

Severe Blunt Cardiac Trauma: Management of a Rare Injury

Francesca Izzo MD; Reginald Alouidor MD, FACS; Elizabeth Santone MD; Aixa Perez-Caraballo MS, MPH; Nicole Corriveau, CCRP; Edward Kelly, MD FACS; Eleanor Winston, MD FACS; Adin Putnam, MD FACS; Gabriel Ryb, MD FACS; Kristina Kramer, MD
Department of Surgery, UMass Medical School-Baystate, Springfield, MA

BACKGROUND

- Autopsies performed on blunt trauma fatalities commonly reveal cardiac injury as cause of death.
- Reports suggest a 95% pre-hospital mortality rate with severe cardiac injury
- Severe cardiac injury is defined as structural injury or electrical disturbance resulting in symptoms
- Survival after severe blunt cardiac trauma is uncommon, and there are no clear management guidelines.
- Treatment ranges from observation to resuscitative thoracotomy
- There are few contemporary studies reviewing the management of these injuries

RESULTS

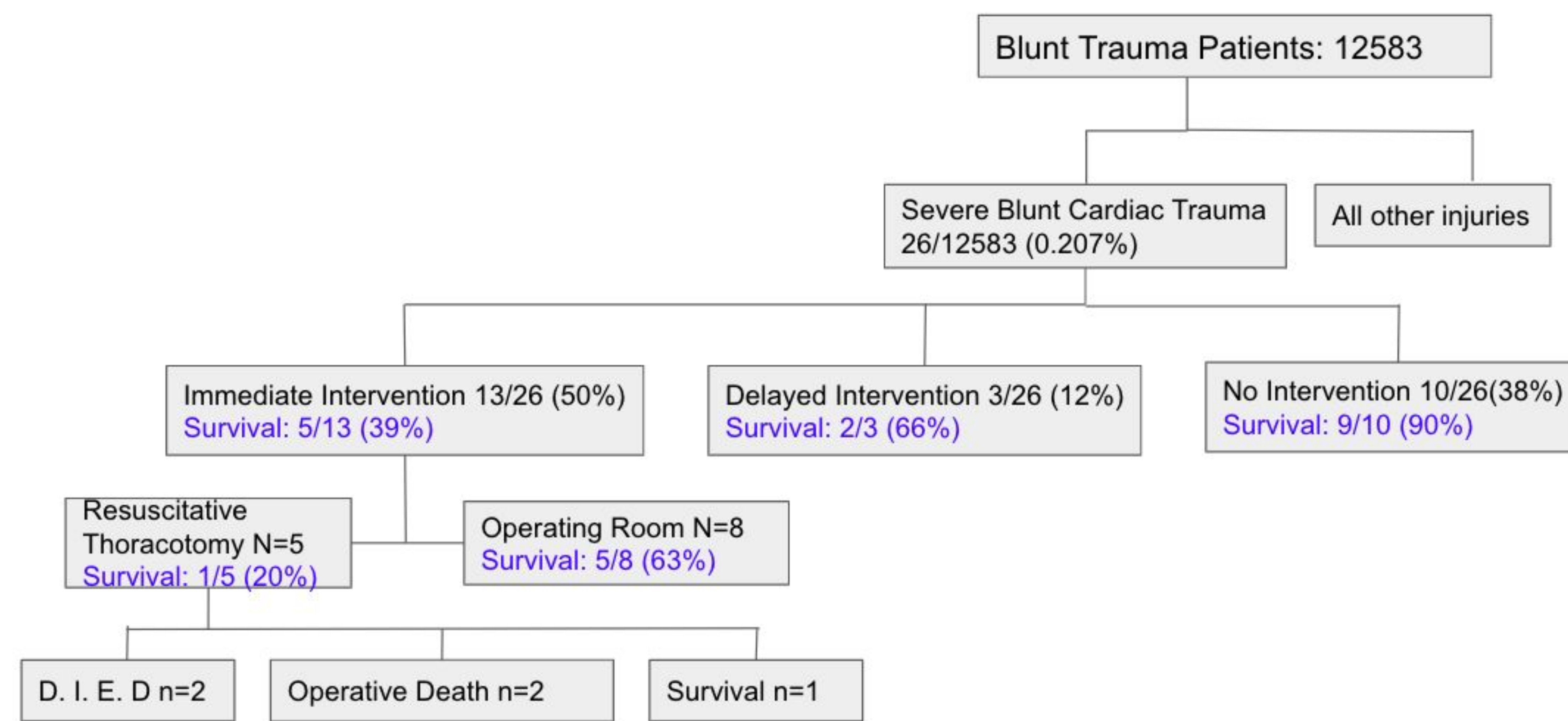


Figure 1. Flow chart demonstrating break down of cardiac injury in blunt trauma patients over 10-year period

Table 1: Summary of patient mechanism, injury, repair, and complications

Patient	Mechanism	Cardiac Injury	Repair	Complication
Immediate Intervention				
1	MVC	Right atrial appendage laceration	Interrupted suture	Exsanguination
2	MCC (dirtbike)	Left atrial laceration, right atrial appendage injury	Pledgeted suture	Herniation, VAP
3	MVC	Pericardial effusion, tamponade	Pericardiectomy	Exsanguination
4	MCC	Aortic root injury	Injury non survivable	Exsanguination
5	MVC	Right atrial laceration, pericardial laceration	Pledgeted suture	Respiratory failure
6	MVC	Left atrial appendage laceration	Pledgeted suture	Retained drain, CVA
7	MVC	Ruptured right ventricle, large pericardial defect	Resuscitative thoracotomy	Exsanguination
8	MVC	Left ventricle laceration, tamponade	Resuscitative thoracotomy	Exsanguination
9	MVC	Right atrial appendage laceration, pericardial effusion	Pledgeted suture, pacing wire	
10	MVC	Cardiac contusion	Resuscitative thoracotomy	Exsanguination
11	MVC	Right ventricle laceration, pericardial effusion	Pledgeted suture, pericardiectomy	
12	MVC	Tricuspid valve injury, mediastinal hematoma	TEVAR	Pulmonary embolism
13	MVC	Aortic valve injury	Aortic valve repair, CABG x1	GI bleed
Delayed Intervention				
14	MVC	Cardiac contusion	Transvenous pacer	Cardiac arrest
15	MVC	Pericardial effusion	Pericardial window	
16	MCC	Cardiac contusion	ECMO	Cardiogenic shock, MSOF
No Intervention				
17	MVC	Cardiac contusion	None	HAP
18	MVC	Cardiac contusion	None	Respiratory failure
19	Fall (40')	Right ventricle contusion, traumatic pericarditis	None	VAP, C. diff
20	MVC	Cardiac contusion	None	None
21	MVC	Cardiac contusion	None	Hemorrhagic CVA
22	MVC	Pericardial effusion	None	None
23	MVC	Pericardial hematoma	None	None
24	Bicycle accident	Cardiac contusion	None	None
25	Horse kick to chest	Cardiac contusion	None	None
26	MVC	Right ventricle contusion, traumatic pericarditis	None	None

METHODS

- Retrospective review of the Trauma Registry from an academic level I trauma center between January 2009 and December 2019
- Adult patients with ICD code for severe cardiac injury via a blunt mechanism were included
- Primary outcome: inpatient mortality
- Secondary outcomes: LOS, discharge disposition
- Interventions classified as immediate, delayed, or none
- ANOVA was used to compare age, LOS, and time to intervention between study groups
- Chi-square test was used to compare frequency of outcomes

RESULTS

- Patients requiring immediate intervention were younger, had statistically significant lower blood pressures, and lower GCS on average compared to those requiring delayed or no intervention

Table 2: Patient Characteristics and Initial ED Vitals

	Immediate	Delayed	None	P-Value
Age, mean (sd)	48.9 (27.2)	52.3 (34.9)	69 (12.6)	0.14
Gender, n (%)				
Female, n (%)	6 (46.2%)	1 (33.3)	3 (30%)	
Male, n (%)	7 (53.8%)	2 (66.7)	7 (70%)	0.72
Heart Rate, mean (sd)	93.2 (56.1)	114.7 (16.3)	75.0 (19.8)	0.34
Systolic Blood Pressure, mean (sd)	73.8 (56.1)	155.3 (38.0)	116.3 (24.6)	0.01
Diastolic Blood Pressure, mean (sd)	47.9 (38.7)	98.0 (11.0)	78.6 (21.6)	0.02
Glasgow Coma Scale, mean (sd)	9.5 (5.7)	13.7 (2.3)	12.7 (4.8)	0.27

LIMITATIONS

- Single institution study, rare injury, small volume of patients identified

CONCLUSIONS

- Major cardiac injury after blunt trauma is rare
- Injury is frequently fatal, but overall survival is >60% in those who survive the pre-hospital phase
- Aggressive treatment may be warranted despite devastating injuries
- Patients who arrive hemodynamically unstable, or require immediate operative intervention, have poorer outcomes



Baystate Health



University of Massachusetts
UMASS Medical School