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Dental Implant Artifacts in MRI: Compatibility and Considerations

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Abstract

This review investigated dental implant artifacts in magnetic resonance imaging (MRI) and their safety in clinical practice. Dental prostheses, including implants, crowns, and orthodontic appliances, cause artifacts due to their high magnetic susceptibility, particularly in materials like iron, stainless steel, and cobalt-chromium. Titanium implants are considered safe under MRI environments according to the American Society for Testing and Material (ASTM) standards, with no reported thermal injury or dislodgement during examinations. Despite limited artifacts from titanium's paramagnetic nature, minute ferromagnetic components can still affect visualization. Thus, reducing artifacts in oral and maxillofacial MRI scans is crucial.

Two main categories of artifact reduction techniques are identified: improved porous titanium or alternative materials like zirconia and adjusting MR parameters with advanced sequences. Recommendations include increasing the readout bandwidth, reducing slice thickness, using spin-echo sequences instead of gradient-echo, and employing short tau inversion recovery or DIXON techniques for fat suppression. Additional methods like VAT, VAT-SEMAC combination, and MAVRIC show promise, although applicability may be restricted in specific MRI scanners.

Continuous advancements in dental implant materials and MRI sequences are needed to improve imaging quality and reduce artifacts. Collaboration among dental practitioners, radiologists, and MRI technologists is essential for refining techniques and ensuring patient safety. Although overall dental implant artifacts pose challenges, safety in MRI is well-established. Ongoing developments hold significant potential to enhance MRI imaging quality in patients with dental devices.

Keywords: artifact reduction techniques, dental implant artifact, MRI compatibility, MRI safety, titanium implants