learning a new method. It is important to underline that any technique or new approach that you include in your dental practice requires a learning curve at a clinical level and as an organization of work with the team (assistants, laboratory technicians and suppliers). B&B Dental provides multiple support to this topic;

– **offering intensive theoretical and practical training courses**, to lead the clinician to autonomously manage the initially simpler cases up to the more articulated and complex ones,

– **offering an internal service for planning and printing templates** through its own laboratory within which there is a team of expert technicians and dentists

– **electronic support** during the management of individual cases.

– ***Through a web of dealers and partners*** *who are available for training and support.*

B&B Dental has also created a **kit that has been defined as the most complete** kit ever in terms of clinical applications and instrument ergonomics.

Moreover **B&B Dental offers a Guided software that can be downloaded for free from the company's website** and allows the opening of DICOM files and directories of any type, the conversion of DICOM files into STL with manual or semi-automatic correction of the reconstructed surface, the creation of guides using double-scanning technology and the creation of files for printing the templates.

In closing, it is right to underline that although human skills and training can lead to an ever-greater precision of the operator.

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The sloping shoulder of the Bicon implant consistently provides for gingivally aesthetic restorations. These restorations are easily achieved because the bone that is maintained over the shoulder of the implant provides support for the interdental papillae. Bicon's unique design and its revolutionary clinical techniques have not only passed the test of time, but also continue to lead the field of implant dentistry.

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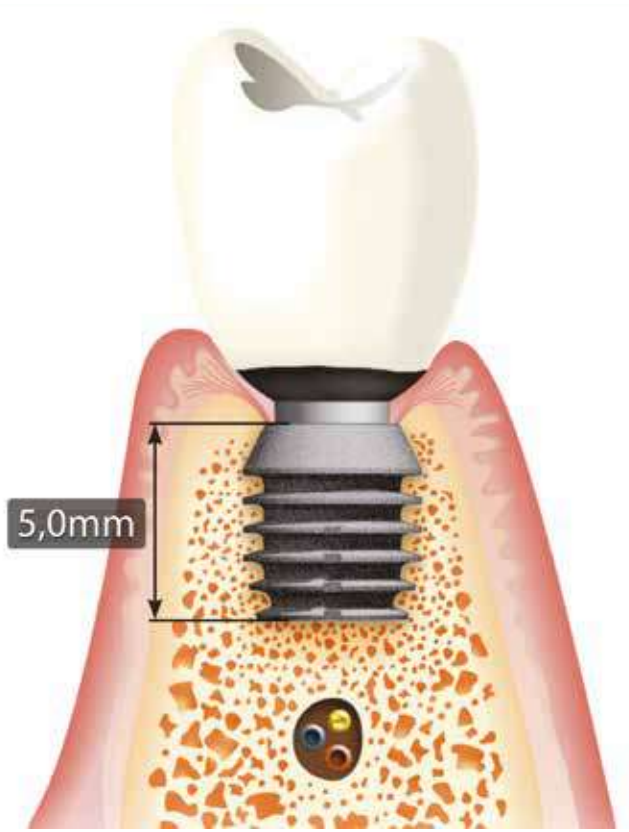

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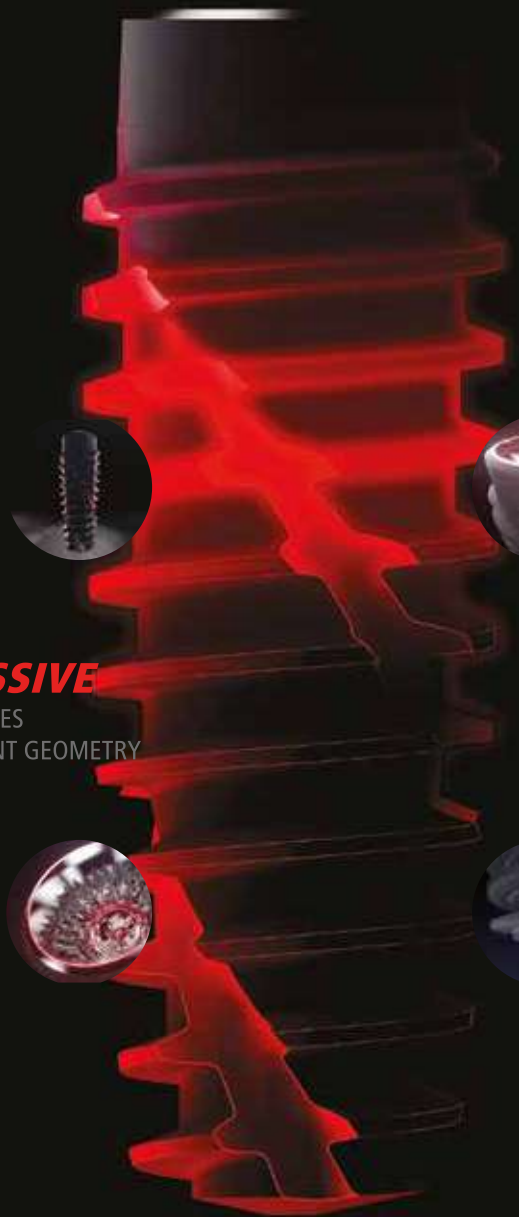

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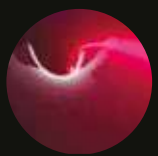

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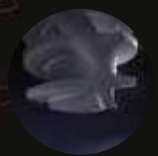

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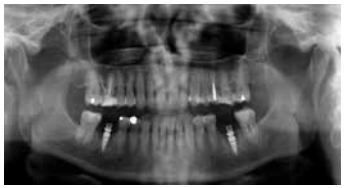
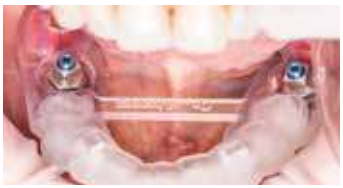
Dr. Orlando Alvarez




Today to navigate on the road you use GPS systems, why not in dentistry?
Here there is a septum case that was solved via combination of virtual implant planning software - Implant Studio (3Shape), with Cortex Guided Surgery Kit System that provides the ability to perform the right implant installation, and Magix Implant by Cortex - a proper implant design that could act as a bone expander using a minimum bone drilling.
The case was planned remote to the treatment place in the Digital Lab at Cortex HQ. After one week the surgical template was received in Chile, where the procedure was performed.

Following the clinical and radiographic examination, a virtual diagnostic impression was taken plus a CBCT scan. The digital data files were imported into computer-guided planning software and perfectly merged.
Cortex Magix implant for the mandibular first molar was virtually planned for placement in the septum site. The ideal position of the implant was virtually planned based on the anatomical architecture and prosthetic considerations. The angulation and vertical position of the implant were determined to minimize axis loading of the implant and create a proper emergence profile.

A 3D printed surgical template from a rapid prototyping machine (Stratasys) was designed and fabricated for the surgery. The drilling osteotomy and Implant installation process were smooth and precise, and the results run as they were planned.
Advances 3D imaging technology, including CT scans combined with CAD/CAM technologies have revolutionized the field of implant dentistry.

The use of computer-guided implant surgery was developed to allow a visualized, precise and prosthetically driven virtual planning. It allows to improve the accuracy of surgical implant placement and final prosthetic outcomes.

There are clear advantages to the clinician as well as to the patient. Some of them are reducing the time of the procedure and the healing process. The implant installation is more secure, like when planned to be installed in a fresh socket site or an incomplete bone healing of a lower or upper first molar.

In conclusion, the procedure based on a virtual simulation allows you a complete analysis of 3D implant position in relation to vital maxillofacial structures such as nerves, sinus, adjacent teeth and of course the limits of bone (quantity & quality). More importantly, it provides a link between the virtual prosthetically driven treatment plan and the actual surgery by transferring the simulated intervention accurately to the surgical site via a surgical template made exclusively to your case and selected implant.

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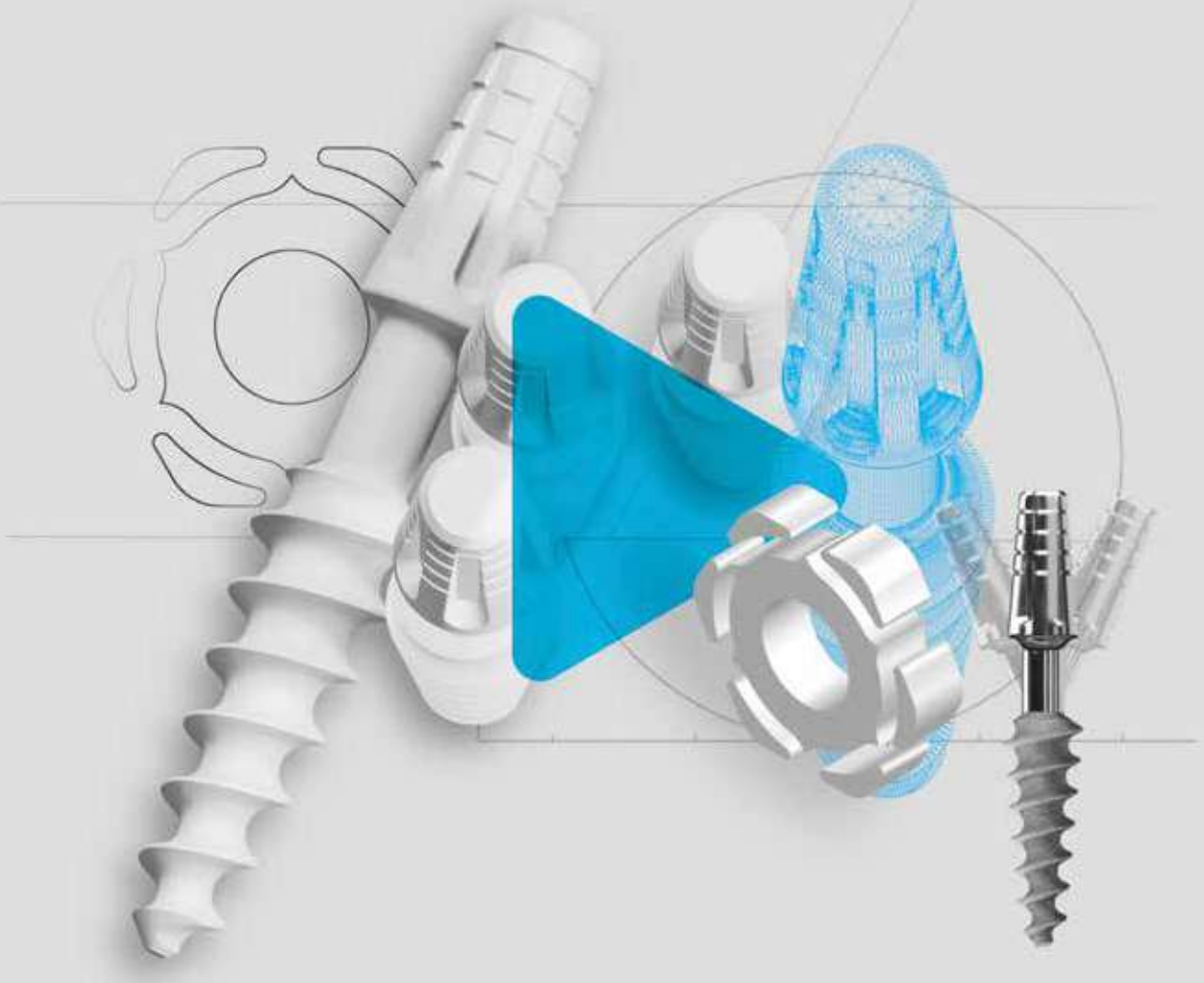

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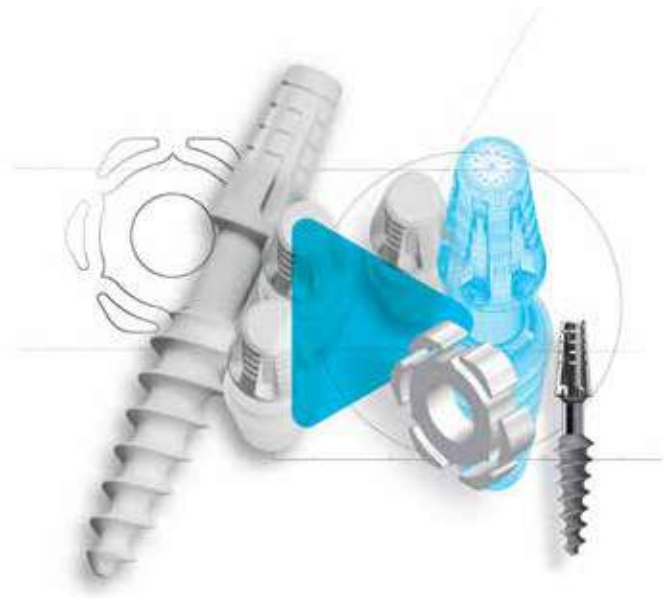
Dental Tech

New D-One Implant System.
One-piece implant with compressive threads

With **over 40 years of experience** in the biomedical and dental implantology area, Dental Tech is an established and constantly growing company in Italy and abroad and specializes in the design, production and distribution of dental implants. In order to satisfy any clinical need, the implant line available to professionals is very wide and includes conical and cylindrical implants; with internal and external connection; transmucosal and submerged implants; short implants and one-piece implants.



Soon, Dental Tech's product range will further expand with **D-ONE implant**.

· **One-piece implant** with compressive threads used for multiple unit restorations with immediate loading in the upper and lower jaws, to provide an anchor for prosthetic superstructures for dental restorations.

· It can be used in combination with others implants and allows for simplified positioning and prosthetic procedure, both with flap and with flapless technique.

· It can also be used as a final or intermediate abutment for fixed or removable bridges and to hold dental prostheses.

· Abutment direction can be adjusted up to **15°** relative to the implant axis, ensuring the desired prosthetic parallelization, but also allowing to take advantage of the adjacent stable bone structures.

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1 Source: CEPID - Centro de Ensino e Pesquisa em Implantes Dentários. Universidade Federal de Santa Catarina. Prof. Dr. Ricardo Magini e equipe. 2018. **2** Aguiar Vilela Júnior R, Aranha LC, Elias CN, Martinez EF. In vitro analysis of prosthetic abutment and angulable frictional implant interface adaptation: Mechanical and microbiological study. J Biomech. 2021 Nov 9;128:110733. doi: 10.1016/j.jbiomech.2021.110733. Epub 2021 Sep 7. PMID: 34530293.

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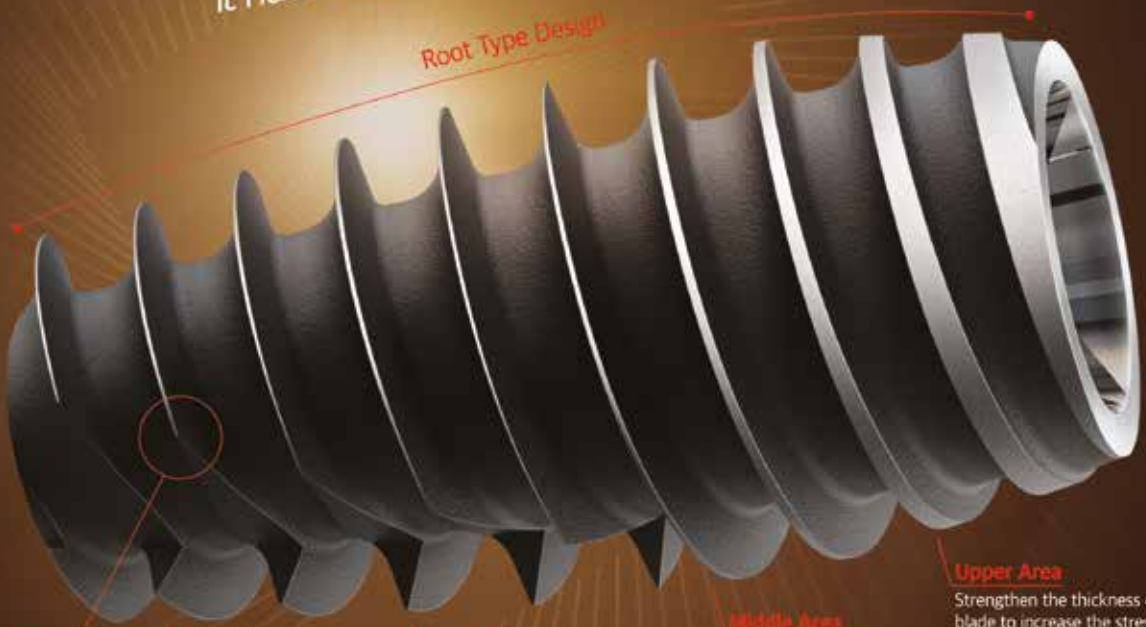
It has excellent initial fixation for weak bone



Wide cutting Edge

Stable self-cutting is possible with a 90degree cutting edge.

You can tap in the from of a sharp blade of triangular thread.

Lower Area

The gradually narrowing tapered body design can minimize the insertion torque in the bone. Securing strong initial fixation in the sponge bone.

Middle Area

The largest diameter increases the contact force with alveolar bone, increasing the initial fixation and primary stability.

Upper Area

Strengthen the thickness of the screw blade to increase the stress of the bone. Reverse tapered form, it can secure residual bones and place them in narrow bone width.

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Self-advancing/self-tapping conical implant design for cortical bone protection, with bone-level insertion. Features an internal-hex conical connection providing implant-to-prosthesis complete sealing. The switching platform design results in optimal shaping of the gingival tissue emergence profile. The conical connection morphology helps decrease microbial infiltration. Also available in a smaller diameter for difficult clinical situations.

Surface: SLA. Double acid etching and sandblasting with particles to achieve a rough surface thanks to microabrasion.

Diameters: 3.0, 3.50, 4.30 & 5.00 mm

Connection: 12° internal conical connection with hexagon (anti-rotation element).
Ideal for: Solution for delayed and immediate loading.

IBO Compatible Attachments & CAD/CAM Digital Workflow

New: New line of intraoral scanbodies.

Dimensions: Monoblock, prevents divergence in coupling. Reduced height for easier use in mouth, same diameter as the connection.

Manufacturing: 100% in medical grade 5 Titanium, for easier X-ray visualization and seating verification. Zirconium Nitride (ZrN) surface treatment makes scanner reading easier.

Specifications:
Color: Creamy white
Thickness: 0.5–6 µm
Roughness: Ra ≤ 0.05 µm
Adhesive strength: at least HF 1
(DIN EN ISO 26443)
Hardness: ~ 2,500 HV

CAD/CAM Workflow: Certified digital CAD/CAM libraries for implant level works, Ti-bases or Cr-Co bases.

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FACILITATES a reduction of microorganism infiltration.

PROVIDES an optimal conformation of the emergence profile of the gingival tissue.

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• IML

UNIVERSE IMPLANT

Manufacturer: IML SA Swiss Dental Implants

Morphology: Conical shape, with double differential spiral thread also present in the apical part. The alternate spur and square double spiral loop generates a perfect balance between intrusive, compressive, and diverging forces capable of providing the bone with extraordinary growth stimuli. The collar, which has microgrooves, varies according to the diameters and lengths of the system and ends with a smooth switching platform, a feature that promotes high biofunctionality and homogeneous distribution of mechanical stresses.

Surface: SL treatment, technically comparable to the best SLA® treatments. It suits any type of bone thanks to its ability to increase primary stability even in the presence of atrophic sites or compromised biological tissue.

Available Implant Lengths (mm): 6 – 8 – 10 – 11.5 – 13 – 15

Available Implant Diameters (mm): 3.4 – 4 – 4.5 – 5

Seating Position To The Bone Crest: 1mm under the bone crest

Abutment-Implant Connection Type: Twelve-sided Morse-taper internal connection, operated by a passing screw. Such locking 6° taper connection with a passing screw achieves a precise and functionally perfect fit, offering a perfect antibacterial seal. The design of the prosthetic part is provided with hexagonal connection that facilitates the procedure during the prosthetic phase. This type of connection is the only one that approaches the ideal condition of the one-piece implant, universally proven to be long-lasting. The same prosthetic parts size (ØU) is used for all implant diameters, facilitating both the surgical phase and the supply management.

Index type abutment repositioning: Twelve-sided Morse-taper internal connection: 12 possible abutment positionings

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• IML

STARFLY IMPLANT

Manufacturer: IML SA Swiss Dental Implants

Morphology: Tapered morphology, with self-tapping apex and emphasised spirals, features that simplify the insertion of the implant in medium and soft bone and in post-extraction cases with a reduced osteotomy, guaranteeing excellent primary stability. The rounded tip facilitates the centering of the implant hole and reduces the lesions risk to anatomical structures. The hybrid neck – polished and cylindrical towards the cortical portion, and smooth golden-yellow anodized where it results in a switching platform – contrasts the bacterial attack while enhancing the soft tissues adhesion and the maintenance of the crestal bone level. The flaring internal hexagonal connection reduces the horizontal strain on the bone, distributes correctly the masticatory forces within the implant, protects the retention screw from excessive load, guarantees an excellent stability of the prosthetic parts and an optimal, long-lasting bacterial seal.

Surface: SL treatment, technically comparable to the best SLA® treatments. It suits any type of bone thanks to its ability to increase primary stability even in the presence of atrophic sites or compromised biological tissue.

Available Implant Lengths (mm): 6 – 8 – 10 – 11.5 – 13 – 15

Available Implant Diameters (mm): 3.5 – 4 – 4.5 – 5 – 6

Seating Position To The Bone Crest: Submerged. The SL treated part of the implant must be completely submerged into the bone. The polished cylindrical neck, aimed at the endo-osseous positioning, guarantees flexibility in managing the depth during the implant positioning.

Abutment-Implant Connection Type: The same prosthetic parts size (RP) is used for all implant diameters, facilitating both the surgical phase and the supply management. Starfly prosthetic components are available in the product range both in Friction version – in which the faces of the hexagon have 1° conometry – and in classic version – with the hexagon displaying parallel faces at 0°.

Index type abutment repositioning: Hexagonal internal connection.

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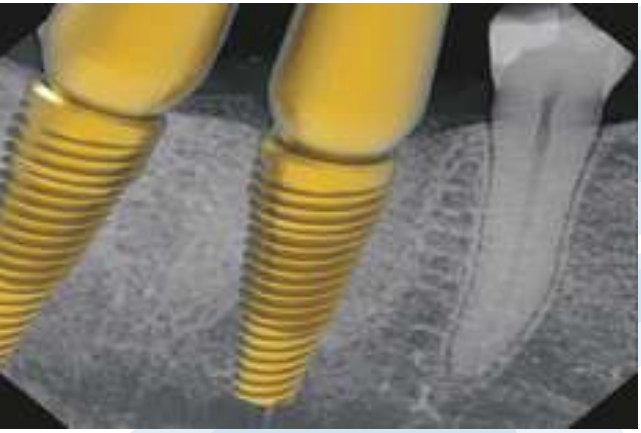
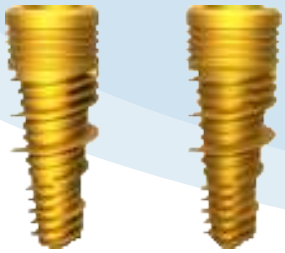


PHI was **born in 1991** and its goal has always been to produce highly innovative and scientifically developed implants. **The PHI (Primary Healing Implant) method enables primary bone repair.** Primary bone healing has been studied mainly in orthopedics by Prof. R. K. Schenk of the University of Bern.

The PHI implant insertion is by coupling, without forcing, and this has always been the first difference with traditional implants. This means **not only no pressure, but also no tension.**

The integration process of the PHI implant was evaluated in a multicentre study carried out in 8 different centres on approximately 2500 implants placed over 24 months and **the success rate was 99.28% overall** (mandible and maxilla). These trials were presented at several IADR world congresses.



The **cono-morse connection** is today the most versatile prosthetic connection for both screw-retained and cemented prostheses.

The **morphology of the EVO implant** (with its cylindrical body in the coronal part and conical in the medullary part, the large self-centring coils with 1.5 mm pitch and the osteogenic corrugations), allows an atraumatic implant insertion for the patient, with long-term follow-up (more than 25 years).

The EVO implant also has a **three-principle apical coil** with a 0.5 mm pitch that promotes primary stability.

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Ø 3.10mm
Ø 3,60mm
Ø 4,10mm
Ø 4,60mm
Ø 5,10mm

Conical Active

- Conical connection with internal antirotational hexagon
- Switch platform system
- Anti percolation tapered connection

Diameters
Ø 3.50mm
Ø 3,90mm
Ø 4,40mm
Ø 5,50mm

Seventeen-One

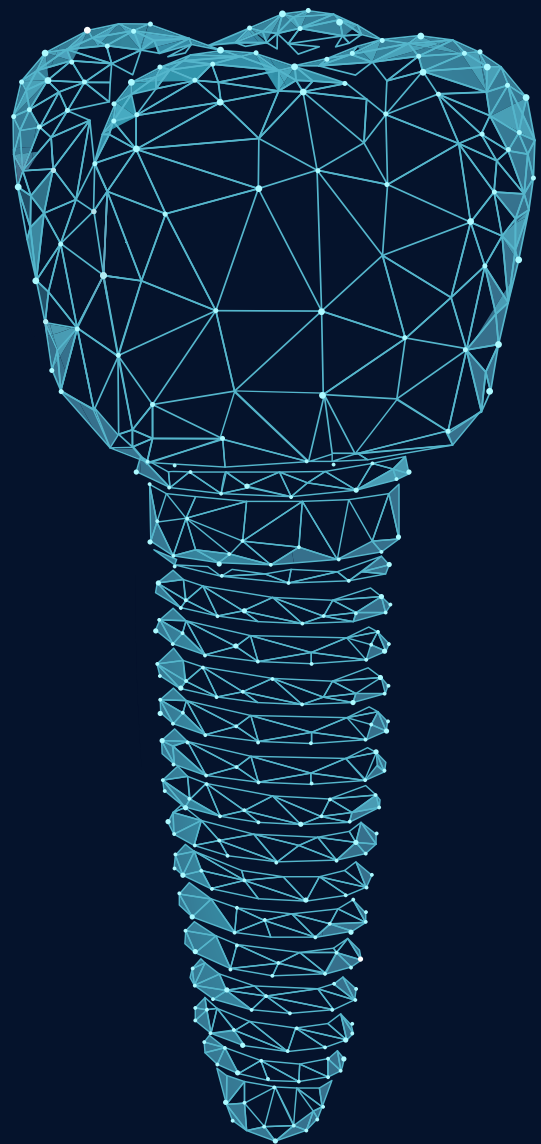
- Internal hexagonal connection
- Switch platform system.
- Coronal microthread

Diameters
Ø 3.30mm
Ø 3,75mm
Ø 4,20mm
Ø 5,00mm
Ø 6,60mm

Easy

- Mini implant designed for stabilization of total prostheses
- Sphere of 1,8mm
- Simplified and minimally invasive surgical protocol

Diameters
Ø 2,3mm
SUPERIOR
Ø 2,00mm
INFERIOR



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The Fixo line system consists of one-stage implants, ideal for the Surgeon who plans an immediate loading rehabilitation. In their one-piece body they integrate a multi-unit-abutment, with 0°, 17° or 30° angulations, in order to fix the disparallelism consequent to the insertion of implants with different inclinations.

To promote optimal soft tissues management, the collar is realised with a particular anatomical conformation, available in two different heights - short and long - adaptable to any morphology. The pink colour also allows the perfect harmonization with the gingival papillae, for an excellent treatment result also from the aesthetic point of view.

Fixo is therefore a "fast" implant: it does not require the screwing of the multi-unit-abutments and the radiological check of their tightening. Consequently, the operating times and the required effort have considerably decreased, to the benefit of the patient's comfort.

Fixo is also "safe": the absence of a connection between implant and abutment determines that the annoying problems resulting from bacterial infiltrations and micro-movements can no longer occur.

The chamfer has a considerably reduced size: in fact, rotating the Fixo around the vertical axis in the morphologically worst case (17° angulation of the Mua platform and 2 mm collar), its outermost point describes a circumference of 4.8 mm, against that of 7 mm diameter obtained in the same way by a traditional "implant + mua" system.

This determines that, even in the most unfavourable situation, the Fixo can be inserted without the use of bone-mill drills, with the consequent safeguard of the bone quantity.

The inclination of the collar relative to the horizontal axis, much more "open" than currently used, promotes better patient's cleaning: plaque accumulation is therefore reduced, minimising one of the causes that determine the onset of dangerous peri-implant inflammations.

The connection between the prosthesis and Fixo is realised with a M1.8 screw, 2.5 mm long, which can be tighten with a 30 Ncm Torque. In this way, the problem of the possible breakage of the small M1.4 screw, traditionally used in screwed prostheses, due to the considerable chewing loads, is prevented.

Fixo, considered the perfect coaxiality of the implant-mua monobloc and the reduced diameter of the chamfer, is easy to use with the most popular guided surgery systems. Taking into account these characteristics, during its insertion there is no interference with the guiding sleeves positioned in the surgical guide. The template is simply removable at the end of the intervention.

However, the tools available in the dedicated surgical kit allow the Fixo to be used easily even in traditional surgery: a specific guide, for example, can in fact provide support in creating the implant site with the best angulation and also, the particular pins allow to evaluate previously what is the best angle of the multi-unit-abutment platform to be used in each single case.

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Root Open implant system

Created for dentists by dentists

The ROOTT Implant System was developed and is being constantly upgraded by TRATE AG in close cooperation with members of Open Dental Community.

The ROOTTCONCEPT has dispensed with the overcomplicated treatment procedures recommended by implant manufacturers who are limited by their products on the market.
The ROOTT philosophy is to create the ideal artificial tooth which organically integrates with existing biological structures in the simplest way.

The system development aims at reflecting the collective view of independent dental experts throughout the world, thus TRATE AG closely cooperates with the Open Dental Community NPO (Luxembourg). This approach helps to avoid reliance on individual opinions and makes dentists free to select the method most suitable for the patient.

Back in the old days original implants' design had a form of a straight parallel wall. But since then science has greatly moved on with the modern designs being tapered. The tapered design (also known as "V-shape design", "tapered shape design") imitates the root of a real tooth. This kind of design allows more placement options and more room available for finding the best position for it, especially in cases when the implant placement should perform in a limited space. And it makes always more sense to go with the patterns of nature rather than with an artificial straight wall design that is contrary to nature.

Besides that, the V-shape design allows to preserve more bone. When inserting a tapered implant less bone gets displaced than with a straight wall design. The diagonal V-shape design has proven to provide a greater primary stability than just a straight body design.
Root open implant system has 3 implant family designs - **ROOTFORM** (two-piece implants), **COMPRESSIVE** and **BASAL** (one-piece implants).

The core is the two-piece implant ROOTFORM - it has an aggressive implant body design with a deep tapered conical connection and an indexing hex. Besides that, wide variety of prosthetic options make it a very versatile system. Rootform implants are suitable for single and multiple restorations with delayed and immediate loading in the upper and lower jaws in all types of bone tissue. Implant can be placed by flap or flapless approach. Implant placement is also possible immediately following tooth extraction, in case sufficient bone tissue is available vertically and horizontally.

Sizes. A wide variety of diameters from 3.0 to 5.5 mm and large selection of lengths from 6 to 16 mm allows always to find the right size of implant for a patient. Special design of ROOTT conical connection allows to create a special size of an implant with minimum diameter of just 3 mm, which makes possible to replace lower incisors easily and in some cases due to a great torque load even immediately.

The same platform for all diameters. For all diameters of ROOTFORM implants one platform was developed. No matter which diameter of implant will be used, there will be no need to care if it is correct platform or not. It helps to eliminate the stock and to simplify practice.

Conical connection. Flat-on-flat connections were proven to create a micro-gap between the abutment and the implant while chewing. This constant opening & closing begins to act as a pump that sucks in all kinds of bacteria, which can lead to peri-implantitis and implant prolapse. That's why TRATE developed ROOTFORM implants with conical connection. This connection is so tight that there is no micro-gap visible even under an electronic microscope.

Multi-functional part gratis. Each ROOTFORM implant comes together with a free multi-functional part (CRE) which is made of the same material as implants and abutments. Many of dentists use CRE as temporary or permanent straight abutment. It's possible to reduce the costs up to 30% simply by using CRE part as abutment.

· **COMPRESSIVE** - the compression screw implant is ideal for simplified immediate loading protocols in healed edentulous ridges. It is used for multiple unit restorations with immediate loading in the upper and lower jaws with adequate bone tissue. It can be used in combination with basal implants and allows flap and flapless placement. Abutment direction can be adjusted using a special instrument up to 15° relative to the implant axis. It can be used with caution to create single restorations in situations where high primary stability is achieved on placement. There is wide variety of diameters from 3.0 to 5.5 mm and large selection of lengths from 6 to 20 mm.

· **BASAL** - the axial bicortical screw design is used to treat the more challenging cases with simplicity and efficiency. They can be placed in extraction sockets and in healed bone as well. The structural characteristics allow placement in bone that is deficient in height and width. They can be placed with flap or flapless technique. They can be used to bypass the mandibular nerve, and for engagement of the cortical bone at the fusion of the pterygoid with the maxilla. They also can be used in combination with Compressive implants. There is wide variety of diameters from 3.5 to 5.5 mm and large selection of lengths from 6 to 26 mm.

Both types of one-piece implant have all varieties of prosthetic components - closed tray transfer, implant analogues, burn out copings, angulation correction burnouts and shoulder burn out. The abutment is also compatible for intra oral welding protocol.

Bendable neck. The implant has bendable neck design that has a specific diameter and length that gives the implant neck the unique ability to be bent so, as to correct the abutment angulation when needed.

Simplicity. The compressive implants provide a very simple protocol for surgery and prosthesis, that works especially well for patients who would not like to go for conventional implant surgery.

Open implant system Rootт is constantly developing system, which aims to solve different and the most challenging tasks in the field of implant dentistry.

For example, Rootform implants as well as Compressive and Basal implants have innovative prosthetic option – telescopic fixation, which doesn't need ***screw or cement***. Conometric fixation provides a way to retain prosthesis, additional abutment modifications, without the need of cement or screw. Conometric fixation works on the principle of frictional contact and elastic deformation of the connecting coping. The abutment profile of all one-piece implants allows usage of an external connection system – conometric. In case of two-piece implants you just need to use the special type of abutment which is suitable for conometric caps. These and other numerous factors ensure the best biologic and prosthetic outcome. Conometric prosthetic solution with patented lifting technology for multiple unit restorations allows fixation of crown without screws or cement, that is easy but strong.

Another one example of useful innovations is unique bone builder screw for two-piece implants. Special design of the screws GF0 and GFN0 allows to grow bone on the top of the implant platform. As a space maintainer Screw Bone Builder reserves the spatium and keeps the soft tissue far from the implant platform, stopping the soft tissue migration process and giving to the bone a chance to migrate and fill in the empty space. Reserved spatium between 2 platforms (implant and screw) is about 1 mm.

This space will be filled with the blood and then a clot or a fibrin clot will fill this hollow. The bone cells will use this fibrin clot to migrate through this space and build a new bone. Screw Bone Builder allows to get complete coverage of the implant platform by bone, which means extended periosteum. Increase of the bone surface will enhance the vascularization of the periosteum and will allow more collagen attachment on the top of the implant.

Recent product innovation of Rootт are the angulated multi-unit abutments for two-piece implants, which were developed to provide the dentists with a wider range of comfortable solutions and prosthetic options. They are similar to the current regular multi-unit abutments, but now there is a choice of three different angles (15°, 30°, 60°) for each of four sizes.

Angulated multi-unit abutments allow to insert Rootform type implants at a wider range of angles, for example, when the angle between two Rootform type implants is wider than 60° and regular multi-unit abutments are insufficient. Angulated multi-unit abutments are also essential in cases with severe bone atrophy, when Rootform type implants must be inserted not perpendicularly, but angularly to the bone level, in order to achieve higher primary stability, to avoid sinus lifting procedure on the maxilla or to ensure nerve bypassing on the mandible.

Dental implant manufacture based on Open Dental Community members experience left in the system essential parts and because of it could offer products and services that are of the highest standard and at extremely competitive rates.

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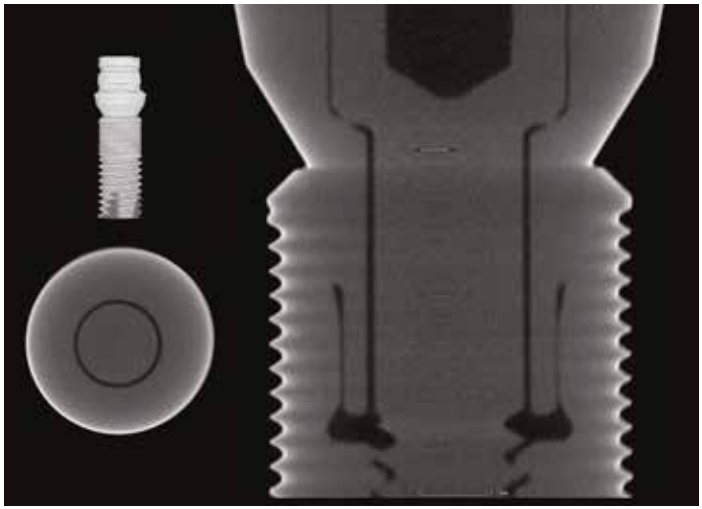

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(1) Study on Ticare Inhex conical connection at 20 and 30 Nw published in 2018 in **Clinical Implant Dentistry and Related Research.**

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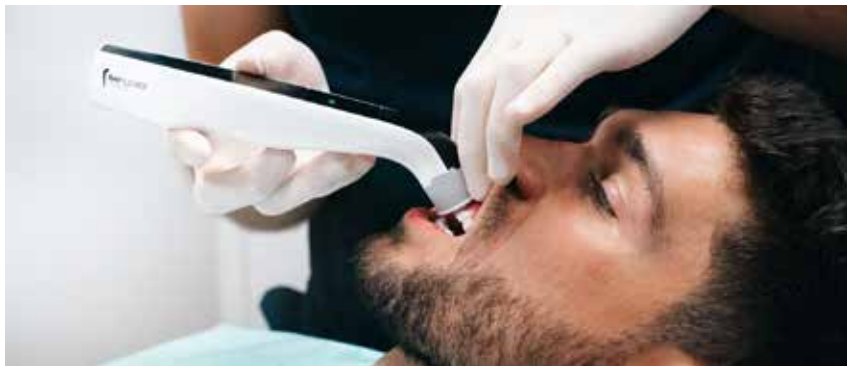
Borea is a French company that designs, manufactures and markets dental shade-taking devices. Borea's mission is to provide dental surgeons and laboratories with innovative solutions to improve comfort and quality in their day-to-day practice.

The flagship product of Borea is the "Rayplicker". This solution enables to obtain in a single acquisition complete shade mappings and translucency of a tooth. On Rayplicker Vision software, visualize the tooth overall shade, a 3 or 9 parts shades or a detailed mapping pixel by pixel. With these spectrophotometers, dental surgeons and dental technicians can take the color in a reliable and reproducible way, without influences of the external environment.



The data collected with the spectrophotometers are sent directly to the Rayplicker Vision software that enables analysis and archiving of acquisitions, thanks to a simplified data management by patient. This software centralizes patient aesthetic data: Rayplicker shade files, stl files, patient pictures. It also normalizes and standardises the digital workflow between practitioners and laboratories. Furthermore, image treatments such as color analysis based on CIE L*a*b* / L*C*h values become accessible in one click.

Once the patient's folder is completed and recorded, the production order is made and sent through the Borea Connect platform. The laboratory which has also registered to the free platform instantly receives all necessary information to realize a prosthesis faithful to the order and this from any computer means (computers, tablet, smarphones).

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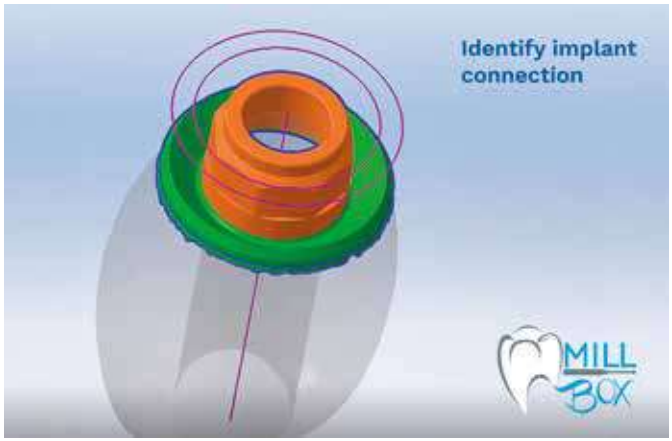

Thanks to the advances in **Artificial Intelligence**, MillBox is an even more intuitive, reliable, and **high-performing CAM**. The software, as every year, brings innovation and updates, such as new features and tools that save you time.

One of the biggest revolutions of 2021, is the new "**Identify connection**" feature that allows to select the surface inside a volume extraction (alike the "Export connection" function) and turns it into an interface. This is useful if the user wants to specify a custom milling strategy or if the automatic interface detection during the import phase is not satisfactory.

MillBox has also different add-on modules that can be used to custom implant connection, such as the "Implant Editor"add-on. Using Implant Editor, you can create custom implant connection geometries in a very easy way. The software guides you through the geometry design step by step, via basic shapes. It is possible to design optimized protections for connections to reduce both milling time and tool overuse. The CAD can automatically be imported into MillBox with perfect fitting of settings and parameters. With Implant Editor you have the freedom to design and save your library as never before and building geometries will not be an issue anymore.

MillBox is an highly customizable software that also offers synergistic manufacturing workflows featuring both additive and subtractive technologies (Make&Mill).

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Now we would like to give you a brief introduction of DenTag

Renowned throughout the world for its traditional craftsmanship and superlative quality of its knives and scissors, the small town of Maniago, in northeastern Italy, is the home of **DenTag**. The Company was established in the early 1950s by a team of expert artisan knife-makers and, as may readily be imagined, knives and scissors were their very first products. Soon thereafter, the ambition and vision of the founders pushed the company towards another direction, diverting its attention to the manufacture of high-quality surgical and dental instruments.
The raw materials – stainless steel, aluminum and titanium – are carefully selected. Hardening and sharpening techniques for which craftsmen of Maniago have been famous for generations have been applied in their precise manufacturing of instruments.
During the years, **DenTag** establishes many contacts with universities and final users, to adapt and modify its own production to continuous changing requests of a demanding market. The result was an increasing expansion through the Italian and foreign market, so at the end of the '80s the company moved to a new and bigger plant. The success of **DenTag** is due to its continuous and steady investments in research and quality. During the years, digital control machineries were introduced and many manufacturing processes automated. Moreover, computer – aided design was introduced, and the entire production cycle is computer controlled, even the packaging process and the final LASER marking phase.
Despite this, at **DenTag** final testing and control procedures are made by expert craftsman, trained within the company, as certain phases are particularly important and delicate in terms of quality. Today, DenTag offers a varied amount of new items, with different aesthetic features, and it is known for its high quality level, which is able to satisfy the most demanding customers.
DenTag has obtained UNI EN ISO 9001 Q.S., and UNI EN ISO 13485 Medical Devices certifications, and it is recognised by FDA "Food and Drug Administration" for products exported to the United States. Thanks to its focus on quality, **DenTag** today produces surgical and dental instruments for several companies in Italy and abroad, as well as a range bearing its own brand.
Given the highly-specialized nature of its products, DenTag receives requests for new instruments – on a nearly daily basis. For this reason, research specifically focuses on the manufacture of instruments that are innovative in every way – in their shape, the materials used, and in the surface finish.
We are firmly convinced that quality will have an increasing important and predominant role, in a market which is becoming more and more globalized, and we will continue to achieve this goal. We are firmly convinced that, during this third millennium, the concept of total and real quality is destined to become increasingly vital, especially in light of the extraordinary level of

globalization that is rapidly becoming the dominating factor in the market. We will continue to achieve this goal with versatility and continuous research into innovative production technologies. It will be the basis for expansion of DenTag in this field.

Following it we introduce our new line of instruments "EVO"
DenTag always produces surgical and dental instruments... using stainless steel.
Over the years, we have produced, for us and others, innumerable variations of instruments. We have also started the production of tools in aluminum, titanium and with inserts in hard metals but always working in the field of metals. We believe, in our little experience, to have built a recognized standard of quality and reliability.
However, we always pay attention to changes and trends in the market that evolves rapidly and sometimes suddenly.
Cyclically we receive requests for instruments lighter but at the same time as reliable as those made of stainless steel. Not being able to change the material used for the tips, to lighten the devices, we can only works on the handles. That is why we started to manufacture an entirely new line of light material handles. Clearly this solution is already used by others before us so that, in the design, we started to study the state of art, trying to take advantage and, if possible, improve the positivity and correcting any errors, if we found.
The result of this search is the EVO family of instruments with handles which has, we think for the first time, several positivity together:
· **Material**: Lightweight (11 g) and resistant to stress. Use turns out to be easy, for sure grip and non-fatiguing. Tested and used in the food field, then completely non-toxic and free of potentially harmful substances. Autoclavable without change of shape and color.
· **Form**: 10.5 mm Diameter of the handle and the center of 9.0 mm to minimize the problems to carpal tunnel data from prolonged use in time. Longitudinal notches to increase the grip and the sensibility.
· **Construction**: We have inserted during molding of the handle, two stainless steel bushes suitably shaped, in which the tips are then introduced. With this procedure will eliminate the presence of an internal longitudinal metal bar with obvious reduction in weight. The tips are not glued to the material and so there is no risk of potentially harmful substances are released.
· **Aesthetics**: Profile simple, easy to wash and clean. Without deep grooves or notches that may cause accumulation of germs and bacteria. Since plastic is possible to color in various

shades aesthetically pleasing and with advantages for the immediate recognition of the instrument.

It is known that simple dental instruments such as curettes or double probes may injure the operator's hand or lacerate the glove (with the opposite working points). The possibility of injury is during use, handling or passing the instrument between Assistant-Dentist-Assistant while performing the procedures on the patient. Directive 2010/32/EU - prevention from sharp injuries in the hospital and healthcare sector, also it states that it's necessary to prevent workers' injuries caused by all medical sharps and pointed devices. Instruments with a handle 100, 105 mm are too short and the tips, even if they are turned contrary than working one, very often touch on the back of his hand. Instead, what it can do as an additional preventive action is to choose, when buying or replacing, one instrument with a long handle. The longer instruments can be wrapped exactly like the other and, in the event that the dentist use cassettes or trays for sterilization of small size, it will be sufficient to put the instruments in the direction of the longer side. That's another reasons to choose new DenTag "EVO" family of instruments. As always we are respecting our quality standards and, we are proud of, 101% Italian quality.

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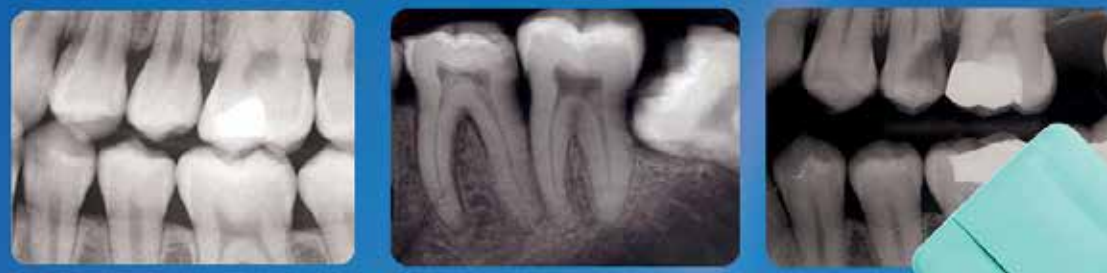

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Mandibular Bone Block Harvesting from the Retromolar Area with piezosurgery

DDS Angelo Cardarelli
Specialist in Oral Surgery
Adjunct Professor at San Raffaele University in Milan
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San Raffaele Hospital Milan
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The reconstruction of alveolar defects after tooth loss is one of the biggest challenges in implant dentistry. In order to increase the bone thickness we can have several options alloplastic grafts, xenografts, allografts, and autografts. However, autogenous bone grafts are osteoinductive, osteogenic, and osteoconductive, with significant regenerative capacity in comparison to all other grafts. This is why autogenous bone remains the gold standard for augmentation. Extraoral donor sites for autogenous bone include the skull, the fibula, the ribs, and the iliac crest, all of which inevitably lead to additional patient morbility. Intraoral sources have the advantages of proximity of the donor and recipient sites, convenient surgical access, low morbility, and elimination of a hospital stay. The best anatomical area that allows to obtain a good cortical bone block grafts, suitable for two- or three- dimensional reconstructions of alveolar ridge defects is the retromolar and paramolar areas (external oblique ridge), or edentulous areas. The removal of large bone block grafts with drills or engraving or oscillating saws may be particularly dangerous in the anterior mandibular ramus. Piezosurgery is the state of the art bone cutting instrument in oral surgery and also in the harvesting of the ramus bone graft.The micro-oscillations, which are created at this frequency, cut only mineralized hard tissue while adjacent soft tissue, nerves and vessels remain unharmed. Using ultrasonic surgery, it is possi-

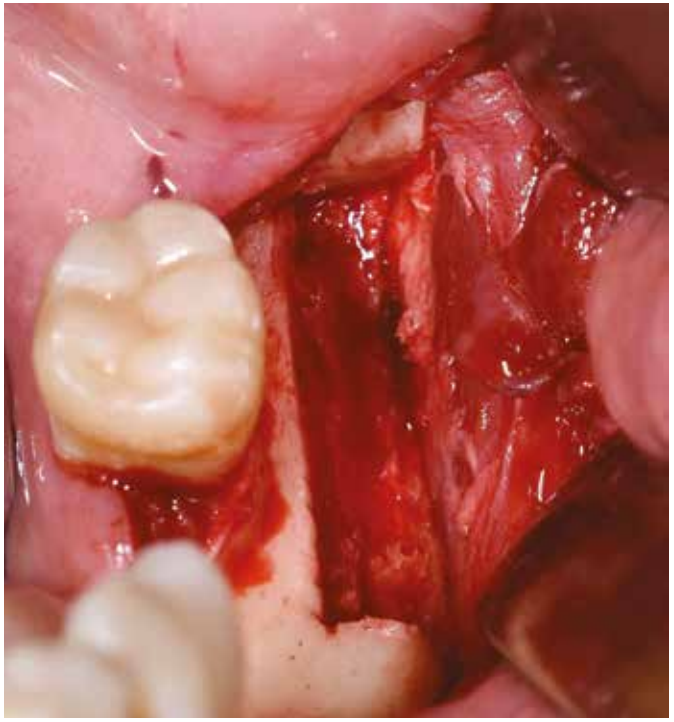

Fig. 1

Fig. 2

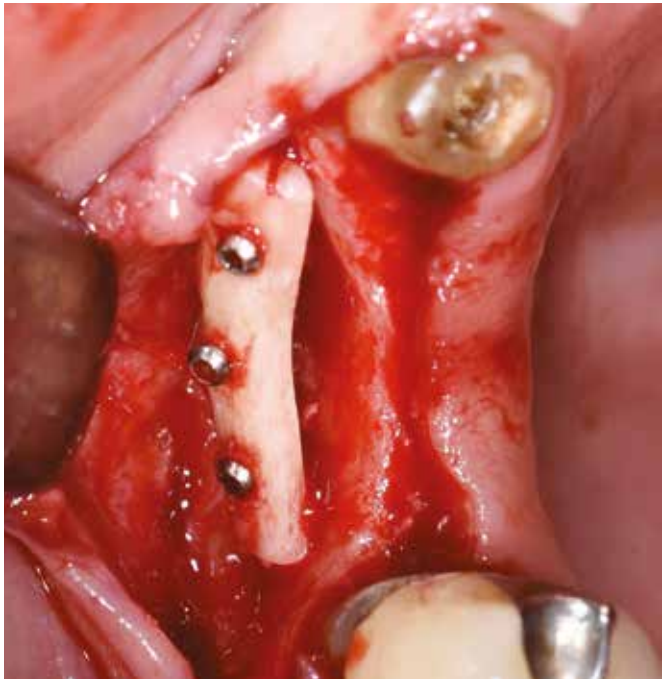

Fig. 3

ble to cut mineralized tissue with greater precision and selectivity. Cavitation effect that is created by the irrigation/ cooling solution and oscillating tip of the device, provides blood- free surgical area, as a result greater visibility for the surgeon. With regard to bone formation and healing, it has been showed that ultrasound bone cutting is more favorable than it is with conventional bone cutting techniques.

Surgical Procedure

The procedure was performed under local anesthesia using Piezosurgery device (ESACROM Italy) with saw shape inserts. In the ramus zone, a midcrestal incision was performed, avoiding the lingual nerve trajectory. The donor area was exposed by extending a full thickness flap in the apical and distal aspect. Care was given to prevent any damage to the n. lingualis. For ramus bone harvesting, four osteotomies were made: one superior and 2 vertical as well as one osteotomy was made at the inferior border. The superior horizontal cut was made 4 to 5 mm medial to the external oblique ridge with ES007lT Esacrom insert, cut was made from the edentulous area and continues posteriorly along the external oblique ridge to ascending ramus. The two vertical osteotomies, anterior and posterior, were also made with the ES007lT insert extending 10 to 12 mm in length in the supero inferior direction. Then, a cut connecting the inferior aspect of each vertical osteotomy was made with the angulated bone saw insert ES007LT. This special insert was exclusively produced for this inferior horizontal cut. After completed all the outline cuts of the graft, the harvest was usually pried out by gentle manipulation with a small flat chisel using hammer. fig 1-2 The donor site was primarily sutured back with 4-O SILK sutures. The patient received a single preoperative dose of oral antibiotics amoxicillin/ clavulanate sodium 2 gram, that same antibiotic regimen continued for 5 days postoperatively. Additionally, non steroidal anti-inflammatory

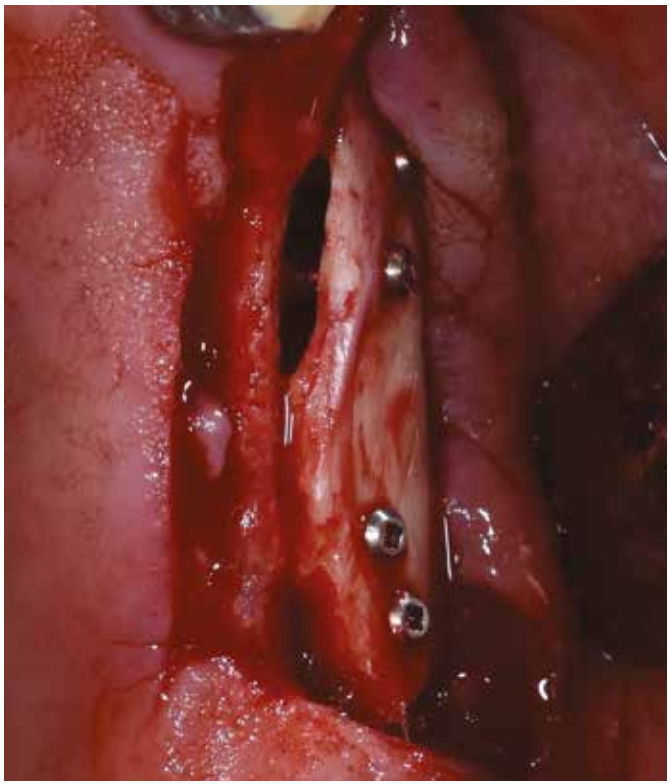

Fig. 4

agent naproxen sodium for pain and swelling, were prescribed as needed. Patient was also advised to rinse three times per day with 0.2% concentration chlorhexidine mouthwash for 7 days post-operatively. Extraoral application of a cold pack was recommended for 12 hours after the surgery. The harvested monocortical bone block was split in two pieces for horizontal augmentation in the maxilla and osteosynthesis screws were used to fix the plates bone to the recipient area. fig 3-4 The bone chips harvested from the bone block with the bone scrape were used to fill the gap around the blocks and the recipient bone. Any sharp edges or corners were rounded to avoid further soft tissue dehiscence.

Conclusions

Ultrasound surgery has certain advantages over traditional manual or high-speed motorized instruments in oral and maxillofacial surgery. Micro-oscillations of the tip of the device (ESACROM), operates in low frequency range allows for precise cutting and yields minimal wastage of bone. Low Frequencies causes minimal damage to soft tissues (nerves, vessels, mucosa). The unique phenomenon of cavitation effect gives operator a better visibility than using any conventional manual or rotary instrument. One of the important difficulties harvesting ramus block graft mentioned in literature is that managing the caudal horizontal cut due to close proximity of the IAN. With the specially angulated inserts of the device (ESACROM), ultrasound surgery has distinct advantage over conventional technique. Using this special tip for horizontal cut, surgeon does not need to reflect the flap extensively and making complete caudal cut is possible without damaging IAN.

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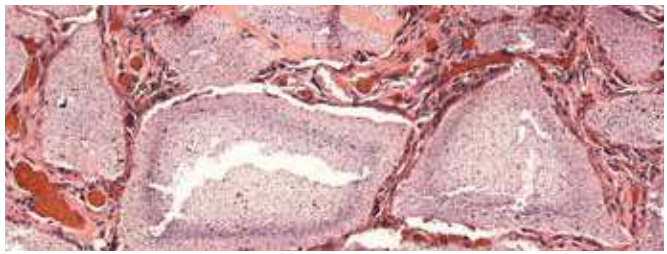

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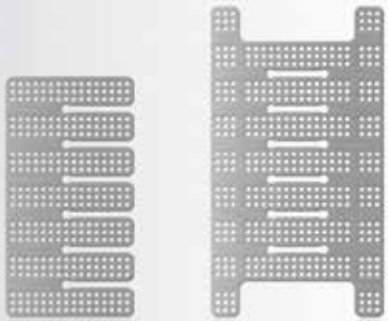

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XIMPLANT
Currents decontaminator in the treatment of infected peri-implant and periodontal sites.

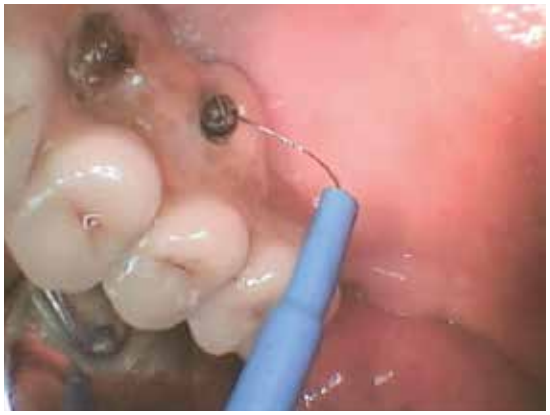
Doctor Paolo Calvani* and Doctor Cesare Paoleschi**
** Freelance in Florence*
*** Dentist, freelance, founder of IRIS Dentistry Company*

This article presents a new decontaminating method through the application of currents for the decontamination of infected peri-implant and periodontal sites. The method is called the **XIMPLANT system**. The current treatment technique provides precise protocols, in terms of timing and intensity of automated currents, for each type of application, such as to carry out a non-invasive and non-traumatic treatment for healthy tissues. The concept of the treatment is based on the physical action of destruction of the bacterial biofilm. The "electrode" effect of the system is exploited, thus developing a current around its surface which decontaminates it. These treatments are performed "closed" without local anesthesia.

The **XIMPLANT system** involves contact with the active electrode on the implant, which is "crossed" by a high frequency electromagnetic wave that breaks the biofilm acting on the entire surface of the implant. In fact, it should be remembered that titanium has an ionic conductivity subjected to a potential difference of 3%, sufficient to induce the ionic movement on its surface, such as to induce the destruction of the bacterial biofilm.Peri-implantitis represents a pathology that poses serious survival problems for a high percentage of prosthetic rehabilitations on implants. The bacterial flora forms a biofilm that undermines osseointegration by inducing a resorption of the peri-implant bone which, in the long run, leads to the loss of implant anchorage, as in periodontitis occurs for a natural element. The bacterial flora in question is the same responsible for periodontal problems.

The formation of the biofilm begins with the adhesion of microorganisms to a surface. When a certain amount of bacteria accumulates on a surface and reaches a certain cell density, it begins to secrete a substance which is basically a polymer made up of polysaccharides, proteins and DNA. This substance mixes with the water present in the environment and gives rise to a matrix where bacterial cells are strongly rooted in the form of biofilms. Peri-implant mucositis occurs in about 80% of subjects and in 50% of implants. Peri-implantitis occurs in 28% and in a percentage greater than or equal to 56% of the subjects (Zitzmann, Berglund T. - J Clin Periodontol 2008 Sep, 35 (8 Suppl) 286-91). Currently, the therapeutic treatments of peri-implantitis involve mechanical maneuvers associated or not with topical and / or general pharmacological treatments, such as antibiotic therapy.

Prevention actions are essentially based on home and professional hygienic maneuvers, in order to prevent irritative spines from which bacterial colonization can start, first of the gingival sulcus, creating a mucositis, then of the peri-implantation creating frank peri-implantitis. In the initial stage of mucositis, bone resorption is usually of little entity, but the bacterial biofilm already extends to affect the deep implant surface, that is, a contaminated area that is not evident in this phase with instrumental examinations. It is precisely at this stage that it is interesting to have a device available that allows the "breaking" of the bacterial biolfilm along the entire surface of the implant, even the one where bacterial colonization has not yet caused pathology (not visible.) In fact, even managing to remove the biofilm in the exposed parts of the implant, one does not act on those bacteria that colonize the perimplant in the areas where it is still anchored to the bone, but since the surface of the implant is an easily etched surface, it allows maturation and bacterial aggregation. Also, even in the face of "frank" peri-implantitis with bone resorption and suppurative state, an instrument that allows the deep decontamination of the implant and of the deep peri-implant areas would be particularly effective from the point of view of survival of the implants themselves. Until now, this profound preventive-therapeutic action was not feasible.



Treatment methodology

Once the infection and the stage of mucositis and / or frank peri-implantitis (probing depth, plaque index, bleeding index) have been diagnosed, professional hygienic treatment is carried out. At the end of the peri-implant toilet, the active electrode is applied to the implant collar. The ground electrode is held in the patient's hand. The **XIMPLANT** decontaminator is set on the peri-implantitis program and the currents are applied, according to pre-set times and methods.

The treatment is painless. The patient is then invited to adopt an adequate home hygiene attitude. The bactericidal action of the current is reported by numerous studies in the literature. Particularly significant are the works of Del PozoJ, L, M.S. Rouse, (1) where there is an effective action of the electric current against the biofilm in culture, consisting of Pseudomonas aeruginosa, staphylococcus aureus and Staphylococcus epidermidis. Sy et all. Other particularly significant works are those of Dreesa (2) on electrochemical inhibition of 2003, and of LEE, Sy et all (3) of 2012. A recent work, currently being published, by Prof. Giammarco Raponi and Dr. Lisa Valentini, of the Department of Public Health and Infectious Diseases of the Sapienza University, highlighted the effectiveness of the **XIMPLANT system**: "In the experimental procedures, a strong bacterial biofilm produced by Enterococcus faecalis from ATCC collection has been layered on the implants that were successively treated in a treatment chamber by electric current produced by the **X-IMPLANT** machine. Evidences are provided that the electric treatment granted by the **X-IMPLANT system** completely removed the bacterial biofilm". Particularly interesting in this method is the prevention of peri-implant infections. The "prevention" protocol provides at the end of a normal scaling session the preventive application on the implant collar in the subgingival prosthesis-implant passage area of the active electrode.

For "Toronto" rehabilitations, the application takes place directly through contact with the passing structure.

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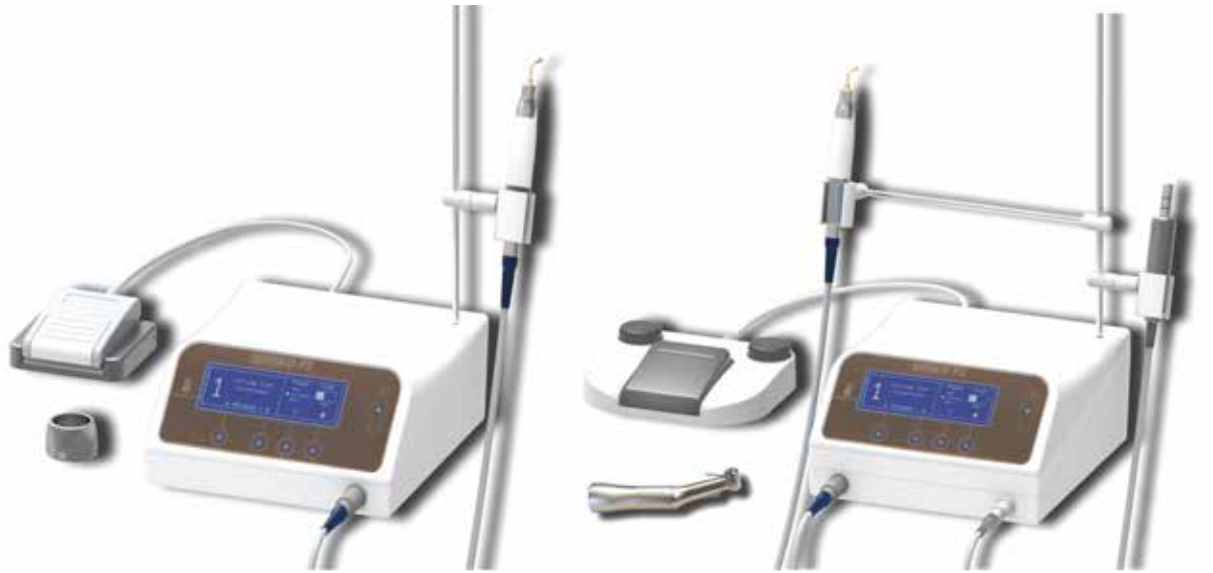

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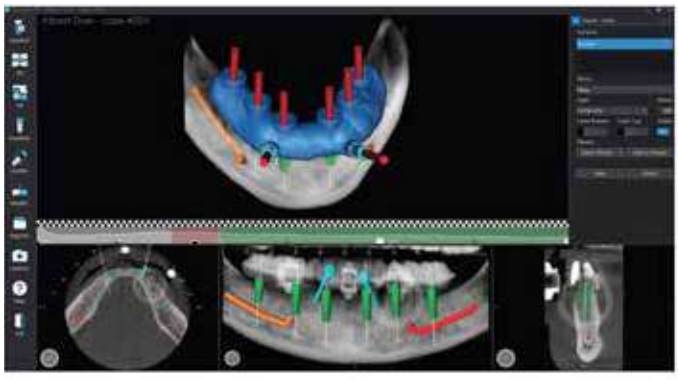

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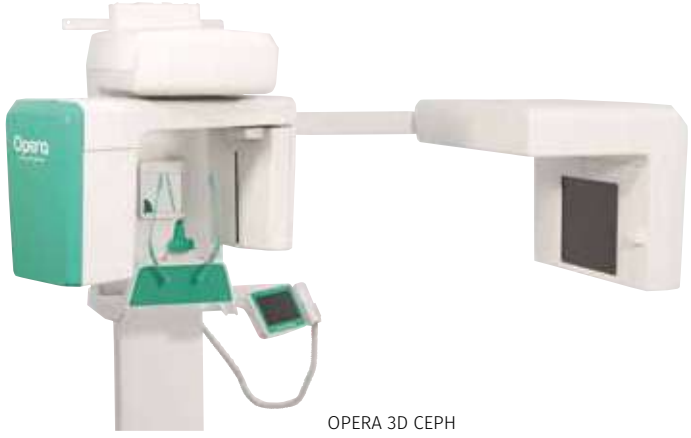

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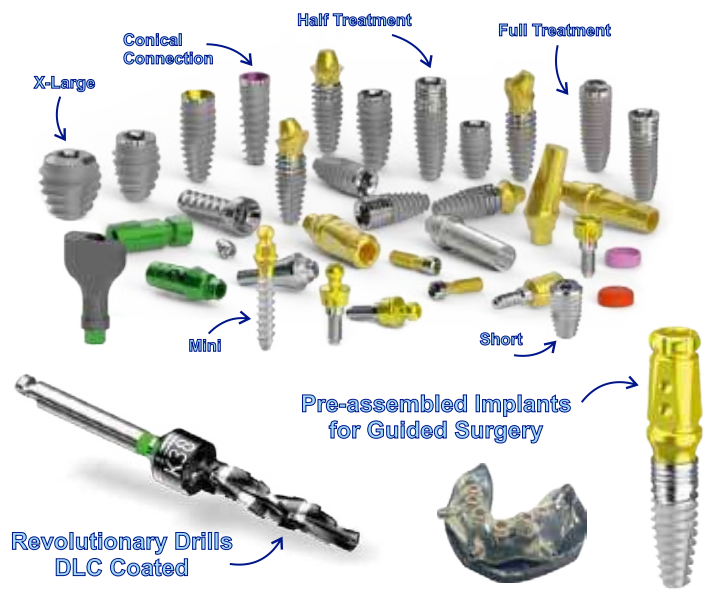

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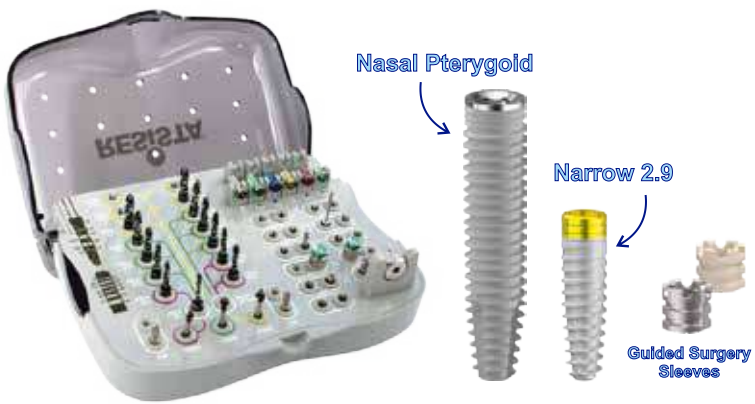

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OSTEO-CARE PROJECT

Dental prosthetic devices osseointegration improvement by the permeation of autologous growth factors of the implant surface

Release of VEGF from Dental Implant Surface (IML® Implant) Coated with Concentrated Growth Factors (CGF) and the Liquid Phase of CGF (LPCGF): In Vitro Results and Future Expectations

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Abstract: This study aimed to evaluate the combined use of the Concentrated Growth Factor (CGF) and the liquid phase of CGF (LPCGF) on dental implant surfaces, using a medical device to determine the migration of growth factors, from the implant surface to the recipient. The implants were permeated by autologous growth factors, using a specific centrifuge device. CGF adhesion on the implant surface was evaluated through a scanning electron microscope analysis. To assess the release of the vascular endothelial growth factor (VEGF) from CGF, LPCGF, and CGF- or LPCGF-permeated implant, an ELISA assay was carried out. The results showed that the concentration of the growth factor VEGF was greater in CGF than in LPCGF. Our innovative technique allowed the incorporation of autologous growth factors on the surface of the dental implants. Moreover, we reported the release of VEGF, over time, by CGF- or LPCGF-permeated implant. On this basis, it was possible to obtain a biologically active implant surface, essential to create intercellular communication and neo-angiogenesis, to facilitate wound healing and tissue regeneration.

Keywords: *bilateral osseointegration; growth factor; dental implant*

1. Introduction

Implant osseointegration is a concept that now enjoys wide support. In 1999, Alberktsson and Zarb defined osseointegration from the clinical standpoint as a rigid and clinically asymptomatic fixation process of an alloplastic material, in bone loaded functionally [1]. The most important aspects for successful osseointegration are the biological characteristics of the host site (the patient) and the macro- and micro-structure of the titanium implant [1,2]. Dental implant surfaces have now achieved outstanding performances, which were previously unimaginable. This ensures an extremely high percentage of osseointegration, even in the most complex situations [3]. However, this meant that the margins for the further improvement of modern surfaces, through mechanical or chemical procedures, are very small. Improvement can be achieved biologically, although, through the addition of autologous growth factors, obtained by processing the patient's venous blood to the implant surface.

The study on tissue reparative processes has highlighted the fundamental role played by platelets (in this context), which are physiological reservoirs of growth factors and proteins. There are various platelet concentrates, such as platelet-rich plasma (PRP), platelet-rich fibrin (PRF), and concentrated growth factor (CGF), which reconstruct bone defects [2]. Numerous studies have shown that PRF provides positive results in tissue engineering [4]. A research by Sohn et al. has demonstrated the greater regeneration capacity of the CGF and its multi-purpose use [5]. After a long phase of study, our therapeutic choice was the use of the CGF, for the following reasons. It is 100% autologous and biocompatible, requires a simple preparation, is easily identifiable, has a very high concentration of platelets in a fibrin network, has a presence of growth factors and no manipulation of the product is necessary when exclusively using autologous blood products, without the addition of other substances. Platelets, in particular, contain biologically active proteins at high concentrations and support cell healing, growth, and morphogenesis [6]. In addition to platelets, CGF contains fibroblasts, leukocytes, and endothelial cells for angiogenesis and tissue remodeling; and provides a matrix for cell migration [7,8]. CGF is a fibrin biomaterial rich in the growth factors obtained by centrifugation of venous blood, at alternating speeds, as set on the Silfradent device [8].

CGF, associated with guided bone regeneration, has been used to accelerate new bone formation. Due to its special characteristics, including lack of immune reaction, capability of accelerating tissue healing and vascularization, and anti-swelling properties, CGF is widely used in implant surgery [9–11]. However, the interaction between CGF and dental implant is not clear. The addition of autologous growth factors to the implant surface is hindered by titanium's characteristics of extremely low wettability [12]. This means that to simply wet the implant with autologous growth factors is of little use, unless it is left in immersion for more than 30 min [13]. This makes the procedure difficult to include in the clinical routine. In view of these difficulties, the challenge of producing a biologically active surface still remains. The present study reports a protocol that could produce a biologically active implant surface. The growth factors are incorporated onto the implant surface, using a dedicated implant ampoule, which enables the procedure to be carried out in a closed field. A centrifuge device (Round up) made by a Silfradent related to the ampoule enables autologous fibrin and growth factors to be incorporated onto the implant surface, within five seconds. We verified the adhesion of CGF on the titanium implant surface and then quantified the release of the vascular endothelial growth factor (VEGF) from CGF, the liquid phase of CGF (LPCGF), and CGF- or LPCGF-permeated implants.

2. Materials and Methods 2.1.

Preparation of CGF and LPCGF Blood samples (8 mL) were taken by puncture of a vein from five donor patients, non-smokers, and those in good general health. The five donors involved in the study (three men and two women) were aged between 25 and 45 years, with a BMI (Body Mass Index) between 21 and 23 points. The remote and pathological anamnesis were negative. Patients were not on therapy with any type of drug and the blood samples were taken separate from the main meals, on empty stomach. Informed consent was obtained from the patients included in this study. Tubes of blood were processed by a device (Medifuge MF200; Silfradent srl, Forlì, Italy) to obtain CGF, following the manufacturer's instructions. The resulting CGF was then inserted into dedicated implant ampoules (Figure 1), so that the coating procedure could be carried out in a closed field; each contained an implant (Immediateload®, Swiss dental implants, diameter 4 mm and height 8 mm). To incorporate the CGF onto the implant surface, these tubes were inserted into a second device, Round Up (Silfradent srl, Forlì, Italy), and centrifuged for 5 seconds, following the manufacturer's instructions (Figure 2).

Evaluation of the quality of the CGF was done on two fractions—the so-called white fraction and the red fraction.

Figure 1. Concentrated Growth Factor (CGF) isolation after using the Silfradent device (Medifuge MF200; Silfradent srl, Forlì, Italy).

Figure 2. Centrifugation of the test tubes with Immediateload implants along with CGF or the Liquid Phase of CGF (LPCGF) by Round Up (Silfradent srl, Forlì, Italy).

The white cup-tubes allowed the obtainment of a fraction, known as LPCGF (liquid phase of CGF), that comprised non-polymerized liquid fibrin. It was isolated by placing the centrifuged blood in a test tube, with a white lid; this was completely smooth within and contained no additives.
It produced the material in a liquid state; this would polymerize at room temperature (RT), over the subsequent 15 min. The red cup-tubes allowed the obtainment of a fraction, known as CGF polymerized fibrin, which was isolated using a test tube with a red lid and textured inner walls, to promote polymerization, through an exclusively physical process.
The resulting fraction had a thicker consistency than the fraction obtained by the white cup-tube, a gelatinous appearance, and a higher cell concentration of the non-polymerized fibrin.

2.2. SEM Analysis

The CGF-permeated implant was fixed in 2.5% glutaraldehyde for 2 h at RT. The specimen was fixed with 1% osmium tetroxide for ~2–4 h, and then dehydrated with a graded ethanol series (from 50% to 100%, in steps of about 20%, for 10 min each). After dehydration, the SEM preparation procedure was completed by critically drying the material.
The analysis was performed by means of ZEISS EVO 40 (Carl Zeiss, Milano, Italy)) in a low vacuum modality and by applying a voltage of 25 kV. The sample was placed on the SEM sample holder, using double-sided adhesive tape, and was observed without any further manipulation, at a lower and higher magnification (50× and 1000×) [14].

2.3. ELISA Assay

LPCGF (white fraction) and CGF (red fraction), or implants plus CGF/LPCGF, immediately after the preparation, were transferred to the wells containing phosphate buffer saline (PBS, Sigma Aldrich, Milan, Italy). The supernatants were collected at time 0, and after 1, 2, and 3 days. VEGF concentrations in the media were determined by using ELISA and following the manufacturer's protocols (R&D Systems, Minneapolis, MN, USA). In brief, 100 µl of the culture supernatant was added to each ELISA well, pre-coated with anti-human VEGF polyclonal antibody. After 2 h of incubation at room temperature, the plate was washed and 100 µl of human VEGF conjugate was added to each well. The plate was incubated at RT for 1 h, washed again, and 100 µl of the substrate solution was added to each well. The plate was then incubated at RT, in the dark, for color development. After 30 min, 100 µl of stop solution was added to each well. Absorbance in each well was measured by using a microplate reader at 450 nm. The concentration of VEGF in the culture supernatant was determined through interpolation from the standard curve.

2.4. Statistical Analysis

Data were expressed as mean ±SD. Statistical analysis was determined by paired Student's t-test. In all comparisons, $p < 0.05$ was considered as statistically significant.

3. Results and Discussion

CGF is constituted by a fibrin network that includes many cellular components, such as stem cells and growth factors [8,15]. The CGF exerted its effects through the degranulation of the platelet granules, which contained various growth factors that are considered important in the initial phase of wound healing. This resulted in an increase in cell proliferation and differentiation, matrix formation, osteoid tissue production, connective tissue formation, angiogenesis, and collagen synthesis. The degranulation process began immediately after platelet aggregation and lasted about
7–8 days. This affected the macrophage cells that continued the repair process. The wound healing rate was directly proportional to the quality of platelet concentration in the clot, inside the graft. In the present study, we obtained two different concentrated growth factors, named CGF and LPCGF, and we analyzed the release of the growth factor VEGF, from both preparations incubated
in PBS, for up to three days, as shown in Figure 3. The results showed that both preparations of CGF and LPCGF released VEGF, the concentration of VEGF was higher in CGF than in LPCGF, by about five times, at time 0 (Figure 3).
However, the VEGF release from the CGF drastically decreased by about 78% and 93%, after the first and second day, respectively, compared with time 0 (Figure 3). The VEGF release was also reduced in LPCGF by about 43% after the first day, and was further lowered on the second day, reaching levels comparable to the VEGF release from the CGF (Figure 3). Our results expand on the previous findings regarding the release of VEGF by CGF [15].

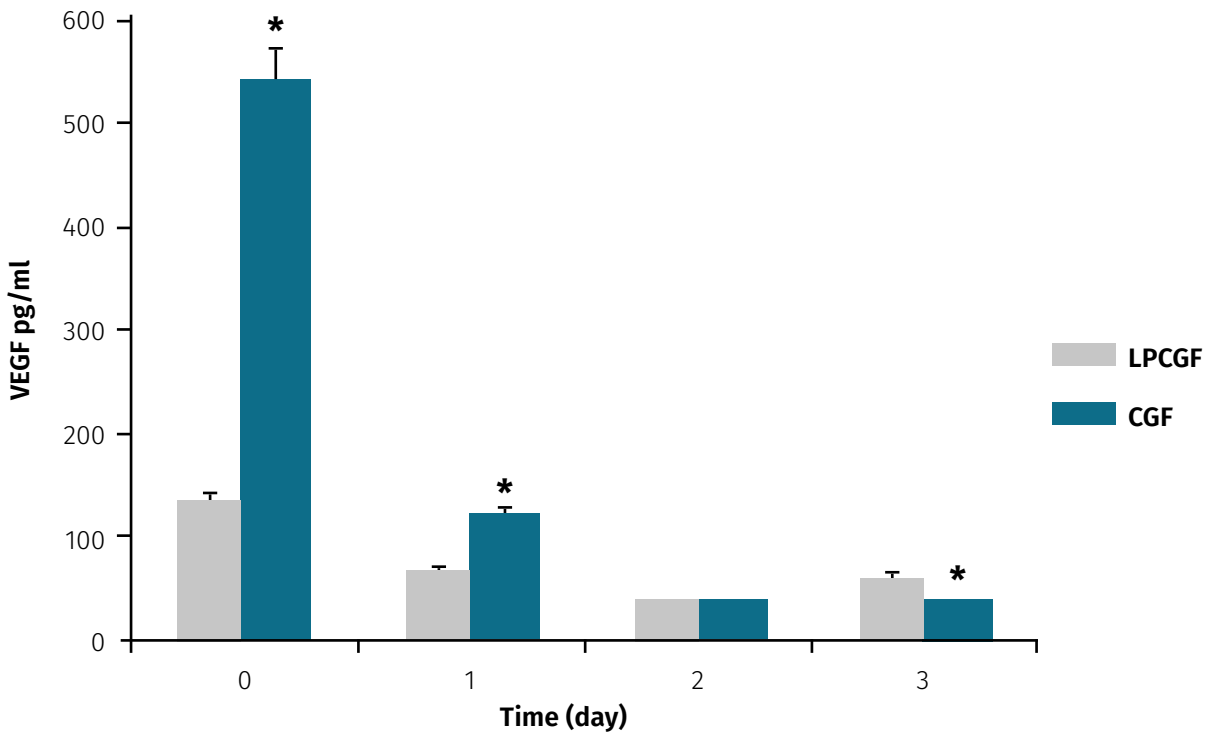
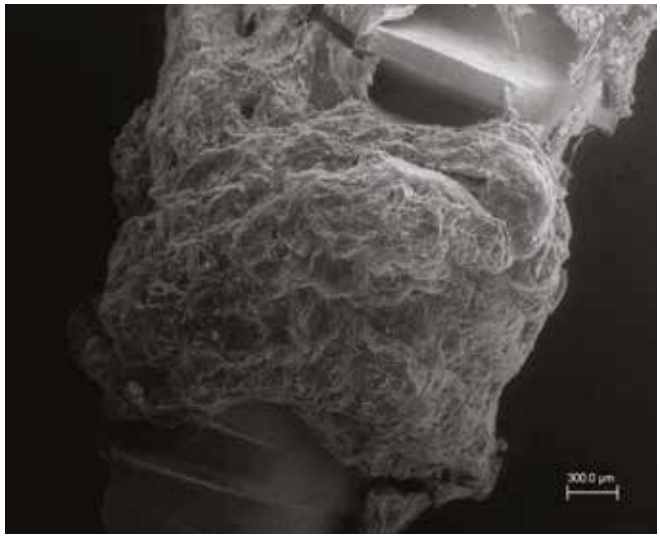


Figure 3. ELISA quantification of human vascular endothelial growth factor (VEGF) into phosphate buffer saline (PBS) from CGF and LPCGF at various times (0–3 days). Values are means ± SD, n = 3. *p < 0.05 denotes the statistically significant differences between VEGF released by CGF or LPCGF.



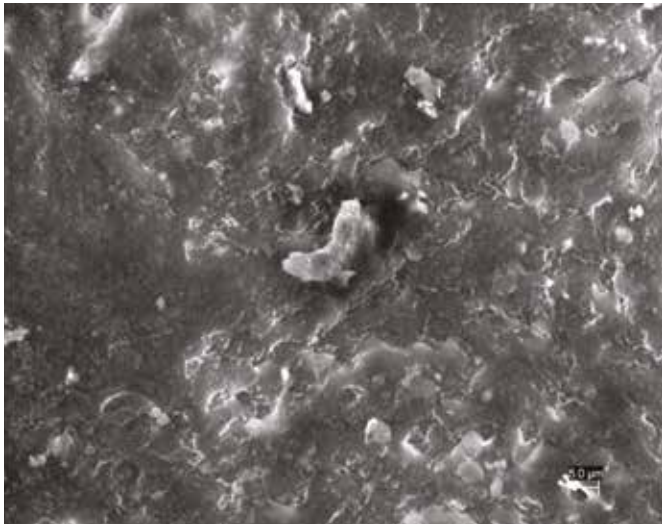


Figure 4. (a) SEM photomicrograph of the CGF-permeated implant. (b) Large magnified image of the CGF-permeated implant detail.

By using an innovative device, we evaluated the potential incorporation of CGF on the surface of the titanium implant. We verified the interaction between the CGF and the titanium implant surface, by SEM analysis, revealing that the CGF actually permeated the surface of the implant (Figure 4). Having shown that, in our experimental conditions the CGF was able to adhere to the implanted surface forming a fibrin network, we evaluated whether the CGF-permeated implant also allowed the release of growth factors, in particular VEGF, from the implant towards the medium—PBS.

As shown in Figure 5, the implants permeated with CGF or LPCGF were able to release VEGF in PBS medium. At time 0, in the permeated implant, as well as in the system without implants, the concentration of VEGF was five times higher in CGF than in LPCGF. However, contrary to the CGF or LPCGF without implants, VEGF released from the CGF or the LPCGF-permeated implant, increased on time. In particular, the VEGF levels from the LPCGF-permeated implant increased in a time-dependent manner, until the second day and then remained constant.

The time course in Figure 5 also shows that the VEGF released from the CGF-permeated implant was significantly raised on the first day, by about 70%, remained almost constant on the second day, and was then lowered by about 15% on the third day (Figure 5). To the best of our knowledge, our study provided, for the first time, results concerning the incorporation of autologous growth factors on dental implants, and the associated release of VEGF over time. It is important to emphasize that the use of specific implants was crucial for a better implant micro-surface that enabled the growth factors to settle on the inner surface. The surface of the Immediateload implant was specifically designed to be coated by the patient's CGF, while presenting excellent characteristics of osseointegration, in the absence of CGF.

From a practical standpoint, a coating with LPCGF could be achieved through a closed system created for the direct addition of LPCGF, within the implant tube, using needles. The procedure is easily reproducible in an outpatient setting, thanks to the dedicated implant tubes. However, when using CGF, although its concentration of VEGF at time zero was much higher than that in LPCGF, it entailed the opening of the tube for inserting the CGF, and its closure, before centrifugation. However, this last procedure (the opening of the tube and the addition

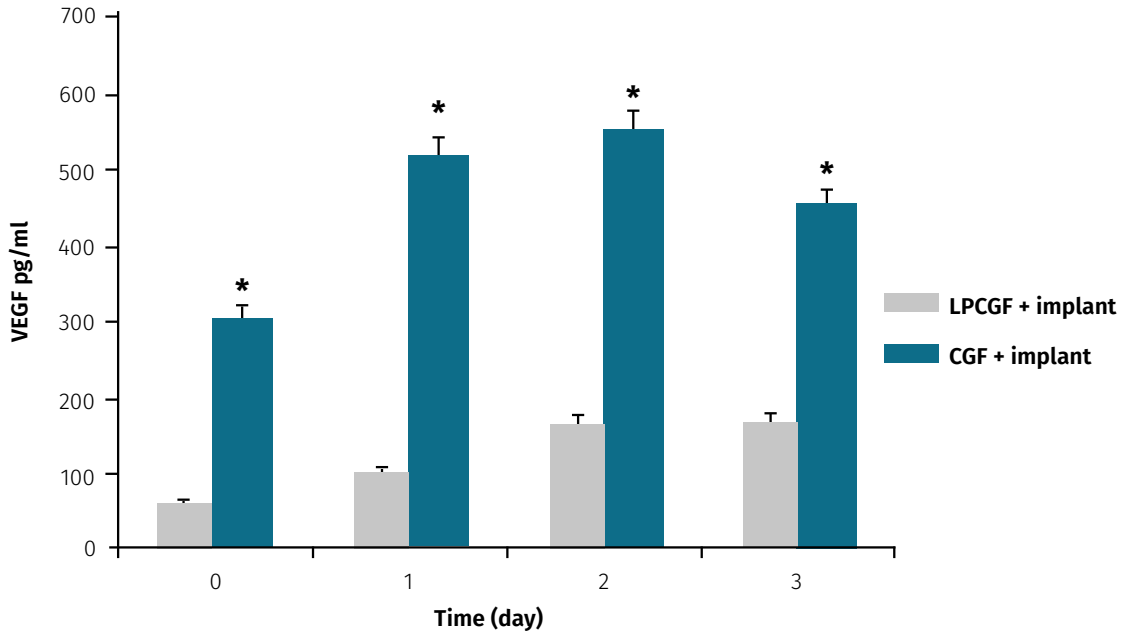


Figure 5. ELISA quantification of human VEGF into PBS from CGF- and LPCGF-permeated implants at various times (0–3 days). Values are means ± SD, n = 3. *p < 0.05 denotes statistically significant differences between the VEGF released by CGF- and LPCGF-permeated implants.

of the CGF) took place in an open system, but with a contiguity of time and space that did not limit its clinical application. From a clinical point of view, it would be very important and interesting to evaluate if a slow and gradual release of VEGF by LPCG, over time, would be more effective, than a quick release of VEGF by CGF. In fact, the presence of VEGF on the implant surface was crucial, since this growth factor could improve the osseointegration of the dental implant [16].

Incorporation of the CGF/ LPCGF on the surface of the titanium implant could be carried out in private practice, but always according to the national laws of a country, which might be different from one country to another. The organization should first obtain all necessary authorizations for medical and surgical practice.

4. Conclusions

The results reported here showed that a titanium dental implant surface, permeated with CGF or LPCGF, contained fibrin, which is fundamental to accommodate the cellular network. The permeated dental implant surface was found to slowly release VEGF, a growth factor indispensable increating inter cellular communication and neo-angiogenesis, during bone regeneration and healing [17–19]. The devices used in this study could be employed to produce the first biologically active implant surface, permeated with both fibrin (which is essential to accommodate the cellular network) and growth factors (which are essential to create intercellular communication and neo-angiogenesis).

By using this procedure, the osseointegration process becomes bilateral, operating both from the bone towards the implant, and from the implant towards the bone. This could reduce healing time and potentiate the physiological response. It will, thus, become possible to expand the application of this type of surface in other fields of medicine, including orthopedics, maxillofacial surgery, and plastic surgery. Further studies are needed to investigate the use of biologically active surfaces, in greater depth, and to further improve the implant micro-surfaces, making them increasingly permeated by the autologous growth factors.

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MEDIFUGE-CGF

Author Contributions: Conceptualization, A.P., L.S., M.A.C., and T.B.; methodology, A.G., C.D., F.D., F.F., and E.S.; validation, A.P., F.F., E.S., and L.S.; investigation, A.G., C.D., F.D., F.F., and E.S.; resources, E.S.; writing—original draft preparation, E.S. and F.F.; writing—review and editing, A.P., F.F., E.S., M.A.C., and L.S.; supervision, A.P. and L.S.; project administration, L.S.; funding acquisition, A.P., L.S., and T.B.

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- 100% cotton - ideal for applying medicaments
- Highly absorbent
- Chrome tilt-top dispensers available for sizes #1 through #4 they hold one size each
- Plastic temple dispensers for use with sizes #1 through #4 they hold four sizes at a time
- EZ UP® Pellet Dispenser for sizes #1 through #5

	CODE	PRODUCT	DESCRIPTION	PACKAGING	CASE COUNT	ORIGIN
☐	100106	SIZE 1	9/32" DIAMETER	2000 PELLETS/BOX	6 BOXES	USA
☐	100107	SIZE 2	7/32" DIAMETER	2550 PELLETS/BOX	6 BOXES	USA
☐	100108	SIZE 3	5/32" DIAMETER	2500 PELLETS/BOX	12 BOXES	USA
☐	100109	SIZE 4	1/8" DIAMETER	3000 PELLETS/BOX	12 BOXES	USA
☐	100900	ASSORTED REFILLS	2 - #1'S, 4 - #2'S, 4 - #3'S, 2 - #4'S		1 BOX	USA
☐	100901	#1 REFILLS	9/32" DIAMETER	12 REFILLS/BOX	1 BOX	USA
☐	100902	#2 REFILLS	7/32" DIAMETER	12 REFILLS/BOX	1 BOX	USA
☐	100903	#3 REFILLS	5/32" DIAMETER	12 REFILLS/BOX	1 BOX	USA
☐	100904	#4 REFILLS	1/8" DIAMETER	12 REFILLS/BOX	1 BOX	USA
☐	600091	TILTOP #1 PELLETS	PELLET DISPENSER - CHROME	1 DISP. W/PELLETS	1 DISPENSERS	SWITZ.
☐	600092	TILTOP #2 PELLETS	PELLET DISPENSER - CHROME	1 DISP. W/PELLETS	1 DISPENSERS	SWITZ.
☐	600093	TILTOP #3 PELLETS	PELLET DISPENSER - CHROME	1 DISP. W/PELLETS	1 DISPENSERS	SWITZ.
☐	600094	TILTOP #4 PELLETS	PELLET DISPENSER - CHROME	1 DISP. W/PELLETS	1 DISPENSERS	SWITZ.
☐	600601	TEMPLE DISP.	PELLET DISPENSER - PLASTIC	1 DISP. + 10 REFILLS	1 DISPENSER	USA
☐	600095	EZ UP® PELLET DISPENSER	1 DISPENSER, 1 LARGE GRID, 1 SMALL GRID	1	1	SWITZ

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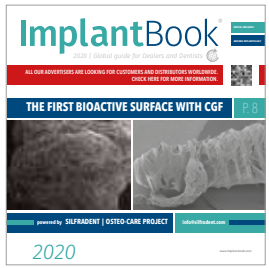

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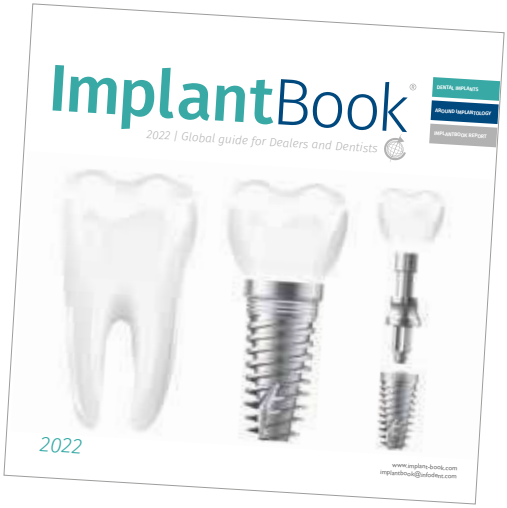

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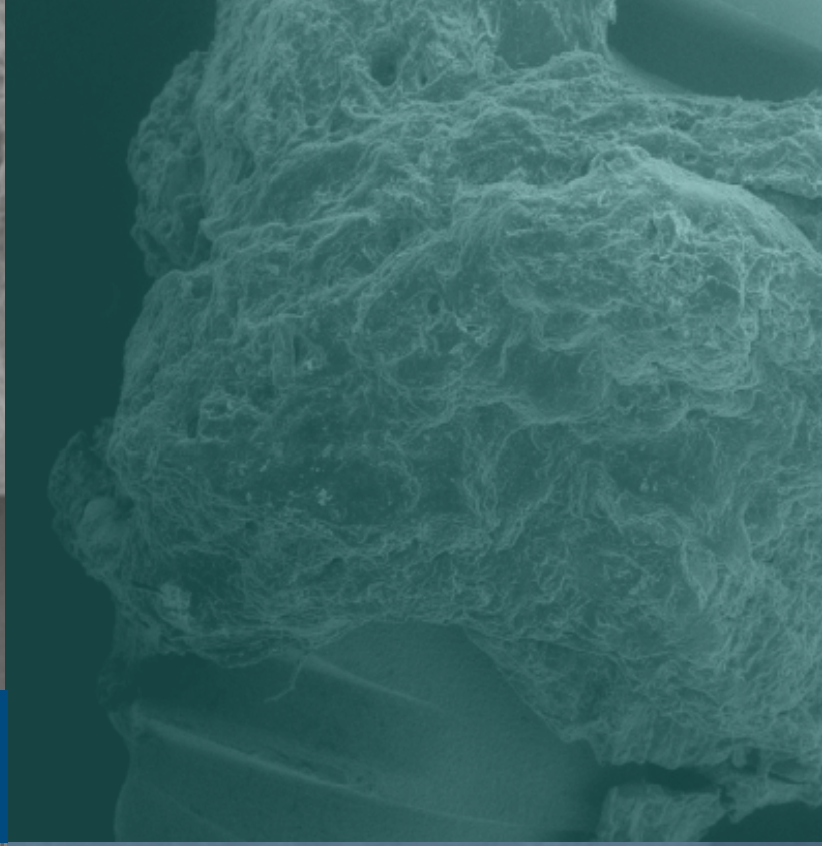

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