Early Predictors of Damage Control Thoracotomy

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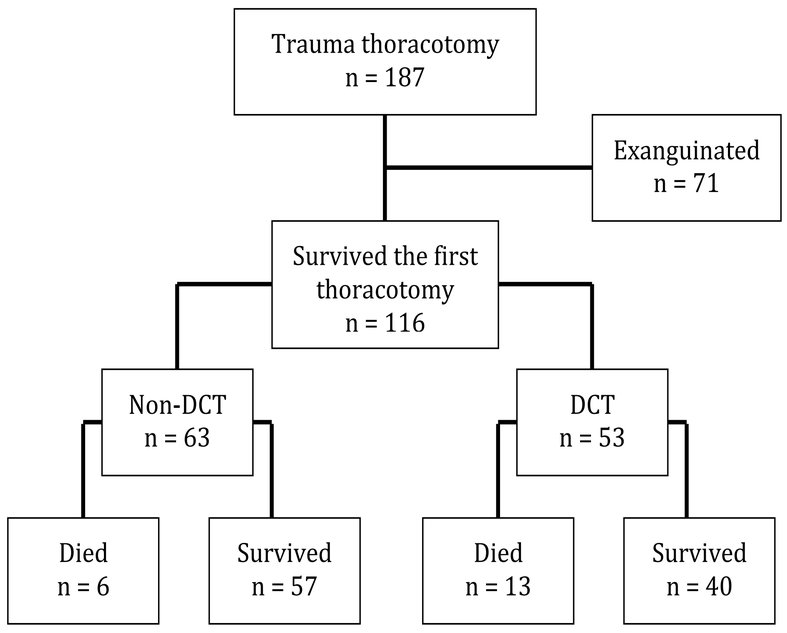
ABSTRACT

Introduction: Improved care and volume replacement strategies have resulted in more severely injured patients surviving emergency thoracotomies. A significant number of these patients may end up requiring a damage control thoracotomy (DCT). We retrospectively reviewed a series of trauma patients who were submitted to an emergent thoracotomy in order to identify risk factors associated with DCT. **Methods:** Retrospective review in a level I trauma center. Demographics, clinical characteristics, surgical findings, physiologic variables and indication for massive transfusion were evaluated. Early predictors of DCT were identified by multiple logistic (MLR) modeling. **Results:** A total of 187 thoracotomies were performed. Seventy one patients died in the operating room from exanguination and are excluded from the analysis. Of the 116 remaining 112, (96.6%) were male. Penetrating injuries occurred in 108 (93.1%). Median age was 27, (IQR 19.5 – 34) years. Median-IQR of RTS and ISS were 7.0 (5.9-7.4) and 17.5 (16-25) respectively. The lungs were injured in 73 (62.1%) patients, the heart in 35 (30.2%) and major vessels in 4(3.6%). Resuscitative thoracotomy was performed in 18 patients. Packing of different structures was performed in 41(35.3%), tractotomies in 32 (27.6%) and pulmonary resections in 10 (8.6%), three of them deferred. Temporary closure in DCT was done by skin suture over laparotomy pads in 35 subjects (66.0%). Seventy five patients met criteria for massive transfusion, (64.7%). Extrathoracic DC surgery was performed in 33 subjects (28.5%). Six (9.5%)of the non-DCT and 13(24.5%) of the DCT died. Results from multiple logistic modeling are showed in Table 2. The model had a good discriminative ability (AUROC 0.84, 95% CI 0.77-0.91) and goodness of fit (HL p 0.77). **Conclusion:** We identified impaired mentation on admission, amount of blood loss, need for aortic occlusion and main injury in high risk structures as independent predictors of DCT that can be recognized early in the clinical evaluation and during the surgical procedure and may aid in the decision making process.

INTRODUCTION

Although the tenets of Damage Control Surgery for exsanguinating thoracic injuries have been well described during the last decade, the decision to perform a damage control thoracotomy (DCT) is mainly based on the feel that patients will die from exsanguination. In practical terms, the frequent need for rapid decision-making in an unstable patient makes difficult to ascertain which patients will benefit from DCT. Our objective was to analyze a series of trauma patients who were submitted to emergent thoracotomy in order to identify risk factors associated with DCT.

RESULTS



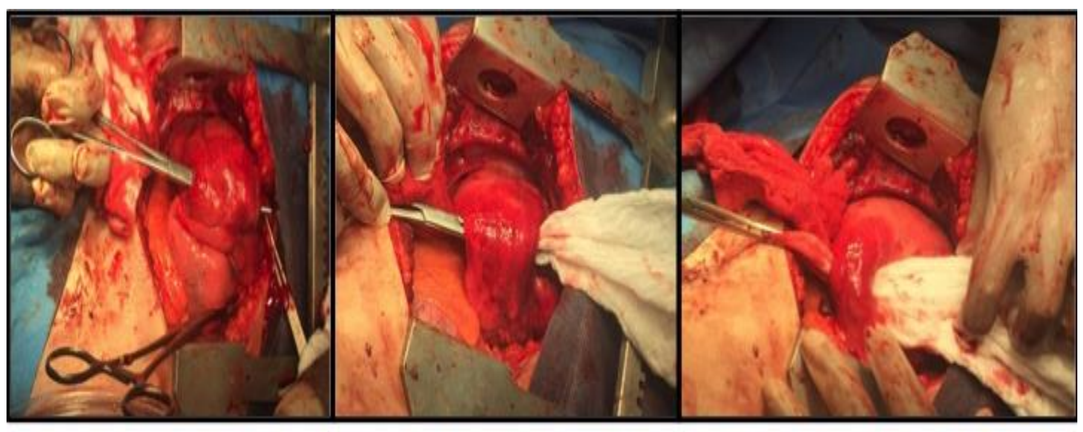


Figure 1. Packing of the tract, as definitive management of a transfixing lung injury

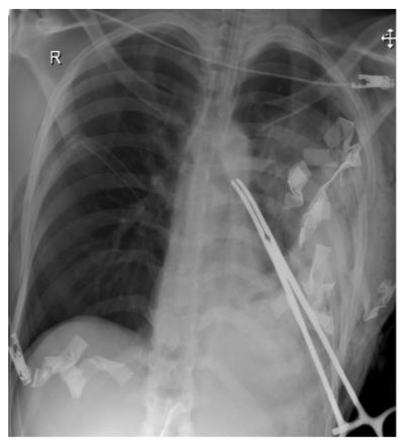


Figure 2. Postoperative X-Ray after pulmonary hilum clamping before a deferred lobectomy

Table 1. Study Groups

Variables	NODCT	DCT	TOTAL	P
Patients, n	63	53	116	
Male, n (%)	63 (100%)	49 (92.5%)	112 (96.6%)	0.04
Age, median (IQR)	25 (19-35)	28 (20-34)	27 (19.5-34)	0.3
Glasgow, median (IQR)	15 (14-15)	14 (7-15)	15 (10-15)	<0.01
RTSs, median (IQR)	7.6 (6.4-7.8)	6.4 (4.1-7.1)	6.2 (5.3-7.8)	<0.01
TRISS (PS), median (IQR)	0.99 (0.92-0.99)	0.92 (0.51-0.99)	0.98 (0.77-0.99)	0.0003
Shock Index, median (IQR)	1.1 (0.9-1.6)	1.6 (1-2)	1.2 (0.9-1.9)	0.03
Penetrating trauma, n (%)	63 (100%)	45 (84.9%)	108 (93.1%)	0.001
Resuscitative thoracotomy, n (%)	4 (6%)	39 (73.6%)	18 (15.5%)	0.03
Estimated hemorrhage (Lt), median (IQR)	1.6 (1-2.5)	3 (2-4)	2 (1.4-3.4)	<0.001
Need of aortic occlusion, n (%)	5 (7.9%)	18 (34.0%)	23 (19.8%)	<0.01
Extrathoracic damage control, n (%)	9 (14.3%)	24 (45.3%)	33 (28.5%)	<0.001
Abdominal trauma, n (%)	14 (22.2%)	24 (45.3%)	38 (32.8%)	0.01
ISS, median (IQR)	16 (16-25)	22 (16-32)	17.5 (16-25)	0.007
Vascular injury, n (%)	18 (28.6%)	25 (41.2%)	43 (37.1%)	0.053
Heart injury, n (%)	26 (41.2%)	9 (17%)	35 (30.2%)	0.005
Lung injury, n (%)	27 (42.9%)	36 (67.9%)	63 (54.3%)	0.009
Physiologic Index <3, n (%)	30 (47.6%)	39 (73.6%)	69 (59.5%)	0.004

Table 2. Multiple logistic regression analysis of predictors of DCT

Variable	Descriptor	OR (95% CI)	p
Clinical			
Age (Years)	27 (19.5-34)	--	0.45
GCS<8	20 (17.2%)	5.5 (1.2-24.8)	0.03
Physiologic Index<3	69 (59.5%)	--	0.98
Early Indication of DCR*	75 (64.7%)	--	0.72
Intraoperative			
Amount of blood loss (Lt.)	2.0 (1.4-3.4)	2.1 (1.4-3.2)	<0.001
Need of aortic occlusion	23 (19.8%)	5.0 (1.3-19.7)	0.02
Extrathoracic damage control	33 (28.5%)	--	0.1
Main lesion in high risk organ**	75 (83.3%)	4.9 (1.5-16.6)	0.01

*Damage control resuscitation

**Lung AIS≥3, major vascular, trachea or main bronchus, more than 1 bleeding source

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CONCLUSIONS

We present a series of patients with life threatening chest trauma who were submitted to an emergent thoracotomy. Our findings further support the idea of the potential live-saving effect of applying damage control techniques in patients with exsanguinating hemorrhage arising from intrathoracic injuries. We also identified several risk factors for DCT that had not been described previously, that could help the trauma surgeon in his/her decision-making process.