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Autologous Platelet-Rich Plasma in preventing post-operative wound infection and acceleration of surgical wound healing: Systematic Review and meta-analysis

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ADMINISTRATIVE INFORMATION

Support - Review has no specific/external funding but is supported by guarantor/review team (non-commercial) institutions.

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 6 July 2026 and was last updated on 6 July 2026.

INTRODUCTION

Review question / Objective To investigate the efficacy of platelet-rich plasma (PRP) in the prevention of surgical site infection (SSI) and its impact on postoperative wound healing.

Rationale PRP is a hemo-concentrate enriched in platelets and contains a high concentration of viable growth factors (Hasan et al., 2019), including transforming growth factor-β and vascular endothelial growth factor (Badade et al., 2016). Moreover, PRP increases the levels of GFs in the wound site after degranulation of the platelets to improve the wound healing process. Another substance in PRP is neutrophilic polymorphonuclear leukocytes, which, along with growth factors and neutrophilic polymorphonuclear Leukocytes play an essential role in the innate immune system in the infection process (Hasan et al., 2019). In addition, prp have act to inhibit macrophage infiltration in the wound site as a result to shorten the inflammatory phase and accelerating the initiation of the proliferative phase. (Badade et al., 2016)

PRP has regenerative and antibacterial effects (Yang et al., 2023), thus accelerating the healing of infected skin wounds because it has antibacterial activity and rapidly reduces inflammation, which allows rapid re-epithelialization and granulation tissue formation.(Farghali et al., 2019). The Recent study has been reported that PRP has been also antimicrobial effect in against Staphylococcus aureus,(Torres et al., 2023), (Sultana et al., 2022) Fusobacterium nucleatum (Shrestha & Reyes, 2023), Escherichia colli, Klebsiella pneumonia and Pseudomonas aeruginosa (Attili et al., 2021), indicating that PRP is potentially platelet concentration to fight against postoperative infections(Zafar et al., 2023). The antibacterial effect of PCs has also been recently highlighted in in vivo studies on surgical wounds (Cetinkaya et al., 2018); however another in vivo study showed controversial results (SanGiovanni & Kiebzak, 2016).

Condition being studied The review focuses on clinical settings involving patients with postoperative wounds, typically managed in surgical wards, wound care clinics, or hospital inpatient and outpatient services where PRP therapy may be considered as part of standard or alternative wound care management. 1. Inclusion Criteria:
• Population: Patients with postoperative wounds
• Intervention: Studies investigating autologous PRP applied topically or locally injected to the wound area, either alone or in combination with other agents, with reported antimicrobial and/or wound healing outcomes.
• Comparison: Standard or control wound care (without PRP), or the use of other wound therapies such as saline, povidone-iodine, silver sulfadiazine, or regular bandages
• Outcomes of Interest: Incidence of postoperative wound infection (surgical site infection), wound healing outcomes (including wound healing time and wound healing rate), microbiological culture findings, and wound-related complications.
• Study Design: Randomized controlled trials (RCTs), non-randomized controlled studies, cohort studies, and comparative observational studies.
• Language and Publication Year: Not specified (should be clarified in the protocol).
2. Exclusion Criteria:
• Population: Patients with non-operative wounds (traumatic wounds, diabetic ulcers, burns), chronic wounds, and other non-surgical wounds
• Intervention: PRP is not used at all, or where other regenerative products are applied without any PRP component.
• Comparison: There were no comparison groups
• Outcomes: Irrelevant outcomes (e.g. cosmetics only)
• Study Design: Systematic reviews, meta-analyses, narrative reviews, editorials, case reports, conference abstracts without sufficient data, in vitro studies, ex vivo studies, animal studies, and studies without a comparison or control group.

METHODS

Search strategy The Literature searches were conducted comprehensively and systematically using the electronic databases PubMed, Scopus, and ScienceDirect. The search strategy using Medical Subject Headings (MeSH) in the form of Population-related terms included "surgical wound," "surgical incision," "postoperative wound," and "surgical site infection," while intervention-related terms included "platelet-rich plasma," "PRP," and "plasma concentrate." These terms were combined using Boolean operators ("AND" and "OR"). database inception to June 2025, with no restrictions on publication year. Only articles published in English were considered eligible.

Participant or population Inclusion population: Patients with postoperative wounds
Exclusion population: Patients with chronic wounds such as DM, burns, or other wounds that are susceptible to infection.

Intervention Inclusion: Studies investigating autologous PRP applied topically or locally injected to the wound area, either alone or in combination with other agents, with reported antimicrobial and/or wound healing outcomes.

Exclusion: Studies where PRP is not used at all, or where other regenerative products are applied without any PRP component.

Comparator Inclussions: the comparison or control including Standard or control wound care (without PRP), or the use of other wound therapies such as saline, povidone-iodine, silver sulfadiazine, or regular bandages.

Exclusions: there was No comparison groups.

Study designs to be included Randomized controlled trials (RCTs), non-randomized controlled studies, cohort studies, and comparative observational studies.

Eligibility criteria The review focuses on clinical settings involving patients with postoperative wounds, typically managed in surgical wards, wound care clinics, or hospital inpatient and outpatient services where PRP therapy may be considered as part of standard or alternative wound care management.
1. Inclusion Criteria:
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• Outcomes of Interest: Incidence of postoperative wound infection (surgical site infection), wound healing outcomes (including wound healing time and wound healing rate), microbiological culture findings, and wound-related complications.

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Information sources Pubmed, scopus, ScienceDirect database.

Main outcome(s) Main Outcomes for Data Extraction and Analysis
• Incidence of surgical site infection (SSI)
Defined as a clinically diagnosed infection at the surgical wound site, based on CDC criteria or physician diagnosis.
Measured as dichotomous data (presence/absence of infection).
Time points: within 30 days postoperatively or as defined by individual studies.
Effect measure: risk ratio (RR) or odds ratio (OR) with 95% confidence intervals.
• wound healing outcome
Defined as wound healing parameters including time to complete wound healing, wound healing rate, wound closure, epithelialization, or other healing-related outcomes as reported by individual studies.
Measured as continuous or dichotomous data depending on the outcome reported.
Time points: from surgery until complete healing or according to study-specific follow-up periods.
Effect measure: Mean Difference (MD), Standardized Mean Difference (SMD), Risk Ratio (RR), or Odds Ratio (OR) with 95% confidence intervals, as appropriate.

Additional outcome(s) • Microbiological culture findings, including the types of microorganisms isolated from postoperative wounds and the antimicrobial activity of PRP against specific bacterial species.
• Wound-related complications, including wound dehiscence, delayed healing, seroma formation, hematoma, and other postoperative wound complications as reported by individual studies.
• Length of hospital stay, where available.
• Adverse events related to PRP application, including local reactions, treatment-related complications, or other safety outcomes reported by the included studies.

Data management Data were screened and managed using Rayyan for title/abstract and full-text screening. Statistical analyses were conducted using Review Manager (RevMan) version 5.4.

Quality assessment / Risk of bias analysis Risk of bias be assessed using Cochrane RoB-2
(GRADE Domains Assessed:
For each outcome, the certainty of evidence will be rated across the following five domains:
Risk of Bias, Based on assessments using the RoB 2.0 tool for randomized trials)

Studies will be assessed independently by at least two people (or person/machine combination) with a process to resolve differences.

additional information will be sought from study investigators

Risk of bias due to missing results in a synthesis will be assessed using funnel plot analysis when at least 10 studies are included in a meta-analysis. Funnel plot asymmetry will be evaluated visually and, where appropriate, Egger's regression test will be performed.

Strategy of data synthesis Methods of Synthesis (Following PRISMA Guidance)
The methods for data synthesis in this review will follow the PRISMA 2020 statement and, where applicable, the PRISMA extension for interventions (PRISMA-IPD) and PRISMA harms, depending on the outcome.

Data Synthesis Approach:
Data from eligible studies will be synthesized quantitatively using meta-analysis when appropriate. Dichotomous outcomes such as incidence of wound infection will be pooled using Odds Ratios (OR) with 95% Confidence Intervals (CIs). Continuous outcomes such as wound healing time will be summarized using Mean Differences (MD) with 95% CIs. A random-effects model will be used considering the expected clinical and methodological heterogeneity among

studies (e.g., differences in PRP preparation, surgical procedures, and outcome measurements).

Heterogeneity will be assessed using the Chi² test and I² statistic. Subgroup analysis may be performed based on factors such as type of wound, PRP administration method, and study quality. If meta-analysis is not feasible due to substantial heterogeneity or limited number of studies, a narrative synthesis will be provided.

Subgroup analysis Although the protocol prespecified subgroup analysis by wound type and PRP administration method, formal quantitative subgrouping by these factors was not feasible due to the limited number of studies with poolable data. Instead, a narrative subgroup comparison was performed based on PRP activation status (active PRP, non-activated/unspecified PRP, leukocyte-rich PRP, and lyophilized PRP), examining differences in wound healing and SSI outcomes across these categories.

Sensitivity analysis Sensitivity analysis was based on visual inspection of forest plots, defining outliers as studies whose 95% confidence intervals did not overlap with the pooled effect estimate. For both pooled outcomes (wound healing time and surgical site infection), all included studies' confidence intervals overlapped with the pooled estimate; therefore, no outliers were identified and no studies were excluded in sensitivity analysis.

Language restriction English.

Country(ies) involved Indonesia, Netherland.

Other relevant information This systematic review's protocol was drafted on 22 June 2025, coinciding with the start of literature searching. Although prospective registration was intended, finalization of the protocol was delayed due to an administrative oversight, and by the time of registration the review process (screening, data extraction, risk of bias assessment, and data synthesis) had already been completed (December 2025). This protocol is therefore submitted retrospectively, with full transparency regarding its current stage

Keywords Surgical wound; Platelet rich plasma; surgical site infection.

Dissemination plans We plan to publish the results of this systematic review and meta-analysis in a peer-reviewed international journal, in English. The findings are also intended to be disseminated as part of a doctoral thesis (PhD dissertation) at Radboud University Medical Center, in collaboration with Universitas Jambi.

Contributions of each author

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