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Metal artifacts in MRI from non-magnetic dental alloy and its FEM analysis

Tomohide TANIYAMA[1)], Taiji SOHMURA[1)], Takanori ETOH[2)], Masaaki AOKI[3)], Eiji SUGIYAMA[3)] and Junzo TAKAHASHI[4)]

1) Division of Oromaxillofacial Regeneration, Course for Integrated Oral Sciences and Stomatology, Osaka University Graduate School of Dentistry
2) Department of Implantology, Osaka Dental University Hospital
3) NEOMAX Co., Ltd
4) IDS Co., Ltd

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Abstract:
Artifacts in MR(Magnetic Resonance) images of oral cavity produced from non-magnetic metal restorations was verified by measuring the image of index finger and a cylinder of fat test piece with a type 4 gold alloy ring using a compact MRI equipment. In the images of finger, portion around the ring disappeared. However, it was nearly restored with a cut ring. In the cylinder of fat test piece, obvious artifacts appeared when circumferential surface of the ring was placed perpendicular to RF(Radio Frequency) field of MRI equipment's excitation/detection coil. However, in other directions or with a cut ring, artifact disappeared. The cause was simulated with FEM(Finite Element Method) electromagnetic field analysis, and alternating magnetic field was shown to induce surface current on the continuous gold ring. Magnetic field produced by that current interfered with the field from excitation coil. This demonstrated the characteristics and cause of artifacts by non-magnetic dental metals.

Key words:
MRI, Metal artifacts of MR image, FEM electromagnetic field analysis

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