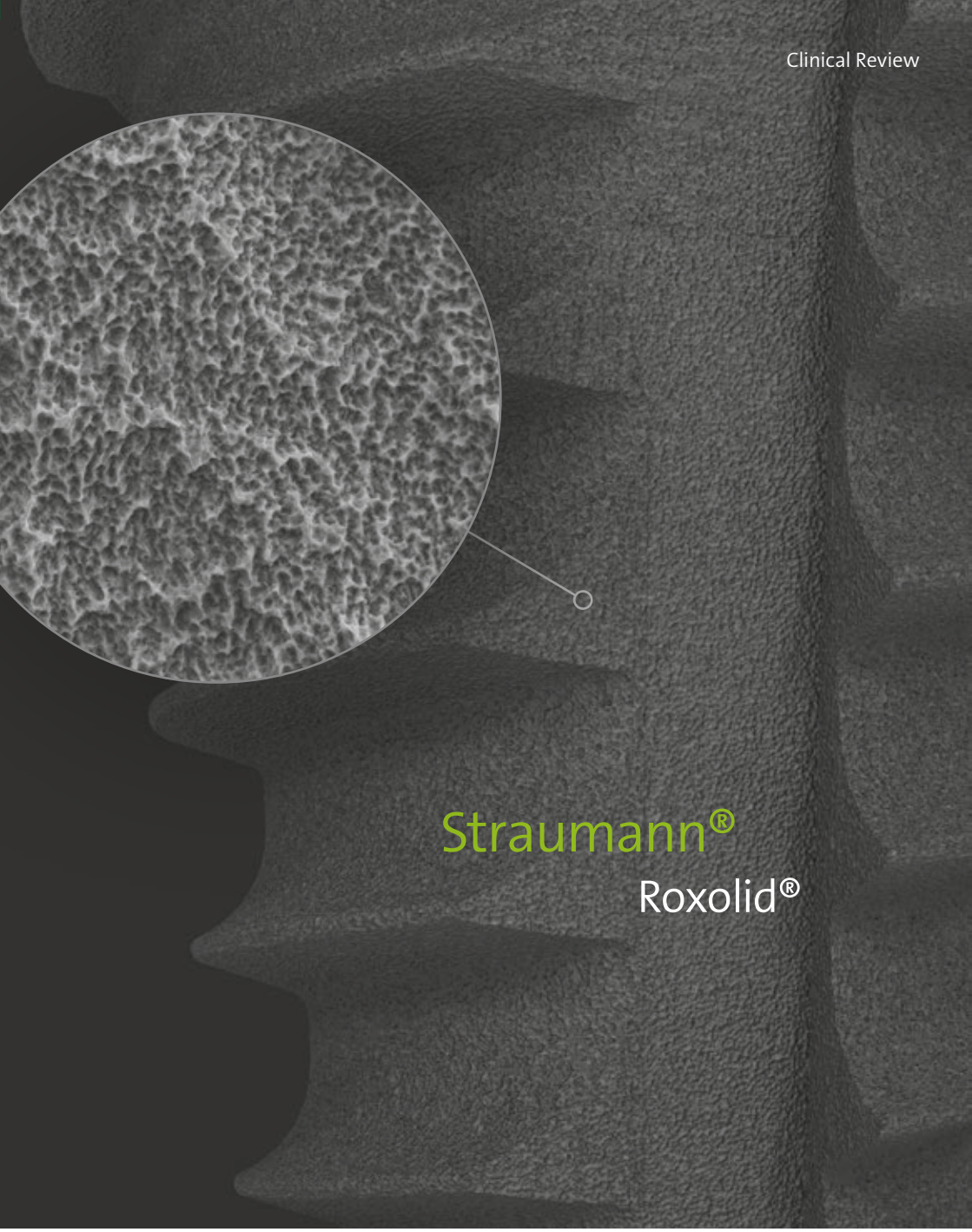
Clinical Review



Straumann®
Roxolid®

straumann
simply doing more

Stronger than titanium

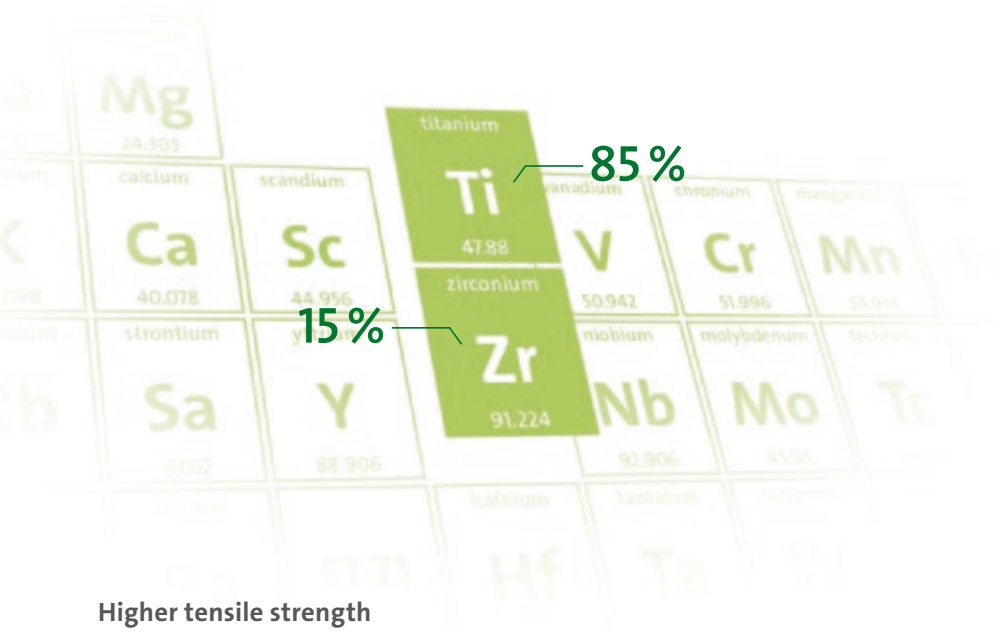
Reduced surgical invasiveness

Shorter treatment time

More treatment options

STRONGER THAN TITANIUM

Roxolid® is an alloy of ~85 % titanium and ~15 % zirconium. The combination of the properties of these two metals leads to higher tensile and fatigue strength than comparable titanium implants **(Bernhard et al., 2009; Grandin et al., 2012; Ho et al., 2008; Kobayashi et al., 1995).**



Higher tensile strength

Ultimate tensile strength is the maximum force that a material withstands without breaking. The higher a material's tensile strength, the lower the risk for forced rupture. Roxolid® shows a 10–15 % higher ultimate tensile strength compared to titanium grade 4 **(Medvedev et al. 2016).**

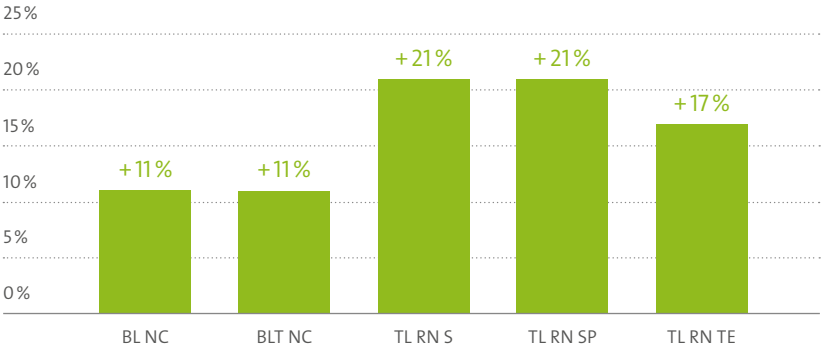
DID YOU KNOW?

Roxolid® was tested in a comprehensive multicenter clinical trial in 9 countries, including 40 study centers and 603 Roxolid® Implants placed in 357 patients (**Al-Nawas et al., 2015**). This is the largest clinical research program ever initiated by a dental implant company before the commercial launch of a product.

Higher fatigue strength

Fatigue strength is the long-term capability of the implant to withstand normal masticatory forces. High fatigue strength is especially important when using reduced-size implants **(Grandin et al., 2012).** The fatigue strength of **Roxolid® SLActive®** reduced-diameter implants was found to be up to 21% greater than that of comparable titanium **SLActive®** Implants **(Medvedev et al., 2016)** (Fig. 1).

Fig. 1. Higher fatigue strength of Roxolid® SLActive® ∅ 3.3 mm Implants in comparison to titanium SLActive® ∅ 3.3 mm Implants.



BL NC Bone Level Implant / Narrow Crossfit®
BLT NC Bone Level Tapered Implant / Narrow Crossfit®
TL RN S Tissue Level / Regular Neck / Standard Implant
TL RN SP Tissue Level / Regular Neck / Standard Plus Implant
TL RN TE Tissue Level / Regular Neck / Tapered Effect Implant

REDUCED SURGICAL INVASIVENESS

Interest in short-length and reduced-diameter implants is rising globally **(Millenium research group, 2015)**, because they offer the opportunity to avoid bone grafting procedures in cases where there is not enough bone volume or inter-dental space for regular-sized implant placement **(Barter et al., 2012; Calvo-Guirado et al., 2015; Chiapasco et al., 2012; Papadimitriou et al., 2015).**

Roxolid® reduced-diameter (Ø ≤ 3.3 mm) Implants

Reduced-diameter implants provide advantages in several clinical indications such as narrow single-tooth gaps or edentulous ridges with limited width **(Benic et al., 2013, Lambert et al., 2014, Müller et al., 2015, Quirynen et al., 2014)**. Five-year follow-up data of a recent randomized controlled trial with a split-mouth design **(Al-Nawas et al., 2015)** confirmed that Roxolid® reduced-diameter implants provide a safe alternative to titanium grade-4 dental implants **(Müller et al., 2015)**. Clinicians also documented that for more than half of the placed implants, a bone augmentation procedure could be avoided **(Al-Nawas et al., 2015; Lambert et al., 2014)**. A recent systematic review and meta-analysis reported that Roxolid® provides the basis to use reduced-diameter implants with the same level of treatment success as with regular-diameter implants, even in high-loading situations **(Altuna et al., 2015)**.

DID YOU KNOW?

Titanium and zirconium, the two elements which form Roxolid®, are the only two metals which do not inhibit the growth of osteoblasts **(Steinemann, 2000)**. Osteoblasts are bone-forming cells that are essential for successful osseointegration of the implant.

Roxolid® short-length Implants (≤ 6 mm)

The lack of sufficient bone volume in severely resorbed jaws and in close proximity to the inferior alveolar nerve or the maxillary sinus are challenging clinical situations for the placement of regular-length dental implants. Vertical bone augmentation procedures may be indicated but result in time-consuming, often painful and expensive treatments for the patient with high risk for complications. A Cochran systematic review concluded that short-length implants appear to be a better alternative to vertical bone grafting procedures **(Esposito et al., 2006)**. Clinical evidence exists that Roxolid® short-length implants maintain full function and healthy peri-implant conditions over time with survival rates comparable to longer implants **(Calvo-Guirado et al., 2015)**.

DID YOU KNOW?

Macrophages are important cells of the immune system. They can increase or decrease inflammatory response. A recent cell-culture study reported that macrophages reduce the inflammatory environment on Roxolid® SLActive® discs. **(Hotchkiss et al., 2016)**.

SHORTER TREATMENT TIME

Today, dentists and their patients expect not only a successful dental implant treatment but also a short treatment time. The structure of **Roxolid®** is similar to titanium allowing the creation of the **Straumann® SLA®** and **SLActive®** surface. The **SLA®** surface is one of the best long-term documented surfaces in dental implantology **(Buser et al., 1991; Cochran et al., 1996)**. **SLActive®** is a chemically modified hydrophilic nano-structured surface which showed in pre-clinical studies even better osseointegration properties compared to the well-established **SLA®** surface **(Buser et al., 2004; Schwarz et al., 2007)**.

The combination of **Roxolid®** material with the **SLActive®** surface leads to better peri-implant bone response and higher removal torque values compared to titanium **SLActive®** Implants **(Gottlow et al., 2012; Thoma et al., 2011; Wen et al., 2013)** and can therefore be successfully used in immediate and early treatment protocols **(Bornstein et al., 2010; Buser et al., 2013; Nicolau et al., 2013)**.

MORE TREATMENT OPTIONS

Through its increased strength, **Roxolid®** Implants offer a wider choice of treatment options with short-length or reduced-diameter implants. In patients with limited ridge width or patients who are not ideal candidates for grafting procedures, **Roxolid®** can also be the solution to increase patients' acceptance of implant treatment.

DID YOU KNOW?

The Roxolid® material and the SLActive® surface technology each received the Frost & Sullivan Medical Device Technology of the Year Award.

In summary, the use of **Roxolid®** Implants can help to reduce surgical invasiveness, to shorten treatment time with more immediate prosthetic placement, and offer more treatment options with increased patient acceptance for the clinical practice.

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