

Time-saving debridement of implants with rotating titanium brushes

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Introduction

The mechanical debridement of implants as part of peri-implantitis therapy is time-consuming and tedious. The use of rotating brushes with titanium bristles can result in significantly shortened treatment times. Compared with mechanical curettage, they ensure a gentler and more even treatment of the exposed portions of the thread.

Despite—or because of—the success story of oral implantology, peri-implantitis, associated with significant bone loss, is on the rise. A meta-analysis performed by Berglundh et al. in 2002 (which included periimplant mucositis) showed that the incidence of periimplant disease for different implant systems was between 5 and 8 per cent.¹ In fact, the prevalence of periimplantitis alone is assumed to be between 10 and 20 per cent today.^{2,3} The biological response to the implant and the implant's ability to integrate with the surrounding tissue are determined by the structure of the implant surface. Roughened implant surfaces to enlarge the bioactive surface are a clinically proven method and have been accepted by all manufacturers as the basis for

successful osseointegration of their implants.^{4,5} Advanced periimplantitis invariably leads to bone loss and, hence, to the exposure of implant surfaces, including threaded parts. One of the most frequently discussed topics in oral implantology today is that of finding the right treatment approach in this situation. In cases with pocket depths of more than 6 mm, surgical access followed by mechanical cleaning and decontamination of the exposed portions of the thread is certainly an option. Following bone loss, the implant surface is generally covered by concrements, necrotic bone and inflammatory tissue. Proper debridement thus requires mechanical cleaning of the implant surface to remove concrements and granulomatous tissue.

This mechanical debridement is generally performed by specific curettes. The vertical movements of these curettes, which have only limited contact with the implant thread, are not very efficient. It stands to reason that rotationally symmetrical, screw-shaped structures like those of most contemporary implants are more rapidly and more evenly debrided with rotary instruments (Fig. 1). Rotating brushes are capable of adapting more closely

Fig. 1 Mounted titanium brush (PeriBrush™, Tigran Technologies).

Fig. 2 The titanium brush was designed to match the implant architecture.



Fig. 1



Fig. 2



Fig. 3



Fig. 4

to the architecture of the implant. In a previous study⁶ we have analyzed the effect of rotating titanium brushes (PeriBrush™, Tigran Technologies; Fig. 2) on different types of implant surfaces. Implants with an anodized surface and implants with a titanium-blasted surface were examined with a scanning electron microscopic (SEM) and with a Keyence VHX 600 before and after treatment with a single-use rotating titanium brush as well as before and after curetting. For the purposes of this study, the brush was inserted into an angled hand piece and held against the implant while rotating at 300 to 600 rpm. Only minimal pressure was applied, because excessive pressure can bend the titanium brushes and reduce the cleaning effect. Under the light microscope, the traces of curettage are clearly visible (Fig. 3), whereas the treatment with the rotating brush results in only barely discernible damage to the implant surface. The brush has an even, slightly smoothing effect on the implant surface (Fig. 4). This is confirmed by the corresponding SEM images (Figs. 5–8).

The topographic effect of the rotating brush on the implants surface and on the brush itself is directly correlated with the horizontal load/force and the duration of the treatment. In the actual study "Clinical parameters for the use of rotating titanium debridement brushes" we analyzed the surface ef-

fects of different loads/forces between 10 and 60 g / 0.1–0.6 N on the surface of sandblasted and acid etched implants.

Four implants were fixed at the apex in Pattern Resin, GC. The Pattern Resin plate with the implant in the middle was fixed in a turning machine and carefully turned down until a complete rotational symmetry with the centered implant was achieved (Fig. 9). Two screws fixed the Pattern Resin plate with the centered implant on a motor driven plate of aluminum (Fig 10).

To ensure the different horizontal loads/forces onto the KaVo angel piece and therefore on the rotating PeriBrush, a spring based construction (spring steel wire) with defined distances of impression under load was used. The spring length shows a linear correlation to the load/force as seen in Fig-ure 11.

Fixed in an angle piece (KaVo), the Tigran™ PeriBrush™ transfers a defined horizontal load/force on the implants surface according to the predefined length of the spring. The angle piece works with additional rinsing at 600 rpm and has been applied vertically against the implant at an angle about 20–30 degrees, so that the bristles make contact with the circular side of the implant and also clean in be-

Fig. 3 Implant following mechanical debridement using a curette (light microscope, ×20).

Fig. 4 Implant following mechanical debridement using the titanium brush (light microscope, ×20).

Fig. 5 Implant surface before treatment (SEM, x100).

Fig. 6 Implant surface after curetting (SEM, x100).

Fig. 7 Implant surface after debridement using the titanium brush (SEM, x100).

Fig. 8 Implant surface after debridement using the titanium brush (SEM, x200).

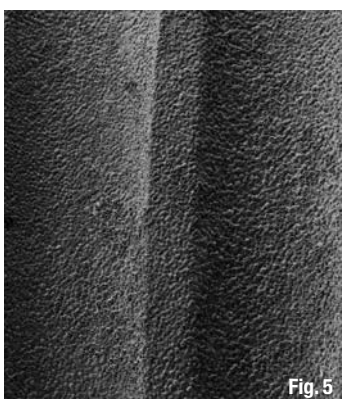


Fig. 5

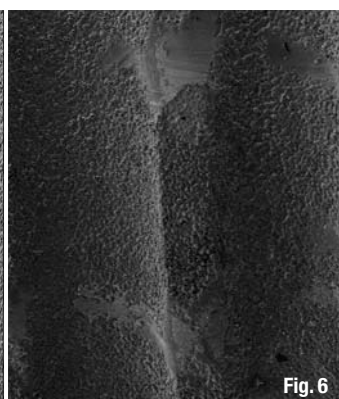


Fig. 6

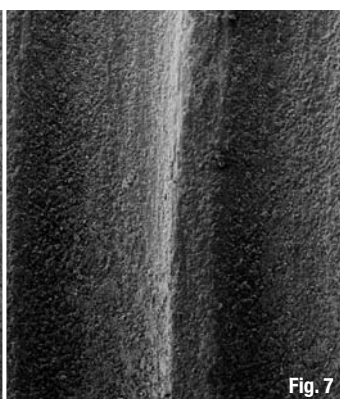


Fig. 7

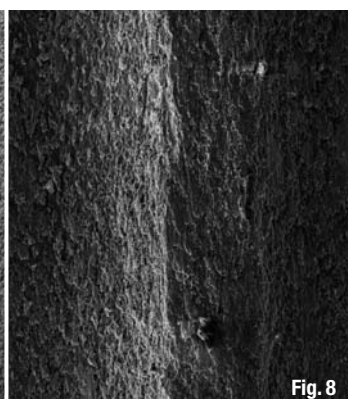


Fig. 8

Fig. 9_Turning machine with centered implant.

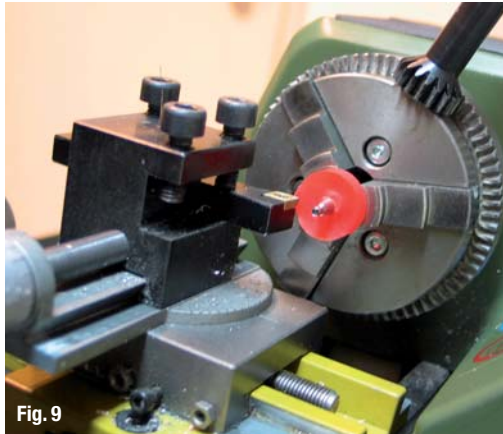


Fig. 9

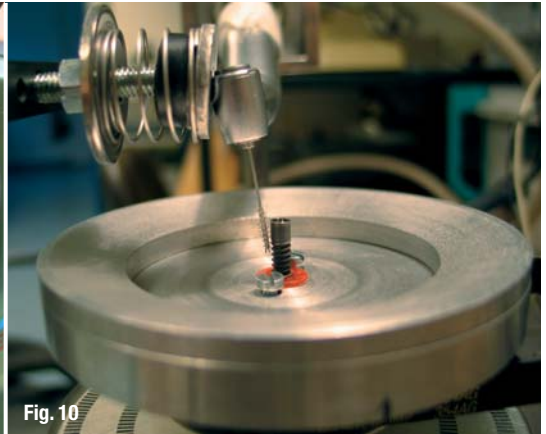


Fig. 10

Fig. 10_Spring based horizontal load and overview of the lab situation.

Fig. 11_Spring length shows a linear correlation to the load/force.

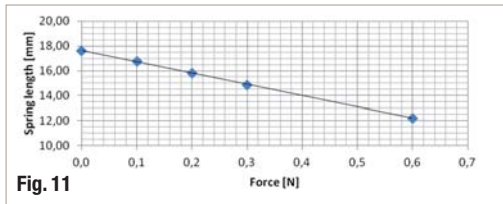


Fig. 11

tween the threads (Fig. 11). The round aluminum table rotated at 20 rpm (clinical measured average turns with the rotating device around the implant).

bending, but not rupturing the fine titanium bristles (Figs. 12–14).

Another advantage of the PeriBrush, beyond the gentler and more effective cleaning of the implant surfaces, is the significantly shortened treatment time. The implant surfaces can be cleaned within a few seconds under continuous irrigation with sterile saline solution (Fig. 15).

Samples of the Tigran™ PeriBrush™—before and after use—and dental implants with sandblasted-acid-etched titanium surfaces before and after the treatment with rinsing were investigated by scanning electron microscopy (SEM) after different loads/forces and treatment time. The load/force of 20 g/0.2 N for 60 seconds is the suggested and recommended normal treatment case and 60 g/0.6 N for 120 seconds of treatment time, as this load/force is the suggested worst case scenario.

Editorial note: A list of references is available from the author.

- Fig. 12**_Tigran™ PeriBrush™ before use.
- Fig. 13**_Brush after load/force of 20 g/0.2 N for 60 sec.
- Fig. 14**_Brush after load/force of 60 g/0.6 N for 120 sec.
- Fig. 15**_Clinical case exhibiting pronounced periimplantitis. Debridement is effected within 60 seconds under continuous saline irrigation.

SEM analysis confirmed the gentle polishing effect to the implant surface with all loads/forces in this study. Loads/forces of more than 60 g/0.6 N and 120 sec of treatment time (worst case) results in minor damage to the brush—caused by an uncontrolled vibration with a “slip-off” of the brush thus

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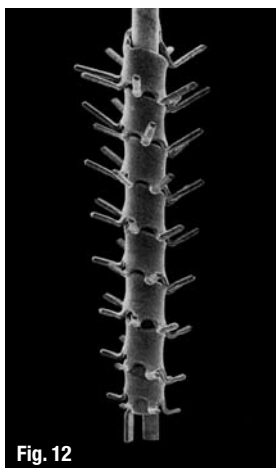


Fig. 12

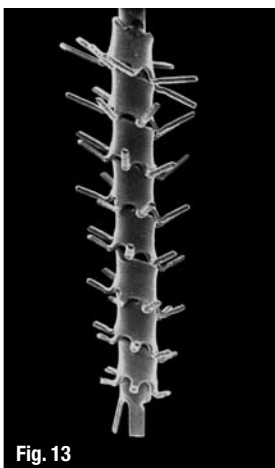


Fig. 13

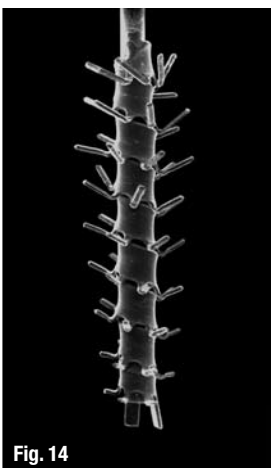


Fig. 14

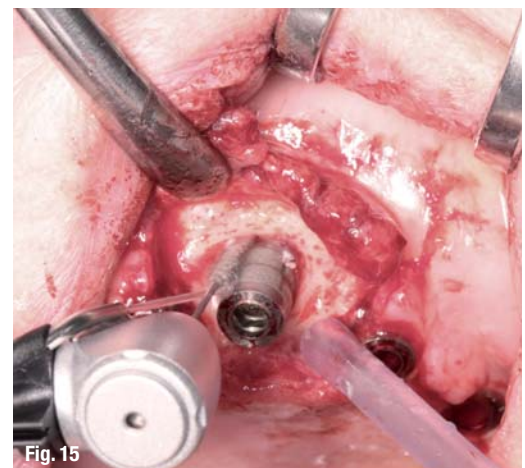


Fig. 15

