SurfLink® Dental Implant: A Novel Implant Surface for Accelerated and Improved Bone Healing

M. von Salis[1], B. von Rechenberg[1], S. Ferguson[2], S. Buchini[3], R. Curno[3]
P. Pechy[3], B.-O. Aronsson[3]

[1] *Musculoskeletal Research Unit, Dept. of Vet. Surgery, University of Zurich, Zurich, CH,*
[2] *Institute for Biomechanics, ETH Zurich, Zurich, CH,*
[3] *Nano Bridging Molecules SA, Gland, CH*

INTRODUCTION: SurfLink® Dental is a novel surface treatment by NBMolecules® and has shown the potential to establish a rapid and stable bone-to-implant interface, an essential requirement for successful implant integration and patient prognosis. SurfLink® binds covalently to titanium producing a nano-meter thin molecular monolayer. The treated implant is highly hydrophilic by virtue of its biomimetic phosphate-like groups. This results in enhanced biocompatibility. In the clinical situation, such enhanced biocompatibility can be expected to result in increased osseointegration and long-term implant stability, significantly reducing the risk of micromotion and increasing implant success.

METHODS: Dental implants with a roughened surface finish (SPI® Element, Thommen Medical) with either SurfLink® Dental treatment or no treatment (control) were placed in the left and right pelvis of 24 sheep according to a well-established animal model. Animals were sacrificed after 2, 8 and 52 weeks. Overall integration of SurfLink® Dental implants was assessed by histological, biomechanical and scanning electron microscopy (SEM) evaluations at short and long-term time points.

RESULTS: Implants from all groups were partially or fully surrounded by cortical and cancellous bone after 2, 8 and 52 weeks, as shown by histological analysis.

In cancellous bone at 2 weeks, SurfLink® Dental treated implants showed greater integration over control implants, as evidenced both by a higher new bone formation (+ 43 % New/Old bone) and slightly higher Bone-to-Implant Contact (BIC) values (+ 3 %). This is a significant observation, as over time, failure rates are more commonly caused by a lack of implant stability from the cancellous bone. At 8 weeks, SurfLink® Dental treated implants showed a 13 % increase in new bone formation over control implants. After 52 weeks bone remodelling appeared to slow down, with mature lamellar bone structures seen around dental implants of all groups. Compared to control implants, SurfLink® Dental treated implants showed a 39 % increase in BIC values.

SurfLink® Dental treated implants showed greater integration over control implants with higher torque and stiffness values at 2 weeks (+ 32 % and + 37 % $p \leq 0.05$, respectively). Furthermore, at 52 weeks, long term fixation and stability continued to be reflected by superior torque and stiffness values (+ 7 % and + 21 %, respectively).

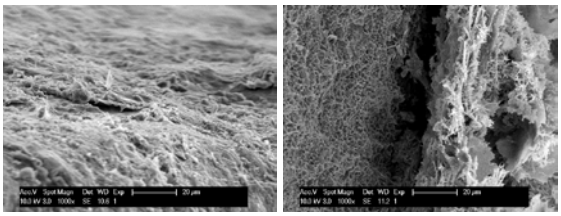

Fig. 1: SEM of implants retrieved after 52 weeks showing fracture within bone on SurfLink® Dental treated implant (left), and separation at the bone-to-implant interface on control implants (right).

SEM observations of SurfLink® Dental implants showed abundant bone coverage with fractures occurring within bone rather than at the bone to implant interface (Figure 1). This indicates a high degree of adaptation and adhesion integrating the treated surfaces with the surrounding bone.

DISCUSSION & CONCLUSIONS: In conclusion, SurfLink® Dental was shown to greatly enhance early and long-term implant fixation and overall implant osseointegration.