International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

INPLASY202550047 doi: 10.37766/inplasy2025.5.0047

Received: 18 May 2025

Published: 18 May 2025

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The Impact of Parathyroid Hormone Supplementation on Dental Implant Osseointegration: A Systematic Review

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ADMINISTRATIVE INFORMATION

Support - Not applicable.

Review Stage at time of this submission - Formal screening of search results against eligibility criteria.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202550047

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 18 May 2025 and was last updated on 18 May 2025.

INTRODUCTION

R eview question / Objective In osteoporotic subjects undergoing dental implant placement, how does parathyroid hormone supplementation compared to no supplementation affect osseointegration levels?

Rationale With dental implants becoming increasingly popular as a long-term prosthodontic solution, there is a growing need to optimize their success. This can be beneficial for population groups such as postmenopausal women and osteoporotic patients who have compromised bone quality. Recent studies have explored the use of parathyroid hormone (PTH) to enhance osseointegration in these patients. PTH plays a crucial role in calcium homeostasis by regulating bone remodeling. While continuous exposure to PTH leads to bone loss, intermittent low doses have anabolic effects on bone. Promising results

from animal studies suggest that PTH supplementation can significantly improve implant osseointegration.

Condition being studied Osseointegration of dental implants in osteoporotic subjects undertaking Parathyroid Hormone Supplementation.

METHODS

Search strategy Search used: (TITLE-ABS-KEY ("dental implant*" OR "surgical dental") AND TITLE-ABS-KEY (endosseous OR osseointegrat* OR osteointegrat* OR "bone implant*" OR boneimplant* OR stability) AND TITLE-ABS-KEY ("parathyroid hormone*" OR pth OR parathormone OR teriparatide OR fortea OR forsteo)).

Participant or population The review is mainly based on in vivo animal studies performed on

osteoporotic subjects, including dogs, rats, sheep and rabbits.

Intervention Intermittent Parathyroid Hormone supplementation in osteoporotic subjects prior to dental implant placement.

Comparator Comparing the effect of parathyroid hormone supplementation in osseointegration of dental implants in animal subjects versus those who did not receive supplementation.

Study designs to be included In vivo studies; animal intervention studies.

Eligibility criteria 1) In vivo, animal intervention studies from 2015-2025 2) Letters to the editor, case reports, narrative reviews, commentaries and articles published in languages other than English, or where full text is unavailable will be excluded.

Information sources A search string was created after a preliminary search to identify relevant keywords and MeSH terms. This search string will be used across 5 databases: Scopus, PubMed, Medline, Cochrane and Web of Science to generate results in the English language from January 1st, 2015 until February 14th, 2025. Searches shall be re-run prior to publication.

Main outcome(s) This review aims to evaluate the effect of intermittent doses of PTH on the osseointegration of implants in osteoporotic subjects. Osseointegration will be compared across ISQ values, new bone formation (in micro CT scans), Bone to Implant Contact (BIC) and bone volume per tissue volume data from the included studies.

Additional outcome(s) Not applicable.

Data management Titles and abstracts of studies identified will be screened by two researchers alongside the inclusion and exclusion criteria. A third researcher will resolve any disagreements. The full text of the selected articles will be evaluated by the two independent researchers. Discrepancies will be resolved by the third independent researcher.

Quality assessment / Risk of bias analysis Risk of bias shall be assessed using the SYRCLE risk of bias tool for animal studies, and will be assessed independently by the initial reviewers. A third mediator will mediate in situations of disagreement. **Strategy of data synthesis** Narrative review of studies grouped on animal model and location of implant placement.

Subgroup analysis Not applicable.

Sensitivity analysis Not applicable.

Language restriction The review will be based on articles in the English language only.

Country(ies) involved Australia.

Keywords Parathyroid hormone; Dental implants; Osseointegration; Osteoporosis; Bone-to-implant contact; Animal studies.

Dissemination plans The findings of this systematic review will be disseminated through peer-reviewed journal publication and online platforms such as ResearchGate and institutional repositories. Key stakeholders, including clinicians, researchers, and policymakers, will be targeted to ensure the results inform clinical decision-making and future research.

Contributions of each author

Author 1 - Dominique Kindaro - Author 1 conducted the literature search and authored the abstract, introduction, and conclusion section. Author 1 served as the mediator between disagreements between Author 1 and 2 in the full-text screening.

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Author 2 - Jeremy Chiu - Author 2 performed title and abstract screening, followed by full-text screening according to the predefined criteria. Author 2 co-authored contributed to the methods section and formatted references in accordance with journal guidelines. Author 2 also provided conceptualization for the paper.

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Author 3 - Maitreyi Hariharan - Author 3 performed title and abstract screening, followed by full-text screening according to the predefined criteria. Author 2 co-authored the methods section and formatted references in accordance with journal guidelines.

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Author 4 - Farnaz Sedghidiznab - Author 4 conducted risk-of-bias assessments, and authored the results and discussion sections.

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Author 5 - Prabhpal Panaich - Author 5 conducted risk-of-bias assessments, and authored the results and discussion sections.

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Author 6 - Justin Curtin - Author 6 reviewed the research design and methodology. Provided oversight on analytical processes and compliance with scientific standards. Ensured consistency with ethical requirements and reviewed drafts for structure and coherence.

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Author 7 - Kate Miller - Author 7 reviewed the research design and methodology. Provided oversight on analytical processes and compliance with scientific standards. Ensured consistency with ethical requirements and reviewed drafts for structure and coherence.

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