

# Postoperative Outcomes associated with Timing of Definitive Fixation and Soft Tissue Coverage in Gustilo 3B Tibial Fractures

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**INTRODUCTION:** 3B open tibial fractures remain problematic in orthopaedic trauma with high postoperative infection rates. These patients typically present after a high energy trauma with concomitant injuries. Controversy persists about the timing of coverage, and whether the clock for coverage starts at injury or time of definitive fixation. Using a large sample size insurer database, this study aims to investigate postoperative outcomes of patients with 3B open tibia fracture depending on their time of fixation and coverage.

**METHODS:**

A large insurance database identified 1,297 patients with Gustilo Type 3B tibial fractures who underwent soft tissue flap coverage within 45 days of fixation from 2009 to 2021. Using ICD9, ICD10, and CPT codes, we differentiated patients by timing of surgical fixation and from fixation to soft tissue coverage. Those who underwent fixation within 3 days of injury were classified as “prompt fixation” while those who received fixation between 3 and 60 days of injury were assigned as “delayed fixation.” Patients who received flap coverage within 3 days of fixation were considered “prompt flap” while those between 3 and 45 days following fixation were considered “delayed flap.” Each of the populations were subsequently evaluated for perioperative complication rates and return to the OR at 30 days, 90 days, and 1 year of their injury.

**RESULTS:** A total of 311 (24.0%) patients received prompt fixation and prompt flap coverage while 621 (47.9%) patients received prompt fixation and delayed flap coverage. In total, 335 (25.8%) underwent both delayed fixation and flap coverage while only 30 (2.3%) received prompt flap coverage following a delay in receiving definitive fixation. Patients with delayed flap coverage were significantly more likely to return to the OR within 30 days, 90 days, and 1 year, irrespective of timing to fixation (OR—2.27, p<0.0001; OR—2.21, p<0.0001; OR—1.94, p<0.0001). Those patients who had a prompt fixation and a delayed flap had lower complications than those who had both delayed fixation and flap. Surgical site infection (SSI) and wound disruption (WD) were significantly elevated among the delayed fixation cohort compared to the prompt fixation group within 90 days of tibial fixation (SSI: OR—1.79, p=0.0006; WD: OR—1.73, p=0.0013).

**DISCUSSION AND CONCLUSION:**

Patients with prompt fixation and prompt flap coverage showed significantly lower complication rates than the other groups. Interestingly, there were very few patients that underwent delayed fixation with prompt flap coverage, which makes us rethink using time from definitive fixation to flap as a guide for expedient coverage. It is often stated that fixation can be delayed as long as flap coverage occurs promptly after this. In reality this appears to be very rare. Interdisciplinary teams with orthopaedic and plastic surgeons with implemented protocols for early fixation with prompt flap coverage are crucial to achieve optimal outcomes in these injuries.

**Table 1:** Open tibia stratification by time to definitive fixation and soft tissue coverage

		(<72 Hours)		(>72 Hours)			
		Prompt Fixation		Delayed Fixation			
(<72 Hours)	Prompt Flap	311 (24.0%)	30 (2.3%)	Total Prompt Flap		341 (26.3%)	
	Delayed Flap	621 (47.9%)	335 (25.8%)	Total Delayed Flap		956 (73.7%)	
		Total Prompt Fixation		Total Delayed Fixation		Total 3B Open Tibias	
		932 (71.9%)		365 (28.1%)		1297	

**Table 2:** Surgical site infection (SSI), wound disruption (WD), and reoperation rates by timing to definitive fixation and soft tissue coverage within 90 days of injury.

A. Prompt Fixation, Prompt Flap		B. Delayed Fixation, Prompt Flap	
Complication	n (%)	Complication	n (%)
SSI	42 (14%)	SSI	4 (13%)
WD	42 (14%)	WD	6 (20%)
Reoperation	144 (46%)	Reoperation	14 (47%)

  

C. Prompt Fixation, Delayed Flap		D. Delayed Fixation, Delayed Flap	
Complication	n (%)	Complication	n (%)
SSI	91 (15%)	SSI	79 (24%)
WD	94 (15%)	WD	79 (24%)
Reoperation	399 (64%)	Reoperation	228 (68%)