

2023 대한심장혈관흉부외과학회

제55차 추계학술대회 & APELSO 2023

2023. 11. 02 (Thu) - 11. 04 (Sat), 그랜드 인터컨티넨탈 파르나스 서울

Damage Control Thoracic Surgery for blunt trauma; Single Center Retrospective study



- After reports of improved outcomes with damage control laparotomy, this strategy has been expanded to thoracic surgery and various techniques has been introduced so far.
- Compared to damage control laparotomy, though, thoracic damage control surgery lacks accumulated data especially for blunt trauma patients.
- The purpose of this study is to describe the prehospital and hospital characteristics, management and outcome of DCTS(Damage Control Thoracic Surgery) for blunt trauma patients and find implications to improve outcomes.

- We included patients who came to Single level 1 trauma center with blunt mechanism injury from January 2016 to December 2022 and received unilateral or bilateral thoracotomy or median sternotomy with temporary skin closure.
- We excluded patients who received only resuscitative thoracotomy without any bleeding control procedure of thorax, and table death cases.
- Korea Trauma Data Base(KTDB) data(Prehospital and demographic data), Hospital medical records(admission physiologic and laboratory data, technical details of thoracotomy and combined operations and procedures, transfusion requirements, time spent on DCTS(min), period between the first and second operations(hrs), and postoperative outcomes)

Table 2. Surgical and non-surgical resuscitation methods

Table 1. Demographic information of patients who received damage control thoracic surgery

	Total (N=22)	Survivor(N=7)	Dead (N=15)	p
Age, median (IQR), y	51.0 [27.5, 58.8]	28.0 [26.0, 61.0]	54.0 [42.0, 58.0]	0.396
Male, n(%)	17 (77.2%)	5 (71.4%)	12 (80.0%)	1.000
Overall survival, n(%)	7 (31.8%)			
Mechanisms, n(%)				0.639
Fall down	11 (50.0%)	5 (71.4%)	6 (40.0%)	
Driver TA	1 (4.5%)	0 (0.0%)	1 (6.7%)	
Pedestrian	4 (18.2%)	0 (0.0%)	4 (26.7%)	
Motorcycle collision	3 (13.6%)	1 (14.3%)	2 (13.3%)	
Other mechanism	3 (13.6%)	1 (14.3%)	2 (13.3%)	
Trauma bay initial physiology				
SBP(mmHg), med (IQR) (N=16)	82.0 [61.5, 112.8]	102.0 [79.5, 122.3] (N=6)	80.0 [59.3, 108.5] (N=10)	0.157
SBP<90mmHg, n(%) (N=22)	9 (40.9%)	2 (28.6%)	7(46.7%)	0.302
Heart rate, med (IQR) (N=13)	103.0 [68.5, 132.0]	111.5 [89.8,129.0] (N=6)	80.0 [48.0, 148.0] (N=7)	0.391
GCS score, med (IQR) (N=22)	4.0 [3.0, 12.3]	6.0 [4.0, 12.0]	3.0 [3.0, 13.0]	0.170
GCS < 9, n(%) (N=22)	15 (68.2%)	4 (57.1%)	11 (73.3%)	0.630
Prehospital cardiac arrest (N=11)	11 (50%)	1 (14.3%)	10 (66.7%)	0.063
CPR time(min), median (IQR)	8.0 [4.0, 22.0]	4.0 [4.0, 4.0] (N=1)	9.0 [3.5, 23.5] (N=10)	0.024
PEA, n(%)	9 (81.8%)	1 (100.0%)	8 (80.0%)	1.000
Asystole, n(%)	2 (18.2%)	0 (0.0%)	2 (20.0%)	
Admission laboratory values				
Lactic acid, mean (SD), mmol/L	10.0 ± 4.8	8.5 ± 5.8	10.7 ± 4.3	0.341
BE, mean (SD)	-13.4 ± 6.6	-11.6 ± 7.6	-14.2 ± 6.3	0.459
pH, mean (SD)	7.1 ± 0.2	7.2 ± 0.1	7.1 ± 0.2	0.275
INR, mean (SD) (N=21)	2.3 ± 1.6	1.7 ± 0.4	2.6 ± 1.9	0.412
aPTT, mean (SD), sec (N=21)	81.2 ± 48.4	59.6 ± 18.3	92.1 ± 55.4	0.247
fibrinogen, mean (SD), mg/d (N=20)	125.1 ± 71.0	157.3 ± 58.4	109.0 ± 73.1	0.179
Postop laboratory values		(N=7)		
Lactic acid, mean(SD), mmol/L(N=21)	9.0 ± 3.4	6.5 ± 2.9	10.3 ± 3.1	0.021
BE, mean (SD)	-10.0 ± 6.1	-5.6 ± 2.7	-12.1 ± 6.1	0.012
pH, mean (SD)	7.2 ± 0.1	7.3 ± 0.1	7.1 ± 0.1	0.005
INR, mean (SD) (N=16)	1.7 ± 0.4	1.5 ± 0.1	1.9 ± 0.4	0.023
aPTT, mean (SD), sec (N=17)	91.6 ± 50.4	53.1 ± 10.3	118.5 ± 49.8	0.002
fibrinogen, mean (SD), mg/d (N=17)	141.0 ± 109.6	194.3 ± 150.7	103.7 ± 49.4	0.064

N=22	
Incision and Approach(N=22)	
Anterolateral thoracotomy, n(%)	16 (72.7%)
Clamshell thoracotomy, n(%)	5 (22.7%)
Posterolateral thoracotomy, n(%)	1 (4.5%)
Thoracic procedure	
Intrathoracic gauze Packing, n(%)	21 (95.5%)
Wedge resection, n(%)	1 (4.5%)
Pulmonary hilum ligation, n(%)	1 (4.5%)
Pneumorrhaphy, n(%)	5 (22.7%)
Cardiorrhaphy, n(%)	4 (18.2%)
Vessel ligation(IMA, ICA), n(%)	10 (45.5%)
Great vessel repair(IVC, PV, PA), n(%)	4 (18.2%)
Pericardium repair, n(%)	2 (9.1%)
Combined extra-thoracic surgery (N=14)	14 (63.6%)
Laparotomy, n(%)	13 (59.1%)
External fixation, n(%)	3 (13.6%)
Pelvis, n(%)	2 (9.1%)
Lower extremity, n(%)	1 (4.5%)
Craniectomy, n(%)	1 (4.5%)
Resuscitative procedure	
Preperitoneal packing, n(%)	4 (18.2%)
REBOA, n(%)	2 (9.1%)
Angioembolization, n(%)	7 (31.8%)
TEVAR, n(%)	2 (9.1%)
Transfusion amount(preoperative)	
Units of pRBC, med (IQR)	11 [7,15]
Units of FFP, med (IQR)	5 [0,11]
Units of Platelet, med (IQR)	0 [0, 0]
Transfusion amount (intraoperative)	
Units of pRBC, med (IQR)	10 [4, 15]
Units of FFP, med (IQR)	8 [4, 12]
Units of Platelet, med (IQR)	0 [0, 5]
Transfusion amount (total)	
Units of pRBC, med (IQR)	29 [15, 40]
Units of FFP, med (IQR)	26 [12, 39]
Units of Platelet, med (IQR)	12 [2, 18]
Units of Cryoprecipitate, med (IQR)	0 [0, 20]
Operation time, med(IQR), min	92 [61, 109]
Second look operation(N=9)	9 (40.9%)
Pneumonectomy, n(%)	1 (4.5%)
Pericardium reconstruction, n(%)	3 (13.6%)
Time interval DCTS and definitive surgery (N=9)	
median(IQR), hr	42 [20, 46]
< 24hr, n(%)	3 (33.3%)
24≤ <48hr, n(%)	4 (44.4%)
48≤ <72hr, n(%)	2 (22.2%)



Table 3. Comparison of groups; Patients who experienced preoperative traumatic cardiac arrest and patients who didn't experience preoperative arrest

	Total(N=22)	Preop arrest(N=11)	No arrest(N=11)
Mortality	68.2%	90.9%	45.5%
ISS	35.5[27.5, 50]	33[25.5, 35]	50[38, 57]
TRISS	0.4800±0.2560	0.4953±0.1961	0.4648±0.3036
TRAIS	-0.1619±0.5041	-0.4044±0.3532	0.0807±0.5155
Lactic acid	9.83±4.88	10.66±4.03	9.00±5.48
BE	-11.1±9.77	-11.1±11.48	-11.1±7.70
pH	7.13±0.16	7.08±0.14	7.17±0.17

Table 4. Clinical outcome of survivors

N=7	
ICU LOS, median(IQR), d	29 [23, 62.5]
HOD LOS, median(IQR), d	50 [45.5, 78.5]
MV day, median(IQR), d	27 [18, 41]
Complication	
VAP, ARDS, n(%)	2 (28.6%)
AKI, n(%)	1 (14.3%)
Neurologic outcome	
Cerebral Performance Category(CPC) 1-2, n(%)	5 (71.4%)
CPC 3, n(%)	2 (28.6%)

- Damage control thoracic surgery may have benefit for severely injured patients with blunt mechanism without severe complications itself.
- Patients who didn't experience traumatic cardiac arrest before the surgery have higher change of survival which suggests precise triage and fast prehospital transportation to the trauma center may have important role.