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Assessment of Osteo-/Angiogenesis in Minipig Mandibula by MicroangioCT with µAngiofil

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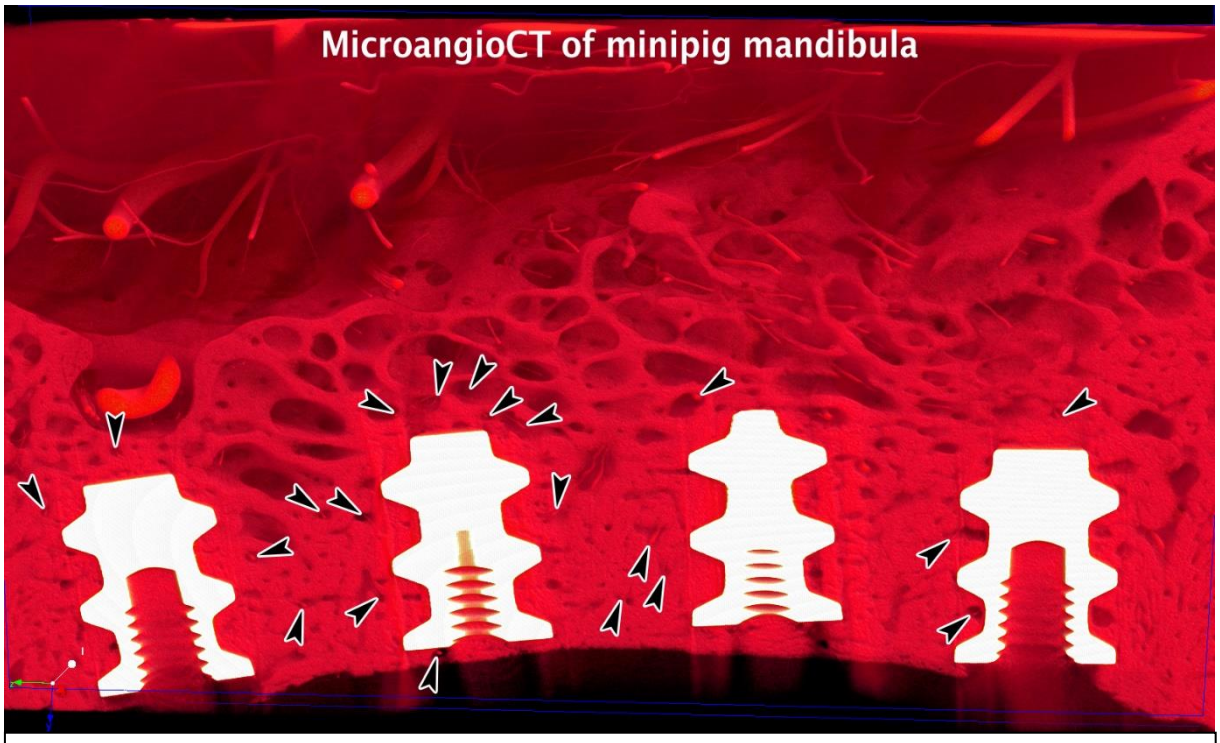
Objectives: In the dental research, the 3D-imaging of the microvasculature within the bone and soft tissue without its destruction remains a major challenge. Application of microCT with appropriate contrast agents could help resolve the situation. Our aim was to establish a reliable and reproducible protocol for the high-resolution non-destructive 3D-vascular imaging of the minipig mandibula, eventually with implanted metal parts.

Methods: As an intravascular contrast medium we used the polymer-based contrast agent µAngiofil (Fumedica AG, Switzerland). The animal model of choice was the Göttingen minipig (Ellegaard Göttingen Minipigs, Denmark). The perfusion procedure was performed through the carotid artery/ies or its distal branches. The obtained samples were scanned using Skyscan 1275 and Skyscan 2214 microCT-systems (Bruker microCT, Belgium).

Results: The detailed perfusion protocol respects the anatomical peculiarities of Göttingen minipigs and enables reproducible perfusion of minipig mandibula on the side of interest. The contrast agent µAngiofil has superior perfusion qualities and a different, from bone and metal, X-ray absorption index, which enables excellent simultaneous visualization of those structures (see the image: arrowheads indicate the microvessels in the vicinity of implanted metal parts). Afterwards the samples are still available for any other standard investigation method (e.g., correlative histology).

Conclusions: The established perfusion protocol enables excellent non-destructive 3D-imaging of microvasculature, bone tissue and metal implants in the minipig mandibula. This approach allows quantitative analysis of various structures as well as their subsequent correlative morphology. It is a very promising tool in the preclinical dental research dealing with angiogenesis and bone/soft tissue formation around implants.



MicroangioCT of minipig mandibula using µAngiofil. The described approach provides excellent visualization of the bone, implanted metal parts (white) and vasculature (arrowheads=microvessels near implants).