

Traumatic Amputation: The Effect of Early Guillotine on Surgical Site Infection

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Introduction

- Uncommon but morbid complication of traumatic injury
- Wound contamination predisposes to surgical site infection
- Guillotine versus limb salvage not well described

Introduction

- Distal amputations preferred
- Surgical site infection may require more proximal amputation
- Extremity Injury Scoring Systems



Variables	Score
Skeletal/soft-tissue injury	
Low energy (stab; simple fracture; pistol gunshot wound)	1
Medium energy (open or multiple fractures, dislocation)	2
High energy (high speed MVA or rifle gunshot wound)	3
Very high energy (high speed trauma + gross contamination)	4
Limb ischemia	
Pulse reduced or absent but perfusion normal	1 ^a
Pulseless; paresthesias, diminished capillary refill	2 ^a
Cool, paralyzed, insensate, numb	3 ^a
Shock	
Systolic BP always >90 mmHg	0
Hypotensive transiently	1
Persistent hypotension	2
Age (years)	
<30	0
30–50	1
>50	2

Note: ^aScore doubled for ischemia >6 hours.

Abbreviations: BP, blood pressure; MVA, motor vehicle accident.

Objective

- Identify the relationship between timing and choice of surgical therapy with incidence of surgical site infection in traumatic extremity injuries.

Methods

- Trauma Registry and Chart Review for Operations / Timing
- 2013 – 2023
- > 18 years old
- Traumatic injury to extremity requiring amputation

Methods

- SSI
- Mortality
- Conversion to higher amputation
- Injury Severity
 - MES, Hospital Days, Complications, ED Vitals, ED Labs
- Attempt at Limb Salvage
 - Debridement before guillotine, or no guillotine

Results

- N = 100
- Average study participant
 - 42.6 years old
 - Male (70%)
 - White (49%)
 - MES 7.34
 - Lower Leg Amputation (46%)
 - 4.83 Operations relating to injured limb
 - ICU LOS 6.59 days
 - Hospital LOS 19.70 days

Table 1. Comparison Between Patients with SSI following amputation versus No SSI

Variable	SSI	no SSI	<i>p</i>
	(n = 24)	(n = 76)	
Age, mean ± SD	43.46 ± 19.99	42.39 ± 19.39	0.817
Male, n (%)	20 (83.3)	50 (65.8)	0.102
Race:			0.736
White, n (%)	10 (41.7)	39 (51.3)	
Black, n (%)	11 (45.8)	30 (39.5)	
American Indian, n (%)	1 (4.2)	1 (1.3)	
Other, n (%)	2 (8.3)	6 (7.9)	
Ethnicity:			0.581
Hispanic or Latino, n (%)	2 (8.3)	4 (5.3)	
Not Hispanic or Latino, n (%)	22 (91.7)	72 (94.)	
BMI, mean ± SD	28.30 ± 6.25	27.28 ± 6.61	0.510

Table 1. Comparison Between Patients with SSI following amputation versus No SSI

Variable	SSI	no SSI	<i>p</i>
	(n = 24)	(n = 76)	
ED HR, mean ± SD	109.79 ± 21.61	105.95 ± 28.47	0.545
ED SBP, mean ± SD	123.38 ± 23.55	119.74 ± 25.58	0.538
ED GCS, mean ± SD	12.83 ± 4.57	11.57 ± 5.24	0.259
ED Lactate, mean ± SD	4.03 ± 2.80	4.68 ± 3.67	0.525
MES, mean ± SD	6.79 ± 2.47	7.51 ± 2.19	0.452
ISS, mean ± SD	18.08 ± 10.31	17.04 ± 10.10	0.661
RTS, mean ± SD	6.83 ± 1.99	6.37 ± 2.24	0.385
AIS Extremity, mean ± SD	3.13 ± 0.54	3.03 ± 0.57	0.452
Amputation Site:			0.256
Lower Leg, n (%)	14 (58.3)	32 (42.1)	
Upper Leg, n (%)	7 (29.2)	31 (40.8)	
Upper Arm, n (%)	1 (4.2)	7 (9.2)	
Lower Arm, n (%)	0 (0)	4 (5.3)	
Shoulder Region, n (%)	1 (4.2)	1 (1.3)	
Knee Region, n (%)	0 (0)	1 (1.3)	
Upper Leg and Arm, n (%)	1 (4.2)	0 (0)	

Table 1. Comparison Between Patients with SSI following amputation versus No SSI

Variable	SSI	no SSI	<i>p</i>
	(n = 24)	(n = 76)	
ICU LOS, mean ± SD	9.67 ± 12.02	5.62 ± 8.80	0.137
Hospital LOS, mean ± SD	30.17 ± 21.56	16.51 ± 13.19	0.007
# Trips to OR, mean ± SD	7.25 ± 5.59	4.05 ± 3.51	0.013
Death, n (%)	1 (4.2)	7 (9.2)	0.427

Table 2. Comparison Between Early Guillotine Group and Delayed / No Guillotine Group

Variable	Early Guillotine (<6hr)	No Early Guillotine	<i>p</i>
	(n = 39)	(n = 61)	
Age, mean ± SD	37.46 ± 16.37	45.97 ± 20.61	0.032
Male, n (%)	29 (74.4)	41 (67.2)	0.447
Race:			0.716
White, n (%)	20 (51.3)	29 (47.5)	
Black, n (%)	16 (41.0)	25 (41.0)	
American Indian, n (%)	0 (0)	2 (3.3)	
Other, n (%)	3 (7.7)	5 (8.2)	
Ethnicity:			0.247
Hispanic or Latino, n (%)	1 (2.6)	5 (8.2)	
BMI, mean ± SD	27.76 ± 6.59	27.40 ± 6.51	0.797

Table 2. Comparison Between Early Guillotine Group and Delayed / No Guillotine Group

Variable	Early Guillotine (<6hr)	No Early Guillotine	p
	(n = 39)	(n = 61)	
ED HR, mean ± SD	109.28 ± 30.20	105.33 ± 24.75	0.477
ED SBP, mean ± SD	114.90 ± 23.99	124.26 ± 25.21	0.068
ED GCS, mean ± SD	11.67 ± 5.26	12.00 ± 5.02	0.751
ED Lactate, mean± SD	5.18 ± 3.69	3.99 ± 3.29	0.118
MES, mean ± SD	8.62 ± 1.41	6.52±2.35	<0.001
ISS, mean ± SD	20.00 ± 10.14	15.56 ± 9.78	0.031
RTS, mean ± SD	6.42 ± 2.22	6.50 ± 2.18	0.864
AIS Extremity, mean ± SD	3.26 ± 0.498	2.92 ± 0.557	0.003
Amputation Site:			0.047
Lower Leg, n (%)	12 (30.8)	34 (55.7)	
Upper Leg, n (%)	16 (41.0)	22 (36.1)	
Upper Arm, n (%)	5 (12.8)	3 (4.9)	
Lower Arm, n (%)	3 (7.7)	1 (1.6)	
Shoulder Region, n (%)	2 (5.1)	0 (0)	
Knee Region, n (%)	0 (0)	1 (1.6)	
Upper Leg and Arm, n (%)	1 (2.6)	0 (0)	

Table 2. Comparison Between Early Guillotine Group and Delayed / No Guillotine Group

Variable	Early Guillotine (<6hr) (n = 39)	No Early Guillotine (n = 61)	p
ICU LOS, mean ± SD	7.72 ± 10.19	5.87 ± 9.48	0.358
Hospital LOS, mean ± SD	19.00 ± 16.91	20.30 ± 16.45	0.705
# Trips to OR, mean ± SD	4.67 ± 4.858	4.93 ± 3.948	0.765
Death, n (%)	3 (7.7)	5 (8.2)	0.928
SSI	5 (12.8)	19 (31.1)	0.036
Conversion to Joint Above, n (%)	8 (20.5)	4 (6.6)	0.036

Table 4. Comparison Based on Attempt at Limb Salvage

Variable	No Attempt To Salvage (n = 57)	Attempt At Limb Salvage (n = 43)	<i>p</i>
Age, mean ± SD	41.37 ± 18.82	44.35 ± 20.32	0.451
Male, n (%)	41 (71.9)	29 (67.4)	0.628
BMI, mean ± SD	28.48 ± 6.63	26.35 ± 6.22	0.114

Table 4. Comparison Based on Attempt at Limb Salvage

Variable	No Attempt To Salvage (n = 57)	Attempt At Limb Salvage (n = 43)	p
MES, n ± SD	8.25 ± 1.85	6.14 ± 2.23	< 0.001
ISS, n ± SD	19.42 ± 10.30	14.47 ± 9.22	0.014
RTS, n ± SD	6.23 ± 2.32	6.77 ± 1.99	0.24
AIS Extremity, n ± SD	3.21 ± 0.526	2.84 ± 0.531	< 0.001
ED HR, mean ± SD	112.56 ± 28.17	99.33 ± 23.44	0.014
ED SBP, mean ± SD	118.8 ± 24.5	122.98 ± 25.8	0.414
ED GCS, mean ± SD	11.37 ± 5.37	12.53 ± 4.67	0.249
ED Lactate, mean ± SD	5.37 ± 3.88	3.176 ± 2.29	0.004

Table 4. Comparison Based on Attempt at Limb Salvage

Variable	No Attempt To Salvage (n = 57)	Attempt At Limb Salvage (n = 43)	<i>p</i>
ICU LOS, mean ± SD	8.42 ± 11.14	4.16 ± 6.96	0.021
Hospital LOS, mean ± SD	20.86 ± 19.72	18.37 ± 11.31	0.427
SSI, n (%)	10 (17.5)	14 (32.6)	0.082
Death, n (%)	7 (12.3)	1 (2.3)	0.069
# Trips to OR, mean ± SD	4.95 ± 5.18	4.67 ± 2.77	0.75
Conversion to Joint Above, n (%)	11 (19.3)	1 (2.3)	0.01

Discussion

- SSI associated with more operations, longer LOS
- Worse injuries and more unstable patients typically received guillotine amputation versus attempt at salvage.
- Increased conversion to joint above with guillotine
 - Through joint amputations?

Conclusion

- For those undergoing amputation, early guillotine (<6 hr) associated with decreased incidence of surgical site infection

Further Study

- Expand study group to include those that did not undergo amputation
 - Identify factors that indicate success at limb salvage