



Have Times Changed? An Evaluation Of Free Flap Timing After Lower Extremity Trauma In A National Sample Of 1,030 Patients



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INTRODUCTION

For 35 years the Godina Principle has governed the timing of free flap reconstruction (FFR) after lower extremity (LE) trauma. Various advances in orthopaedic and microsurgical management of patients with lower extremity trauma have been developed since Dr. Godina's time and the clinical relevance of the 72 hour cutoff has been questioned recently in the literature. Various single-center studies exist and have concluded varying recommendations regarding FFR timing, though there remains a gap in terms of large, adequately powered studies evaluating this question.

OBJECTIVES

- Quantify the national trend in timing of FFR after lower extremity trauma.
- Evaluate the relevance of the 72 hour cutoff in terms of microsurgical and infectious outcomes.
- Determine the optimal time cutoff for FFR utilizing a national database with recent data.

METHODS

All patients suffering acute and isolated LE trauma were queried from the **Nationwide Readmission Database** from 2014-2019. Patients were then stratified based on day of FFR. Univariate and risk-adjusted logistic regression modelling was used to determine the risk associated with **microsurgical, infectious complications** (surgical site infection [SSI], osteomyelitis), **sepsis**, and **wound complications** (dehiscence, abscess, delayed healing) by flap day. Time windows were defined as "emergency" (0-72 hours), acute (3-10 days), subacute (10-30 days) and delayed (>30 day) periods. Receiver operator curves and **optimal time cutoffs** were determined for each complication type and Youden indexes were used to determine day at which risk significantly increased for each of the respective complications.

RESULTS

A total of **1,030** patients were identified. The median age was **45** (IQR 31-58), they were on average privately insured (43.4%), and in the **bottom income quartile** (28.6%). The **ISS** during trauma admission was **5** (IQR 1-12) and the median time to free flap was **7 days** (IQR 1-22). Patients on average had **2 comorbidities** (IQR 0-3). **33%** of free flaps were performed **within 72 hours**. Subsequently, **24.3%** were performed in the acute period, 18% in the subacute period, and 24% in the delayed period. 220 (21%) of flaps were performed during a readmission after discharge from initial trauma admission. The cohorts **differed** in terms of **age** ($P=0.023$), **ISS** ($P<0.001$), **AHQ severity of illness** ($P<0.001$), the **ownership of the hospital** ($P=0.027$), and whether they were treated at a **teaching center**. Significant differences in **all outcomes** except for **revision amputation** were observed between the cohorts. **Surgical site infection** rate for all the flaps was 16.9%, predominating in the delayed cohort (31.4%) versus 5.2% of those performed in the emergency period ($P<0.001$). **Osteomyelitis** after flap procedure was 6.6% for the entire cohort with 13.9% of delayed flaps having a subsequent diagnosis of bone infection versus 1.0% in the emergency cohort ($P<0.001$). **Microsurgical complications** were 4.5% for all flaps with the highest rate again being in the delayed period flaps at 7.5% versus 1.4% in the emergency period ($P=0.001$). **Sepsis** and **wound complications** were also similarly distributed ($P<0.001$). After for controlling for relevant confounders, it was found that flaps performed **after 10 days** were associated with increased risk of **surgical site infection** (OR 9.57, $P<0.001$), **osteomyelitis** (OR 5.24, $P=0.030$), and general **wound complications** (OR 3.26, $P=0.008$) all compared to flaps performed in the emergency period. Flaps in the **acute period** were **not associated** with any increased risk of the same complications. **Revision amputation** ($P=0.341$) and **microsurgical complications** ($P=0.244$) were not associated with time to flap. ROC analysis using Youden indexes optimal cutoff day of **13.5 days** for SSI, osteomyelitis, and general wound complications. The predicted risk cutoff for microsurgical complications was **9.5 days**.

FIGURE 1: Distribution of free flap reconstruction timing after LE trauma in a national database.

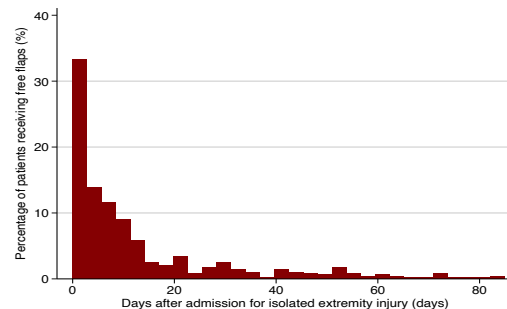
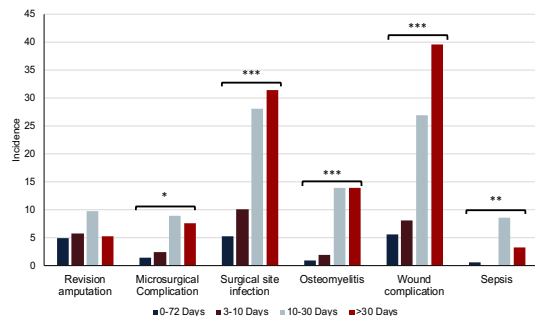


FIGURE 2: Un-adjusted microsurgical and infectious outcomes by free flap timing.



CONCLUSIONS

- Expedient time to flap coverage should remain the gold standard for patients.
- Significant risk for complications remains a consideration when delaying FFR beyond the acute injury period.
- In line with recently reported results in the literature, the authors feel short delays of up to **10-14 days** for adequate stabilization of life threatening injuries and transfer to dedicated limb salvage centers.
- Further studies should quantify these results and the results in the literature using prospective data in order to eliminate certain limitations such as lack of granularity and differences in management between centers.

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DISCLOSURES

The opinions expressed are not the official position of the United States Government, United States Army, or Department of Defense.

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