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Systematic Review: Outcomes of Revision Total Ankle Arthroplasty (RTAA) Following Failed Primary Total Ankle Arthroplasty - A Systematic Review with Narrative Synthesis

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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: INPLASY202660048

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 10 June 2026 and was last updated on 20 July 2026.

INTRODUCTION

Review question / Objective In adult patients who have undergone primary total ankle arthroplasty (TAA) and subsequently developed implant failure, what are the clinical outcomes — including implant survival, re-revision rates, functional outcomes, and complication profiles — of revision total ankle arthroplasty (RTAA), defined as surgical exchange of one or both metallic components with reimplantation of a new ankle prosthesis?

P -
Adult patients (≥18 years) who underwent primary total ankle arthroplasty (TAA) and subsequently required revision surgery due to implant failure (aseptic loosening, periprosthetic joint infection, periprosthetic fracture, instability, malalignment, or other TAA-related complications).

I - Revision total ankle arthroplasty (RTAA): surgical exchange of one or both metallic components of a failed primary TAA with reimplantation of a new ankle prosthesis. Includes revision using primary implant systems and revision-specific modular implant systems (e.g. INVISION, Salto Talaris Revision). Single-stage and two-stage procedures are both eligible.

C - Where available: comparison between different RTAA implant systems (revision-specific vs. primary implant used at revision) or between single-stage and two-stage revision procedures. Single-arm studies without a comparator are also eligible.

O - Primary: implant survival (Kaplan-Meier at 1, 3, 5, 10 years), re-revision rate, time to failure and cause of failure. Secondary: PROMs (EFAS, AOFAS, VAS pain score), complication rates, radiographic outcomes, risk factors for failure.

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S - RCTs, prospective and retrospective cohort studies, registry-based studies, and case series with a minimum of 5 revision procedures. Conference abstracts, editorials, letters to the editor, and narrative reviews are excluded.

Rationale With the increasing number of primary TAA procedures, the absolute number of revision surgeries is also rising, and further increases are anticipated. Despite the increasing importance of TAA revisions, available data remains limited.

Condition being studied End-stage ankle osteoarthritis results in severe pain, significant functional limitations, and diminished quality of life. When conservative management is unsuccessful, surgical intervention becomes necessary. Ankle arthrodesis (AA) has traditionally been considered the gold standard, providing reliable pain relief and durable outcomes but changes of biomechanical function. Total ankle arthroplasty (TAA) offers a motion-preserving alternative.

METHODS

Search strategy Databases: MEDLINE (via PubMed), Embase (via Ovid), Cochrane Central Register of Controlled Trials (CENTRAL)

Additional sources: Reference lists of included studies (backward citation tracking); forward citation tracking via Web of Science; ClinicalTrials.gov; manual search of Foot & Ankle International, Bone & Joint Journal, Foot and Ankle Surgery

PubMed search string:
("total ankle arthroplasty"[MeSH] OR "total ankle replacement"[tiab] OR "ankle arthroplasty"[tiab] OR "ankle prosthesis"[tiab])
AND ("revision"[tiab] OR "re-revision"[tiab] OR "salvage"[tiab] OR "failed"[tiab] OR "failure"[tiab] OR "reoperation"[tiab])
AND ("survival"[tiab] OR "outcome"[tiab] OR "complication"[tiab] OR "arthrodesis"[tiab] OR "fusion"[tiab] OR "periprosthetic"[tiab]).

Participant or population Adult patients (≥18 years) who underwent revision surgery after failed primary TAA.

Intervention Surgical interventions: surgical exchange of one or both metallic components of a failed primary TAA with reimplantation of a new ankle prosthesis, using primary implant systems and revision-specific modular implant systems, Single-stage and two-stage procedures.

Comparator Where available, comparison between different revision procedures using primary or revision total ankle Arthroplasty systems, single- oder two stage. Single arm studies without a comparator group are also eligible for inclusion.

Study designs to be included Randomised controlled trials, prospective and retrospective cohort studies, registry-based studies, case series with a minimum of 5 revision surgeries. conference abstracts, letters to the editor, editorials and narrative reviews will be excluded.

Eligibility criteria Inclusion: Adults (≥18 years) with failed primary Total ankle arthroplasty (TAA) requirring revision surgery. Minimum 5 revision surgeries. At least one reported outcome of interest. Full text available. Exclusion: primary TAA studies without revision cohort, isolatet polypropylene exchange, less than 5 surgeries, abstracts without full text, duplicate datasets.

Information sources Electronic databases: MEDLINE (PubMed), Embase (Ovid), Cochrane CENTRAL. Additional sources: Backward and forward citation tracking of included studies, manual search of Foot & Ankle International, Bone & Joint Journal.

Main outcome(s)
1. Implant survival (Kaplan-Meier estimates at 1, 3, 5, and 10 years where available)
2. Re-revision rate (further revision surgery of any kind)
3. Time to failure and cause of failure.

Additional outcome(s)
1. PROMs: EFAS score, AOFAS Ankle-Hindfoot Score, VAS pain score
2. Complication rates (wound complications, deep infection, periprosthetic fracture, nerve injury)
3. Radiographic outcomes (alignment, osteolysis, subsidence)
4. Risk factors for failure (patient-level and implant-level)

Data management Search results from all databases will be exported and imported into Zotero for reference manage,ent. Duplicates will bei removed. Study selection will be performed using Rayyan. Standardised data extraction forms (Microsoft Excel) will be used to collect data from included studies. All extracted data will be stored securely and made available upon reasonable request.

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Quality assessment / Risk of bias analysis The methodological quality of all included non-randomised studies will be assessed usin the Methodological Index for non-randomised studies (MINORS).

Strategy of data synthesis Due to anticipated clinical and methodological heterogeneity across included studies (differences in study design, patient population, follow-up duration, outcome definitions), a formal meta analysis will not be performed. Data will be synthesised narratively and presented in structured evidence tables.

Subgroup analysis Planned for: (1) septic vs. aseptic revision indication; (2) revision-specific vs. primary implant used at revision; (3) single- vs. two-stage procedure; (4) follow-up duration (5 years). Contingent on sufficient available data.

Sensitivity analysis Restricted to studies with minimum 24-month follow-up; additionally restricted to studies with MINORS ≥10/16 (non-comparative) or ≥16/24 (comparative), to assess robustness of findings when limited to higher-quality evidence.

Language restriction English.

Country(ies) involved Switzerland.

Other relevant information This review is conducted as a systematic review with narrative synthesis. A formal meta-analysis was not planned due to anticipated heterogeneity in study design, patient populations, implant systems, and outcome reporting. The review follows PRISMA 2020 guidelines. No ethical approval required. Protocol amended after initial registration: scope restricted to RTAA only (RAA, RTTC, and amputation excluded as primary outcomes). Amendment documented transparently.

Keywords total ankle arthroplasty; total ankle replacement; revision arthroplasty; ankle arthrodesis; tibiotalocalcaneal fusion; implant survival; salvage procedure; periprosthetic joint infection; aseptic.

Dissemination plans The results of this systematic review with narrative synthesis will be submitted for publication in a peer-reviewed orthopaedic journal (Minerva Medica).

Contributions of each author

Author 1 - Svenja Kaiser - Developed the protocol, performed title/abstract and full-text screening, conducted data extraction and quality assessment, drafted manuscript.
Email: svenja.kaiser@usb.ch
Author 2 - Peter Kvarda - Independently performed title/abstract and full-text screening, conducted data extraction and quality assessment, critically revised manuscript for important intellectual content.

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