International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

Aggressive dental implant thread design and primary stability: protocol for a systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202580055

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 17 August 2025 and was last updated on 17 August 2025.

INTRODUCTION

Review question / Objective - Population: Human patients receiving dental implants in any jaw, under any placement protocol or bone quality.
- Intervention: Dental implants with aggressive thread macro-design (deep threads, small pitch, buttress/square flank angle, self-tapping flutes, taper).
- Comparator: Conventional or less aggressive thread designs under comparable conditions.
- Outcomes: Primary stability, measured as insertion torque, implant stability quotient (ISQ), and early implant failure.

Study design: Randomised controlled trials, controlled clinical trials, prospective and retrospective cohort studies.

Objective: To systematically review and meta-analyse the effect of aggressive implant thread design compared with conventional thread designs on primary stability in human patients.

Rationale Primary stability is crucial for implant success and determines whether early or immediate loading can be performed. Aggressive implant thread designs are widely marketed as improving stability, especially in softer bone, yet the evidence is inconsistent and fragmented. Some studies suggest significant increases in insertion torque and ISQ, while others report minimal clinical impact. A systematic review and meta-analysis is required to pool available evidence, assess the magnitude of effect, evaluate risk of bias, and guide clinical decisions regarding implant macro-design choice.

Condition being studied Dental implant therapy in partially or fully edentulous patients. Focus on implant macro-design (thread geometry) and its effect on primary stability at placement.

METHODS

Search strategy Searches will be conducted in MEDLINE (via PubMed/Ovid), Embase (Ovid),

Scopus, Web of Science, and Cochrane Library (CENTRAL) from inception to search date. No language or date restrictions will be applied.

Draft PubMed search string:
("Dental Implants"[Mesh] OR dental implant* OR oral implant*)
AND ("thread design" OR "thread geometry" OR "aggressive thread*" OR "macrodesign" OR pitch OR "thread depth" OR "flank angle" OR "self-tapping" OR tapered)
AND ("primary stability" OR "initial stability" OR "insertion torque" OR "implant stability quotient" OR ISQ OR "resonance frequency analysis" OR micromotion)

Grey literature: trial registries (ClinicalTrials.gov, WHO ICTRP), conference abstracts (IADR, AO, EAO), dissertations.

Participant or population Human patients receiving endosseous dental implants in maxilla or mandible, any bone quality, any placement protocol (immediate, early, delayed).

Intervention Dental implants with aggressive thread macro-design.

Comparator Conventional or less aggressive thread designs.

Study designs to be included Randomised controlled trials (RCTs), Controlled clinical trials, Prospective, Retrospective cohort studies.

Eligibility criteria Exclude case reports, case series <10 implants, animal and in vitro studies, simulation-only studies, and narrative reviews.
Exclude zygomatic implants and patients with systemic contraindications (e.g., uncontrolled diabetes, bisphosphonates).

Information sources Electronic databases (MEDLINE, Embase, Scopus, Web of Science, CENTRAL), trial registries, conference abstracts, dissertations, and manual reference list screening.

Main outcome(s)
- Insertion torque (Ncm) at placement.
- Implant Stability Quotient (ISQ) via resonance frequency analysis.

Additional outcome(s) - Early implant failures (≤3 months).
- Complications related to aggressive thread design (e.g., cortical microfractures, insertion complications).

Data management References will be exported to EndNote, deduplicated, and screened in Covidence or Rayyan. Data extraction will be done with a piloted Excel form. Two independent reviewers will extract and cross-check all data.

Quality assessment / Risk of bias analysis Risk of bias and study quality will be assessed independently by two reviewers. Disagreements will be resolved by discussion or a third reviewer.

Tools
- Randomised controlled trials (RCTs): Cochrane Risk of Bias 2 (RoB 2) tool.
- Non-randomised intervention studies (controlled clinical trials): ROBINS-I tool.
- Observational cohort or case–control studies: Newcastle–Ottawa Scale (NOS).

Strategy of data synthesis Random-effects meta-analysis (DerSimonian–Laird or REML, Hartung-Knapp adjustment where small sample size). Mean difference (MD) for IT and ISQ; standardised mean difference (SMD) where measurement scales differ. Heterogeneity assessed using I^2, τ^2, and Q. Narrative synthesis where meta-analysis is not feasible.

Subgroup analysis
Bone density (D1-D4)
Jaw (maxilla vs mandible)
Placement protocol (immediate vs delayed)
Osteotomy undersizing vs conventional preparation
Thread profile (buttress, square, V-shape, tapered vs parallel).

Sensitivity analysis
Exclude studies at high risk of bias
Fixed-effect vs random-effects comparison
Leave-one-out analysis.

Country(ies) involved Australia.

Other relevant information The review will follow PRISMA 2020 guidelines and will be registered with PROSPERO before screening begins.

Keywords Dental implants, Thread design, Aggressive threads, Macrodesign, Primary stability, Insertion torque, Implant stability quotient.

Dissemination plans Findings will be submitted to a peer-reviewed dental journal and presented at professional implantology meetings (EAO, AO, IADR). Results will be published in English.

Contributions of each author

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