

# Chairside with plasma for improved osseointegration

*Freshly produced implants have the desired high level of hydrophilicity, but this property soon declines measurably. However, good wettability of the implant has been shown to be crucial to good osseointegration – what effect does pretreatment with cold plasma have?*



Interview with Dr Claudio Cacaci

Dentist specialising in oral surgery & implantology

## **Manufacturers are keen to promote exceptional hydrophilicity of implants – how are things in practice?**

The advantages of highly wettable implant surfaces are indisputable and evident. It is indeed the case that carbon adsorbates settle on the surface within just a few days, significantly reducing surface energy and, inevitably, hydrophilicity. This is an entirely normal ageing process of the product. The consequence is a bone-to-implant contact – BIC – rate of 45-65%. The question I ask myself is: Why should we be satisfied with this? Why aren't we targeting BIC levels of 85-95%? With plasma activation, we found a way to simply reverse this adverse development back in 2009.

## **How does activation with plasma work, and how easy or complex is this additional step?**

Plasma activation has long been established in the industry as a method of connecting materials with each other more effectively by increasing wettability. For dental implantology, it was important to create a technology that can also be easily integrated into the treatment process in an operating context within a sterile environment, i.e. chairside. The activation process with the Yocto system from Diener Electronic, now available from Myplant, takes about three minutes, and the implant can be used immediately. This all happens chairside and does not disrupt the operation process at all.

## **What is the precise biological effect of plasma activation?**

Various scientific studies, some of which I was involved in, have shown that the quantity and adhesion of osteoblasts on the surface of the implants was significantly improved after pretreatment with cold plasma. Furthermore, this positive effect applies to both titanium and zirconium oxide, without changing the surface of the implant. The result is the creation of a superhydrophilic implant surface with all the biological properties that bone apposition requires on the surface in order to integrate the implant quickly and reliably.

## **Are there different methods, and which one do you prefer yourself – and why?**

Essentially, there are two suitable methods for surface activation: activation with UV-C radiation, and plasma activation. Both methods have a similar degree of effectiveness, with plasma activation having slight advantages. Plasma activation also has the edge in terms of equipment, and in Diener Electronic, we have found a German manufacturer that can serve the dental market.

## **How have you integrated this method into your clinical routine, and what results have you achieved with it?**

I have been using this method clinically since 2014. We soon saw that the Osstell values, which enable quantitative measurement of osseointegration, are much higher than without an activation process. Obviously, there are only a few clinical studies that have also demonstrated this in patients. Schlee et al. also confirmed this recently in a clinical human study.

We ourselves have been seeing strength figures for a long time, for instance in the augmented maxilla, that we otherwise only see in the mandible with a mainly cortical bone structure. This is the result of the much higher BIC levels on account of the superhydrophilic surface. Of course, there is the question of whether that is relevant. However, I firmly believe that in compromised situations – be they local due to insufficient bone, which has to be built up, or due to diseases of the patient that affect bone quality – this is a crucial factor in determining whether or not the treatment works in the long term.

After all, our patients are getting older and older, and in many cases more morbid, so we rely on reliable and improved osseointegration of our implants.

**Thank you very much for talking to us.** ●