Primary Closure of External Fixation Pin Sites Lowers Risk of Infection

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INTRODUCTION:

External fixation has been used to stabilize fractures commonly in the orthopedic trauma community as means for provisional fixation or definitive fixation purposes. One of the most commonly reported complications with external fixation is pin site infection.[4] While there is a bounty of knowledge on external fixator application and pin site maintenance and care, there is a lacking in knowledge about management of pin site incisions after removal.[1-3] The traditional teaching has been to leave the pin sites open, as primary closure was thought to increase the risk of infection. The current standard of care is left up to the surgeons best clinical judgement, and there is minimal literature on pin site treatment after external fixation removal. The goal of this study was to compare infection rates after external fixation removal, comparing pin sites that were primary closed compared to those left open to heal by secondary intention.

METHODS:

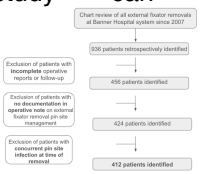
This is a retrospective review of operative management of pin sites upon external fixator removal between January 2007 and March 2023. Patients were identified by utilizing patient records from a large hospital system, utilizing CPT code 20694. Patients were stratified into two cohorts: 1) external fixator pin sites that were primarily closed and 2) pin sites that were left open to heal with secondary intention after external fixator removal. The inclusion criteria for the study were 1) patients who underwent external fixator placement and removal for fracture and 2) age > 18. Exclusion criteria included 1) follow-up less than 30 days after external fixation removal, 2) external fixator not for an extremity or pelvis, 3) incomplete operative reports, and 4) concurrent pin site infection at time of removal. Primary outcome was rate of pin site infection in the first 30-days post external fixation removal.

RESULTS:

A total of 412 patients met the inclusion and exclusion criteria and were included, with a mean follow-up of 259 days (range 32-1583). There were 254 patients in the closed pin site group and 158 in the open pin site group. High energy mechanism of injury comprised of 287 patients (69.7%) and low energy mechanism of injury comprised of 125 patients (30.3%). Mean duration of external fixator in the closed group was 16.9 days, and 29.1 days in the open group (p <0.001). Compared to primary closure, open pin sites were associated with an increased risk of pin site infections if the external fixator was in place less than 1 week (p=0.04), and if it was in place between 1-2 weeks (p=0.009). If the external fixation was in place >2 weeks the risk of infection was not statistically significantly different between the two cohorts. Multivariate analysis demonstrated increased odds of pin site infection if the pin site was left open (OR 3.6 p=0.016), current tobacco users (OR 2.9 p=0.033), and with tibial plateau fractures (OR 13, p=0.049).

DISCUSSION AND CONCLUSION:

Despite prior teachings, this study suggests that after external fixation removal, closure of pin sites is associated with 3.6 times lower risk of infection, compared to leaving them open to heal by secondary intention. This was particularly the case if the external fixation was in place less than 2 weeks. External fixation is a commonly performed procedure, and this study can help change practice and decrease the risk of pin site infection.



Patient Characteristics	Closed Pin Sites (n=254)	Open Pin Sites (n=158)	p-value
Age, years	53 (18-90)	54 (18-93)	0.427
Female sex	96 (38.0%)	78 (49.4%)	0.018
BMI	30.47 (7.4)	30.69 (7.7)	0.981
CKD	7 (2.7%)	17 (10.8%)	<0.001
PVD	9 (3.5%)	6 (3.8%)	0.893
DM	36 (14.3%)	35 (22.2%)	0.063
Alcohol Abuse	14 (5.5%)	10 (6.3%)	0.73
Smoking Status:			
Current	75 (29.5%)	30 (19.0%)	0.017
IV Drug Use	7 (2.8%)	9 (5.7%)	0.133
Mechanism			
High MOI	189 (74.4%)	98 44.3%)	0.008
Low MOI	65 (25.6%)	60 (38.0%)	0.008
Average external fixation duration, days	16.4 (20.8)	29.1 (25.9)	<0.001
Average Follow-up, days	267 (238.4)	245 (244.4)	0.358
Polytrauma	121 (47.6%)	66 (41.8%)	0.245
Closed Fracture	190 (73.2%)	109 (69.0%)	0.353
External fixator location			
Ankle spanning	120 (47.2%)	81 (51.3%)	0.427
Knee spanning	114 (45.3%)	56 (35.4%)	0.058
Femoral shaft	7 (2.8%)	1 (0.6%)	0.129
Elbow spanning	4 (1.6%)	1 (0.6%)	0.396
Wrist spanning	2 (0.7%)	15 (9.5%)	<0.0001
Pelvis	6 (2.4%)	4 (2.5%)	0.913
Pin Site Infection	13 (5.1%)	20 (12.7%)	0.006

	OR	95% CI	P-value
Left open	3.618	1.293	9.313	0.014*
Gender (female)	1.195	0.541	0.440	0.727
DM	1.571	0.719	3.254	0.617
Current tobacco user	2.892	1.018	1.051	0.033*
MOI:				
High energy	1.188	0.483	3.311	0.799
Low energy	1.745	7.822	0.388	0.448
Fracture Site				
Tibial shaft	3.832	23.865	0.384	0.307
Tibial plateau	18.064	167.449	1.854	0.049*
Wrist	0.000	0.000	-	0.999
Ankle OR	1.754	26.476	0.528	0.186