www.downstatesurgery.org

Trauma Pneumonectomy

Johanna V. Basa
SUNY Downstate Medical Center
Kings County Hospital
Feb. 21, 2013

www.downstatesurgery.org

- 34 yr old male with no PMH presents as a trauma code s/p GSW to the mandible and right chest
- On physical exam
- GCS 15
- BP 130s/60s, 110s
- Decreased breath sounds on the right, single bullet hole in the 2nd intercostal space in mid clavicular line

- Pt becomes hypotensive 70s/40s and tachycardic 140s
- Pt is intubated, Femoral cordis placed
- Right chest tube placed
- Foley catheter placed
- 2 L of crystalloid infused via level I
- Packed RBCs transfused

www.downstatesurgery.org

- Pt responds to transfusion
- 200ml of blood is drained
- Post CT CXR taken shows significant hemothorax
- 2nd chest tube is placed
- Total 500 ml of blood drained
- Pt taken to CT scan to determine trajectory of GSW

www.downstatesurgery.org

- Despite adequate placement of chest tube, there is significant retained hemothorax, BP remains 130s/60s, with HR in 130s
- CT surgery is consulted
- Pt taken to the OR for Right Thoracotomy and Debridement of mandible fracture

- Injury noted to the pulmonary artery, 2.5L of blood evacuated
- Unable to maintain vascular control with suture repair
- BP drops to 70s/30s, O2 saturation drops to 80s
- Pneumonectomy performed

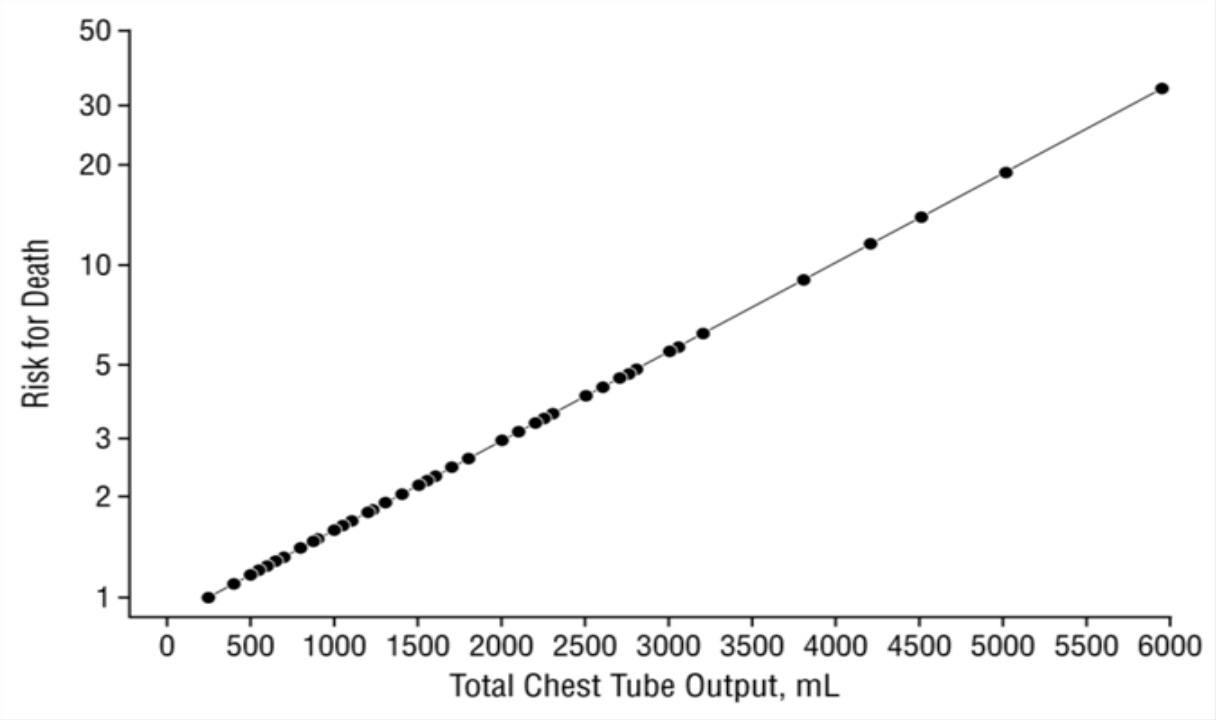
- POD#1 Bronchoscopy- bronchial stump intact, TTE showed Grade I diastolic dysfunction, pulmonary artery pressure 24mmHg
- POD#3 Chest tube removed
- POD#5 Pt had percutaneous tracheostomy placed
- POD#7 Mandible ext-fix with maxillary internal fixation, pt on trach collar

- POD#7-18 pt was treated with IV antibiotics for pneumonia, started on pureed diet
- POD#18-20 pt transferred to the floor and discharged home with VNS

Indications for Thoracotomy

- Shock or arrest with correctable intra-thoracic lesion
- High chest tube output. Initial output of 1500ml or 200ml per hour for initial 4 hrs
- Persistent (large) air leak
- Air embolism

www.downstatesurgery.org



Correlation between mortality and total chest tube output before thoracotomy. The mean (± SD) total output before thoracotomy was 1627 ± 945 mL. The mean (± SD) time to thoracotomy was 2.4 ± 5.4 hours. Risk for death is a logarithmic scale based on the assumption that risk for death at 250 mL is 1

Excerpta Medica

The American Journal of Surgery

The American Journal of Surgery 186 (2003) 620–624
Scientific paper

Surgical management of traumatic pulmonary injury

Joseph Huh, M.D.[a,b,*], Matthew J. Wall, Jr., M.D.[a], Anthony L. Estrera, M.D.[a], Ernesto R. Soltero, M.D.[a], Kenneth L. Mattox, M.D.[a]

[a]Michael E. Debakey Department of Surgery, Division of Cardiothoracic Surgery, Baylor College of Medicine, Ben Taub General Hospital, Herman Memorial Hospital, Houston VA Medical Center, Houston, TX, USA
[b]Houston VA Medical Center (112), 2002 Holcomb Blvd., Houston, TX 77030, USA

Manuscript received July 11, 2003; revised manuscript August 21, 2003

Presented at the 55th Annual Meeting of the Southwestern Surgical Congress, Tucson, Arizona, April 27–30, 2003

Abstract

Background: Surgical treatment of traumatic pulmonary injuries requires knowledge of multiple approaches and operative interventions. We present a 15year experience in treatment of traumatic pulmonary injuries. We hypothesize that increased extent of lung resection correlates with higher mortality.

Methods: Surgical registry data of a level 1 trauma center was retrospectively reviewed from 1984 to 1999 for traumatic lung injuries requiring operative intervention. Epidemiologic, operative, and hospital mortality data were obtained.

Results: Operative intervention for traumatic pulmonary injuries was required in 397 patients, of whom 352 (89%) were men. Penetrating trauma was seen in 371 (93%) patients. Location of the injuries was noted in the left side of the chest in 197 (50%), right side of the chest in 171 (43%), and bilateral in 29 (7%). Operative interventions included pneumonorraphy (58%), wedge resection or lobectomy in (21%), tractotomy (11%), pneumonectomy (8%), and evacuation of hematoma (2%). Overall mortality was 27%. If concomitant laparotomy was required, mortality increased to 33%. The mortality rate in the pneumonectomy group was 69.7%.

Conclusions: The majority of lung injuries occurred in males due to penetrating trauma. Surgical treatment options ranged from simple oversewing of bleeding injury to rapid pneumonectomy. Mortality increased as the complexity of the operative intervention increased. Rapid

www.downstatesurgery.org

Grade[a]	Injury Type	Description[b]
I	Contusion	Unilateral, <1 lobe
II	Contusion	Unilateral, single lobe
	Laceration	Simple pneumothorax
III	Contusion	Unilateral, >1 lobe
	Laceration	Persistent (>72 hours), air leak from distal airway
	Hematoma	Nonexpanding intraparenchymal
IV	Laceration	Major (segmental or lobar) air leak
	Hematoma	Expanding intraparenchymal
	Vascular	Primary branch intrapulmonary vessel disruption
V	Vascular	Hilar vessel disruption
VI	Vascular	Total, uncontained transection of pulmonary hilum

- Suture pneumorraphy
- Stapled pulmonary tractotomy
- Non anatomical wedge resection
- Pulmonary hilar twist
- Lobectomy
- Pneumonectomy

www.downstatesurgery.org

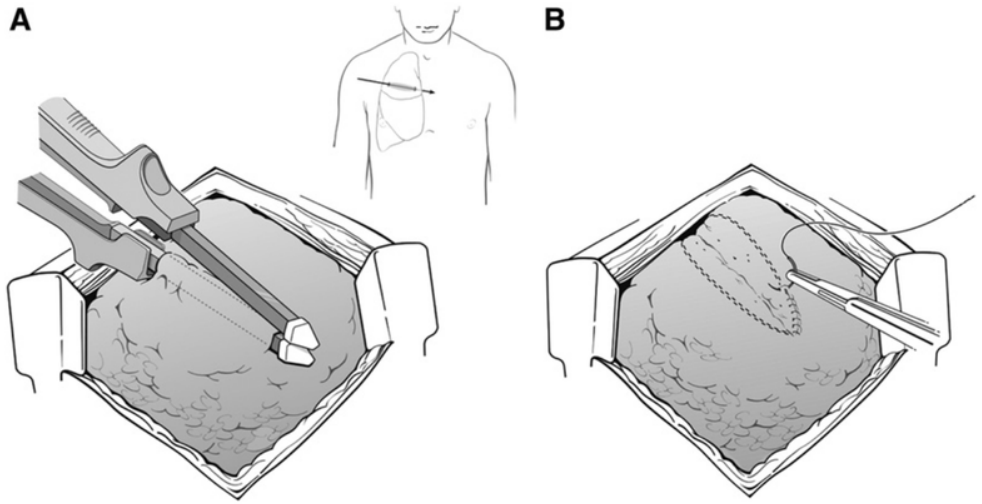


Fig. 3. Tractotomy for nonhilar injuries. (*A*) The principle of tractotomy is to open the tract of the bullet or knife wound (*inset*) so that larger interior vessels may be identified and ligated individually. (*B*) 3-0 polypropylene suture may be used to individually ligate the vessels or may be run along the length of the tractotomy. Oversewing penetrating lung injury is discouraged.

www.downstatesurgery.org

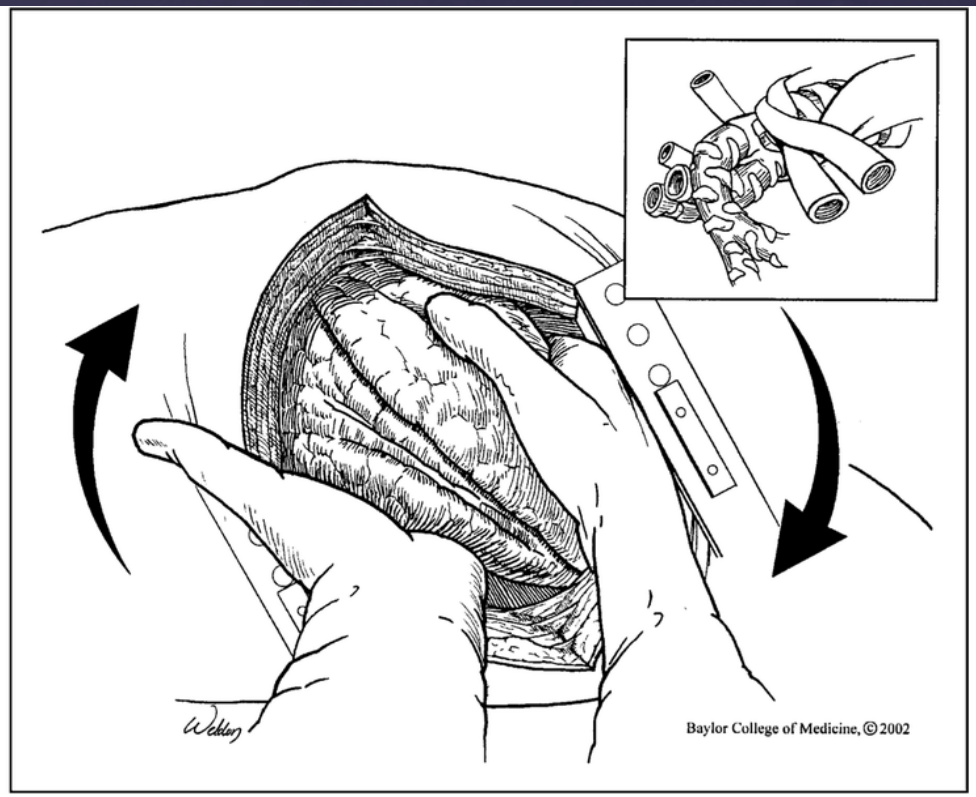


Fig. 1. Rapid control of pulmonary hemorrhage by pulmonary hilum twist.

Operative Management and Outcomes of Traumatic Lung Resection

Matthew J Martin, MD, Jerome M McDonald, MD, FACS, Philip S Mullenix, MD, Scott R Steele, MD, Demetrios Demetriades, MD, PhD, FACS

BACKGROUND: To analyze the presentation, injury patterns, and outcomes among a large cohort of patients requiring lung resection for trauma, and to compare outcomes stratified by the extent of resection.

STUDY DESIGN: Review of all adult patients undergoing lung resections in the National Trauma Data Bank. Patients were categorized by extent of lung resection; wedge resection, lobectomy, or pneumonectomy. Patient factors, injury data, and outcomes were compared between groups using univariate and multivariable analysis for the entire sample, and after excluding patients with severe associated injuries.

RESULTS: There were 669 patients who had a lung resection after trauma identified for an overall prevalence of 0.08%, with 325 undergoing wedge resection (49%), 244 had a lobectomy (36%), and 100 underwent complete pneumonectomy (15%). Blunt mechanism was associated with worse outcomes in terms of prolonged hospital stay, complications, disability, and a trend toward higher mortality (38% versus 30%, $p = 0.07$). Patients undergoing pneumonectomy had a higher mortality (62%) and more complications (48%) compared with patients undergoing lobectomy (35% mortality, 33% complications) and wedge resection (22% and 8%, all $p < 0.05$). After excluding patients with severe associated injuries (head, abdomen, heart, great vessels), there were 535 patients with "isolated" lung injury. There was again a stepwise increase in mortality by extent of resection, 19% for wedge resection, 27% for lobectomy, and 53% for pneumonectomy. Extent of lung resection remained an independent predictor of mortality for both the entire sample and for patients with isolated lung injury.

CONCLUSIONS: Lung resection is infrequently required for traumatic injury, but carries substantial associated morbidity and mortality. The extent of lung resection is an independent predictor of hospital mortality, even after exclusion of patients with severe associated injuries. The worst outcomes were seen after complete pneumonectomy. (J Am Coll Surg 2006;203:336–344. © 2006 by the American College of Surgeons)

www.downstatesurgery.org

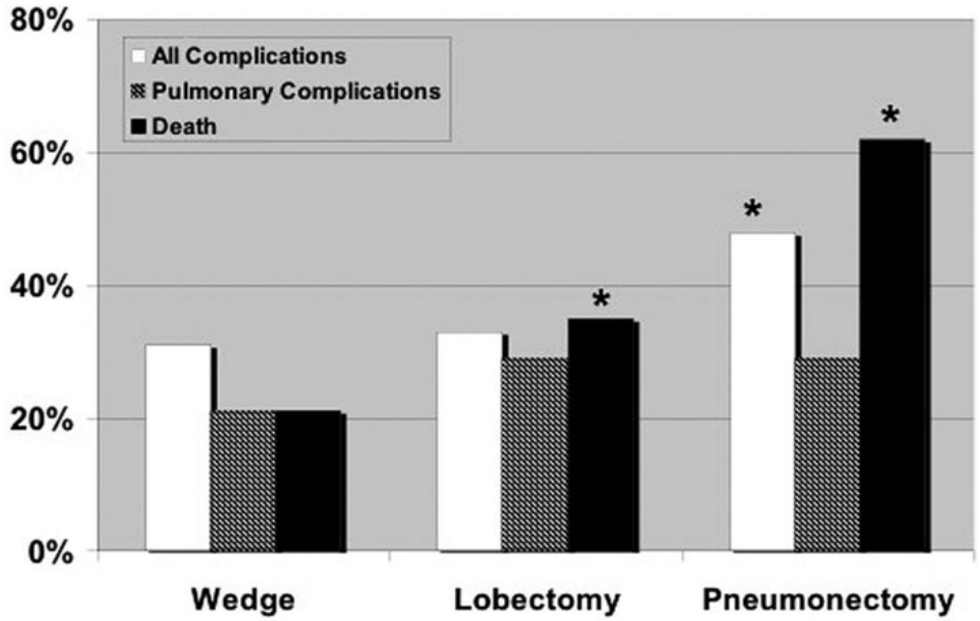


Figure 1. Comparison of death and complication rates by extent of lung resection. $p < 0.05$ (unadjusted) by pairwise chi-square with wedge resection as reference group.

www.downstatesurgery.org

Table 5. Outcomes by Extent of Resection for Patients with Isolated Lung Injury

Variable	Wedge (n = 270)	Lobectomy (n = 188)	Pneumonectomy (n = 77)	p Value
Mean hospital stay ± SD (d)*	23 ± 24	24 ± 24	22 ± 27	0.88
Mean ICU stay ± SD (d)*	11 ± 16	13 ± 18	11 ± 8	0.66
Mean ventilator ± SD (d)*	10 ± 17	11 ± 19	65 ± 200	0.01
Complications,† n (%)	62/230 (27)	46/148 (31)	19/43 (44)	0.08
Severe disability (FIM < 9), n (%)	8/219 (4)	7/137 (5)	1/36 (3)	0.75
Died, n (%)	51 (19)	51 (27)	41 (53)	< 0.001

FIM, Functional Independence Measure.
*Includes only survivors to discharge (n = 392).
†Includes only patients with a hospital length of stay longer than 48 h (n = 421).

- Most chest trauma can be managed with chest tubes
- The more lung tissue resected the higher the mortality and morbidity
- Early mortality post pneumonectomy results from right heart failure
- Pneumonectomy can be a viable option

Conclusion

www.downstatesurgery.org

- Scalea, TM, Dubose JA, O'Conner JV, chapter 25. Lung, trachea and esophagus in: Mattox KL, Moore EE, Feliciano DV, Trauma, 7th ed.
- Cryer, G. et al. Shock, Transfusion, and Pneumonectomy, death is due to right heart failure and increased plmonary vascular resistance. Ann Surg 1990; 212(2):197-201
- Matthew JM, Mcdonald J, Mullenix PS, Steele SR, Demetriades D. Operative Management and Outcomes of Traumatic Lung Resection. J Am Coll Surg 2006;203:336-344
- Huh J, Wall MJ, Estrera AL, Soltero ER, Mattox KL. Surgical Management of traumatic pulmonary injury. Am J of Surg 2003;186:620-624
- Meridith JW, Hoth JJ. Thoracic Trauma: When and How to Intervene. Surg Clin N Am 2007;87:95-118
- Karmy-Jones et al. Timing of urgent thoracotomy for hemorrhage after trauma: a multicenter study. Arch Surg. 2001 136(5):513-518
- Halonen-Watras J, O'Connor J, Scalea TM. Traumatic Pneumonectomy: A Viable Option for Patients in Extremis. Am Sur. 2011; 77(4);493-497

- 21 yr old male with GSW to the right chest. First wound is 2cm lateral to the right nipple. Second wound is at the tip of the right scapula. VS are HR 126, SBP 88. A right sided chest tube is placed. 1200ml of blood is drained. 2L of crystalloid is given. His total chest output 2 hours later is 2300ml. What is your next step in management?

- A.Chest CT
- B. Check CBC
- C. Thoracotomy
- D. Check ABG
- Admission to ICU for cardiac and pulse ox monitoring

- A 30 yr old male suffers a stab wound to the right chest, 3 cm inferior to the middle portion of the clavicle. Paramedics reported a weakly palpable pulse 5 min earlier in the ambulance. On admission no pulses are present, his pupils are reactive. What is the initial surgical approach?

- A. Median Sternotomy
- B. Right Clavicular Incision
- C. Right anterolateral thoracotomy
- D. Right posterolateral thoracotomy
- E. Left anterolateral thoracotomy