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INPLASY

Comparative Effectiveness of Different Antimicrobial Strategies as Adjunctive Treatments for Peri-Implantitis: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION

Support - None.

Review stage at the time of initial registration - Preliminary searches.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2026110023

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 7 November 2026 and was last updated on 7 November 2026.

INTRODUCTION

Review question / Objective Population: Adults with clinically diagnosed peri-implantitis.
Intervention: Different antimicrobial strategies used as adjuncts to mechanical debridement, including locally delivered minocycline, antimicrobial photodynamic therapy, laser therapy, local antimicrobial agents, and other antimicrobial strategies.
Comparator: Mechanical debridement alone, placebo/sham treatment, or another antimicrobial strategy.
Outcomes: Probing depth, plaque index, bleeding on probing, clinical attachment level, marginal bone level, microbiological outcomes, adverse events, implant survival, and disease recurrence.
Study design: Randomized controlled trials.

Condition being studied Peri-implantitis is a plaque-associated inflammatory condition affecting the soft and hard tissues surrounding dental implants. It is characterized by inflammation of the peri-implant mucosa, bleeding and/or suppuration on probing, increased probing depth, and progressive loss of supporting bone. Without effective treatment, peri-implantitis may lead to implant instability and eventual implant failure. Mechanical debridement is the basic non-surgical treatment; however, its effectiveness may be limited because of the complex implant surface and difficulty in completely removing pathogenic microorganisms. Therefore, antimicrobial strategies are frequently used as adjunctive treatments to control infection and improve clinical outcomes.

METHODS

Search strategy The search strategy will combine controlled vocabulary terms (MeSH and Emtree terms) and free-text terms relating to the population, interventions, and study design. The PubMed search strategy will be: ("Peri-Implantitis"[Mesh] OR peri-implantitis[Title/Abstract] OR periimplantitis[Title/Abstract] OR peri-implant disease*[Title/Abstract]) AND ("Anti-Infective Agents"[Mesh] OR "Anti-Infective Agents,

Local"[Mesh] OR "Anti-Bacterial Agents"[Mesh] OR "Minocycline"[Mesh] OR "Photochemotherapy"[Mesh] OR "Laser Therapy"[Mesh] OR antimicrobial*[Title/Abstract] OR anti-microbial*[Title/Abstract] OR anti-infective*[Title/Abstract] OR antibiotic*[Title/Abstract] OR antiseptic*[Title/Abstract] OR minocycline[Title/Abstract] OR doxycycline[Title/Abstract] OR metronidazole[Title/Abstract] OR chlorhexidine[Title/Abstract] OR photodynamic therap*[Title/Abstract] OR antimicrobial photodynamic therap*[Title/Abstract] OR aPDT[Title/Abstract] OR laser therap*[Title/Abstract]) AND (randomized controlled trial[Publication Type] OR controlled clinical trial[Publication Type] OR randomized[Title/Abstract] OR randomised[Title/Abstract] OR randomly[Title/Abstract] OR placebo[Title/Abstract] OR trial[Title/Abstract] OR groups[Title/Abstract]) NOT (animals[MeSH Terms] NOT humans[MeSH Terms]). This strategy will be adapted for each database using the appropriate controlled vocabulary, field tags, and search syntax. No restrictions on language or publication date will be applied.

Participant or population Adults aged 18 years or older diagnosed with peri-implantitis based on clinical and radiographic criteria. Studies including both peri-implantitis and peri-implant mucositis will be eligible only when data for participants with peri-implantitis can be extracted separately.

Intervention Antimicrobial strategies used as adjuncts to non-surgical mechanical debridement for the treatment of peri-implantitis, including locally or systemically administered antimicrobial agents, antimicrobial photodynamic therapy, and laser-assisted antimicrobial therapy. Where applicable, the intervention and comparator groups must receive the same basic mechanical treatment.

Comparator Mechanical debridement alone, mechanical debridement combined with placebo or sham treatment, or mechanical debridement combined with another antimicrobial strategy. Where applicable, the comparator group must receive the same basic mechanical treatment as the intervention group.

Study designs to be included RCT.

Eligibility criteria Inclusion criteria: Randomized controlled trials, including parallel-group and split-mouth randomized trials, will be included. Eligible participants will be adults aged 18 years or older with clinically and radiographically diagnosed peri-implantitis. Eligible interventions will include antimicrobial strategies used as adjuncts to non-surgical mechanical debridement. Comparators may include mechanical debridement alone, placebo or sham treatment, or another antimicrobial strategy administered with the same basic mechanical treatment. Studies must report at least one prespecified clinical, radiographic, microbiological, implant-related, or safety outcome and provide sufficient data for analysis. No language restrictions will be applied.

Exclusion criteria: Non-randomized studies, observational studies, case reports, case series, reviews, animal studies, and laboratory studies will be excluded. Studies involving only peri-implant mucositis, studies evaluating the prevention rather than treatment of peri-implantitis, and studies evaluating only surgical treatment will also be excluded. Studies with unclear intervention or comparator definitions, duplicate publications, or insufficient outcome data that remain unavailable after contacting the authors will be excluded.

Information sources PubMed/MEDLINE, Embase, the Cochrane Central Register of Controlled Trials (CENTRAL), Web of Science Core Collection, China National Knowledge Infrastructure (CNKI), Wanfang Data, VIP Database, and the Chinese Biomedical Literature Database (CBM) will be searched from inception to the final search date. ClinicalTrials.gov, the WHO International Clinical Trials Registry Platform (ICTRP), and the Chinese Clinical Trial Registry (ChiCTR) will be searched for ongoing or unpublished trials. The reference lists of included studies and relevant systematic reviews will be manually screened. Dissertations and conference literature will also be considered. Study authors will be contacted when important data are missing or unclear.

Main outcome(s) Changes in probing depth (PD), plaque index (PLI), and bleeding on probing (BOP) or sulcus bleeding index (SBI) from baseline to the reported follow-up time points. When change-from-baseline data are unavailable, post-treatment values will be used.

Quality assessment / Risk of bias analysis Cochrane Risk of Bias 2 (RoB 2) tool.

Strategy of data synthesis Continuous outcomes will be summarized using mean differences (MDs) or standardized mean differences (SMDs) with 95% confidence intervals (CIs), while dichotomous outcomes will be summarized using risk ratios (RRs) with 95% CIs. Studies with comparable interventions, comparators, outcomes, and follow-

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up periods will be pooled separately. Statistical heterogeneity will be assessed using Cochran's Q test and the I^2 statistic, together with clinical and methodological differences between studies. A fixed-effect model will be used when heterogeneity is considered low. If substantial heterogeneity is identified, its potential sources will first be investigated. A random-effects model will be used when heterogeneity exists but quantitative synthesis remains clinically appropriate. Subgroup and sensitivity analyses will be conducted where sufficient data are available. When quantitative pooling is inappropriate, the findings will be presented using a narrative synthesis.

Subgroup analysis Subgroup analyses will be conducted where sufficient data are available. Prespecified subgroup factors will include the type of antimicrobial strategy, route of antimicrobial administration (local or systemic), type of comparator, duration of follow-up, severity of peri-implantitis at baseline, and type of mechanical debridement. Differences between subgroups will be evaluated using a formal test for subgroup interactions.

Sensitivity analysis Sensitivity analyses will be performed to assess the robustness of the pooled results by excluding studies at high risk of bias, removing each study one at a time, comparing fixed-effect and random-effects models, and excluding studies with imputed or converted outcome data. If the conclusions change substantially after these analyses, the potential reasons will be explored and reported.

Country(ies) involved China.

Keywords Peri-implantitis; Antimicrobial therapy; Mechanical debridement; Antimicrobial photodynamic therapy; Systematic review; Meta-analysis.

Contributions of each author

Author 1 - CHUNYUAN HUANG - Author 1 conceived and designed the review, developed the protocol and search strategy, and will participate in the literature search, study selection, data extraction, risk-of-bias assessment, statistical analysis, interpretation of the results, and drafting and revision of the manuscript.
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Author 2 - LEI LI - Author 2 will provide methodological and clinical guidance, resolve disagreements between the first two reviewers, supervise the review process, assist with the interpretation of the results, and critically revise and approve the final manuscript.
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