White Paper WP-3
SurfLink® Dental surface treatment of a variety of dental implants

1. Introduction

A wide range of dental implant designs, roughnesses and other surface properties, dimensions and materials are used and are being developed in order to further biocompatibility. SurfLink® Dental treatment provides a surface that mimics one of the main constituents of bone, hydroxyapatite.

The purpose of this study was to show that a variety of dental implants and relevant materials can be successfully surface treated with SurfLink® Dental.

2. Materials and Methods

Dental implants from representative manufacturers and test discs made from the most commonly used materials in implant manufacture were treated with SurfLink® Dental. Treatment efficiency was assessed by X-ray photoelectron spectroscopy (XPS, Axis Ultra spectrometer, Kratos, Manchester, UK).

3. Results

SurfLink® Dental is a surface treatment that can be easily applied to a variety of oxide surfaces. SurfLink® Dental surface treatment has been successfully carried out on commercial dental implants and a range of materials (Table 1). XPS analysis, showing the presence of a validated amount of phosphorous on the surface, indicates a successful SurfLink® binding [1]. Moreover, presence of elements such as Fluorine and Silicon from implant manufacture, is significantly reduced by the SurfLink® treatment process (Figure 1).

Table 1: Phosphorous ('P%' mean % atomic concentration (Standard Deviation)) present on the surface of various commercial dental implants and commonly used materials in implant manufacture before and after SurfLink® Dental treatment.

Dental Implant or Implant Material	P% before SurfLink® Dental treatment	P% after SurfLink® Dental treatment
Thommen SPI® Element [(a),1]	0.0 (0.0)	3.1 (0.2)
Nobel Biocare™ Brånemark System® Mk III TiU RP [(b),2]	5.1 (0.4)	6.2 (0.6)
Anthogyr Ossfit® [(c),3]	2.1 (0.3)	4.6 (0.5)
Neoss Biomodal Implant System [(d),4]	0.3 (0.2)	3.0 (0.2)
NBMolecules® test implant [(a)]	0.0 (0.0)	3.2 (0.3)
NBMolecules® test implant [(e)]	0.0 (0.0)	2.8 (0.2)
Titanium (Grade 4) disc	0.0 (0.0)	3.1 (0.2)
Titanium (Grade 5) disc	0.0 (0.0)	2.6 (0.1)
Zirconia disc	0.0 (0.0)	2.2 (0.1)

(a) Sand-blasted and dual acid etched implant
(b) Spark anodised implant with highly crystalline and phosphate-enriched surface
(c) BCP® sand-blasted implant
(d) Multistage blasted and cleaned implant
(e) Machined implant

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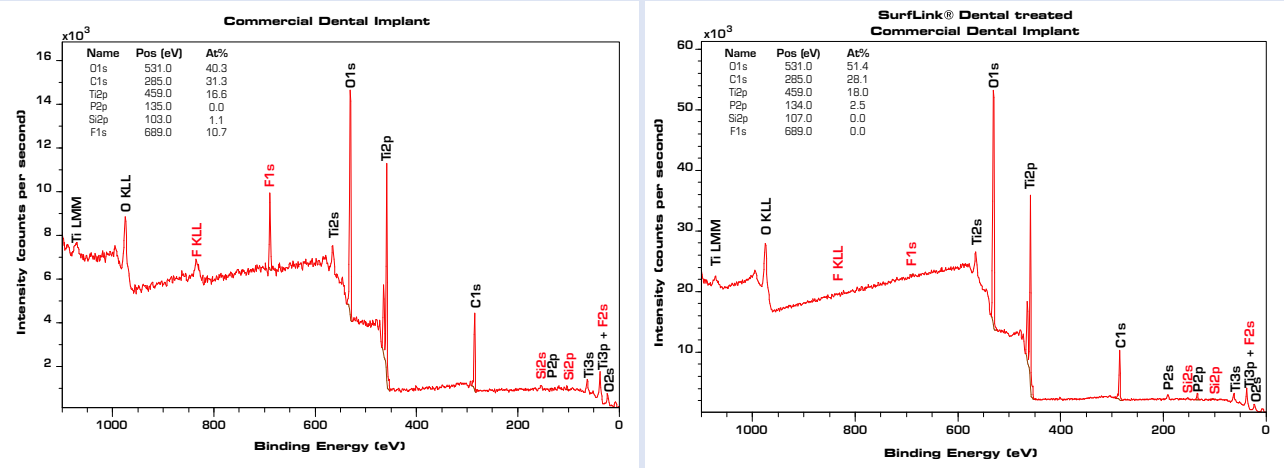

Figure 1: XPS survey spectra of a Commercial Dental Implant before and after SurfLink® Dental surface treatment. After treatment XPS analysis shows the presence of phosphorous on the surface. Moreover, the presence of elements such as Fluorine and Silicon is significantly reduced.

4. Conclusion

Most dental implant designs and surfaces qualify for SurfLink® Dental surface treatment by NBMolecules®. SurfLink® Dental treatment can even be used with various oxide implant surfaces, such as zirconia, which only recently have reached the market.

5. References

[1] NBMolecules®' White Paper WP-1 Surface characterisation of SurfLink® Dental treated titanium implants, **2011**.

Footnotes:

1 Thommen SPI® Element owned by Thommen Medical AG, Switzerland.

2 Nobel Biocare™ Brånemark System® Mk III TiU RP owned by Nobel Biocare Holding AG, Switzerland.

3 Anthogyr Ossfit® owned by Anthogyr SA, France.

4 Neoss Biomodal Implant System owned by Neoss Limited Ltd., UK.