

Drilling and placing of implants in bone grafted with porous titanium granules does not cause overheating or technical complication

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Purpose of the study: The purpose of this study was to evaluate the possibility for placing dental implants in extraction sockets grafted with porous titanium granules and to see if:

- Normal drilling procedures could be used for preparing the implant site
- The temperature increased in the surrounding bone during the drilling procedure

Material and Methods

Premolar teeth were extracted from the lower jaws of 3 minipigs (Göttingen minipigs, Ellegaard, Denmark) and grafted with porous titanium granules or left to heal without grafting. After 11 weeks of healing, implant surgery was performed, and 5 implants per jaw (n=10 per pig) placed in the prepared sockets. Hole for an external temperature probe was prepared 1 mm adjacent to the grafted extraction sockets and the tissue temperature was monitored while preparing the implant bed (800, 600, 300 and 15–20 rpm).



Fig 1. Extraction of teeth

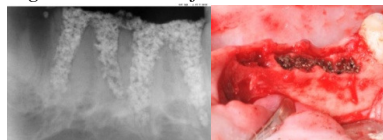


Fig 2. Packing of titanium granules

Results:

- No complications during drilling in bone with osseointegrated titanium granules
- Temperature during drilling was always below 40°C
- Implant placement was uneventful

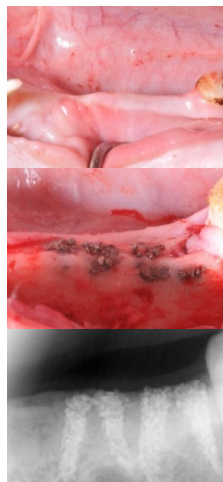


Fig 3. Intact gingiva after healing

Fig 4. Bone incorporation with titanium granules after healing

Fig 5. X-ray after 11 weeks after treatment with titanium granules

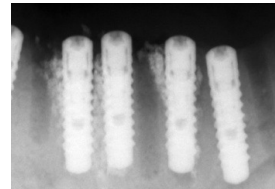


Fig 6a

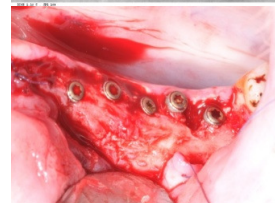


Fig 6b

Fig 6. X-rays (6a) and Photos (6b) after placing the implants. Holes adjacent to implants are for placing of temperature probe.

Conclusion: The elevation in bone temperature when drilling through titanium granules integrated into jaw bone was found to be negligible. There were no observable differences between the temperature measurements while drilling to place implants in grafted and non-grafted extraction sockets after 11 weeks of healing. All temperature measurements were below 40°C, i.e. safely below the threshold temperature for heat injury [1, 2].

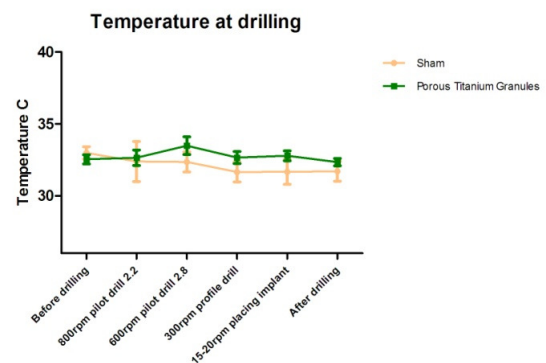


Fig 7 Mean value ± std of the temperature °C at drilling when placing the implants (before drilling, at 800rpm pilot drill 2.2, 600rpm pilot drill 2.8, 300rpm profile drill, 15-20rpm placing the implant and after drilling).

References:

1. Lundskog J. Heat and bone tissue. An experimental investigation of the thermal properties of bone tissue and threshold levels for thermal injury. *Scan J Plast Reconstr Surg* 1972;6(Suppl 9):1-80
2. Eriksson AR, Albrektsson T. Temperature threshold levels for heat-induced bone tissue injury: a vital-microscopic study in the rabbit. *J Prosthet Dent*: 1983, Jul, 50(1):101-7