141

Rotating titanium made brushes for efficient open flap debridement in peri-implantitis therapy - clinical treatment recommendations

Dirk U. Duddeck, Andrea Grandoch, Joachim E. Zöller

Interdisciplinary Dep. for Oral Surgery and Implantology, Dep. for Craniomaxillofacial and Plastic Surgery
University of Cologne, Cologne, Germany; Head: Prof. Dr. Dr. Joachim E. Zöller
Address: Kerpener Str. 62, D 50937 Köln, Germany, eMail: dirk.duddeck@uk-koeln.de

Objectives

Peri-implant bone loss has recently emerged to be the focus of implant therapy[1]. After bone loss caused by peri-implantitis the implant surface becomes exposed to inflammatory cells, microbes, and organic contaminants. The anti-infective surgical treatment of peri-implantitis in cases with a considerable pocket formation larger than 6 mm is based on the open flap debridement followed by implant surface decontamination[2]. To achieve a sufficient implant debridement concrements and tissue remnants have to be removed. In order to avoid recontamination after mechanical cleaning, additional dissolving of the biofilm and disinfection is necessary.

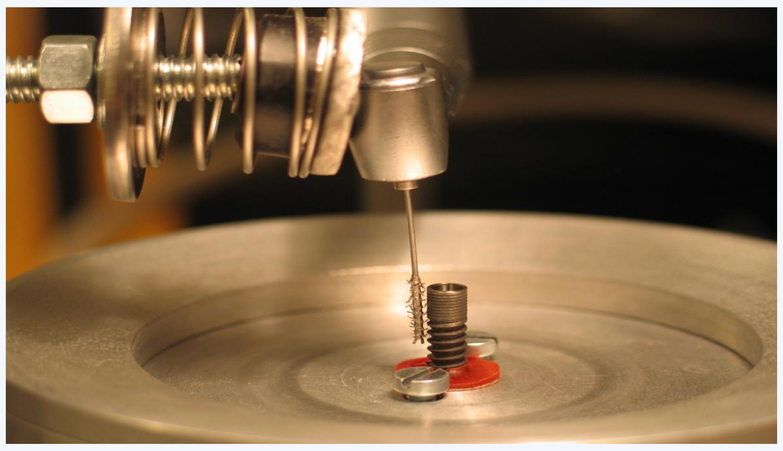
Previous in vitro tests about the effects of titanium made debridement brushes (Tigran PeriBrush) compared to the treatment with curettes demonstrated an effective surface cleaning of the exposed implants with only minor impact on all tested implant structures[3].
The aim of the study is to give treatment recommendations for the use of rotating titanium debridement brushes regarding the load used in the mechanical debridement..

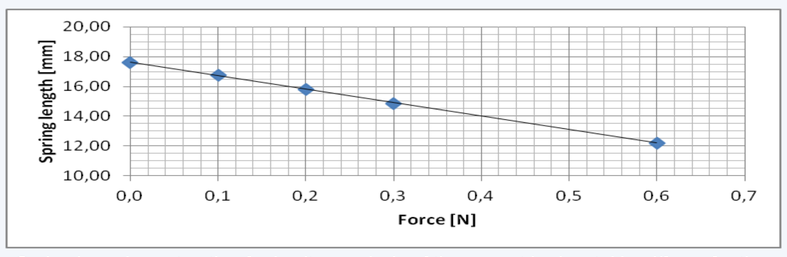
Methods and Materials

The correct horizontal load/force for the rotating Tigran PeriBrush onto the surface of implants was measured in vitro. A spring based construction (spring steel wire) with defined distances of impression under load was used. SEM images of the implant surface and the brush before and after treatment with different load/force (10-60 g / 0.1-0.6 N) were analyzed. In a second stage patients with similar peri-implantitis (pocket depth higher than 6 mm) were treated by open flap debridement followed by implant surface decontamination. The mechanical debridement was performed with rotating titanium brushes using the appropriate horizontal load/force of 20-30 g / 0.2-0.3 N as measured in the preceding in-vitro tests

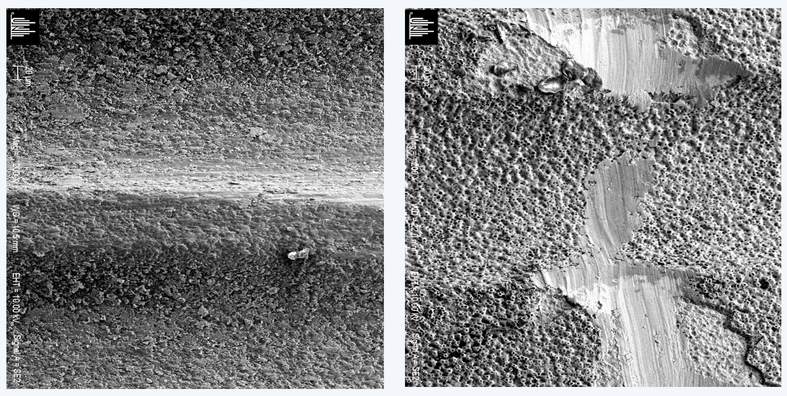
Results

Rotating titanium debridement brushes allow a surface cleaning with only a minor impact on different tested implant structures. The load/force should be less than 60 g / 0.6 N to avoid bending of the stiff titanium bristles. In the range between 10 g and 30 g / 0.1 N and 0.3 N no bristles were bent ore loosened. The time used for a sufficient debridement with a rotating device compared to the vertical movements of a curette was significantly shorter and the debridement, especially in the deeper implants threads, was more efficient due to the rotationally symmetric geometry of the dental implants. X-ray images of the patients treated by curettes or rotating titanium brushes showed no significant difference of bone loss after three month.

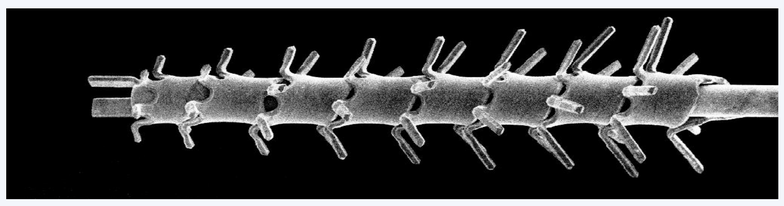




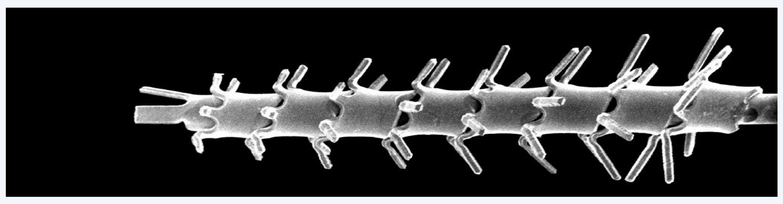
Spring based construction for in vitro analysis of the correct horizontal load/force for the rotating PeriBrush. The spring length shows a linear correlation to the load/force. Under loads/forces of more than 60 g / 0.6 N an uncontrolled vibration occurs with a “slip-off” effect of the brush and bending of the fine titanium bristles leads to a damage of the brush.



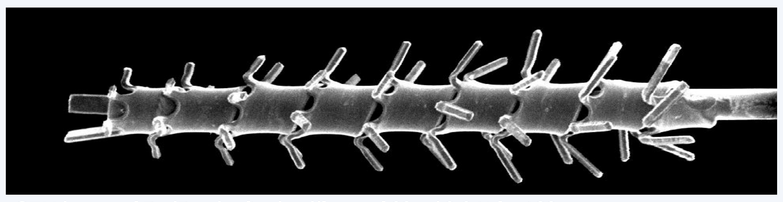
SEM images (Ti-Unite surface 200x) after treatment with rotating PeriBrush (left) causing a gentle polishing effect and after vertical treatment with a curette (right)



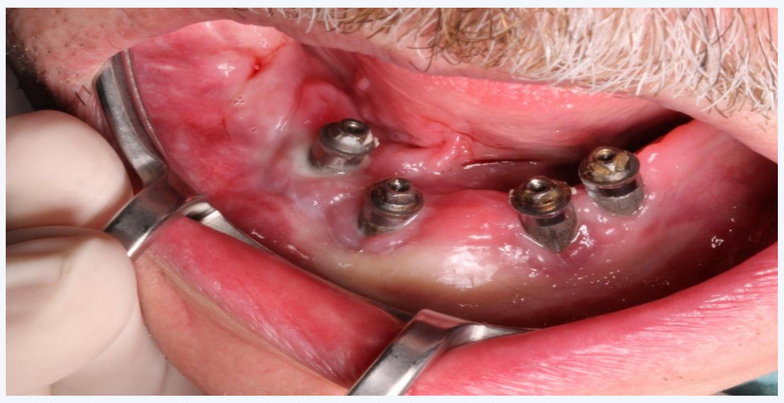
SEM image of PeriBrush before treatment.



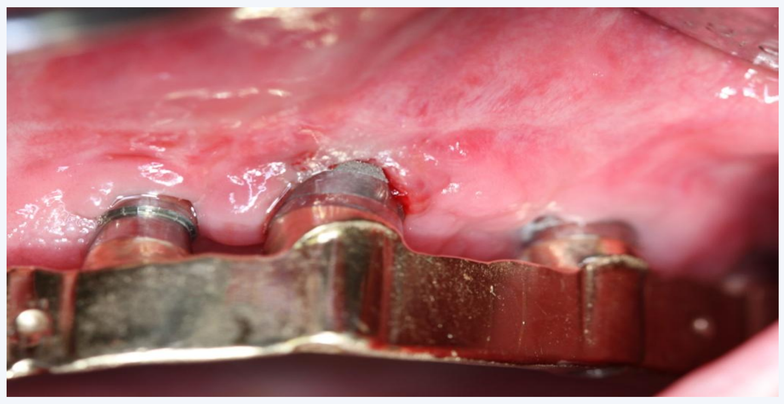
SEM image of PeriBrush after load/force of 20 g / 0.2 N for 60 sec .



SEM image of PeriBrush after load/force of 60 g / 0.6 N for 120 sec.

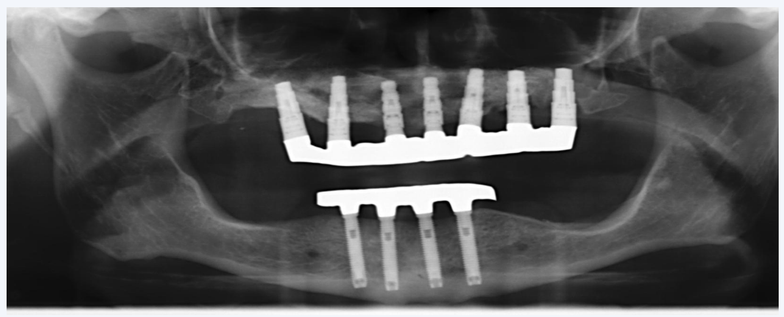


Clinical situation with generalized peri-implantitis in the lower jaw

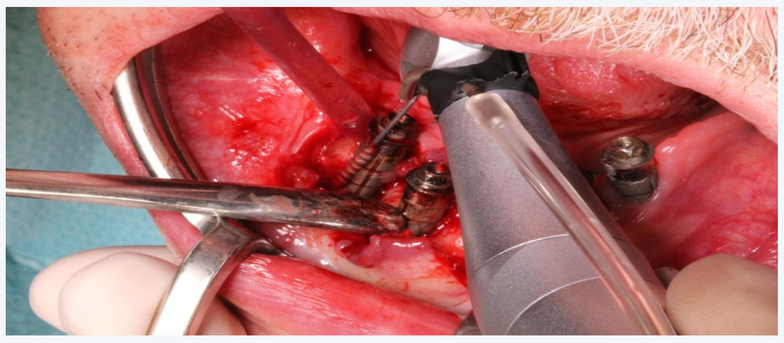


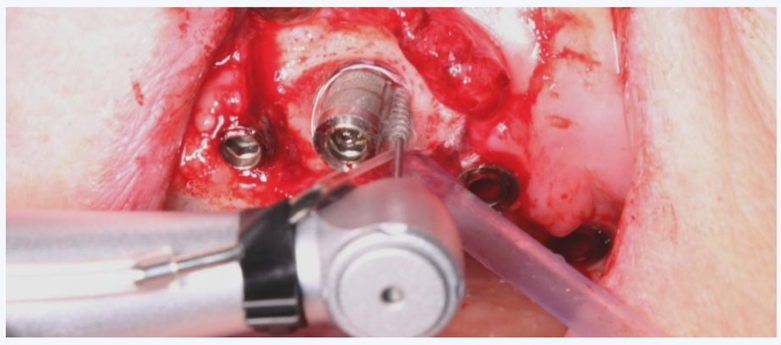
Clinical situation with generalized peri-implantitis in the upper jaw

X-ray of the clinical situation before debridement

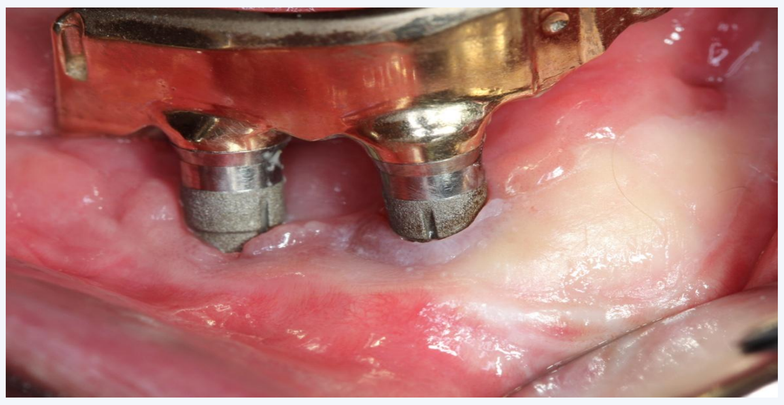


X-ray of the clinical situation before debridement.

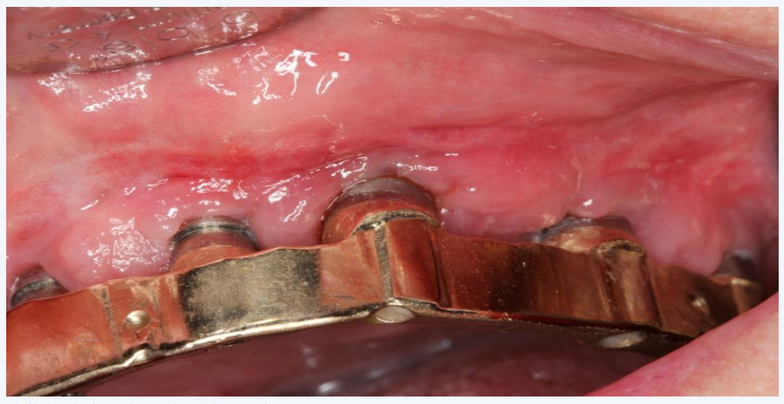




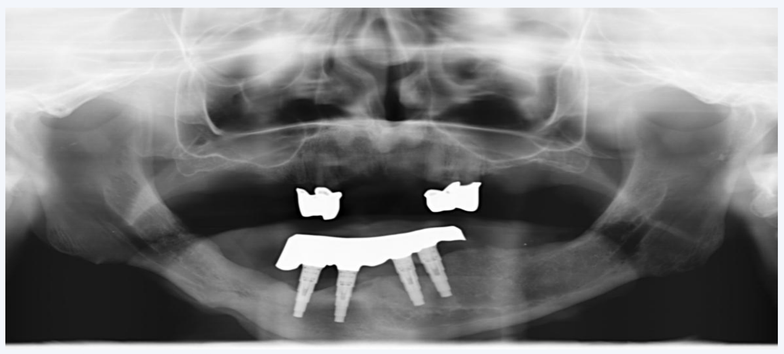
Open flap debridement and treatment with the titanium made brush (Tigran PeriBrush, horizontal load/force of 20-30 g / 0.2-0.3 N for 60 seconds, rinsing with saline solution).



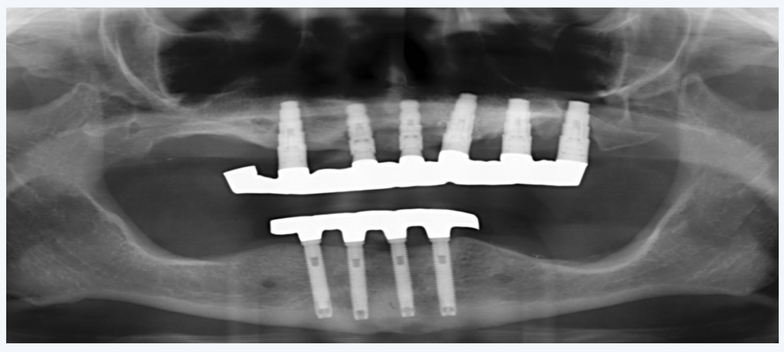
Clinical situation after 3 month



Clinical situation after 3 month



X-ray after 3 month follow up



X-ray after 3 month follow up; Implant in regio 16 had to be removed 3 month before

Conclusions

The optimal horizontal load/force onto the angle-piece with rotating titanium debridement brushes for a sufficient debridement and minor effects on the implant surface and the bristles should be 20-30 g / 0.2-0.3 N for 60 sec. The analyzed brush is more effective compared to the vertical movements of curettes in the treatment of peri-implantitis and can shorten the treatment time.

References

1. Mir-Mari, J., P. Mir-Orfila, et al. (2012). "Prevalence of peri-implant diseases. A cross-sectional study based on a private practice environment." J Clin Periodontol **39**(5): 490-494
2. Lindhe, J. and J. Meyle (2008). "Peri-implant diseases: Consensus Report of the Sixth European Workshop on Periodontology." J Clin Periodontol 35(8 Suppl): 282-285.
3. Duddeck et al; Effects of rotating titanium debridement brushes on the surface structure of dental implants; Poster presentation at EAO meeting October 2011, Athens, Greece

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