

INPLASY

Surgical treatment outcomes of open tibial fractures in Brazilian trauma centers: a systematic review

INPLASY202680052

doi: 10.37766/inplasy2026.8.0052

Received: 13 August 2026

Published: 13 August 2026

Botão, RT; Pereira, MES.

Corresponding author:

Ryan Torquato Botão

ryantorquatobotao@gmail.com

Author Affiliation:

Faculdade Zarns, Itumbiara, Goiás, Brazil.

ADMINISTRATIVE INFORMATION**Support** - No support.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202680052**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 13 August 2026 and was last updated on 13 August 2026.**INTRODUCTION**

Review question / Objective The aim of this systematic review is to describe the epidemiological profile, surgical management strategies, and clinical outcomes (infection, nonunion, amputation, reoperation) of adult patients with open tibial fractures treated in Brazilian trauma centers, in order to characterize the national experience with this injury and identify gaps relative to international evidence. To this end, the proposed systematic review will address the following question: What are the epidemiological characteristics, surgical management approaches, and clinical outcomes of open tibial fractures treated in Brazilian trauma centers?

Rationale Open tibial fractures are among the most common severe long-bone injuries and carry substantial risk of infection, nonunion, and amputation. While the optimal fixation strategy (external fixation vs. intramedullary nailing) has been extensively studied and meta-analyzed internationally, these reviews are dominated by

data from high-income countries with different trauma epidemiology (mechanism of injury, time-to-treatment, resource availability) than Brazil, where high-energy motorcycle-related trauma is a leading cause. No prospectively registered systematic review to date has specifically synthesized the Brazilian experience with open tibial fracture management and outcomes, despite a substantial body of retrospective case series published in national journals (Acta Ortopédica Brasileira, Revista Brasileira de Ortopedia). Synthesizing this regional evidence base is relevant both for characterizing outcomes under local resource constraints and for informing Brazilian trauma protocols, which may not be directly generalizable from international guidelines.

Condition being studied Open tibial fractures (diaphyseal and/or plateau, Gustilo-Anderson types I–IIIC) in adult patients (≥ 18 years) treated surgically in Brazilian trauma centers/hospitals.

METHODS

Search strategy A three-concept search structure was used: (Population: tibial fracture) AND (Injury type: open/exposed) AND (Setting: Brazil), combined with database-specific subject headings and free-text terms.

PubMed/MEDLINE: (Tibial Fractures[MeSH] OR tibia*[Title/Abstract] OR "tibial fracture"[Title/Abstract]) AND ("Fractures, Open"[MeSH] OR open[Title/Abstract] OR exposed[Title/Abstract] OR compound[Title/Abstract]) AND (Brazil[MeSH] OR Brazil*[Title/Abstract] OR Brasil*[Title/Abstract]).

LILACS/BVS: (tw:(fratura da tíbia)) OR (tw:(tibial fracture)) OR (mh:(Fraturas da Tibia)) AND (tw:(fratura exposta)) OR (tw:(open fracture)) OR (mh:(Fraturas Expostas)).

Cochrane CENTRAL: MeSH descriptor Tibial Fractures AND MeSH descriptor Fractures, Open AND (Brazil* OR Brasil*).

SciELO (direct search, complementary): "fratura exposta tibia".

No language or date filters were applied at the search stage. Reference lists of included studies were hand-searched for additional eligible studies.

Participant or population Adult patients (≥ 18 years) with open (exposed) tibial fractures (diaphyseal or plateau, any Gustilo-Anderson type) treated surgically in a hospital or trauma center located in Brazil.

Intervention Surgical management strategies for open tibial fractures, including debridement protocols, external fixation, intramedullary nailing (reamed/unreamed), plate fixation, and soft-tissue/flap coverage strategies, as reported in Brazilian case series and cohorts.

Comparator Where available, comparison between fixation strategies (e.g., external fixation vs. intramedullary nailing). Where comparative data are unavailable, descriptive synthesis of outcomes by treatment strategy was performed instead.

Study designs to be included Randomized controlled trials, prospective and retrospective cohort studies, and case series with ≥ 10 patients, to reduce risk of underpowered studies.

Eligibility criteria Inclusion: adult patients with open tibial fractures treated surgically at a Brazilian institution; at least one outcome of interest

reported (infection, nonunion/malunion, amputation, reoperation, time to union, functional outcome); Portuguese, English, or Spanish language. Exclusion: pediatric-only populations without separate adult data; studies not specifying Brazilian setting; biomechanical/cadaveric studies without clinical outcomes; conference abstracts without full text; narrative reviews without primary data.

Information sources PubMed/MEDLINE, Cochrane CENTRAL, LILACS/BVS, and SciELO (direct search). Embase was not searched due to lack of institutional access; acknowledged as a limitation (see item 27).

Main outcome(s) Deep infection rate following surgical treatment of open tibial fractures.

Additional outcome(s) Nonunion/malunion rate, amputation rate (primary and secondary), reoperation rate, time to bony union, and functional outcome scores where reported.

Data management Two independent reviewers screened titles/abstracts and full texts, and extracted data using a standardized form. Disagreements were resolved by discussion. Data were managed using a structured spreadsheet for screening and extraction.

Quality assessment / Risk of bias analysis Methodological quality was assessed using the Methodological Index for Non-Randomized Studies (MINORS) for observational studies and case series (8 items, 0-16 points for non-comparative studies; 12 items, 0-24 points for comparative studies).

Strategy of data synthesis Given the predominance of retrospective case series with heterogeneous outcome reporting, a narrative/descriptive synthesis was performed, organized by outcome (epidemiology, infection, nonunion, amputation, reoperation). A quantitative meta-analysis was not performed due to insufficient homogeneity between studies in outcome definitions and reporting.

Subgroup analysis Where data permitted, findings were considered by Gustilo-Anderson type (I-II vs. IIIA vs. IIIB/C) and by fixation strategy (external fixation vs. intramedullary nailing vs. plate).

Sensitivity analysis Studies with lower methodological quality (MINORS) were considered separately in the interpretation of findings to assess robustness of conclusions.

Language restriction No restriction; screening considered Portuguese, English, and Spanish publications.

Country(ies) involved Brazil.

Other relevant information Limitation: Embase was not searched due to lack of institutional subscription access. LILACS/BVS and direct SciELO searches were used to mitigate this, as they capture the majority of Brazilian orthopedic literature (typically open access).

Keywords Open tibial fracture; exposed fracture; Brazil; trauma center; external fixation; intramedullary nailing; surgical outcomes.

Dissemination plans Results will be submitted for presentation at an orthopedic/trauma congress and considered for publication in a peer-reviewed orthopedic journal.

Contributions of each author

Author 1 - Ryan Torquato Botão - Conceived and designed the review, developed the search strategy, conducted the majority of screening and data extraction, and drafted the protocol and manuscript.

Email: ryanorquatobotao@gmail.com

Author 2 - Maria Eduarda Silva Pereira - Performed independent screening and data extraction, contributing to inter-rater verification of study selection and data accuracy.

Email: mariaeduardamadu017@gmail.com