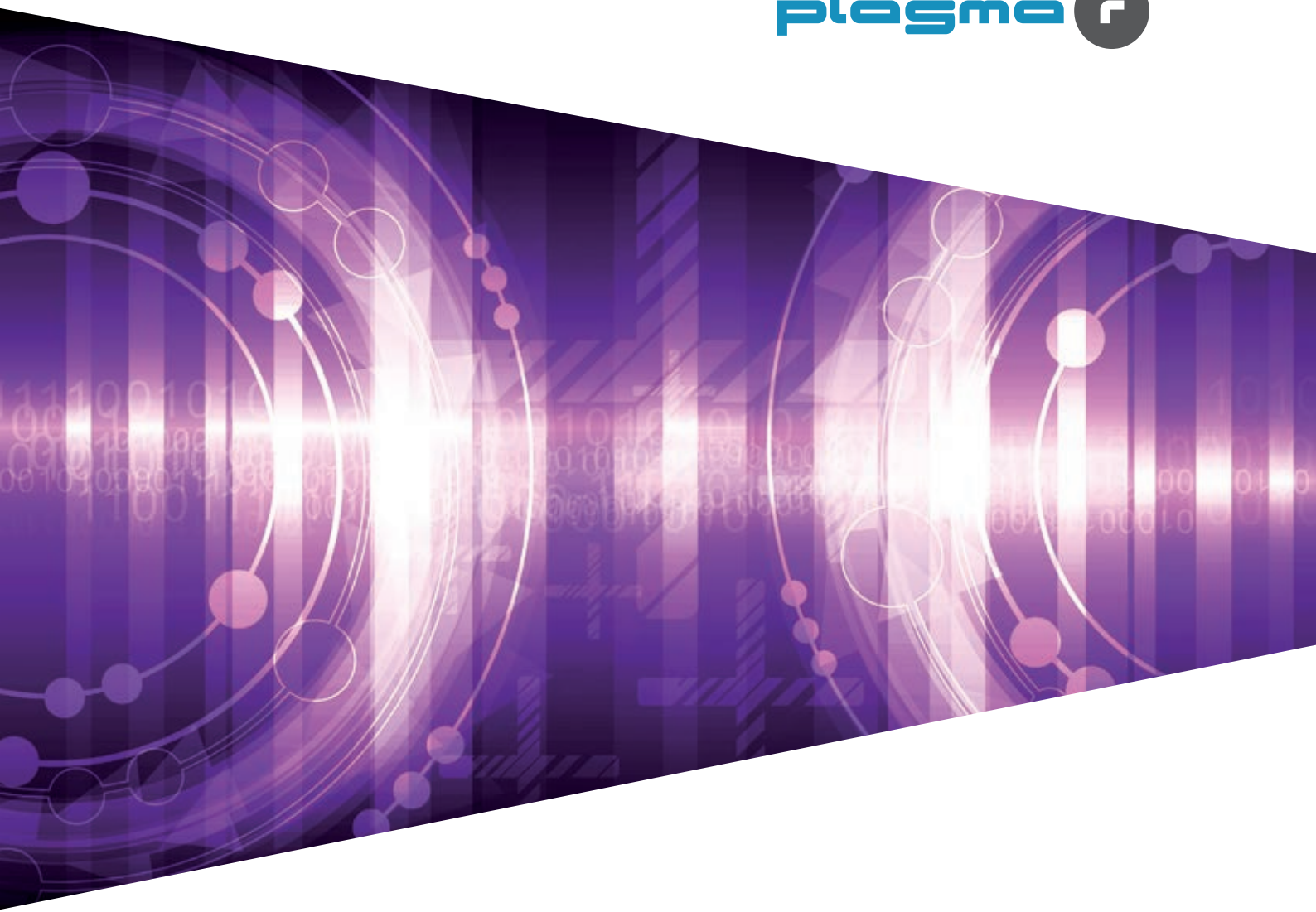


# CHAIR SIDE PLASMA CLEANING

plasma 



  
sweden & martina

## CHAIR SIDE PLASMA CLEANING

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### **Treatment of prostheses on natural teeth:**

- Increases the adhesive cementing processes
- Cleans and activates the prosthetic structures to increase their adhesion to the ceramic
- Cleans the ceramic veneers to optimise the adhesive cementing processes

**Treatment of prostheses on implants:**

- Decreases the unscrewing of prosthetic screws
- Activates the prosthetic surfaces to increase their adhesion to the soft tissues and more rapidly created a mucosal seal around the posts
- Contributes to a better coupling of the connections and therefore to less infiltration of bacteria



It increases the wettability of the prosthetic products, attracting greater growth factors and accelerating the healing process of the mucous membranes and their adaptation.

**If kept according to the instructions, titanium elements remain active for up to 72 hours.**

## Plasma R

Plasma R is an appliance that enables the decontamination and activation of prosthetic structures to be carried out directly in the dentist's surgery before inserting them in the oral cavity.

The technology is the same one used in industry to decontaminate the implants, but the reactor dimensions have been studied especially for chair-side use and for perfect integration with the facilities present in every dentist's surgery.

Plasma treatment, backed up by many scientific studies published in the main reviews in the sector, allows the dentist to carry out surface treatments both on prostheses to be fitted on natural teeth and on implant prostheses, optimising and promoting the bonds of the structures both with the soft tissues and with the adhesive materials.

Moreover, in the specific case of implant posts, the total removal of contaminants from the portion that enters the well of the implant allows a better closing of the connection and higher resistance to the unscrewing of the prosthetic screws.



Chamber sufficiently large to contain anything from a single element to a complete arch

### Fields of application:

- Cleaning and activating implant abutments
- Cleaning prosthetic rehabilitations (crowns and bridges in alloy, metal-free ceramics) to increase their adhesive cementing processes
- Cleaning and activating prosthetic structures to increase their adhesion to the ceramic
- Cleaning ceramic veneers (disilicate and zirconia) to optimise the adhesive cementing processes

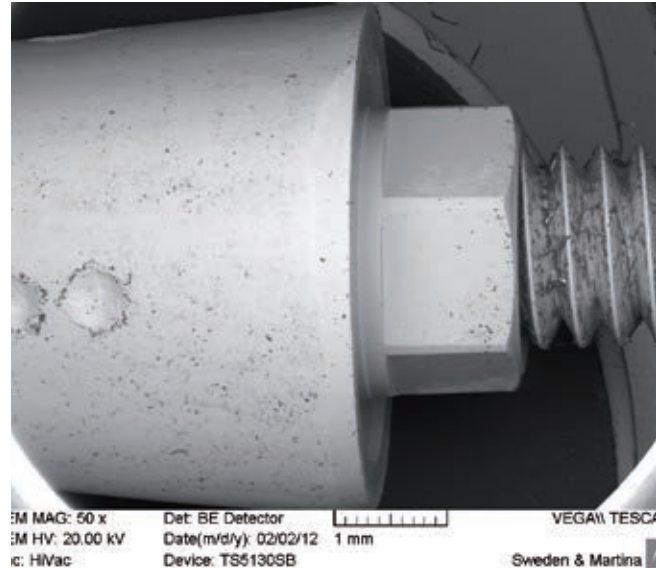
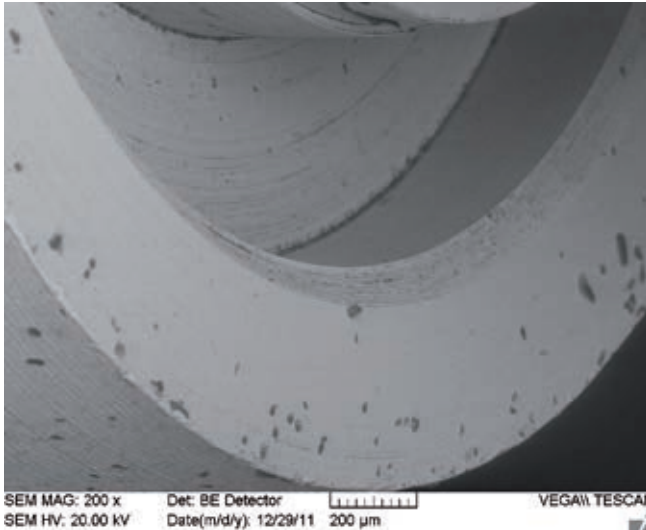
Simple and intuitive controls, with a cycle with pre-set power to make its use easy and safe, error-proof

### Warning

To operate the appliance you must purchase a cylinder of Argon gas, not supplied by Sweden&Martina; apply to your local specialised dealers.

## Operating principle

In the various phases of laboratory processing a series of residues of various origin builds up on the surface of the prosthetic components; if not correctly removed, these residues are transferred into the implant connection, preventing a perfect seal and creating a possible point of access for the infiltration of bacteria. In addition, the contaminants that remain on the crown surface have a negative influence on the adhesion of the soft tissues and often prevent optimum adhesion with the finishing materials.

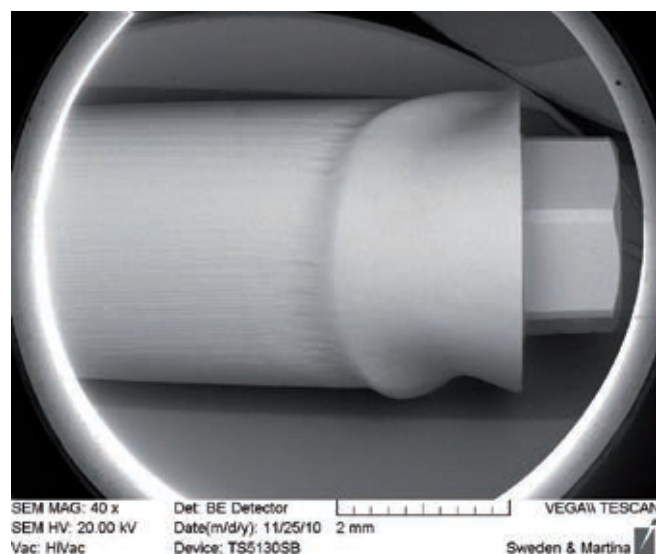


SEM photos of posts at the moment of delivery from the dental technician's laboratory: elements of residual dirt are widely present on the connection and on the connecting screw.

Plasma treatment, which is triggered in the special vacuum chamber of the Plasma R reactor, generates an ionic bombardment with Argon gas, which detaches the contaminants from the surface of the prosthetic product and converts them into their gaseous phase, which is ejected at the same time, removing any residue.



Prosthetic products during Plasma R treatment



Post milled in the laboratory after chair-side treatment with plasma cleaning. All the processing particle residue and the dirt from the environment have been accurately removed

## CHAIR SIDE PLASMA CLEANING

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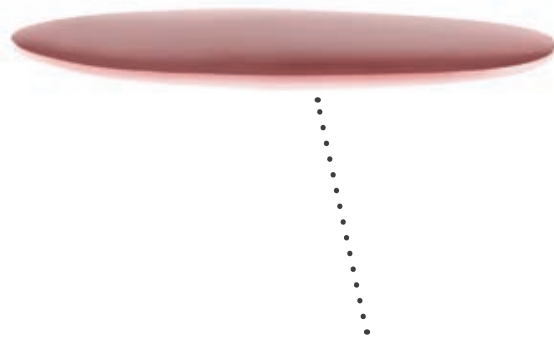
The atomic bombardment to which the titanium molecules are subjected creates a state of excitation of the electronic mantle which prepares the surface of the prosthesis for chemical and physical interaction with the adhesives and, in the case of prostheses on implant, for creating an intimate bond with the internal wall of the implant connecting well.



**Plasma cleaning treatment considerably increases the wettability of the surfaces treated, attracting regrowth factors that promote the healing of the soft tissues and their maturing into keratinised tissues.**



A liquid assumes different morphologies depending on the surface with which it comes in contact: on a surface with poor wettability a drop of blood will tend to maintain its own shape.



On a surface with high wettability it will show a much more flattened morphology, occupying a much greater area with its contact and activating a higher number of biological components involved in the healing processes.

**If kept in suitable conditions, that is wrapped in a clean sheet of aluminium and closed in a sterilisation envelope, the prosthetic products maintain their hydrophilic activation for up to 72 hours.**

Laboratory tests conducted by Sweden & Martina on grade 5 titanium plates with the same characteristics as the raw material used for both standard prostheses on implants and CAD CAM individualised prostheses.

Laboratory tests on a grade 5 titanium plate cleaned with steam cleaning according to the laboratory protocols. A special reactive liquid is used at 40mN/m.



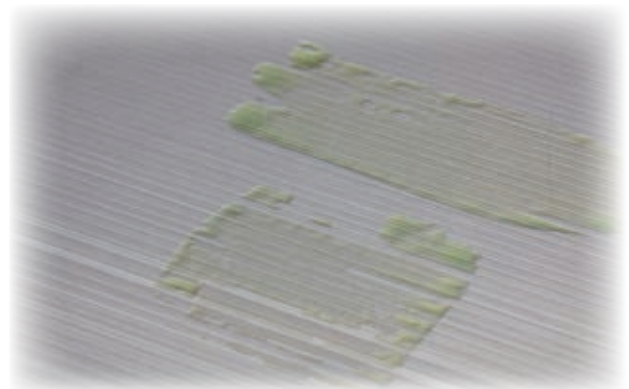
On the titanium disc, clean but not plasma treated, a special solution for assessing wettability is applied with a brush. The liquid thickens immediately forming macro drops that are globular in shape, leaving large areas of metal uncovered.

After treatment with Plasma R the same test is repeated on the same titanium disc: the liquid maintains the morphology given by the brush strokes for a longer time, indeed it gradually tends to spread over the surface.



Reaction 24 hours after treatment with Plasma R of a disc with the same characteristics, kept in a sheet of clean aluminium and closed in a sterilisation envelope. Note that the liquid reacts just as on the newly treated disc, demonstrating that the hydrophilic activation of the surface has been maintained practically unchanged.

Reaction 72 hours after treatment with Plasma R of a disc with the same characteristics, kept in a sheet of clean aluminium and closed in a sterilisation envelope. The hydrophilic activation is still evident, though less intense.



# Why is it necessary to treat the prosthesis before inserting it in to the mouth?

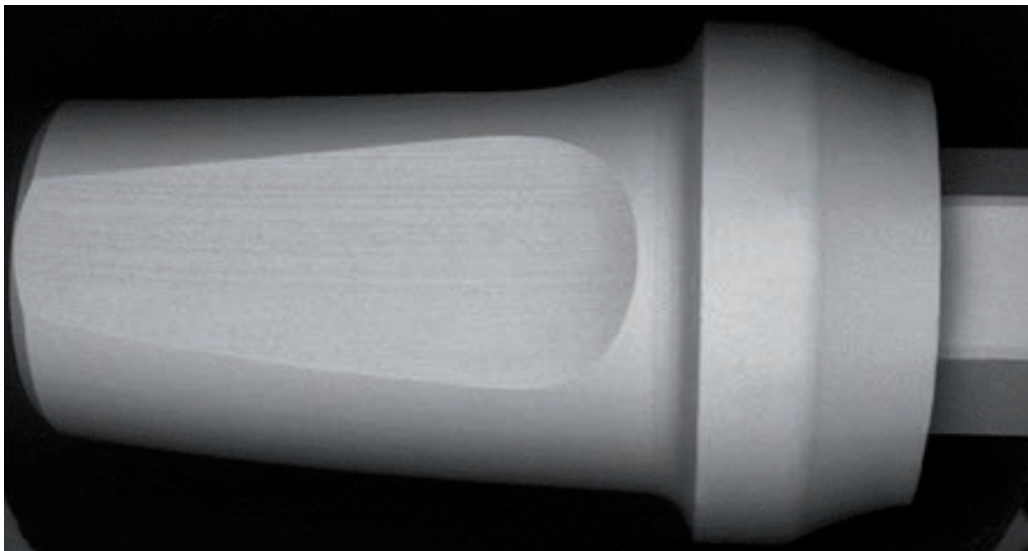
After various steps performed in the laboratory, the prepared posts are contaminated by hydrocarbons, residues of processing oil, acids and mineral powders. Some of these residues remain even after the surface washing performed in the laboratory before the prosthetic product is delivered to the dentist.

**Microscopical and chemical surface characterization of the gingival portion and connection of an internal hexagon abutment before and after different technical stages of preparation**

Canullo L., Micarelli C., Iannello G.

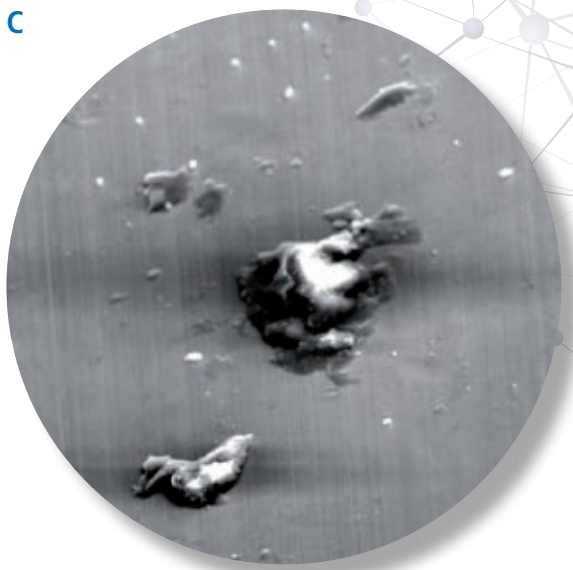
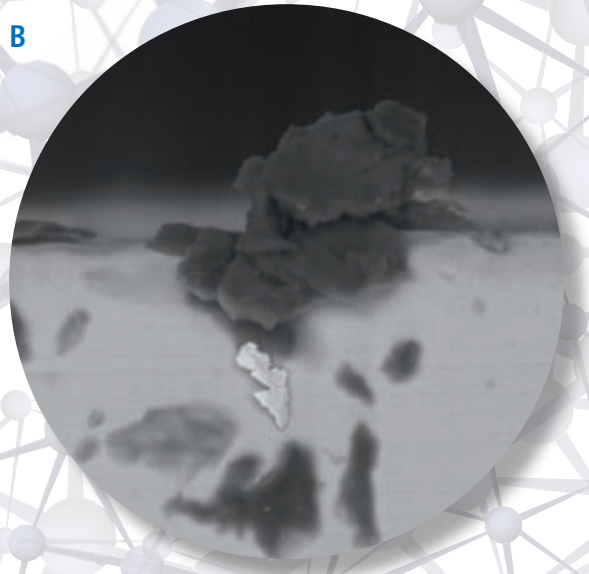
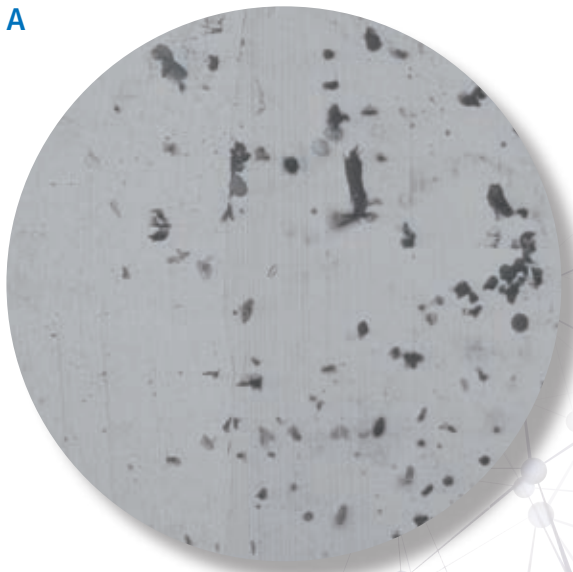
Clinical Oral Implant Research, Early View, First Published online on 2012, May, 16<sup>th</sup>

No matter how implant posts are treated during the technical preparation, they present contaminations which could interfere with the biological stability of the tissues. The authors conclude that it is advisable to follow suitable and adequate cleaning protocols.



*Electronic microscope image of an implant post*





**A,B,C:** Gingival portion and connection of posts after various processing and finishing treatments in the laboratory. Contaminants, residues of lubricants and build-ups of milled titanium powder can be seen, as well as mineral oils and dirt from the environment

# Does plasma cleaning work? Is it effective in removing laboratory residues from prosthetic products?



### Cleaning procedures on customized abutments: microscopical, microbiological and chemical analysis

Canullo L., Micarelli C., Clementini M., Carinci F.  
Clinical Oral Implant Research, 2012; 23 Suppl 7: 55-56

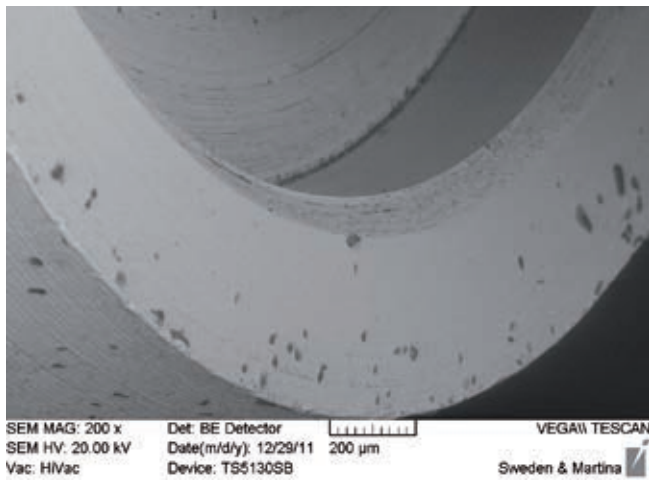
The plasma cleaning technique, carried out chair-side with the PLASMA-R decontamination unit, is highly effective in removing laboratory processing contaminants from implant posts, thus preventing the interference of processing residue with the biological stability of the tissues.

### Microscopical and microbiologic characterization of customized titanium abutments after different cleaning procedure

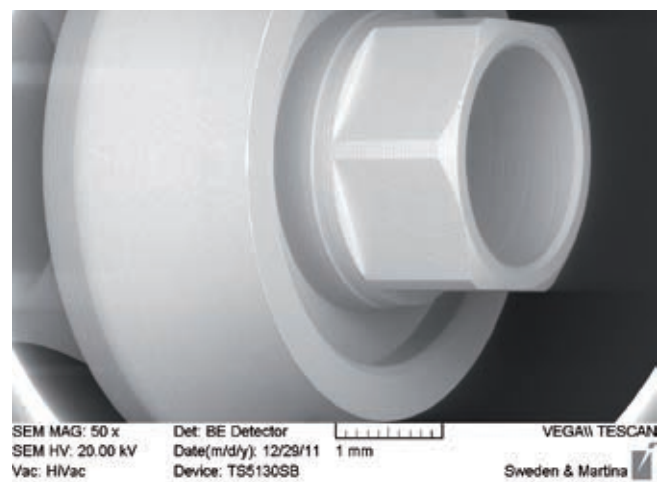
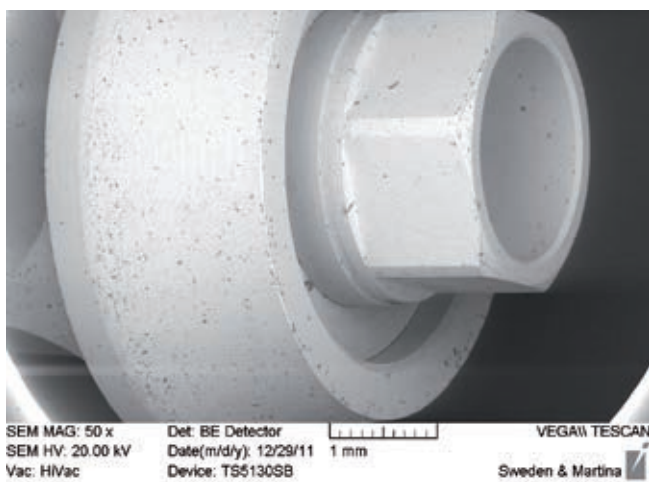
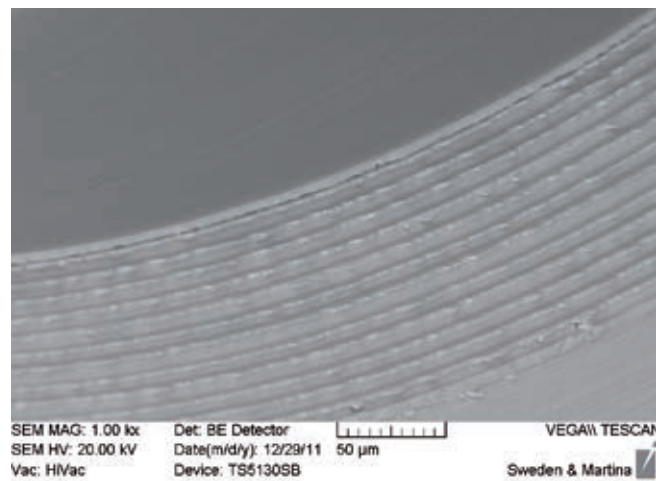
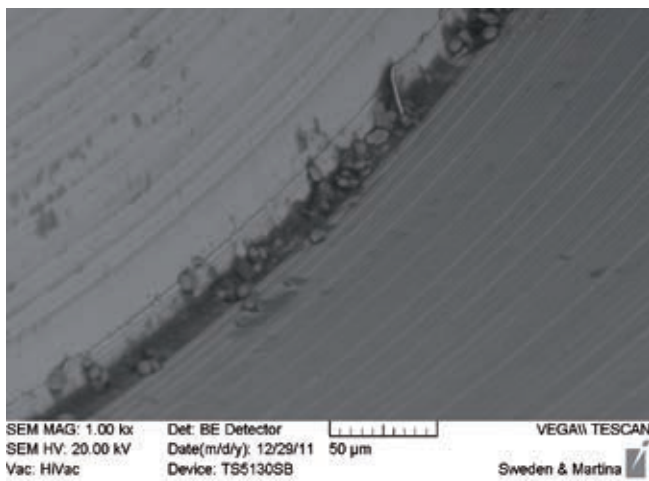
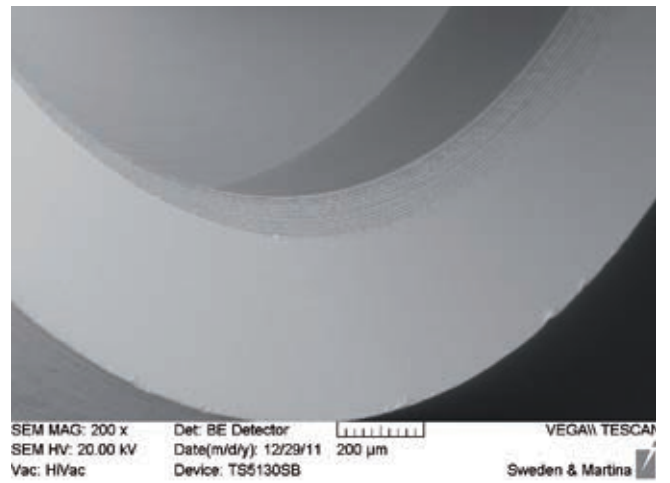
Canullo L., Micarelli C., Lembo-Fazio L., Iannello G., Clementini M.  
Clinical Oral Implant Research, Early View, First Published online on 2012, December 5<sup>th</sup>

Plasma Cleaning has proven to be at least as effective as ultrasound baths in removing particle contaminants, and microbiological analyses have shown the absence of bacteria on the decontaminated surfaces, even at implant connection level.

A. BEFORE TREATMENT WITH PLASMA R



A. AFTER TREATMENT WITH PLASMA R



# What further benefits can plasma treatment offer to the daily practice in a dentist's surgery?

In comparison with the traditional cleaning systems, plasma cleaning increases the resistance to unscrewing of the connecting screws



### Abutment screw removal torque values before and after plasma cleaning

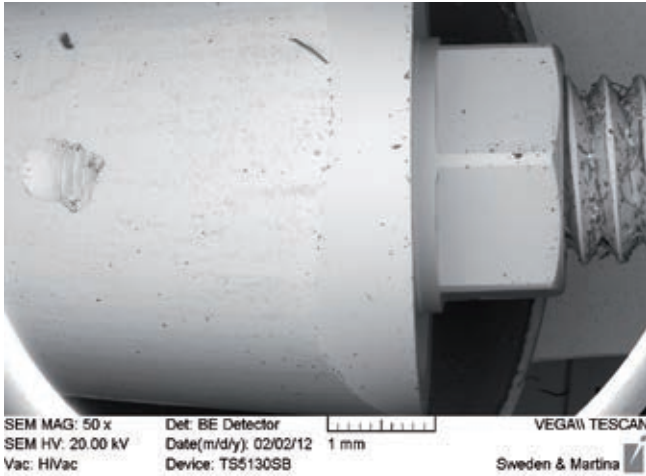
Micarelli C., Canullo L., Baldissara A., Clementini M.  
Clinical Oral Implant Research, 2012; 23 Suppl 7: 72

The authors compared the behaviour of posts cleaned with steam cleaning with that of posts cleaned with Plasma Cleaning, and then compared the presence of dirt in each group of posts with old screws and with new screws. Since the loosening of the connecting screws is a relatively frequent complication, to such an extent that it can condition the prognosis of the implant-post assembly, the authors then wanted to check whether plasma cleaning was able to reduce this complication, so they measured the reverse torque value of the connecting screws of the various groups of posts. They found that the complete removal of contaminants carried out with plasma cleaning improves the pre-load of the screws, minimising loosening, in comparison with steam cleaning. **Plasma cleaning, associated with the use of new screws for the final fixing of the posts, significantly reduces the risk of unscrewing of the screws.**

	CG	TG1	TG2	TG3	TG4
1	12	23	23	18	19
2	23	20	23	22	22
3	11	24	19	21	21
4	22	20	22	25	26
5	18	28	21	1	1
6	21	26	21	26	27
7	21	24	22	29	20
8	16	18	20	25	25
9	21	24	22	23	19
10	16	19	19	24	24
<b>Mean</b>	18,1	22,6	21,2	24,2	22,7
<b>Median</b>	19,5	23,5	21,5	24,5	23

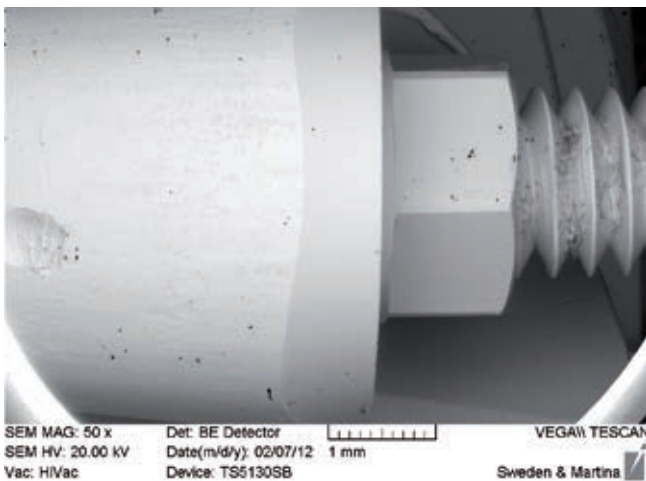
Plasma cleaning, reused screws
 
 Plasma cleaning, new screws

Torque values measured during unscrewing of the connecting screws (CG = non cleaned screws; TG1 = plasma-treated screws, reused; TG2 = steam-cleaned screws, reused; TG3 = plasma-treated screws, new; TG4 = steam-cleaned screws, new).



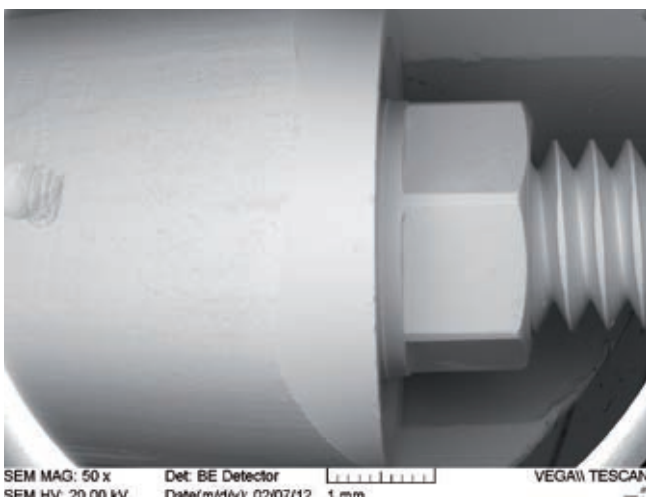
#### NON TREATED POST

*Electronic microscope image of a post subjected to laboratory treatments: a great many contaminants can be seen in the thread of the screw and in the whole area of the connection, which interfere with the correct securing of the prosthesis*



#### WASHING WITH ULTRASOUND

*The same post after washing with ultrasound: the contaminants are mostly removed, but some residue is still visible, especially in the bottom area of the thread*



#### PLASMA CLEANING TREATMENT

*After treatment with Plasma R all the areas of the post are decontaminated and free from particle residue*

# EVIDENCE SUPPORTING THE USE OF PLASMA R

## Plasma cleaning treatment favours the adhesion of the mucosa to the prosthesis



### Cell growth on titanium disks treated by plasma of Argon: Experimental study

Canullo L., Gotz W.  
Clinical Oral Implant Research, 22(9), 2011: 1082-3

In the first hours of contact with the biological fluids, a smooth titanium surface treated with Plasma R favoured the adhesion of in-vivo fibroblasts. This result suggests that this protocol could potentially boost the attachment of mucosa to the implant posts.

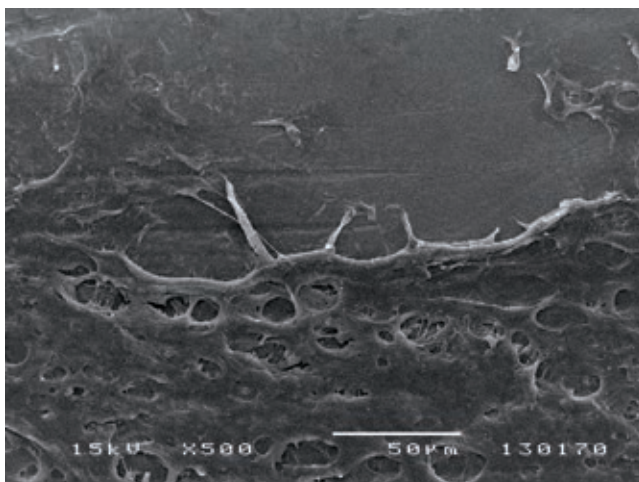
### Fibroblast growth on titanium disks treated by argon plasma : an in vitro triple-blinded study

Clementini M., Canullo L., Micarelli C.  
European Journal of Oral Implantology, 6 (Suppl. Spring), 2013: S29-S30

## Congress 2013



In this in vitro study, fibroblasts grew significantly more on surfaces treated with plasma cleaning than on non treated surfaces. From a clinical point of view, plasma cleaning could help the soft tissues in their healing process.

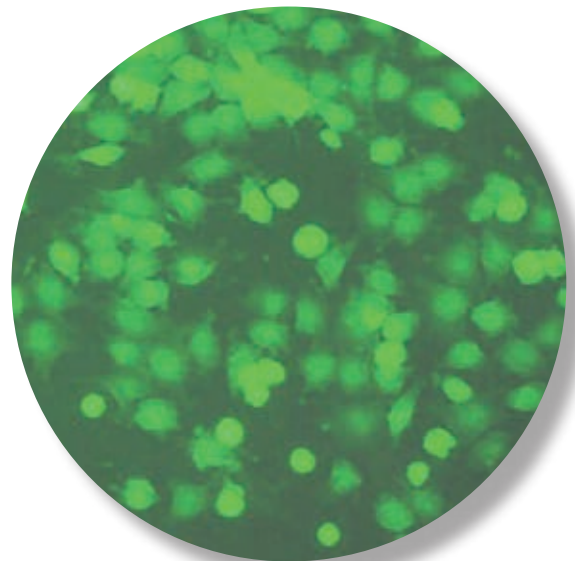
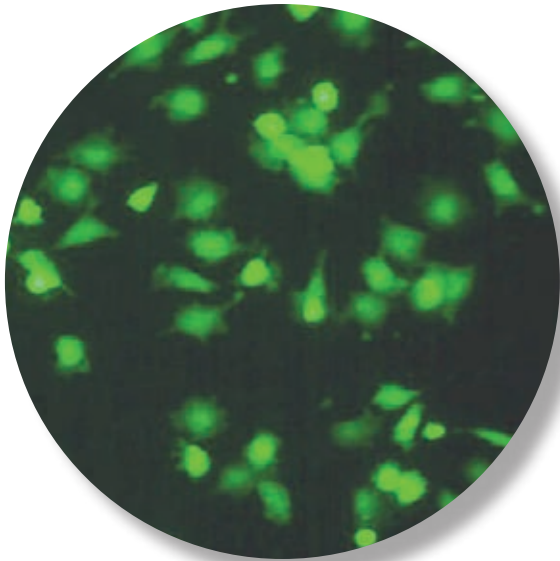


SEM image of a plasma treated titanium post removed after 7 days of healing of the soft tissues.

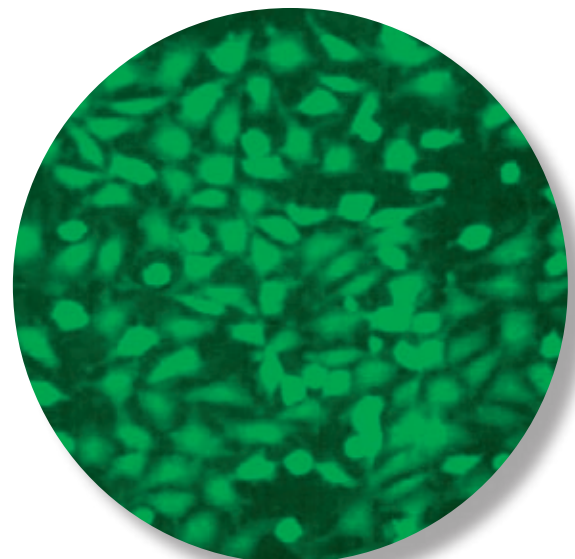
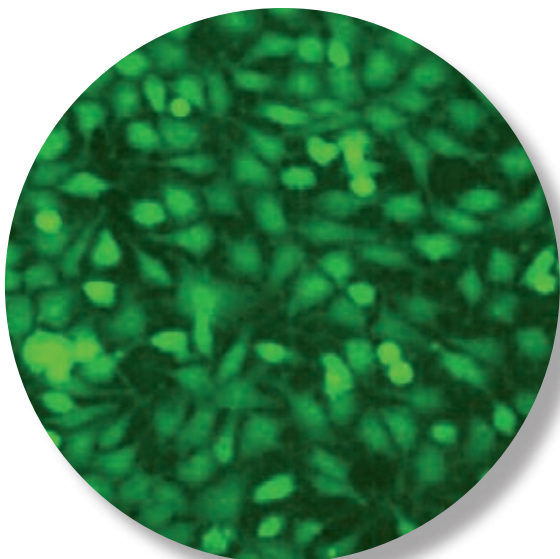
The presence of fibroblasts on the surface of the post allows us to suppose a close adhesion with the prosthetic component. Moreover the expression of pseudopodia shows that the image is the result of efficient adhesion.

A. BEFORE TREATMENT WITH PLASMA R

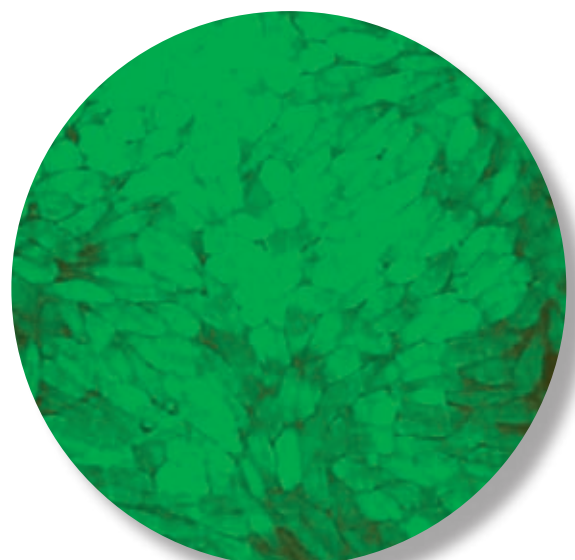
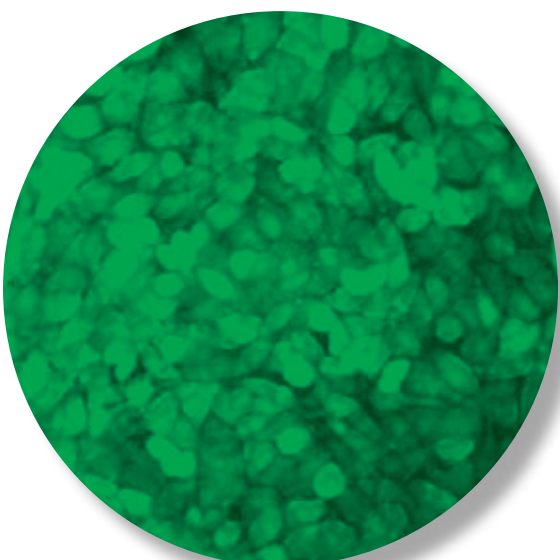
A. AFTER TREATMENT WITH PLASMA R



4 HOURS



8 HOURS



48 HOURS

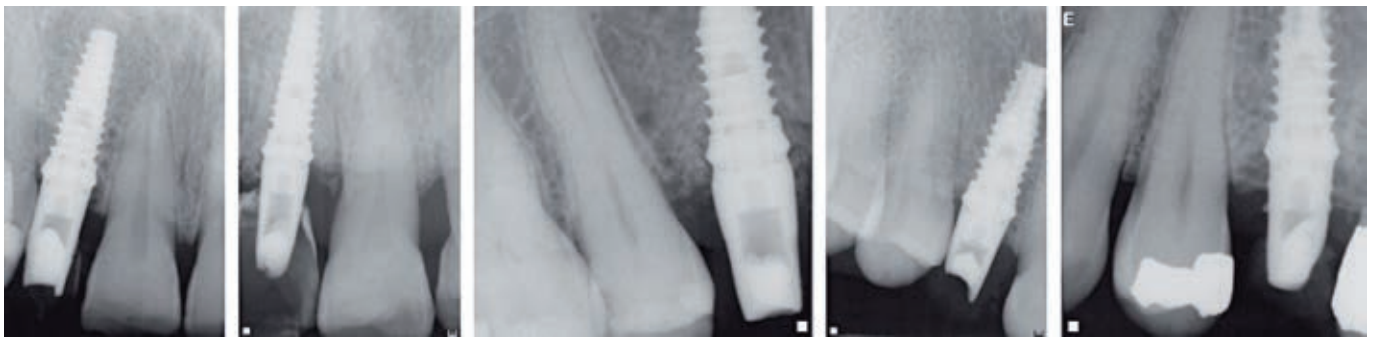
Cell density evaluated at 4, 8 and 48 hours from contact with surfaces activated with Argon plasma (column B) compared to control surfaces (column A).

### Plasma cleaning treatment improves the maintaining of the peri-implant crestal bone

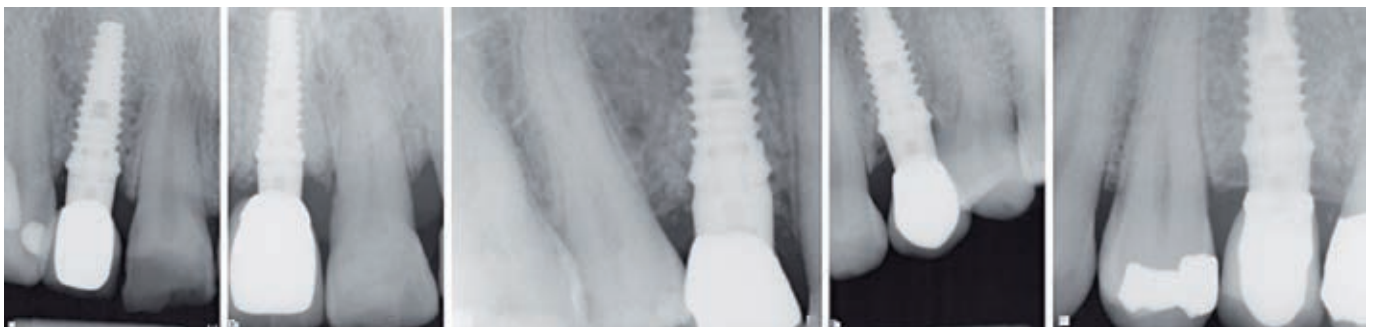
#### Peri-implant hard tissue response to glow -discharged abutments: Prospective study. Preliminary radiological results

Canullo L., Gotz W.  
Annals of Anatomy, 2012; 194: 174-478

During this interesting clinical research, the authors ascertained that using the One-Abutment-One-Time technique, together with the use of the plasma cleaning technique to remove particle and microbiological residue from posts and their connecting screws, has a positive effect in the reaction of the peri-implant hard tissues, the remodelling of which remains stable at 18 months.



*Periapical radiography at implant insertion*



*Periapical radiography at 18 months from implant insertion: no signs of cervical bone reabsorption can be seen*





**Rimodellamento Osseo Perimplantare: Background scientifico e implicazioni cliniche**

Canullo L., Cocchetto R., Loi I. 2012, Quintessenza edizioni

**Effect of titanium abutment plasma cleaning on peri-implant bone level changes: randomized controlled trial, preliminary results**

Canullo L., Micarelli C., Clementini M.  
Poster, Winner, Prize Martignoni, AIOF Congress Bologna,  
22-24 Novembre 2012

National Congress  
AIOF 2012



Accademia Italiana  
di Odontoiatria Protesica

The authors investigated the behaviour of peri-implant tissues following chair-side treatment with plasma cleaning of the posts and connecting screws. The research showed that the crestal bone is maintained significantly better around implants loaded with posts that have undergone this process rather than ones that have not been treated.

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DI IMPLANTOLOGIA  
OSTEOINTEGRATA

**Hard tissue response to argon plasma cleaning treatment on titanium abutments: 2-year follow -up RCT**

Canullo L., Micarelli C., Clementini M.  
European Journal of Oral Implantology, 6 (Suppl. Spring), 2013: S21-S22

This interesting clinical research showed how an accurate removal of contaminants from the surface of posts improves crestal bone preservation.

# Clinic case



Pre-operative view: an important recession can be noted in 2.1



Pre-operative view: after the bridge has been removed, a severe caries can be noted in 1.2 and 2.2



Post-extraction view: after removing the teeth that could not be restored, a preservation protocol was applied to the post-extraction site using non sintered nano-structured hydroxyapatite and a collagen cap



Post-extraction view: the final prosthesis previously removed and suitably remodelled was put back in position



Healing of the tissues at 4 weeks, vestibular view



Healing of the tissues at 4 weeks, occlusal view: it is possible to evaluate an important horizontal contraction of the tissues at the level of 2.2. At the same time the teeth 1.1 and 2.1 were prepared with the BOPT technique



Two months after extraction, the implant is inserted in site 2.2 with the expansion technique through a crestal mini-flap with preservation of the papillae



Using the "one-abutment - one time" concept, after the impression, the post is prepared by the technician, cleaned with Argon plasma and inserted immediately



New temporary prosthesis positioned and finalised immediately after inserting the post on the implant



Healing of the soft tissues one month after positioning of the temporary prosthesis, vestibular view. A positive coronal remodelling of the tissues can be noted



Vestibular view at insertion of the final prosthesis



Occlusal view at insertion of the final prosthesis



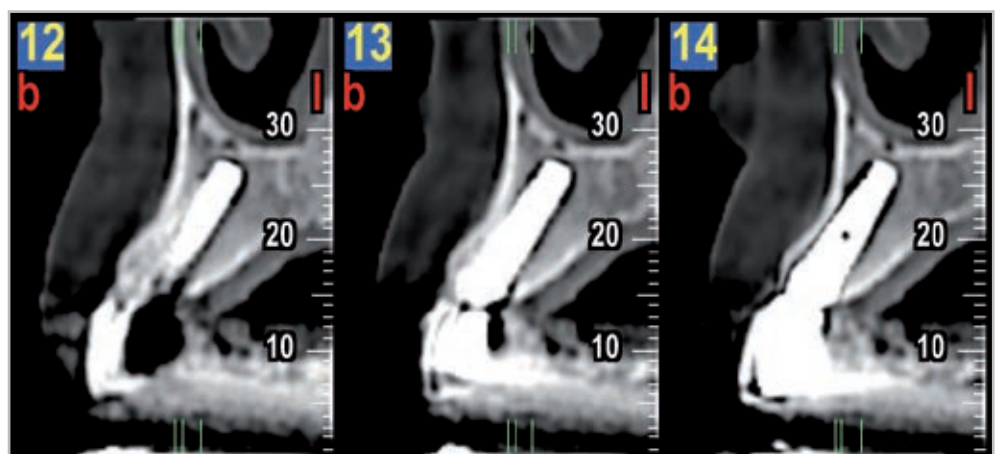
Vestibular view, follow-up after one year



Lateral view, right and left



Endoral radiography, follow-up after one year: it is possible to see the maintaining of the mesial and distal bone levels, probably due to the very slight invasiveness of the entire surgical-prosthetic procedure and to the cleaning/activation of the titanium post using Argon plasma



Dental scan at implant level, the maintaining of the vestibular swelling can be noted



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Numero gratuito 900993963



Plasma R are produced for Sweden & Martina by Diener electronic GmbH + Co. KG, Ebhausen (Germania)

The contents are up to date at the time of publication. Check with the company for any later updates.