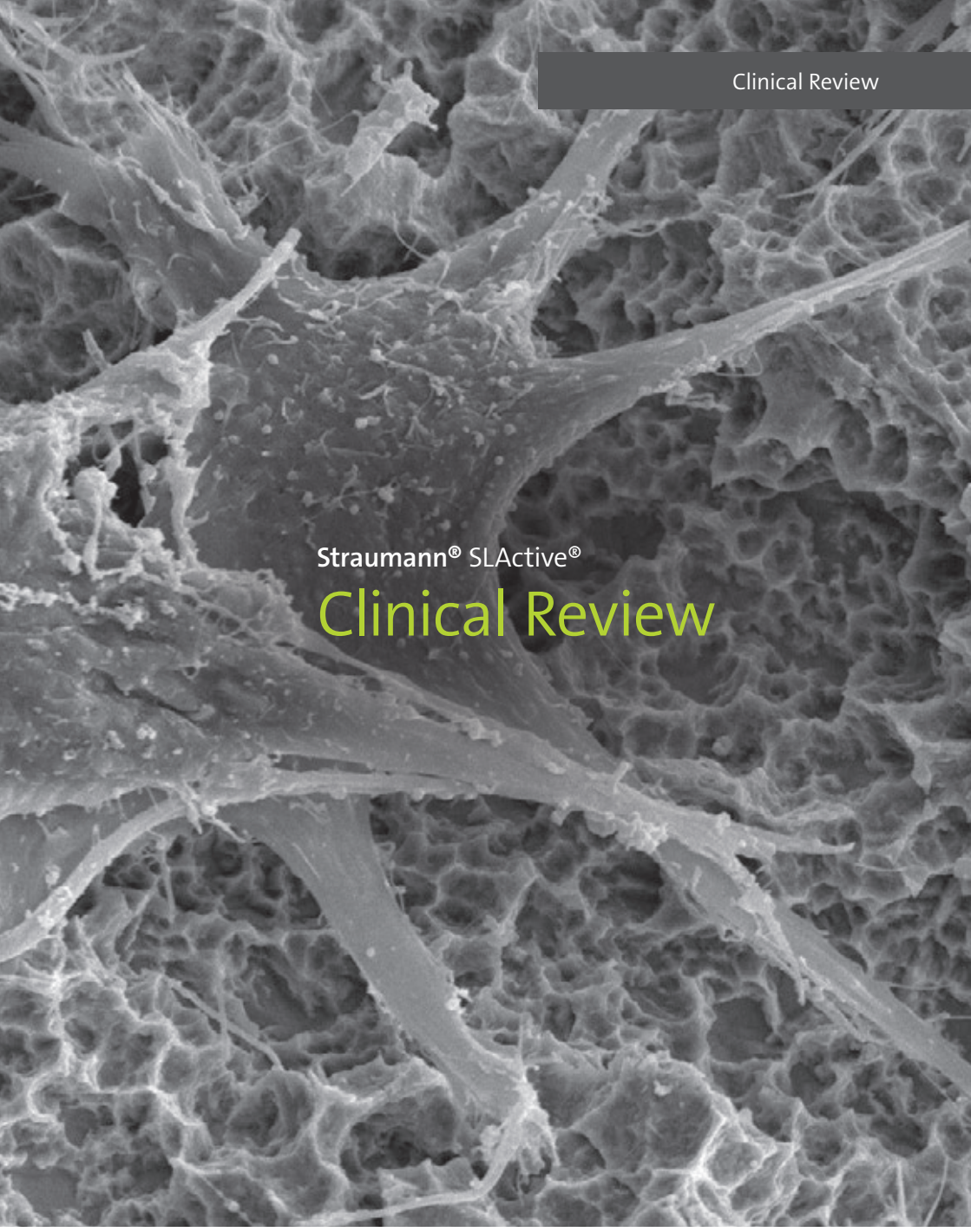

Straumann® SLActive®

Clinical Review

straumann
simply doing more

Long-term clinical success

Immediate function

Predictability in compromised health

In addition, the combination of Roxolid® with the SLActive® surface leads to more favourable peri-implant bone response compared to titanium SLActive® Implants **(Gottlow et al., 2012; Thoma et al., 2011; Wen et al., 2013)** and can therefore be successfully applied for immediate and early treatment protocols **(Bornstein et al., 2010; Buser et al., 2013; Nicolau et al., 2011)**, as well as for a conventional approach **(Barter et al., 2011)**.

PREDICTABILITY IN COMPROMISED HEALTH

DID YOU KNOW?
According to the World Health Organization (2016), an estimated 422 million adults worldwide were living with diabetes in 2014 (compared with 108 million in 1980). It is crucial, therefore, that these as well as other patients with difficult treatment protocols can be offered a reliable, safe implant treatment option.

In patients with oral cancers, the application of radiation therapy causes severe side effects, including progressive fibrosis of blood vessels or hypocellularity **(Hu et al., 2010)**, eventually leading to complications in bone healing and difficult rehabilitation **(Yerit et al., 2006; Nelson et al., 2007)**.
A clinical study evaluated the success rates of both conventional, (SLA®) and chemically modified (SLActive®) implants in patients receiving radiation therapy following the removal of a malignant tumor (oral squamous cell carcinoma). The authors demonstrated that implants with SLActive® surface could be placed in such patients with a high likelihood of success. The overall implant survival rate for implants with SLActive® surface was 100 % for both the 14-months and 5-year follow-up periods, and the crestal bone levels in these patients also remained stable within 5 years of implant placement **(Heberer et al., 2011, Nack et al., 2015, Nelson et al., 2016)**.

Different bone density/quality may also be caused by its localization within the jaws **(Lekholm and Zarb, 1985)**. Recent clinical studies have shown that SLActive® Implants, were successfully placed in patients with low quality bone (grade 4 according to Lekholm and Zarb) with overall 100 % success rates in immediate and early loading protocols **(Ganeles J et al., 2008; Nicolau et al., 2013; Bergkvist et al., 2010; Markovic et al., 2015)**.

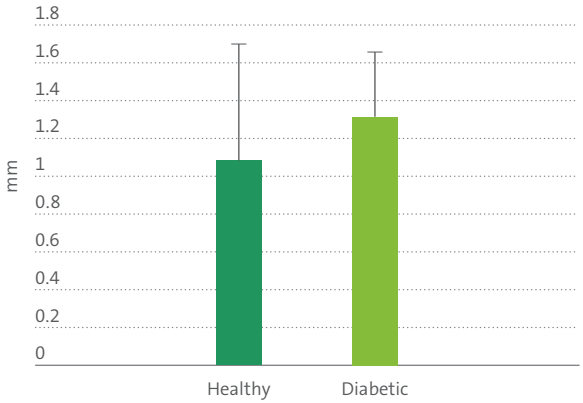

Fig. 1 MBL change between healthy and diabetic individuals with SLActive® implants (6 months follow up) **Cabrera-Domínguez et al. 2016**

DID YOU KNOW?

In vitro, the SLActive® surface exhibits a stronger than SLA® immunomodulatory effect towards M2 anti-inflammatory macrophage activation and reduction in pro-inflammatory factor release. This phenomenon might partially explain the more rapid osseointegration and reduced healing time observed in in vivo studies **(Hotchkiss KM et al., 2016)**.

The success of the implant placement therapy offered to patients mainly depends upon fast and effective osseointegration. According to data from animal studies, unstable glycemic condition can influence this process by affecting bone formation and resorption **(Takeshita et al., 1997; Nevins et al., 1998; Fiorellini et al., 1999; McCracken et al., 2000)**. In a study performed in diabetic animals, the SLActive® implants demonstrated significantly higher BIC values than the implants with the SLA® surface **(Fig. 2, Schlegel et al., 2013)** In a new clinical study SLActive® Roxolid® Implants placed in diabetic patients showed success rates of 100 % after 6 months' follow-up and marginal bone level changes similar to those observed in healthy individuals **(Fig.1, Cabrera-Domínguez et al. 2016)**. Additionally, in a study by Khandelwal et al., 2013, SLActive® Implants placed in patients with poorly controlled diabetes mellitus type 2 showed a 100 % survival rate 16 weeks following implant placement **(T. Oates 2016, personal communication)**, thus clearly demonstrating that SLActive® Implants can be successfully employed in patients with very unfavorable and/or compromised health conditions **Fig. 3.**

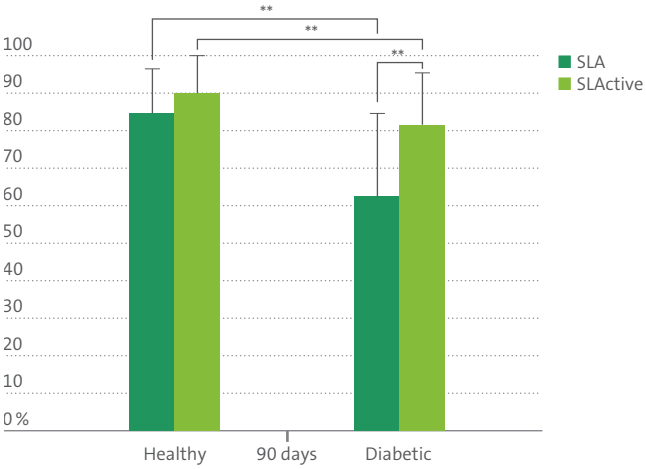

Fig. 2 Bone-to-implant contact in % at 90 days for SLA® and SLActive® implants in diabetic and healthy animals **Schlegel et al., 2013**

Furthermore, a recent study by Marković et al. found that implant stability was not compromised either in patients undergoing oral anticoagulant therapy, in whom SLActive® technology was employed, with a 100 % implant survival rate after 1 year following implant placement being documented **(Marković et al., 2016)**.

DID YOU KNOW?

The SLActive® surface offers increased treatment predictability coupled with shorter treatment times. Implants with SLActive® surface have been successfully placed in healthy individuals as well as in those with difficult treatment protocols.

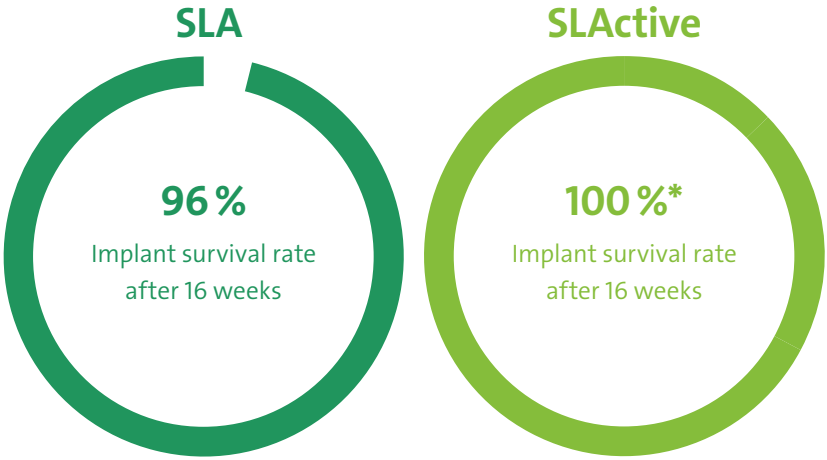

Fig. 3 Survival of SLA vs. SLActive implants in patients with poorly controlled type 2 Diabetes (14 weeks follow up) **Khandelwal N et al 2013**
***T. Oates 2016**, personal communication

LONG-TERM CLINICAL SUCCESS

Straumann® SLActive® is a chemically modified hydrophilic surface, clinically proven to accelerate osseous healing **(Buser et al., 2004; Lang et al., 2011; Oates et al., 2007; Schwarz et al., 2007)**. It was launched in 2005 and has since then been the subject of more than 150 pre-clinical and clinical studies.
A study by **Schwarz et al.** found that SLActive® provides a larger accessible surface area for increased blood protein adsorption **(Kopf et al., 2015)**. Moreover, in pre-clinical studies, greater osteoblast differentiation and increased production of the bone-building protein osteocalcin have been observed (**Zhao et al., 2005, Gu et al., 2013)**, as well as stimulated blood vessel growth **(Schwarz et al., 2008)**.

DID YOU KNOW?
In addition to very high implant success rates, general patient satisfaction 10 years after implant placement was measured excellent for over 90 % of patients with SLActive® Implants (88.2 % in the early and 93.3 % in the immediate loading group). Moreover, patient satisfaction for 1) comfort, 2) appearance, 3) ability to chew and 4) ability to taste was rated as excellent in all 4 criteria by more than 76 % of patients **(Nicolau et al., 2016).**

IMMEDIATE FUNCTION

Surface modifications play an important role in the speed of osseointegration following placing of an implant. They influence implant strength as well as its aging resistance and therefore contribute significantly to the overall success of immediate and early loading protocols **(Buser et al., 1991; Coelho et al., 2011; Dos Santos et al., 2011; Elias et al., 2008; Shalabi et al., 2006)**. A recent study demonstrated that, after an initial remodeling phase of 5–6 months, no differences could be found between the two treatment groups (immediate and early loading). The survival rates were 98.2 % and 97.1 % in the immediate and early loading groups, respectively **(Nicolau et al., 2016)**. Also, in another human study, it was proven that the osseointegration process is accelerated for implants with the SLActive® surface **(Lang et al. 2011).**

REFERENCES

1 Barter S et al. Clin. Oral Impl. Res. 23, 2012; 873–881 **2** Bergkvist G et al. 2010; Int J Oral Maxillofac Implants. 25(2):321-8. **3** Bornstein MM et al. 2010; J Periodontol 81(6):809-818. **4** Buser D et al. 2004; J Dent Res 83(7):529-533. **5** Buser D et al. 2013; J Periodontol 84(11):1517-1527. **6** Buser D et al. 1991 25(7):889-902. **7** Coelho PG et al. 2011; J Mech Behav Biomed Mater 4(8):1974-1981. **8** Dos Santos MV et al. 2011; Clin Implant Dent Relat Res 2011;13(3):215-223. **9** Elias CN, et al. 2008; J Mech Behav Biomed Mater 1(3):234-242. **10** Fiorellini, JP et al. Clinical Oral Implants Research 10: 362–368. **11** Ganeles J et al. 2008; Clin Oral Implants Res. 19(11):1119- 28. **12** Global report on diabetes. World Health Organization 2016, ISBN 978 92 4 156525 7 **13** Gottlow J et al. 2012; Clin Implant Dent Relat Res 14(4):538-545. **14** Gu YX et al. 2013; J Biomed Mater Res A. 101(3):748-54. **15** Heberer S et al. 2011; Clin Oral Implants Res 22(5):546-551. **16** Hotchkiss KM et al. 2016; Clin Oral Implants Res. 2016 Mar 23. [Epub ahead of print] **17** Hu, WW et al. 2010; Journal of Dental Research 89: 77–81. **18** Khandelwal N et al. 2013; Clin Oral Implants Res;24(1):13-19. **19** Kopf BS et al. 2015; Journal of Biomedical Materials Research **20** Lang NP et al. 2011; Clin Oral Implants Res 22(4):349-356. **21** Lekholm U et al. 1985; Osseointegration in Clinical Dentistry. Quintessence Publ Co., pp. 199-209. **22** Machuca G, et al. Abstract presented at EuroPerio8 (2015) and published in J Clin Periodontol., 42 (S17): 315. Manuscript submitted to Int J Oral Maxillofac Implants. **23** Markoviæ A et al. 2015; Clin Implant Dent Relat Res. 17(5):1004-13 **24** Markoviæ A et al. 2016 Clin Oral Implants Res. Aug 18 (Epub ahead of print) **25** McCracken et al. Int J Oral Maxillofac Implants 15: 345–354. **26** Nack C et al. 2015;J Oral Rehabil. 42(1):57-64 **27** Nelson K et al. 2007; Journal of Prosthetic Dentistry 98: 405–410. **28** Nelson K, et al. 2016 J Oral Rehabil. 43; 871–872 **29** Nevins, ML et al. Int J Oral Maxillofac Implants 13: 620–629. **30** Nicolau P, et al. Data presented at the 25th Annual Scientific Meeting of the European Association of Osseointegration – Sep 29 – Oct 1, 2016, Paris, France. **31** Nicolau P et al. 2013; Clin Implant Dent Relat Res. 15(4):600-12. **32** Oates TW et al. 2007; Int J Oral Maxillofac Implants 22(5):755-760. **33** Schlegel KA, et al. 2013; Clin Oral Implants Res. 2013 Feb;24 (2):128-34. **34** Schwarz F et al. 2008; J Clin Periodontol 35(1):64-75. **35** Schwarz F et al.2007; Mund Kiefer Gesichtschir. **36** Shalabi MM, et al. 2006; Clin Oral Implants Res. 17(2):172-8. **37** Takeshita, F et al. Journal of Periodontology 68: 180–185. **38** Thoma DS et al. 2011 J Periodontol. 82(10):1453-61 **39** Wen B et al. 2014; Clinical Oral Implants Research (7):819-25. **40** World Cancer Report 2014. International Agency for Research on Cancer 2014 ISBN 978-92-832-0429-9 **41** Yerit K et al. 2006; Clinical Oral Implants Research 17: 337–344. **42** Zhao G et al. 2005; J Biomed Mater Res A 74(1):49-58.

International Headquarters
Institut Straumann AG
Peter Merian-Weg 12
CH-4002 Basel, Switzerland
Phone +41 (0)61 965 11 11
Fax +41 (0)61 965 11 01
www.Straumann.com

490.259/en/A/00 10/16