

Effect of Magnesium-Modified Titanium Implants on Osseointegration: A Systematic Review and Meta-Analysis of Pre-clinical Studies

INPLASY202610101

doi: 10.37766/inplasy2026.1.0101

Received: 30 January 2026

Published: 31 January 2026

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ADMINISTRATIVE INFORMATION**Support** - This research received no external funding.**Review Stage at time of this submission** - Preliminary searches.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202610101**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 31 January 2026 and was last updated on 31 January 2026.**INTRODUCTION**

Review question / Objective This systematic review and meta-analysis aims to comprehensively assess the effects of Mg-coated dental implants on osseointegration.

Rationale Given the increasing adoption of Mg-incorporated implant technologies and the need to apply these findings in human patients, a systematic and quantitative appraisal of the existing evidence is warranted.

Condition being studied To identify animal studies evaluating Mg-modified titanium implants.

METHODS

Search strategy An electronic literature search was performed in May 2025 across PubMed, Scopus, and Web of Science for English-language publications.

Participant or population Population (P): animal models.

Intervention Intervention (I): Ti implants modified or coated with Mg.

Comparator Control (C): Ti implants without Mg incorporation or coating.

Study designs to be included Population (P): animal models.

Eligibility criteria Studies were eligible if they investigated Mg-modified endosseous Ti implants in animal models. The Mg had to be applied locally, either as a coating or as a releasable agent from an implant surface, during or before implant insertion. Eligible studies reported quantitative bone outcomes, such as bone-to-implant contact (BIC), the percent bone volume (BV/TV), or bone area (BA). The uncoated (control) and Mg-modified (test) implants groups were required to have implants with similar surface characteristics,

except for the incorporation of Mg. Only articles published in English were included.

Information sources Electronic databases.

Main outcome(s) Primary outcomes included bone-to-implant contact (BIC) and bone area (BA) percent-ages.

Data management A standardized extraction form was used to collect key information, including study characteristics, type, Mg-coating technique, animal species, number of subjects and im-plants, healing duration, and mean \pm SD values for BIC and BA outcomes for both the test and control groups.

Quality assessment / Risk of bias analysis Study quality was evaluated using the ARRIVE 2.0 reporting guidelines for animal research. Each item was scored as 2 points (reported), 1 point (unclear), or 0 points (not reported). A quality coefficient was then calculated to categorize studies as excellent (0.8–1), average (0.5–0.8), or poor (< 0.5).

Strategy of data synthesis Titles and abstracts retrieved from the search results were screened against the eli-gibility criteria. Two independent reviewers evaluated abstracts, and when relevance was uncertain, full-text articles were obtained for assessment.

Subgroup analysis No subgroups analysis.

Sensitivity analysis The SYRCLE risk-of-bias tool was applied to evaluate methodological reliability and to identify potential biases within the included experimental studies.

Country(ies) involved Saudi Arabia.

Keywords magnesium coating; titanium dental implants; osseointegration; surface modification; systematic review; meta-analysis.

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