

DENTAL IMPLANTS-INDUCED ARTIFACTS LIMITS THE VALUE OF JAWBONE CBCT FEATURES FOR THE FORENSIC DENTAL IDENTIFICATION

Objectives. To verify the impact of dental implant-induced CBCT artifacts on the possibility of using established jawbone structures features as independent markers during forensic dental identification.

Materials and methods. 46 pairs of CBCT data sets obtained before and after single implant placement were collected from the CBCT clinical registry. In-depth image analysis was provided for peri-implant zone before and after implant placement. Bone clustering and fractal analysis was held using Bone J plugins for Image J software (NIH, USA) on the previously segmented bone area (InVesalius software, CTI, Brazil).

Results. As per operator grading of available 46 post-implant placement CBCT images only 65.22% of them demonstrated some visually detectable signs of metal-induced artifacts of limited spread referred only to the close peri-implant area (0.56 ± 0.49 mm). Changes of peri-implant bone density occurred at the distances of 1-5 mm distant from implant screw, while also in-depth bone parameters, such as level of anisotropy ($p < 0.05$), fractal count ($p < 0.05$) and structure model index ($p < 0.05$) were changed in statistically significant manner at the same distances while comparing to the before implant placement situation. Unique fractal counts at the similar study clusters of peri-implant area were changed while comparing before and after implant placement situations, but those changes characterized with inter-individual variations (variation ration – 0.78).

Conclusions. Dental implants-induced artifacts provoke significant variations of not only bone density at peri-implant region compare to the situation before implant placement, but also differently pronounced bone fractal pattern changes. Present outcomes argument that fractalization itself should be carefully used during comparative and reconstructive dental identification, since such could be compromised by artifacts of different nature, while fractal differentiation within the limited zone of interest still could be serve as minor marker of correspondence during comparative analysis.

Keywords: forensic dentistry, bone-implant interface, bone density, fractal