Safety of Prepping the External Fixator In Situ During Staged Fixation of Pilon Fractures: A Retrospective Comparative Cohort Study

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INTRODUCTION:

Although external fixators have been recognized as a source of potential infection due to bacterial colonization, staged management of lower extremity peri-articular fractures with subsequent maintenance and prepping the external fixator into the sterile field during definitive treatment is common. The objective of this study was to compare the risk of fracture-related infection (FRI) and unplanned re-operation after staged open reduction and internal fixation (ORIF) of pilon fractures between cases in which components of the temporizing external fixator (ex-fix) were prepped into the surgical field and cases in which it was completely removed prior to definitive fixation. To the best of our knowledge, there has been no comparative clinical study evaluating the safety of leaving the ex-fix in situ during staged ORIF of pilon fractures.

METHODS: This was a multisurgeon retrospective comparative cohort study on patients 18 years and older with pilon fractures who underwent operative treatment over a 10-year period between January 1, 2010 and January 1, 2020 at an academic Level 1 trauma center. Medical records and radiographic images were reviewed for each patient to assess demographics, clinical characteristics, and surgical outcomes. The primary outcome measures were FRI and unplanned reoperation, including arthrodesis and amputation. All analyses were completed using JMP Software and $p<0.05$ was used for statistical significance.

RESULTS: 133 patients were treated with staged ORIF, including 47 fractures that had retained components of the original ex-fix prepped in situ during surgery for ORIF and 86 that had the ex-fix entirely removed prior to prepping and draping. The overall rate of fracture-related infection was 23.3% while the overall rate of unplanned re-operation was 11.3% with a 4.5% rate of arthrodesis and 6.8% rate of amputation. There was no difference in FRI between the group in which ex-fix was prepped in and the group in which it was completely removed (23.4% vs 23.3%, $p=0.985$) and no difference in the overall rate of unplanned re-operation (10.6% vs 11.6%, $p=0.863$). Patients who developed an FRI were managed in the initial temporizing ex-fix for a longer time before definitive fixation (21.68+/- 11.44 days vs 16.14 +/- 10.12 days, $p=0.018$). Looking at the subset of patients with FRI, those with the ex-fix prepped in situ had a higher prevalence of infection with methicillin-resistant *Staphylococcus aureus (*MRSA) and methicillin-sensitive *Staphylococcus aureus* (MSSA) (81.8% vs 40*%, p*=0.021). Using alpha=0.05, and power=0.8, a sample size of 42 patients with FRI post-ORIF (27 with ex-fix prepped in, and 15 with ex-fix completely removed) would be needed to detect a difference in MRSA/MSSA bacteriology.

DISCUSSION AND CONCLUSION:

Although there were relatively high complication rates in this cohort of pilon fractures treated with staged ORIF, prepping in components of the external fixator did not lead to a significant increase in rates of FRI nor unplanned re-operation, including arthrodesis and amputation. This study offers clinical guidance regarding maintaining and prepping in situ the existing external fixator during definitive fixation of pilon fractures.

Table 1. Demographics, Characteristics, and Post-Operative Outcomes of Patients with and without External Fixator Prepped into Definitive Fixation

	External Fixator Removed (n=86)	External Fixator Prepped In (n=47)	*P*-Value
Clinical Characteristics			
Age, median (25%, 75%)	42.5 (27.75, 53.25)	47 (38, 56)	0.17
Sex, n (%)			0.38
Male	52 (60.5)	32 (68.1%)	
Female	34 (39.5)	15 (31.9)	
Race, n (%)			0.09
Caucasian	42 (48.8)	30 (63.8)	
Asian	0 (0.0)	1 (2.1)	
Black	39 (45.3)	12 (25.5)	
Native American	0 (0.0)	0 (0.0)	
Other	5 (5.8)	4 (8.5)	
BMI (kg/m^2), median (25%, 75%)	28.1 (25.5, 31.8)	28.1 (25.2, 33.7)	0.88
Smoker, n (%)	47 (54.7)	33 (70.2)	0.08
Diabetes mellitus, n (%)	7 (8.1%)	7 (14.9)	0.23
Injury Characteristics			
Mechanism of Injury, n (%)			0.37
Fall	41 (47.7)	20 (42.6)	
MVC	40 (46.5)	22 (46.8)	
Other	5 (5.8)	3 (6.4)	
Type of Injury, n (%)			0.08
Open	22 (25.6)	19 (40.4)	
Closed	64 (74.4)	28 (59.6)	
Days from Ex-Fix to ORIF, median (25%, 75%)	16 (11, 21)	19 (9, 26)	0.79
Post-Operative Outcomes			
Infection, n (%)	20 (23.3)	11 (23.4)	0.98
Unplanned Re-operation, n (%)	10 (11.6)	5 (10.6)	0.86

Abbreviations: BMI, body mass index; MVC, motor-vehicle collision; ORIF, open reduction internal fixation; Ex-Fix, external fixation