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INPLASY

Periodontal Alterations Associated with Orthodontic Intrusion: A Systematic Review Protocol

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ADMINISTRATIVE INFORMATION

Support - No support.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 29 June 2026 and was last updated on 29 June 2026.

INTRODUCTION

Review question / Objective This systematic review aims to evaluate periodontal changes associated with orthodontic intrusion in human subjects. The review will assess whether orthodontic intrusion using conventional intrusion mechanics, skeletal anchorage-supported mechanics, or clear aligner-based intrusion is associated with alveolar bone loss, root resorption, periodontal ligament changes, gingival recession, probing depth changes, clinical attachment level changes, dehiscence, fenestration or other periodontal outcomes.
PICOS framework:
Population: Human orthodontic patients undergoing intrusive tooth movement.
Intervention: Orthodontic intrusion using fixed appliances, intrusion arches, utility arches, segmental mechanics, temporary anchorage devices, mini-implants, miniscrews or clear aligners.
Comparator: Baseline periodontal status, non-intruded teeth, control groups or alternative orthodontic mechanics.
Outcomes: Alveolar bone loss, root resorption, periodontal ligament space changes, clinical attachment level changes, probing depth, gingival recession, tooth mobility, dehiscence, fenestration and related periodontal parameters.
Study design: Randomized controlled trials, non-randomized clinical trials, prospective and retrospective cohort studies, case-control studies, split-mouth studies and observational clinical studies.

Rationale Orthodontic intrusion is widely used for deep bite correction, excessive incisor display and overerupted teeth. However, intrusive forces are concentrated near the root apex and periodontal ligament, making intrusion a biologically sensitive orthodontic movement. Potential adverse effects include root resorption, alveolar bone loss, periodontal ligament stress, dehiscence, fenestration, gingival recession and changes in clinical periodontal parameters. Existing studies

vary in appliance type, anchorage system, force magnitude, imaging method, follow-up duration and outcome measurement. A systematic review is therefore required to synthesize current evidence on the periodontal safety and risks of orthodontic intrusion.

Condition being studied The condition being studied is periodontal alteration following orthodontic intrusive tooth movement. This includes changes in alveolar bone height and thickness, root resorption, periodontal ligament response, gingival recession, clinical attachment level, probing depth, dehiscence, fenestration and other periodontal parameters occurring after orthodontic intrusion.

METHODS

Search strategy Electronic searches will be conducted using PubMed/MEDLINE, Scopus, Web of Science, Embase, Cochrane Central Register of Controlled Trials, Google Scholar and Dentistry & Oral Sciences Source.
Search terms will include combinations of:
"orthodontic intrusion" OR "intrusive tooth movement" OR "intrusion arch" OR "utility arch" OR "segmental intrusion" OR "mini-implant assisted intrusion" OR "miniscrew-assisted intrusion" OR "temporary anchorage device" OR "TAD" OR "clear aligner intrusion"
AND
"periodontal changes" OR "periodontal health" OR "alveolar bone loss" OR "bone height" OR "crestal bone loss" OR "root resorption" OR "external apical root resorption" OR "periodontal ligament" OR "PDL" OR "periodontal ligament space" OR "gingival recession" OR "clinical attachment level" OR "probing depth".
Reference lists of included studies and relevant review articles will also be searched manually. Grey literature, theses and institutional repositories will be searched where available.

Participant or population Human orthodontic patients of any sex and age group who have undergone orthodontic intrusive tooth movement.

Intervention Orthodontic intrusion performed using fixed orthodontic appliances, intrusion arches, Connecticut intrusion arches, utility arches, Burstone intrusion arches, base arches, segmental mechanics, temporary anchorage devices, miniscrews, mini-implants or clear aligner-based intrusion.

Comparator Baseline periodontal status, non-intruded teeth, untreated or control groups, or comparison with other orthodontic mechanics, including conventional intrusion arches versus skeletal anchorage-supported intrusion or clear aligners versus fixed appliances.

Study designs to be included Randomized controlled trials, non-randomized clinical trials, prospective cohort studies, retrospective cohort studies, case-control studies, split-mouth studies and observational clinical studies.

Eligibility criteria Inclusion criteria:
Studies published from January 2015 to June 2026; human clinical studies; studies evaluating orthodontic intrusion; studies reporting at least one periodontal or dental outcome related to intrusion, including alveolar bone loss, crestal bone height change, root resorption, periodontal ligament changes, probing depth, clinical attachment level, gingival recession, tooth mobility, dehiscence or fenestration.

Exclusion criteria:
Review articles, systematic reviews, narrative reviews, editorials, letters, conference abstracts without full text, case reports, case series with fewer than 10 participants, animal studies, in-vitro studies, finite element analysis studies and studies not directly evaluating orthodontic intrusion.

Information sources PubMed/MEDLINE, Scopus, Web of Science, Embase, Cochrane CENTRAL, Google Scholar, Dentistry & Oral Sciences Source, reference lists of included studies, relevant reviews, grey literature, theses and institutional repositories.

Main outcome(s) Primary outcomes will be alveolar bone changes and root resorption following orthodontic intrusion. Alveolar bone outcomes will include bone height, bone thickness, crestal bone level, dehiscence and fenestration. Root resorption outcomes will include root length reduction, root volume loss and external apical root resorption. Outcomes will be extracted as mean differences, standardized mean differences, prevalence values, odds ratios or descriptive findings, depending on the available data.

Additional outcome(s) Additional outcomes will include periodontal ligament space changes, probing depth, clinical attachment level, gingival recession, tooth mobility, anchorage loss, direction of tooth movement, amount of intrusion, force magnitude, treatment duration, appliance type and imaging method.

Data management All retrieved records will be imported into reference management software. Duplicates will be removed before screening. Two reviewers will independently screen titles and abstracts, followed by full-text review. Disagreements will be resolved through discussion, and a third reviewer will be consulted when necessary. A standardized data extraction form will be used to collect author, year, country, study design, sample size, age, malocclusion type, teeth intruded, intrusion mechanics, anchorage system, force magnitude, treatment duration, assessment method, imaging method, follow-up period, periodontal outcomes and statistical findings.

Quality assessment / Risk of bias analysis Risk of bias will be assessed independently by two reviewers. Randomized controlled trials will be assessed using the Cochrane Risk of Bias 2 tool. Non-randomized clinical and observational studies will be assessed using ROBINS-I or the Newcastle–Ottawa Scale, depending on study design. Disagreements will be resolved by consensus or through consultation with a third reviewer.

Strategy of data synthesis A qualitative synthesis will be performed for all included studies. Findings will be tabulated according to outcome category, including alveolar bone changes, root resorption, periodontal ligament changes and clinical periodontal outcomes. Studies will also be grouped by intrusion mechanics: conventional intrusion arches, segmental mechanics, skeletal anchorage-supported intrusion and clear aligner-based intrusion.

If sufficient clinical and methodological homogeneity exists, meta-analysis will be performed. Continuous outcomes will be summarized using mean difference or standardized mean difference with 95% confidence intervals. Dichotomous outcomes will be summarized using risk ratios or odds ratios with 95% confidence intervals. Heterogeneity will be assessed using the I^2 statistic. A random-effects model will be used when substantial heterogeneity is expected.

Subgroup analysis Subgroup analyses will be considered according to age group, tooth type, anterior versus posterior intrusion, conventional versus skeletal anchorage-supported intrusion, fixed appliances versus clear aligners, treatment duration, force magnitude and imaging method, especially CBCT versus two-dimensional radiography.

Sensitivity analysis Sensitivity analysis will be performed by excluding studies with high risk of bias, studies with incomplete data, studies using non-CBCT assessment methods and studies with unclear intervention protocols, where appropriate.

Language restriction Only studies published in English will be included.

Country(ies) involved Cambodia. Additional countries may be added depending on the affiliations of co-authors.

Other relevant information The review will follow PRISMA 2020 reporting guidance. A PRISMA flow diagram will be used to report the study selection process.

Keywords Orthodontic intrusion; Periodontal changes; Alveolar bone loss; Root resorption; Periodontal ligament; Temporary anchorage devices; Miniscrews; Clear aligners; CBCT.

Dissemination plans The completed systematic review will be submitted to a peer-reviewed dental, orthodontic, or periodontal journal. Findings may also be presented at relevant orthodontic, dental research, or academic conferences.

Contributions of each author

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