

Early Flap Reconstruction and Infection Rates in Open Lower Extremity Fractures: A Systematic Review and Meta-analysis

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Background: Severe open lower extremity fractures often require soft tissue reconstruction with a flap. Infection is a common complication of lower extremity flap coverage and is associated with prolonged hospitalization, high costs, and poor patient-reported outcomes. Elapsed time from injury to flap coverage can increase infection risk, but the optimal timing threshold remains debatable. We aimed to synthesize the literature and determine if time to flap is associated with reduced infection rates following traumatic lower extremity injuries.

Methods: We searched 5 databases for articles published before March 2023. We included studies of 10 or more patients undergoing flap reconstruction for open lower extremity fractures. We extracted data on patient demographics, operative details, and postoperative complications and grouped individual data by time-to-flap: 72 hours or less versus more than 72 hours and 7 days or less versus more than 7 days. We performed meta-analyses at a significance level of α equal to 0.05.

Results: Sixteen studies of 973 patients (986 extremities) were included. Reconstruction within 72 hours of injury was associated with a 52% reduction in infection (risk ratio [RR] 0.48 [95% confidence interval (CI) 0.25–0.89]) and a 41% reduction in all complications (RR 0.59 [95% CI 0.36–0.99]). Reconstruction within 7 days of injury was associated with a 50% reduction in infection (RR 0.50 [95% CI 0.31–0.82]) but no significant reduction in total complications (RR 0.57 [95% CI 0.28–1.15]).

Conclusions: Flap coverage within 72 hours of injury reduces infection risk in patients undergoing lower extremity reconstruction for open fractures. (*Plast Reconstr Surg Glob Open* 2025;13:e6829; doi: [10.1097/GOX.0000000000006829](https://doi.org/10.1097/GOX.0000000000006829); Published online 6 June 2025.)

INTRODUCTION

Open lower extremity fractures and dislocations are highly morbid injuries that impose a significant burden of disease on patients.^{1–3} Outcomes following traumatic lower extremity injuries are often poor, with infection and nonunion affecting up to 40% of cases.^{4–8} Reoperation, readmission, and amputation are common following

attempts at limb salvage and create substantial costs for patients and healthcare systems.^{9–11} Therefore, establishing best practices for soft tissue reconstruction following traumatic lower extremity injuries is necessary for improving long-term outcomes, preventing complications, and reducing medical and societal costs.

In the United States, most patients undergo serial debridement and orthopedic fixation followed by reconstruction with a soft tissue flap at a median time of 10 days from injury.¹² This timeline has demonstrated acceptable outcomes but is longer than those in other countries, which may contribute to longer and more expensive admissions.^{11,13,14} In the United Kingdom, national guidelines recommend that surgeons complete radical debridement, orthopedic fixation, and flap coverage within 72

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hours of injury.^{15,16} This protocol was introduced based on evidence suggesting soft tissue coverage within 72 hours of injury decreases postoperative infections, flap failures, and bony nonunion.^{17–21} Alternative strategies aim to complete debridement, orthopedic fixation, and flap coverage within 7 days of injury.^{14,22,23} However, with literature supporting both early and late approaches, it is unclear which pathway provides the best clinical outcomes for patients.

We aimed to determine if time to flap was associated with reduced rates of postoperative complications following traumatic lower extremity injuries. We hypothesized that soft tissue reconstruction within 72 hours of hospital presentation would be associated with lower complication rates, including fewer instances of fracture-related infections, nonunion, unplanned reoperation, flap failure, and secondary amputation when compared with reconstruction after 72 hours.

METHODS

Search Strategy

We conducted a systematic review in March 2023 across 5 databases: PubMed, Embase, Cochrane, Web of Science, and Scopus. (See appendix, Supplemental Digital Content 1, which displays a description of our complete search strategy, <https://links.lww.com/PRSGO/E81>.) Briefly, we searched for original articles addressing lower extremity injuries and surgical flaps using a combination of keywords and subject headings. We did not apply a date restriction, and a medical librarian oversaw all search procedures. We subsequently uploaded all retrieved articles to Covidence (Veritas Health Innovation Ltd, Melbourne, Australia) for screening and data extraction.

Inclusion and Exclusion Criteria

Four authors (R.F.P.T., S.K.R., S.A.S., and S.A.) conducted an independent screen of all titles and abstracts against preestablished inclusion and exclusion criteria. We included original investigations of 10 or more patients who had undergone reconstruction with free flaps, local flaps, or skin grafts following open lower extremity fractures. We included patients of all ages with injuries distal to the mid-femur. Eligible study designs included randomized controlled trials and prospective or retrospective cohort studies. We excluded studies that failed to mention open fractures in their selection criteria or those investigating patients with wounds after oncological resection, burn injuries, actively infected wounds, revision surgery, injuries to the hip and cephalad, and nonautologous reconstruction. We also excluded case reports, literature reviews, textbook chapters, editorials, and animal or cadaver studies. If some but not all study participants met our selection criteria, we included the study if the available data were granular enough to permit analysis of individual patients. A third independent reviewer (R.F.P.T., S.K.R., S.A.S., or S.A.) resolved discrepancies in the selection criteria.

Data Extraction and Definitions

We extracted publication details, patient demographics, injury and operative details, time from injury

Takeaways

Question: Is early flap coverage associated with reduced complication rates in patients with open lower extremity fractures?

Findings: Flap coverage within 72 hours of injury reduced infection risk by 48% and the risk of any complication by 41% compared with coverage after 72 hours. Flap coverage within 7 days of injury reduced the risk of infection by 50% and bony nonunion by 40% compared with later coverage. Rates of unplanned reoperation, flap failure, and secondary amputation did not differ significantly at either timepoint.

Meaning: Early soft tissue reconstruction with a flap reduces the risk of infection and nonunion in patients with open lower extremity fractures.

to reconstruction, length of follow-up, and postoperative complications. Complications included postoperative infection, nonunion, unplanned 90-day reoperation, flap failure, and secondary amputation as defined by the authors of each study.

Data Analysis and Risk-of-bias Assessment

We conducted 2 separate analyses to compare the efficacy of 72-hour and 7-day thresholds for reconstruction timing. For the 72-hour analysis, patients from the included studies were assigned to 1 of 2 groups depending on their elapsed time from injury to flap reconstruction. The “within 72-hour” group contained patients who underwent flap reconstruction within 72 hours of injury, whereas the “after 72-hour” group contained those who underwent reconstruction after 72 hours. For the 7-day analysis, patients from the included studies were similarly divided. The “within 7-day group” included patients who underwent reconstruction within 7 days of injury, and the “after 7-day” group included those undergoing reconstruction after 7 days.

We conducted summary statistics of patient, extremity, reconstruction, and flap data using Microsoft Excel (Microsoft, Redmond, WA). We then conducted meta-analyses using Cochrane Review Manager 5.4. (Cochrane, London, United Kingdom).²⁴ We analyzed pooled data by total and individual complications and used random effects models to estimate risk ratios (RRs) with 95% confidence intervals (95% CI) at the significance level of α equal to 0.05. Two independent reviewers (R.F.P.T. and S.K.R.) assessed the risk of bias in all included studies using the Newcastle–Ottawa scale (NOS).²⁵ Discrepancies were resolved by discussion with the senior author (L.R.M.).

RESULTS

Search Results and Study Details

The initial search returned 11,553 studies, of which 15 met the inclusion criteria and were included in the final analysis (Fig. 1).^{17–19,26–37} We manually added 1 study identified by review of reference lists, for a total of 16 studies.³⁸

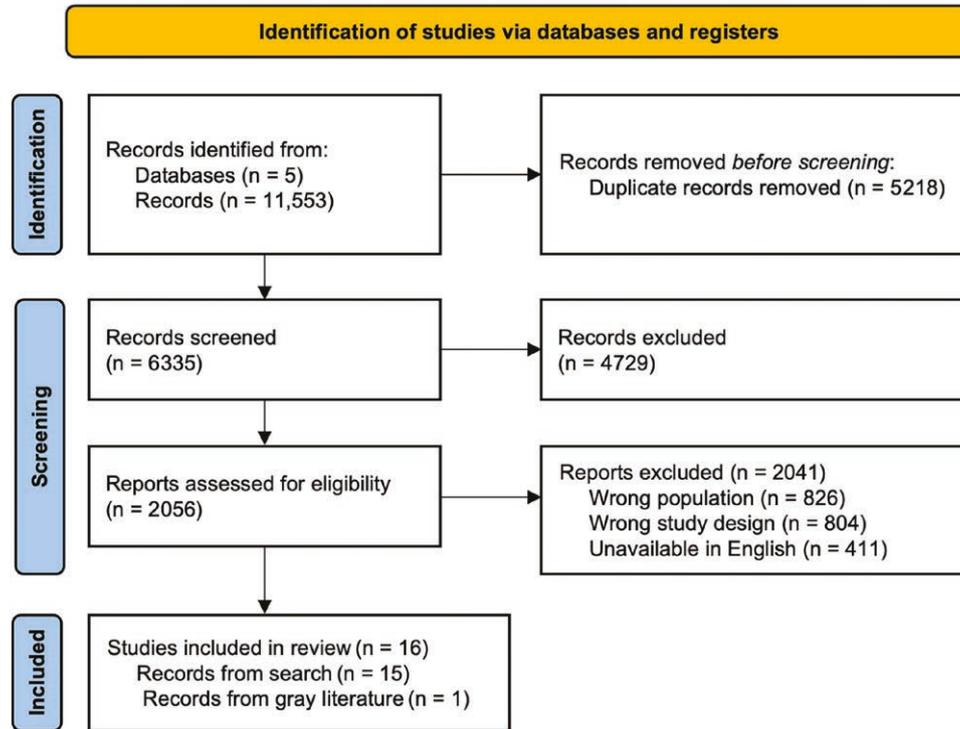


Fig. 1. PRISMA flow diagram. PRISMA, preferred reporting items for systematic reviews and meta-analyses.

(See appendix, Supplemental Digital Content 2, which displays a summary of all included studies, <https://links.lww.com/PRSGO/E82>.)

Patient Demographics

The final dataset included 973 patients with 986 lower extremity injuries and 979 reconstructions. Most patients were men ($n = 722$, 74.2%) with Gustilo–Anderson IIIB fractures ($n = 606$ extremities, 61.5%). Most injuries were tibial fractures ($n = 779$ extremities, 79%), and most reconstructions were performed using free flaps ($n = 693$, 70.1%). Injury details are described in Table 1, and reconstruction details are outlined in Table 2. Duration of follow-up after injury was available from 10 studies with a minimum period of 12 months.^{17,18,28,29,31,32,35–38}

Reconstruction and Complications

Of those with sufficient data for meta-analysis, 190 (30.7%) patients underwent soft tissue reconstruction before 72 hours, and 429 (69.3%) patients underwent reconstruction after 72 hours. Considering the 7-day time-point, 275 (41.2%) patients underwent surgery before 7 days, and 393 (58.8%) patients underwent surgery after 7 days. There were insufficient data for meta-analysis for 367 and 318 patients at 72 hours and 7 days, respectively. Reasons for increased time between injury and flap included medical stabilization,^{18,19,28,38} delays in transfer,^{18,19} delays in orthopedic and plastic surgery consultation,^{18,27} and a lack of operating room availability.³⁸ Complications impacted 43.9% of reconstructions (Table 3). Infections were the most common complication ($n = 114$ events,

11.6%), followed by unplanned reoperation ($n = 104$ events, 10.6%) and nonunion ($n = 102$ events, 10.4%). Flap failure occurred in 6.9% of reconstructions. Reasons for flap failure included unsalvageable venous congestion,^{18,27} infection,^{26,34} hematoma,^{27,34} and arterial or venous thromboses.^{30,34}

Meta-analysis

Reconstructions performed within 72 hours of injury reduced total complication rates by 41% (RR 0.59 [95% CI 0.36–0.99], Fig. 2). Specifically, there was a 52% reduction in the risk of postoperative infection for patients with early reconstructions (RR 0.48 [95% CI 0.25–0.89], Fig. 3A).

Reconstruction performed within 7 days of injury was associated with a 50% reduced risk of infection (RR 0.50 [95% CI 0.31–0.82], Fig. 3B) and a 40% reduced risk of bony nonunion (RR 0.60 [95% CI 0.43–0.85], Fig. 3C). The results of meta-analyses for all outcomes, including infection, unplanned reoperation, nonunion, secondary amputation, and flap failure are included in Table 4.

Risk of Bias

Sixteen studies were reviewed for risk of bias using the NOS (Table 5). Fourteen studies (87.5%) had NOS scores of 7 or more, indicating high-quality methods for the selection and comparison of study groups and the ascertainment of outcome data.^{17,18,26–29,31–38} The remaining 2 (12.5%) studies had NOS scores from 5 to 6, indicating moderate-quality methods.^{19,30} These 2 studies lost points for inadequate comparability of confounders and follow-up duration.^{19,30} All studies received all points possible for the

Table 1. Patient Demographics and Injury Characteristics

Characteristic	Mean ± SD or n (%)
Age, y* [†]	39.3 ± 8.2
Sex	
Male	722 (74.2)
Female	251 (25.8)
Fracture site	
Tibia	779 (79)
Foot	23 (2.3)
Femur	2 (0.2)
Not specified	182 (18.5)
Gustilo–Anderson classification	
IIIB	606 (61.5)
IIIC	40 (4.1)
IIIA	11 (1.1)
II	8 (0.8)
Not specified	321 (32.6)
Time from injury to reconstruction	
72 h (Godina)	
Delayed	429 (43.5)
Early [†]	190 (19.3)
Not specified	367 (37.2)
7 d (Yaremchuk)	
Delayed	393 (39.9)
Early [†]	275 (27.9)
Not specified	318 (32.3)

A total of 973 patients, 986 extremities, and 979 soft tissue reconstructions were included.

*Rinker et al³⁷ reported median age and was not included in this calculation. [†]Lee et al,³² Olesen et al,³⁵ and Rinker et al³⁷ early cohorts are ≤72 hours and ≤7 days.

Table 2. Details of Autologous Reconstruction (N = 989)

Methods of Reconstruction	n (%)
Free flaps	693 (70.1)
Latissimus dorsi	232 (23.5)
Anterolateral thigh	147 (14.9)
Rectus abdominis	113 (11.4)
Gracilis	83 (8.4)
Radial forearm	68 (6.9)
Serratus	10 (1.0)
Other	40 (4.0)
Local flaps	142 (14.4)
Gastrocnemius	52 (5.3)
Soleus	33 (3.3)
Sural	6 (0.6)
Other	51 (5.2)
Skin grafts	6 (0.6)
Not specified*	148 (15.0)

*Autologous soft tissue reconstruction not specified by authors.

representativeness of their sample collection, the selection of their nonexposed cohort, their methods for data ascertainment, their assessment of key outcomes, and the absence of the outcome of interest at the outset of the study.

DISCUSSION

Our systematic review summarizes the current literature on the timing of lower extremity reconstruction. Across the studies reviewed, patients most often underwent delayed reconstruction due to the need for medical

stabilization or transfer from an outside hospital. Other reasons for increased time between injury and flap reconstruction included delays in orthoplastics consultation^{18,27} and a lack of operating room availability.³⁸ Our meta-analysis demonstrated that flap coverage within 72 hours of injury reduced the risk of total complications by 41% when compared with coverage performed after 72 hours. Flap reconstruction within 7 days of injury was not significantly associated with a reduced risk of total complications; however, it was associated with a decreased risk of infection (RR 0.50, $P < 0.05$) and nonunion (RR 0.60, $P < 0.05$). There were no significant associations between reconstruction timing and rates of unplanned reoperation, flap failure, or secondary amputation.

Open tibial fractures are a major source of morbidity among trauma patients and are associated with poor clinical outcomes. Among these are infection in 20%–40%,^{5–8} nonunion in 20%–30%,^{5,39} and immediate amputation in 2.2% of patients.^{40,41} Prolonged and expensive hospital stays are also common. Olesen et al⁴² showed that the average length of stay for patients with severe open tibial fractures treated with a free flap was 57 days and cost patients an average of \$50,000.⁴⁰ When complicated by infection, the length of stay increased to 74 days, and average costs rose to \$80,000.⁴² Complications such as infection also have significant impacts on patient quality of life.⁴³ Fractures complicated by infection have been associated with higher rates of unemployment, poorer physical function, and greater pain than comparable uninfected fractures.⁴⁴ Similarly, fractures complicated by nonunion have been associated with significant functional impairment, psychological distress, and pain.⁴⁵ Therefore, it is imperative to identify interventions to reduce complications and their sequelae in patients with severe open lower extremity fractures.

Our findings in this study support previously reported findings that delayed soft tissue reconstruction of open lower extremity fractures is associated with greater rates of infection than reconstruction within 72 hours of injury.⁴⁶ Suggested reasons for reduced complications and improved patient outcomes are multifold. First, the early provision of a well-vascularized soft tissue envelope around wounds offers a path for the delivery of intravenous antibiotics to the site most at risk of infection.^{47,48} Enhanced perfusion may also improve bone healing and reduce the risk of osteomyelitis.^{49,50} Second, patients who undergo earlier reconstruction may mobilize earlier. Early mobilization after lower extremity surgery has been associated with fewer postoperative complications, improved patient-reported quality of life, and lower risk of readmission and mortality.⁵¹ Third, patients who undergo earlier reconstruction may have less local inflammation and granulation tissue than patients who undergo later reconstruction.⁵² Excess granulation tissue can be challenging to excise and may obscure the differences between healthy and devitalized tissues during debridement.⁵³ Finally, early reconstruction pathways require highly organized and collaborative teams of plastic and orthopedic surgeons; therefore, sites capable of accomplishing early reconstruction may be more adept at treating patients with open lower extremity fractures than lower volume centers.⁵⁴

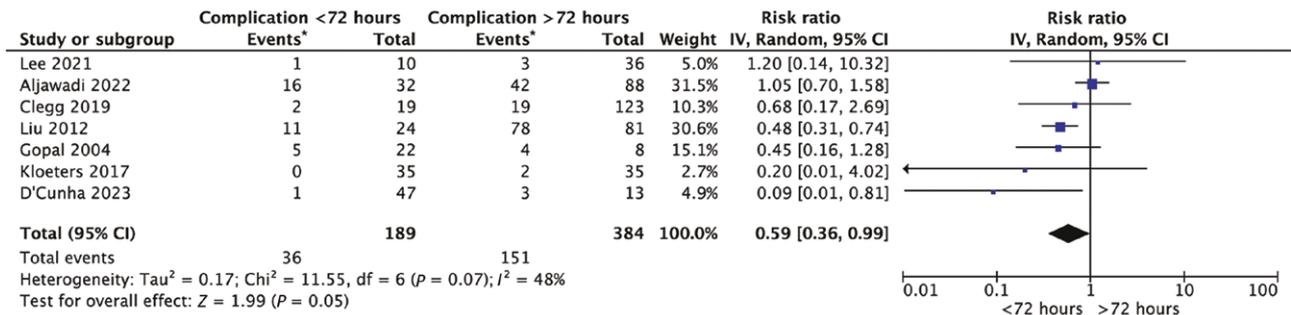
Table 3. Postoperative Complications by Early and Delayed Reconstruction Cohorts

Anal- ysis	Group	Total, n = 430 (43.9%)		Infections, n = 114 (11.6%)		Unplanned Reop- erations, n = 104 (10.6%)		Nonunion, n = 102 (10.4%)		Flap Failures, n = 68 (6.9%)		Secondary Amputations, n = 42 (4.3%)	
		n	Events, n (%)*	n	Events, n (%)*	n	Events, n (%)*	n	Events, n (%)*	n	Events, n (%)*	n	Events, n (%)*
72 h	<72 h†	190	36 (18.9)	126	14 (11.1)	66	12 (18.2)	57	5 (8.8)	60	3 (5)	52	2 (3.8)
	≥72 h	429	203 (47.3)	235	72 (30.6)	205	42 (20.5)	214	42 (19.6)	161	21 (13)	256	26 (10.2)
7 d	<7 d†	275	123 (44.7)	151	19 (12.6)	133	32 (24.1)	151	19 (12.6)	167	24 (14.4)	139	15 (10.8)
	≥7 d	393	234 (59.5)	196	50 (25.5)	208	52 (25)	196	50 (25.5)	260	42 (16.2)	225	24 (10.7)

The number of events should not sum to those in Table 2.

*Lee et al,³² Olesen et al,³⁵ and Rinker et al³⁷ early cohorts are ≤72 hours and ≤7 days.

†n, number of patients (% of events per group and timing).



*Complications included bony nonunions, superficial and deep infections, unplanned reoperations within 90 days, flap failures, and secondary amputations after soft tissue reconstruction (Olsen et al not listed due to negligible effect).

Fig. 2. Reduced risk of complications in reconstructions performed within 72 hours of injury.

Given this rationale, the British Association of Plastic, Reconstructive and Aesthetic Surgeons and the British Orthopaedic Association developed the British Orthopaedic Association Standards for Trauma (BOAST) guidelines for managing open fractures.¹⁶ Now in their fourth iteration (BOAST-4), these guidelines state that definitive soft tissue closure or coverage should be achieved within 72 hours of injury if it cannot be performed at the time of initial debridement.¹⁶ This recommendation is shared by the United Kingdom’s National Institute for Health and Care Excellence (NICE) in their quality statement on open fractures.¹⁵ The guideline further recommends that hospitals ensure they have a dedicated orthoplastic surgery service to perform all necessary surgeries within the 72-hour window.¹⁵ Because of the implementation of the NICE guidelines, flap coverage is routinely performed within 72 hours in the United Kingdom compared with an average of 10 days in the United States,¹² and infection rates are generally less than 10% in the United Kingdom compared with 20%–40% in the United States.^{5–8}

Although the United Kingdom has demonstrated continued success with these guidelines, practice patterns in the United States have not changed. The adoption of early reconstruction timelines faces several barriers. Among these are the resource requirements of early coverage pathways. Flap reconstruction surgery is long and technically challenging, and finding operating room spaces and trained surgeons is difficult, especially among those with busy elective practices. The unpredictable nature of trauma also complicates scheduling

because surgeons may not be able to reliably anticipate the volume of trauma patients who present at a given time. Another possible barrier is that flap reconstruction may not be considered a priority compared with the management of competing injuries in the same patient (eg, thoracic and intra-abdominal). Additionally, vacuum-assisted closure has been viewed as a temporizing measure for patients with open injuries, effectively buying time for soft tissue reconstruction until earlier interventions are complete.⁵⁵

There is also some rationale for why data from the United Kingdom may not apply to the United States. Early coverage requires prompt patient transport to specialized centers and coordinated efforts from orthopedic and plastic surgeons.¹⁶ The NICE guidelines incentivize surgeons and hospitals in the United Kingdom to facilitate these transfers to collaborative care centers, and there are quantitative metrics and reporting systems for monitoring their success.^{15,56} The same pathways and metrics are less prevalent in the United States, and there are no definitive guidelines on early flap coverage to incentivize their development and implementation. Because the NICE guidelines recommend early flap coverage, it is also possible that surgeons in the United Kingdom perform a greater number of flap procedures on patients who would be classified as having Gustilo–Anderson grade IIIA fractures and closed primarily in the United States.⁴⁶ If this were the case, then less severe injuries in the United Kingdom and more severe injuries in the United States would both be treated with flaps, confounding the available evidence. Finally, it has been

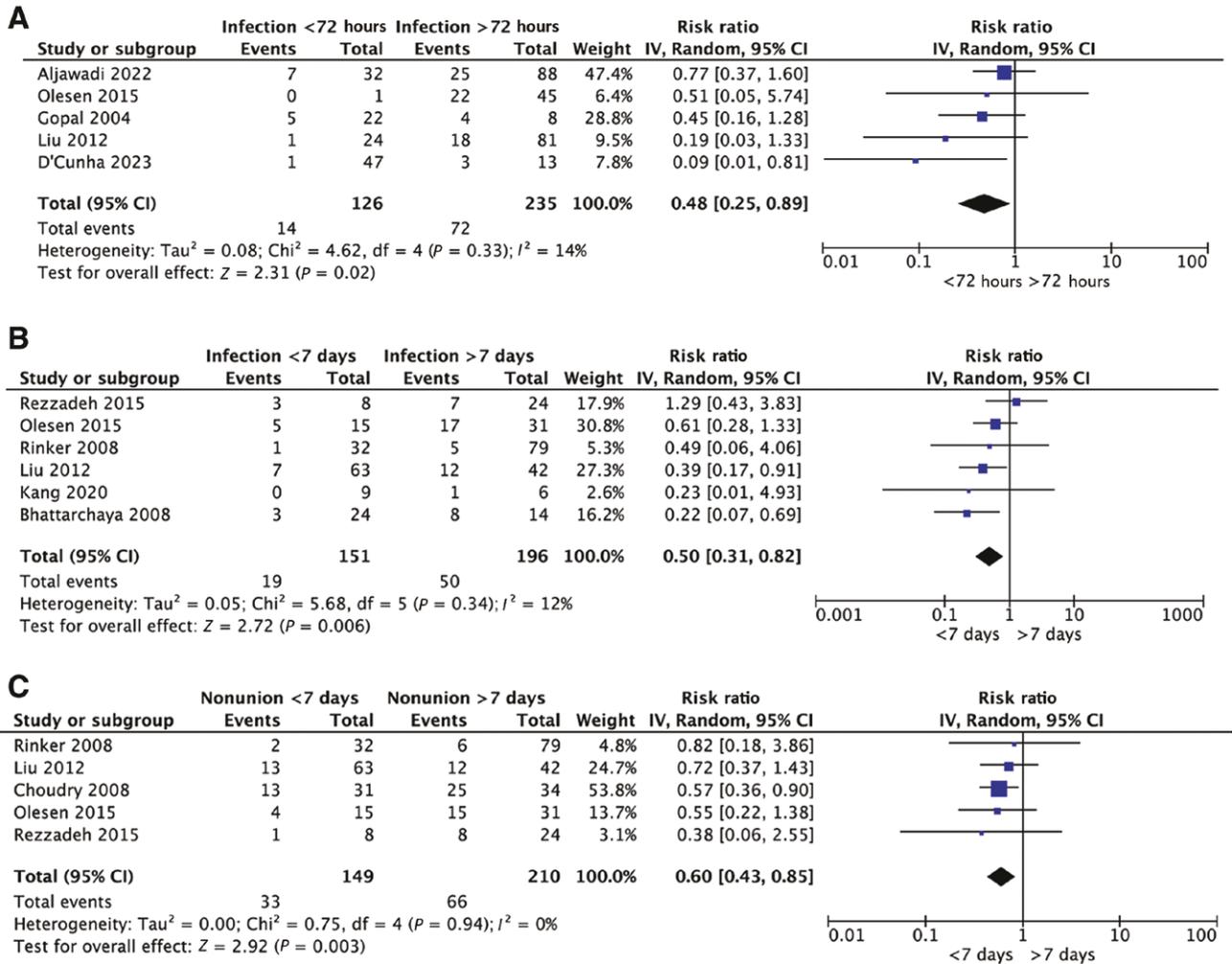


Fig. 3. Forest plots from included studies on the outcomes of infection and nonunion. Reduced risk of infection in reconstructions performed within 72 hours and 7 days of injury (A and B, respectively), as well a reduced risk of nonunion in reconstructions performed within 7 days of injury (C).

Table 4. Meta-analysis Results With Effects From Early Reconstructions

	≤72 h			≤7 d		
	Studies	n	Effect Estimate	Studies	n	Effect Estimate
Total complications	8	619	0.59 [0.36–0.99]	11	668	0.57 [0.28–1.15]
Individual complications						
Infections	5	361	0.48 [0.25–0.89]	6	347	0.50 [0.31–0.82]
Unplanned reoperations	3	271	0.94 [0.30–2.96]	5	341	0.96 [0.44–2.07]
Nonunion	3	271	0.70 [0.30–1.62]	5	359	0.60 [0.43–0.85]
Flap failures	3	227	0.47 [0.14–1.55]	7	427	0.91 [0.46–1.82]
Secondary amputations	3	308	0.81 [0.26–2.48]	5	396	0.92 [0.46–1.82]

RR [95% CI]. Random effects; significance set at $P < 0.05$.

hypothesized that traumatic lower extremity injuries in the United States have different causes than those encountered in Europe.^{57–59} Although both parties share motor vehicle collisions as the leading mechanism of lower extremity trauma, the United States reports more sharp and penetrating injuries, which may influence subsequent infection rates.^{58,59}

There may also be factors outside of flap timing that influence complication rates. For example, the UK approach to debridement is different from the US approach and may impact outcomes.⁶⁰ In the United Kingdom, initial debridement is commonly performed by plastic surgeons or a dedicated orthoplastic service.⁶¹ In contrast, in the United States, initial debridement is

Table 5. NOS Risk-of-bias Analysis

Study	Selection			Result Not Present at Start of Study	Comparability		Outcome		Total
	Representativeness	Selection of Nonexposed Cohort	Ascertainment		Comparability for Confounders	Assessment of Outcome	Follow-up Duration	Adequacy of Follow-up	
Jitprapaikularn et al ²⁸	1	1	1	1	2	1	1	1	9
Kang et al ²⁹	1	1	1	1	2	1	1	1	9
Lee et al ³¹	1	1	1	1	2	1	1	1	9
Aljawadi et al ¹⁸	1	1	1	1	1	1	1	1	8
Bhattacharyya et al ³⁸	1	1	1	1	2	1	1	0	8
Clegg et al ²⁷	1	1	1	1	2	1	0	1	8
Lee et al ³²	1	1	1	1	1	1	1	1	8
Olesen et al ³⁵	1	1	1	1	1	1	1	1	8
Rinker et al ³⁷	1	1	1	1	1	1	1	1	8
Choudry et al ²⁶	1	1	1	1	2	1	0	0	7
Gopal et al ¹⁷	1	1	1	1	1	1	1	0	7
Lee et al ³³	1	1	1	1	0	1	1	1	7
Liu et al ³⁴	1	1	1	1	0	1	1	1	7
Rezzadeh et al ³⁶	1	1	1	1	1	1	0	1	7
Kloeters et al ³⁰	1	1	1	1	0	1	0	1	6
D'Cunha et al ¹⁹	1	1	1	1	0	1	0	0	5

NOS: very good, 9–10 points; good, 7–8 points; satisfactory, 5–6 points; unsatisfactory, 0–4 points. A study can receive a maximum of 1 star for each numbered item in the selection and outcome categories. A maximum of 2 stars can be given for comparability.

typically performed by orthopedic surgeons, and plastic surgeons are later consulted as needed, given the extent of soft tissue injury. The presence of a plastic surgeon may influence the extent of initial debridement, the timing of subsequent debridement, and the time to definitive closure.⁶¹ Additionally, because the NICE guidelines incentivize earlier flap reconstruction, they may also indirectly promote more extensive debridement in the United Kingdom. Given the lack of similar guidance in the United States, surgeons typically use a serial approach, allowing tissues to declare themselves before further debridement.⁷ It is challenging to empirically assess the extent of debridement relative to the true amount of nonviable tissue because all surgeons aim to excise whatever tissues are or will become nonviable.⁶² Therefore, there is little ability to control for the extent of debridement in the available literature.

Aside from the country in which the research was conducted, the literature is also limited by its retrospective nature. Most of the available studies are underpowered, single-center, retrospective reviews.^{63–65} These studies are unable to control for injury severity, which influences the time from injury to flap coverage.^{33,66,67} Patients with less severe injuries that are less likely to be contaminated may be more likely to undergo flap coverage within 72 hours than patients with more severe injuries. By contrast, patients with more severe injuries that are more likely to be contaminated may be more likely to have their flap surgery delayed beyond 72 hours.⁶⁶ Injury severity may also influence flap type, which in turn may influence patient outcomes. For example, patients with larger injuries may be more likely to undergo reconstruction with a latissimus dorsi flap, whereas those with less severe injuries may only require reconstruction with a local pedicled flap or smaller fasciocutaneous free flap. Current studies are also unable to control for practice setting. Patients who receive care at hospitals with large volumes of orthoplastic collaboration

are more likely to receive flaps within 72 hours than patients who present at lower volume settings.^{43,54} Those lower volume facilities may also transfer their most severely injured patients to higher volume centers, meaning that patients with more severe injuries not only get later coverage but also have more contaminated wounds owing to the time required for hospital transfer.⁶⁸ Additionally, the available literature inconsistently addresses the use of vacuum-assisted closures, which are often utilized as a temporizing measure and may influence subsequent infection rates.⁶⁹ Such confounding underscores the need for a randomized controlled trial on the time to flap reconstruction in patients with open lower extremity injuries.

In addition to limitations in the existing literature, our systematic review and meta-analysis are limited by their reliance on observational data, which may limit the generalizability of our findings. We were also unable to control for heterogeneity in treatment protocols, flap types (eg, muscle and fasciocutaneous), or surgeon technique in our analysis. This variability is not unique to our study but is a limiting factor. Despite these limitations, 14 of 16 studies (87.5%) had NOS scores of 7 or more, indicating high-quality methods for the selection and comparison of study groups and the ascertainment of outcome data.^{17,18,26–29,31–38} Thus, although there is no randomized trial data, our results reflect evidence gathered from high-quality observational studies.

CONCLUSIONS

Our study found that soft tissue flap reconstruction within 72 hours of injury reduced the risk of postoperative infection by 48% and the risk of total complications by 41%. Reconstruction performed within 7 days of injury was associated with a 50% reduction in the risk of infection and a 40% reduction in the risk of nonunion. Results were based on data from cohort studies, and a definitive, randomized controlled trial is needed to validate these findings.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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