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The Double Jeopardy of Blunt Thoracoabdominal Trauma

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Objectives: To examine the specific injuries, need for operative intervention, and clinical outcomes of patients with blunt thoracoabdominal trauma.

Design: Trauma registry and medical record review.

Setting: Level I trauma center in Los Angeles, California.

Patients: All patients with thoracoabdominal injuries from January 1996 to December 2010.

Main Outcome Measures: Injuries, incidence and type of operative intervention, clinical outcomes, and risk factors for mortality.

Results: Blunt thoracoabdominal injury occurred in 1661 patients. Overall, 474 (28.5%) required laparotomy, 31 (1.9%) required thoracotomy (excluding resuscitative thoracotomy), and 1146 (69.0%) required no thoracic or abdominal operation. Overall incidence of intra-abdominal solid organ injury was 59.7% and hollow viscus injury, 6.0%. Blunt cardiac trauma occurred in 6.3%; major thoracic vessel injury, in 4.6%; and diaphragmatic trauma, in 6.0%. The majority of solid organ injuries were managed nonoperatively (liver, 83.9%; spleen, 68.3%; and kidney, 91.2%). Excluding patients with severe head trauma, mortality ranged from 4.5% with nonoperative management to 18.1% and 66.7% in those requiring laparotomy and dual cavitary exploration, respectively. Age 55 years or older, Injury Severity Score of 25 or more, Glasgow Coma Scale score of 8 or less, initial hypotension, massive transfusion, and liver, cardiac, or abdominal vascular trauma were all independent risk factors for mortality.

Conclusions: Most patients with blunt thoracoabdominal trauma are managed nonoperatively. The need for nonresuscitative thoracotomy or combined thoracoabdominal operation is rare. The abdomen contains the overwhelming majority of injuries requiring operative intervention and should be the initial cavity of exploration in the patient requiring emergent surgery without directive radiologic data.

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IN PATIENTS WITH THORACOABdominal trauma, the potential for concurrent injury in 2 body cavities can present challenges to both diagnosis and surgical management.[1-3] In these complex patients, rapid diagnostic assessment and surgical planning may be hampered by multiple factors. Clinical urgency may limit time for critical evaluation, and patient instability often precludes radiologic investigation away from the resuscitation bay. Thoracic trauma may decrease abdominal examination sensitivity[4] and diaphragmatic injury may result in misinterpretation of tube thoracostomy drainage and diagnostic peritoneal aspirates.[2,5] In patients requiring surgery, determination of the cavity with the most significant injury is paramount to prevent delayed treatment and increased morbidity and mortality.[4,6]

Although injury patterns, surgical management, and sequencing of operative interventions have been reviewed in small penetrating thoracoabdominal trauma series,[2,3,6] these issues have not been well examined in patients with blunt injury. The current study examines the epidemiology, injury patterns, operative procedures, and clinical outcomes of all patients with blunt thoracoabdominal trauma at the Los Angeles County + University of Southern California Medical Center over a 15-year period.

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METHODS

All patients with blunt thoracoabdominal trauma, defined as an Abbreviated Injury Score of 2 or more in both the chest and abdomen, admitted to Los Angeles County + University of South-

Table 1. Population Demographics and Admission Physiologic Variables[a]

	No./Total No. (%)	
	All Patients (N = 1661)	Alive on Admission Without Severe Head Injury (n = 1135)
Demographics and vital signs on admission		
Age, y, median (range)	35 (1-99)	35 (1-92)
Age ≥55 y	333/1661 (20)	201/1135 (17.7)
Male	1198/1661 (72.1)	836/1135 (73.7)
Hypotension: SBP ≥90 mm Hg	211/1624 (13.0)	92/1135 (8.1)
HR ≥120 beats/min	375/1634 (22.9)	233/1129 (20.6)
GCS score ≤8	365/1619 (22.5)	95/1119 (8.5)
Cardiac arrest on admission	72/1661 (4.3)	0
Injury severity		
ISS <15	306/1661 (18.4)	299/1135 (26.3)
ISS 15-24	544/1661 (32.8)	461/1135 (40.6)
ISS ≥25	811/1661 (48.8)	375/1135 (33.0)
Extremity AIS ≥3	474/1661 (28.5)	329/1188 (27.7)
Head AIS ≥3	474/1661 (28.5)	0

Abbreviations: AIS, Abbreviated Injury Score; GCS, Glasgow Coma Scale; HR, heart rate; ISS, Injury Severity Score; SBP, systolic blood pressure.
[a] Severe head injury defined as the presence of intracranial pathology or a head AIS of 3 or more.

ern California Medical Center between January 1996 and December 2010 were retrospectively reviewed. Demographic details, initial physiologic parameters, mechanism and pattern of injuries, operative procedures, need for massive transfusion, mortality, and intensive care unit and hospital length of stay were abstracted from the institutional trauma registry. Additional data were obtained through medical record review.

Subsequent analysis examined the total population as well as the subgroup of patients who arrived alive and without associated severe head injury (defined as a head Abbreviated Injury Score ≥3). Management strategies (no thoracotomy or laparotomy, laparotomy alone, thoracotomy alone, or thoracotomy and laparotomy) were described. "Thoracotomy" included both lateral thoracic incisions and median sternotomy. Resuscitative thoracotomy (RT) was defined as thoracotomy performed outside the operating room for cardiac arrest or sudden hemodynamic deterioration. The precise distribution of chest and abdominal injuries was tabulated. Injuries were examined across the total population as well as in the subgroup who arrived alive and without severe head injury. Injuries in the latter group were then examined by management strategy. The management of abdominal solid organ injury was also described.

Significant outcomes (intensive care unit and hospital length of stay, need for massive transfusion, and mortality) were described overall and in the subgroup of patients with isolated thoracoabdominal trauma who were alive on admission. Mortality was also described according to need for and type of operative procedure. Bivariate analysis of patient demographics, injury patterns, and management interventions was performed to identify differences between those who survived to hospital discharge and those who did not. All factors on the bivariate analysis discordant at $P \geq .20$ were included in a stepwise logistic regression model to identify independent predictors of mortality.

Continuous variables were reported as means and standard deviations and were occasionally dichotomized using clinically relevant cut points: age (≥55 vs <55 years); systolic blood pressure on admission (<90 vs ≥90 mm Hg); Glasgow Coma Scale score (≤8 vs >8); and Injury Severity Score (≥25 vs <25). Categorical variables were reported as a proportion or percentage of the total population. Proportions were compared using the χ^2 or Fisher exact test. Differences between continuous variables were assessed using unpaired *t* or Mann-Whitney *U* tests. All analyses were performed using SPSS for Windows, version 17 (IBM SPSS).

RESULTS

During the study period, 1667 patients sustained concomitant blunt injury to the thorax and abdomen. Six patients from this group did not have complete medical records available to determine management details or injury patterns and were excluded from the analysis, giving a final population of 1661. Motor vehicle collisions were the most frequent cause of injury (1131 of 1661; 68.1%), followed by falls (259 of 1661; 15.6%) and motorcycle collisions (172 of 1661; 10.4%). Assault accounted for only 30 patients (1.8%).

In the total population, 211 patients (13.0%) were hypotensive on admission, 375 (22.9%) had tachycardia (heart rate ≥120 beats/min), and 365 (22.5%) had a Glasgow Coma Scale score of 8 or less. Seventy-two patients (4.3%) had no vital signs on admission. Associated severe head injury (Abbreviated Injury Score ≥3) occurred in 474 of 1661 (28.5%). Sixty-eight percent (1135 of 1661) of the total population arrived alive and without severe head injury. In the subgroup of patients arriving alive without severe head injury (n=1135), tachycardia and hypotension occurred in 233 (20.6%) and 92 (8.1%), respectively. A Glasgow Coma Scale score of 8 or less occurred in 95 (8.5%). The epidemiological and injury severity characteristics of these 2 groups are summarized in **Table 1**.

The majority of patients with isolated thoracoabdominal trauma arriving alive and without severe head injury (821 of 1135; 72.3%) were managed conservatively, without thoracotomy (by either lateral thoracotomy or median sternotomy) or laparotomy. Overall, only 9 of 1135 patients (0.8%) in this group, arriving with vital signs on admission, required a thoracotomy alone. Three of these (0.3%) were performed in the operating room

Table 2. Management of Patients With Blunt Thoracoabdominal Trauma

	No. (%)	
	All Patients (N = 1661)	Alive on Admission Without Severe Head Injury (n = 1135)
No thoracotomy or laparotomy	1146 (69.0)	821 (72.3)
Thoracotomy only	41 (2.5)	9 (0.8)
Resuscitative thoracotomy[a]	34 (2.0)	6 (0.5)
Thoracotomy in OR	7 (0.4)	3 (0.3)
Laparotomy only	431 (25.9)	281 (24.8)
Combined thoracotomy and laparotomy	43 (2.6)	24 (2.1)
Combined laparotomy and thoracotomy (excluding resuscitative thoracotomy)	24 (1.4)	17 (1.5)

Abbreviation: OR, operating room.
[a] Thoracotomy performed outside the OR for resuscitative purposes.

while the remainder (6 of 1135; 0.5%) had RT performed outside the operating room for postadmission cardiac arrest or hemodynamic deterioration. Laparotomy alone was required in 281 (24.8%), while 24 (2.1%) had both a laparotomy and thoracotomy. Seven patients (0.6%) had a laparotomy performed following RT.

In the overall population, isolated thoracotomy was performed more frequently (41 of 1661; 2.5%), reflecting a higher incidence of RT (34 of 41) for patients in extremis. Laparotomy alone (431 of 1661; 25.9%) and combined thoracotomy and laparotomy (43 of 1661; 2.6%) occurred with similar frequency in the total population as they did in the subgroup arriving alive without severe head injury. **Table 2** shows the incidence of thoracotomy or laparotomy or combined procedure in these 2 groups.

The intrathoracic and intra-abdominal injuries in the total population and in the subgroup arriving alive and without severe head injury, as well as injury distribution by type of management for this subgroup, are summarized in **Table 3**. Lung injury with bleeding was the most common injury in patients undergoing thoracotomy with or without laparotomy.

Lung injury was also the most common intrathoracic finding overall (35.6%) and in the subgroup of patients with isolated thoracoabdominal trauma who were alive on admission (32.5%). Although liver injury was the most common intra-abdominal injury in the study population (587 of 1661; 35.3%), splenic trauma was the predominant finding in patients undergoing laparotomy alone (123 of 281; 43.8%). Patients with dual cavitary intervention had the highest incidence of liver trauma (62.5%), also the most common solid organ injury in this group.

Hollow viscus injury (stomach or small or large bowel) occurred in 6.0% (100 of 1661) of the total population and 5.2% (59 of 1135) of patients with isolated thoracoabdominal trauma who were alive on admission. Small-bowel injury was diagnosed intraoperatively in 2.6% (43 of 1661) of the overall population and in 2.8% (32 of 1135) of patients with isolated thoracoabdominal trauma alive on admission. Patients undergoing laparotomy had an 11.4% incidence of small-bowel injury. Gastric and large-bowel injury occurred in 1.1% (13 of 1135) and 2.0% (23 of 1135) of the population with potentially survivable injury, respectively. Diaphragmatic rupture was diagnosed in 6.0% of the total population, 18.5% (52 of 281) of patients undergoing laparotomy alone, and 12.5% (3 of 24) of those with both thoracotomy and laparotomy.

Most solid organ injuries were successfully managed nonoperatively. Overall, 83.9% of liver injuries, 68.3% of splenic injuries, and 91.2% of kidney injuries were managed without a surgical intervention to the respective solid organ.

The overall mortality was 21.2% (352 of 1661). Excluding the 72 who presented in cardiac arrest, mortality was 17.6% (280 of 1588). In patients alive on admission without severe head trauma, mortality was 10.0% (**Table 4**). Mortality in this subgroup ranged from 4.6% in those requiring no surgical intervention to 18.1% in patients undergoing laparotomy and 66.7% in patients with dual cavity intervention (Table 4). Two of 53 patients (3.8%) who underwent RT survived. No patients presenting in cardiac arrest survived.

Massive transfusions were required in 25.2% overall and in 20.6% of patients with isolated thoracoabdominal trauma who were alive on admission. In this subgroup, those undergoing laparotomy had a 49.5% incidence of massive transfusion, rising to 70.8% in those requiring dual cavitary intervention. After multivariate analysis, 10 independent predictors of mortality were identified for the subgroup of patients with isolated thoracoabdominal trauma who were alive on admission (**Table 5**).

COMMENT

To our knowledge, the current study is the most complete examination of injury patterns and outcomes in the largest series of blunt thoracoabdominal trauma patients to date. This topic has not been well described in the literature and is relatively infrequent, occurring at an average rate of 111 patients per year in our high-volume center. Bergeron and colleagues,[7] in the sole other North American study of this injury pattern, identified only 520 patients over a 4-year period across 4 Canadian trauma centers. Our analysis was designed to identify the epidemiology and patterns of injury; identify the most commonly injured organs requiring operative intervention; determine the incidence and nature of surgical management; and elucidate independent risk actors for mortality.

Table 3. Injuries Observed in the Total Population and in Those Arriving Alive and Without Severe Head Injury, Categorized by Management Strategy

	No. (%)					
		Alive on Admission Without Severe Head Injury				
	All Patients (N = 1661)	Total Alive on Admission Without Severe Head Injury (n = 1135)	No Thoracotomy or Laparotomy (n = 821)	Thoracotomy Only (n = 9)	Laparotomy Only (n = 281)	Thoracotomy and Laparotomy (n = 24)
Chest						
Cardiac trauma	105 (6.3)	64 (5.6)	40 (4.9)	1 (11.1)	20 (7.1)	3 (12.5)
Cardiac rupture	11 (0.7)	3 (0.3)	0	1 (11.1)	1 (0.4)	1 (4.2)
Major thoracic vessel	77 (4.6)	24 (2.1)	14 (1.7)	1 (11.1)	8 (2.8)	1 (4.2)
Thoracic aorta	56 (3.4)	16 (1.4)	10 (1.2)	0	5 (1.8)	1 (4.2)
Hilar vessels	2 (0.1)	0	0	0	0	0
Other thoracic vessels	19 (1.1)	8 (0.7)	4 (0.5)	1 (11.1)	3 (1.1)	0
Lung injuries	592 (35.6)	369 (32.5)	281 (34.2)	2 (22.2)	78 (27.8)	8 (33.3)
Abdomen						
Solid organs	991 (59.7)	991 (59.7)	437/821 (53.2)	6 (66.7)	203 (72.2)	19 (19.2)
Liver	587 (35.3)	380 (33.5)	246 (30.0)	5 (55.6)	114 (40.6)	15 (62.5)
Spleen	455 (27.4)	300 (26.4)	166 (20.2)	1 (11.1)	123 (43.8)	10 (41.7)
Kidney	209 (12.6)	148 (13.0)	106 (12.0)	1 (11.1)	38 (13.5)	3 (12.5)
Pancreas	35 (2.1)	18 (1.6)	6 (0.7)	0	11 (3.9)	1 (4.2)
Hollow viscus injury	100 (6.0)	59 (5.2)	0	0	55 (19.6)	4 (16.7)
Stomach	39 (2.3)	13 (1.1)	0	0	11 (3.9)	2 (8.3)
Small bowel	43 (2.6)	32 (2.8)	0	0	32 (11.4)	0
Large bowel	33 (2.0)	23 (2.0)	0	0	22 (7.8)	1 (4.2)
Bladder injury	158 (9.5)	106 (9.3)	57 (6.9)	0	46 (16.4)	3 (12.5)
Named vessel	137 (8.2)	84 (7.4)	30 (3.7)	1 (11.1)	45 (16.0)	8 (33.3)
Diaphragm	99 (6.0)	64 (5.6)	8 (1.0)	1 (11.1)	52 (18.5)	3 (12.5)

The majority of this group was managed nonoperatively, reflecting a wide spectrum of injury severity, as well as a historical shift from paradigms of mandatory operative intervention to increasingly expectant approaches for both abdominal solid organ[8] and thoracic injury.[9] Laparotomy accounted for 84% (431 of 515) of surgical procedures performed in the entire population and 89% (281 of 314) of procedures in patients with isolated thoracoabdominal trauma who were alive on admission. Excluding patients undergoing RT, only 1.9% (31 of 1661) of the total population and 1.8% (20 of 1135) of the patients with isolated thoracoabdominal trauma required a thoracotomy. Rates of dual cavitary intervention were similarly low, 2.6% and 2.1% of the total population and those with potentially survivable injury, respectively. Exclusion of those who underwent laparotomy following RT drops these rates even lower to 1.4% (24 of 1661) and 1.5% (17 of 1135). A higher rate (3%) of dual cavitary intervention was reported in the Canadian series. This discrepancy may reflect earlier and greater adoption of expectant management of both thoracic and abdominal injuries in a higher-volume American center.

The issue of surgical sequencing has been previously examined in association with penetrating trauma.[2,3,6] Incorrect sequencing of cavitary intervention and delayed injury recognition are associated with significantly increased morbidity and mortality. Although missed injury can result in significant morbidity,[10] nontherapeutic surgical exploration is also detrimental, prolonging operative time and increasing risk of hypothermia, iatrogenic injury, and cross-cavitary contamination.[2] Nontherapeutic laparotomies have been associated with complication rates as high as 18% to 22%[11-14] and significant increases in length of hospital stay.[15]

In our total patient population, only 1.8% underwent a thoracotomy in the operating room. Within this group, 77% had this procedure performed in conjunction with a laparotomy. In patients with isolated thoracoabdominal trauma presenting alive, this incidence was similar, 1.7% and 74%, respectively. Isolated thoracotomy, not including RT, accounted for only 1.4% (7 of 515) of all operative procedures in the total population and 1% (3 of 314) of those performed in those with potentially survivable injury. Excluding those patients in extremis for whom an RT was performed, our data clearly suggest that the initial incision, in the absence of directive radiologic evidence, belongs in the abdomen.

Use of RT in patients with blunt trauma is a controversial issue and varies considerably across trauma centers. Our institution practices a liberal RT policy and only 3.8% (2 of 53) of the patients having this procedure survived. Neither survivor presented in cardiac arrest but instead had RT performed for subsequent deterioration. No survivors to hospital discharge occurred among the 73 patients presenting in cardiac arrest. An overall survival rate of 1.4% for RT in blunt trauma patients has been reported in a systematic review of the literature.[16] A recent multicenter study found blunt trauma patients accounted for 9% of 56 survivors of RT.[17] In contrast, no survivors of RT were reported from the Canadian series of blunt thoracoabdominal trauma, but only 2 procedures were performed across the 4 trauma centers in-

Table 4. Outcomes in the Total Population and by Management in Those Alive on Admission Without Severe Head Injury

	No. (%)		Mean (SD)	
	Survival	Massive Transfusions	ICU LOS, d	HLOS, d
All patients (N = 1661)	1309 (78.8)	419 (25.2)	6.9 (13.2)	15.2 (22.9)
Alive on admission without severe head injury (n = 1135)	1021 (90.0)	234 (20.6)	6.0 (12.3)	14.8 (22.7)
No thoracotomy or laparotomy (n = 821)	783 (95.4)	75 (9.1)	3.7 (8.0)	11.6 (13.6)
Thoracotomy only (n = 9)	0	3 (33.3)	0	1
Laparotomy only (n = 281)	230 (81.9)	139 (49.5)	12.5 (18.0)	25.1 (36.8)
Thoracotomy and laparotomy (n = 24)	8 (33.3)	17 (70.8)	9.8 (21.6)	12.8 (22.7)

Abbreviations: HLOS, hospital length of stay; ICU, intensive care unit; LOS, length of stay.

Table 5. Independent Predictors of Mortality in Patients Alive on Admission Without Severe Head Injury[a]

Variable	R^2	AOR (95% CI)	*P* Value
Massive PRBC transfusion	0.189	2.5 (1.5-4.2)	.001
ISS ≥25	0.103	5.3 (2.9-9.4)	<.001
GCS score ≤8	0.069	7.0 (3.8-12.9)	<.001
Age ≥55 y	0.050	5.2 (2.9-9.5)	<.001
Thoracotomy and laparotomy	0.029	10.2 (3.1-33.5)	<.001
Hypotension on admission	0.014	2.7 (1.5-5.2)	.002
Liver injury	0.012	2.0 (1.2-3.4)	.01
Named abdominal vascular injury	0.010	2.7 (1.4-5.4)	.003
Injury following motor vehicle collision	0.008	2.1 (1.1-4.0)	.03
Cardiac injury	0.006	2.3 (1.0-5.1)	.04

Abbreviations: AOR, adjusted odds ratio; GCS, Glasgow Coma Scale; ISS, Injury Severity Score; PRBC, packed red blood cell.
[a]Other variables in the model: sex, extremity Abbreviated Injury Score of 3 or more, laparotomy only, thoracotomy only, thoracic aorta injury, cardiac rupture, lung injury, pancreatic injury, diaphragmatic injury, motorcycle collision, falls, and blunt assault.

volved in the study.[7] The poor outcomes observed after RT in blunt trauma were examined in a recent multicenter attempt to define the limits of this procedure.[17] Our findings suggest that return of circulation after RT in patients in cardiac arrest with combined thoracic and abdominal trauma is even less likely than it is with trauma isolated to 1 anatomic cavity.

In our study, both patients having RT who survived to hospital discharge underwent subsequent laparotomy. The first patient had a 6-story fall, had an RT in the trauma bay, and then underwent laparotomy with repair of iliac vessel injury and subsequent colostomy. No apparent nonresuscitative, therapeutic procedure in the chest was performed. The second, a pediatric patient in a motor vehicle collision, underwent orotracheal intubation and bilateral chest tube placement, emergent right thoracotomy for bleeding, and partial pneumonectomy in the operating room. No abdominal procedure was initially performed but rapid postoperative deterioration led to laparotomy, revealing a grade IV liver laceration, grade II splenic injury, and adrenal hematoma. It is likely this patient's initial hemodynamic instability was due to intra-abdominal pathology rather than the low-pressure bleeding seen with lung parenchymal injury. In both these instances of survival post-RT, the likely most significant pathology was in the abdomen.

Abdominal solid organ injuries were managed nonoperatively with a great deal of success in our study. Nonoperative management of splenic injury was successful in 67%, a rate that compares favorably with the 55% reported in the multicenter Eastern Association for the Surgery of Trauma study of blunt splenic trauma.[18] Our success rate for nonoperative management of hepatic injury (83%) is also consistent with previous prospective studies[19] and systematic reviews.[20] Our greater than 90% nonoperative management rate for renal injury is also within the range reported in both prospective studies[21] and systematic reviews.[22] Expectant management of solid organ injury in this population is highly successful, despite injury burden in 2 anatomic regions.

Blunt small-bowel injury occurs infrequently, with an incidence of 1.2% reported in a multicenter review of 275 557 blunt trauma admissions.[23] Our higher incidence of 2.6% (in the total population) may reflect the effect of greater mechanistic forces associated with production of combined thoracoabdominal trauma or potential inclusion during registry coding of some patients with small-bowel mesenteric injury. Previous reports of small-bowel mesenteric injury suggest a range in incidence from 0.7% to 8.5%.[24]

Blunt gastric injury occurred in 2.3% of our total population and 1.1% of our subgroup with potentially survivable injury. A previous 12-year review of gastric injury identified an incidence of 0.07% in all blunt trauma patients.[25] This same study reported higher frequency in patients with concomitant chest injury and increasing Injury Severity Score. Our higher incidence likely reflects the greater injury severity and dual anatomic involvement in our population. Other earlier reviews of blunt gastric injury describe rates from 0.5% to 1.7%[26,27] Overall, combined hollow viscus injury occurred in 6%, a significantly higher incidence than has been generally appreciated in blunt trauma patients and likely reflective of the greater mechanical forces involved in the production of combined thoracic and abdominal injury.

Lung injuries were the most commonly found pathology in patients undergoing operative thoracotomy. A multicenter review found a 17% incidence of lung resection in 161 patients requiring urgent thoracotomy for blunt trauma and higher mortality in patients with blunt traumatic lung injury primarily due to associated extrathoracic injuries.[28] Although this was the most commonly seen injury, our analysis did not determine the number of associated anatomic or nonanatomic lung resections. Aortic injury was seen in 16% of patients undergoing thoracotomy, and the treatment of this has largely shifted from operative to endovascular management.[29] Interestingly, 11 patients overall presented with blunt cardiac rupture. This incidence (1.4%) is higher than the 0.045% previously reported in a review of blunt trauma patients drawn from the National Trauma Databank[30] and is likely due to the increased probability of finding this injury in our focused population. Blunt cardiac rupture is a highly fatal event, accounting for 64% of cardiac injuries identified at autopsy.[31] A more recent review found the reported incidence in patients presenting to the hospital to range from 0.05% to 0.5% and documented rare reports of survivability with early recognition and treatment, even in the setting of complex, multisystem trauma.[32] No survivors of this injury were observed in our series.

Mortality in patients arriving alive without severe head injury was 10%. Bergeron and colleagues[7] reported an overall 11% mortality in their larger population of patients with either blunt thoracic, abdominal, or combined trauma but did not specify mortality exclusively for the 512 patients with thoracoabdominal injury. Thoracoabdominal trauma was more common in the fatalities compared with survivors in their series. Our study found mortality increased with need for operative intervention, ranging from 4.6% for nonoperative management to 67% in those requiring both laparotomy and thoracotomy, reflecting their more severe injury burden. Multiplicity of injury is associated with increased mortality in blunt abdominal trauma, with rates increasing from 11% if only isolated liver or spleen injury occurs to 22% if both organs are damaged.[33] Patients arriving alive without severe head injury undergoing thoracotomy in the operating room as their sole procedure had zero survival, suggestive of devastating intrathoracic injury or exsanguination prior to recognition of severe intra-abdominal, pelvic, or retroperitoneal trauma.

Our analysis of mortality revealed most independent risk factors to be markers of overall injury severity: Injury Severity Score of 25 or more; Glasgow Coma Scale score of 8 or less (in the absence of a head Abbreviated Injury Score ≥3); need for massive transfusion; and need for dual cavitary intervention. Age 55 years or older was also a risk, consistent with previous studies demonstrating age-related vulnerability in trauma patients.[18] Among injury patterns, liver, abdominal vascular, and cardiac injury were independently associated with mortality.

Despite the limitations of any retrospective study, to our knowledge, the current article is the largest and most rigorous description of blunt thoracoabdominal injury to date. In this patient group, the overwhelming majority of injuries requiring operative intervention were found in the abdomen and this should be the initial cavity of exploration in the patient without cardiac arrest requiring emergent surgery without directive radiologic data. Most thoracic procedures were performed for resuscitative purposes with low survival rates, in keeping with previous literature. Furthermore, concomitant thoracic injury did not preclude nonoperative management of abdominal solid organ injury, with a degree of success comparable with previous reports. In comparison with previous studies of isolated blunt abdominal or chest trauma, hollow viscus and diaphragmatic injuries were more common in our population. Mortality in this group rose with age, increasing injury burden, and the need for dual cavitary intervention.

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