AORTIC TRANSECTION

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LEFT

Management

- Blood pressure control

  SBP< 100mmHg

- documentation/management associated injuries

  major intracranial/abdo bleed

  neuro status - ? paraplegia

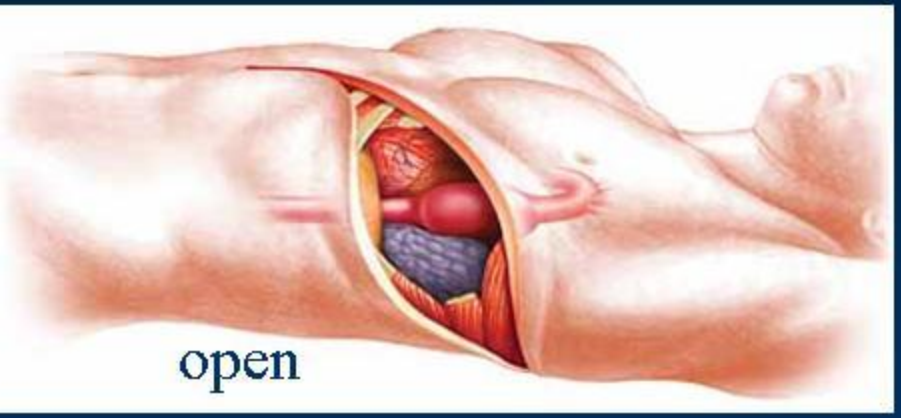
  cervical spine

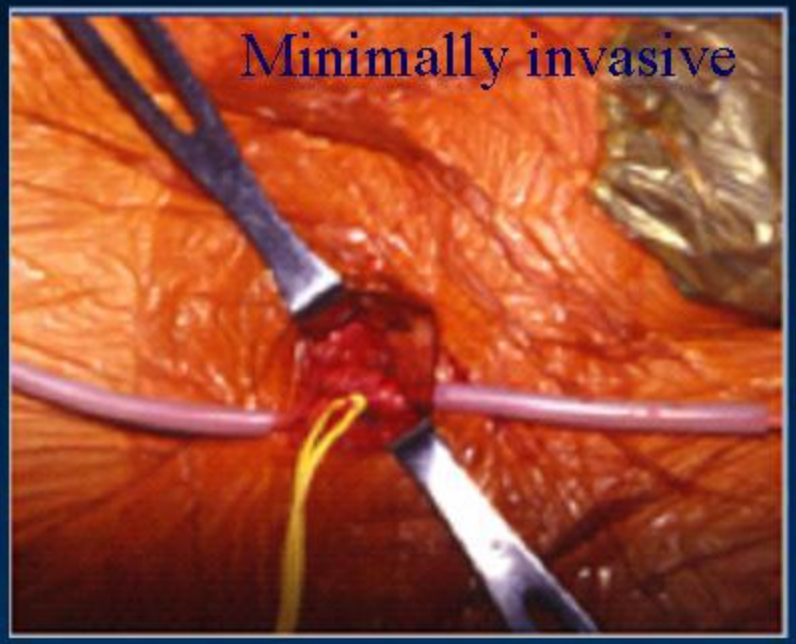
- timing of interventions

SURGICAL MANAGEMENT

EMERGENT??

DELAYED??





Surgical Technique -open

- Double lumen tube
- high postero-lateral thoracotomy 4th space
- clamp above subclavian, subclavian, decending aorta - minimise distance
- partial tear - primary repair
- primary repair not possible - interposition graft

fragile aortic tissue

Spinal Cord Protection

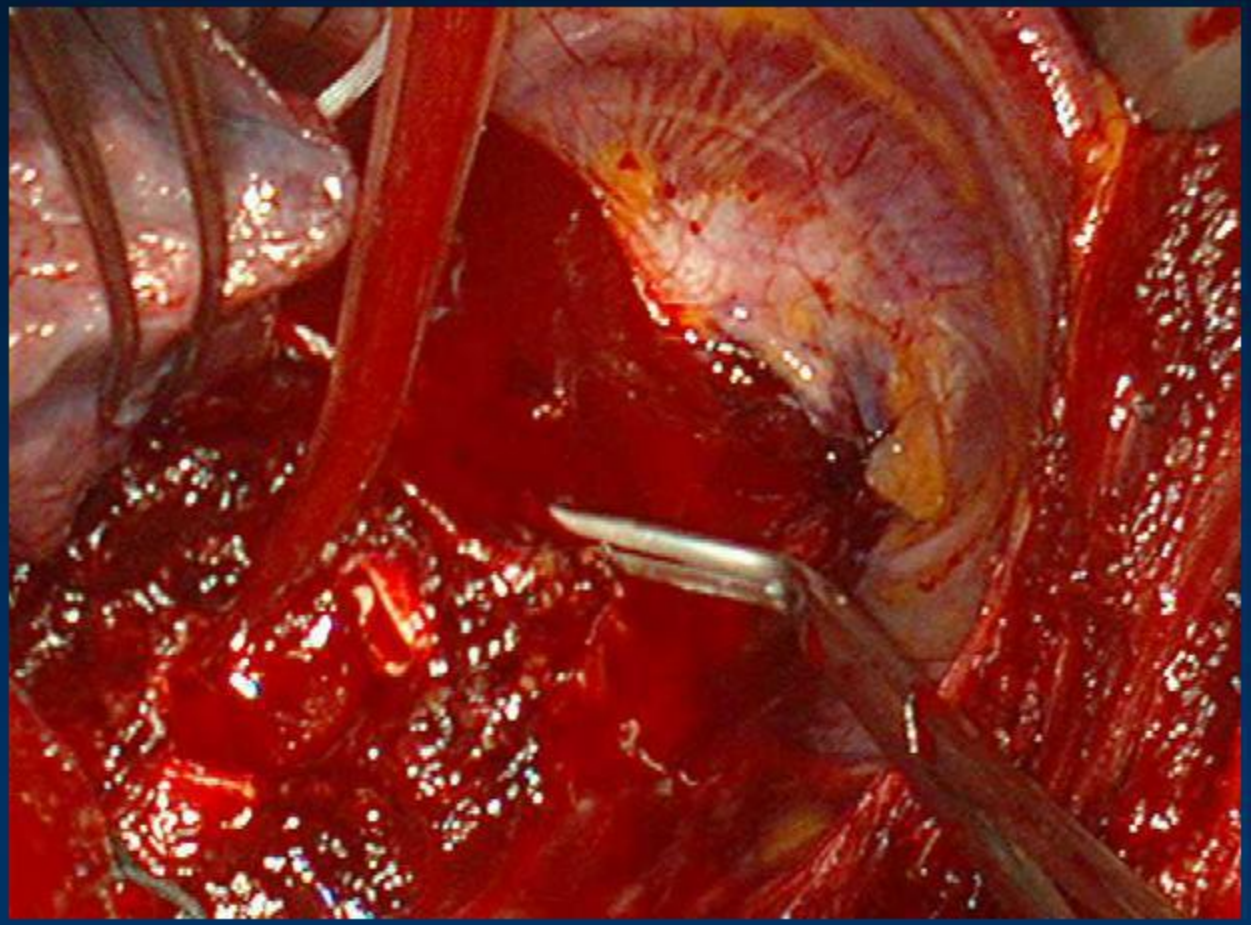
- Artery of Adamkiewicz *variable*
- Clamp and sew

vs

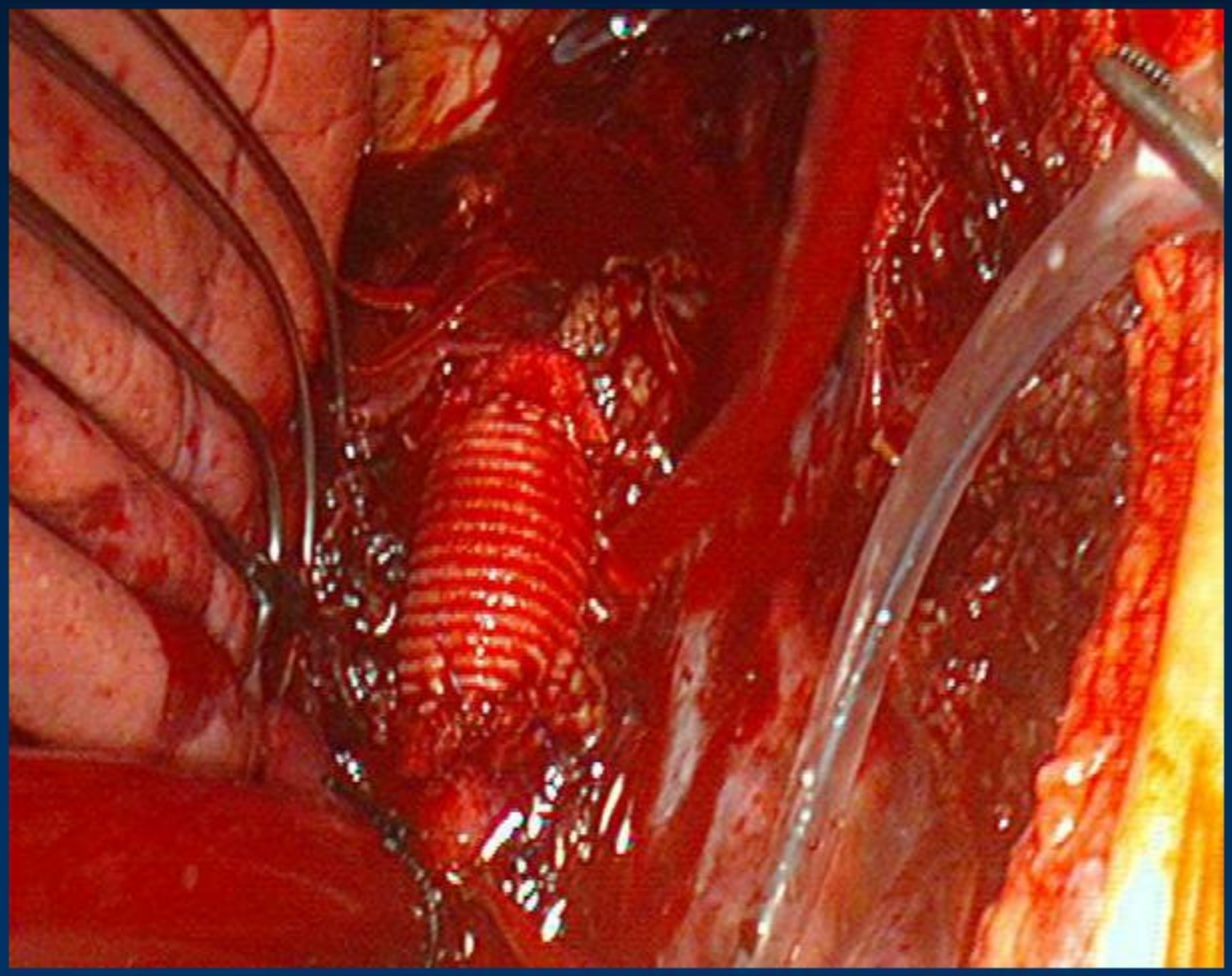
- Passive shunt GOTT
- active shunts Left Heart Bypass

  Partial CPB
- ENDOLUMINAL GRAFT

Performing Repair



Completed Repair



Traumatic Aortic Rupture: Twenty-year Metaanalysis of Mortality and Paraplegia.

von Oppell U.O. et al. ATS 1994; 58: 578-84

- Most reported series are small, relatively uncommon operation
- of the 1742 pts "salvageable" 1972-1992
- 179 died before opn 10.3%(0-62%)
- further 61 bleed out despite emergent opn 3.5%
- 117/ 1492 died intraop 6.7%
- 201 died post op 11.5%

Results According to Technique

	deaths(15.3%)	new paraplegia(10.2%)
S-AXCL	16	19.2
Shunt-Un	14.6	13.9
Shunt-AA	11.3	8.2
Shunt-LV	8.7	26.1
Passive	*12.3*	*11.1*
Active(no heparin)	*9.9*	
C-P	11.9	1.7
HFVAB	0.0	0.0
Active (Heparin/CPB)	18.2	2.4
		2.3
Total Perfusion	*15*	*6.1*

Influence of distal perfusion and clamp time on paraplegia

cantly greater than that of the perfused group at a cross-clamp time of 31 minutes ($p < 0.05$).

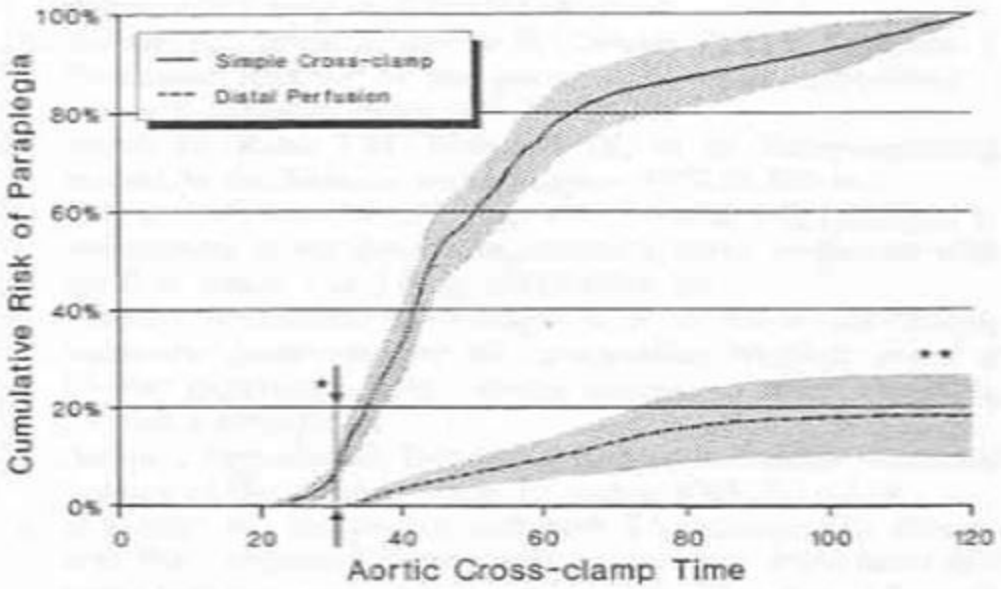


Fig 1. Cumulative risk of new paraplegia with respect to duration of aortic cross-clamping in patients undergoing surgical repair of acute traumatic rupture of the descending aorta, either with no augmentation of distal perfusion (simple cross-clamp group: n = 137) or with

Open Surgical Procedure

Endovascular Repair

CONCLUSION

- Spiral CT, angiography where equivocal
- aggressive BP control
- diagnosis = cardiothoracic emergency
- hypotensive and active bleeding head/abdo = priority over aorta
- stable but potentially progressive pathology = priority over aorta
- aorta = priority over injuries non life threatening but needing opn
- prohibitive risk pts - delay repair/ conservative
- technique of repair dependant on individual case
- where open - active distal perfusion

ENDOVASCULAR APPROACH


TAG
THORACIC ENDOPROSTHESIS
GORE

Endovascular Stent Graft in Traumatic Aorta

- Very attractive minimally invasive alternative
- Technically safe & feasible
- Allows avoidance of:
  - Large, physiologically debilitating incisions
  - major heparinization
  - Aortic cross clamping & prolonged distal Hypotension → significant reduction in paraplegia

Other Advantages of Endovascular Stenting

Allows safe management of cases

– traditionally considered delayed management better option

- Greater feasibility of repair in acute phase – enables earlier management of this preventing in-hospital ruptures/bleed

Potential/Theoretical Disadvantages

- Relatively new technique & technology
- Long-term fate/durability of these grafts unknown
- L Subclavian artery needs to be covered in
  - large majority → Arm ischaemia ??
    → Vertebral artery ?? Ischaemia
- Endoleaks/migration

Deployment System

Deployment sleeve releases
(starting from center)

Endoprosthesis opens rapidly
(accurate / no foreshortening)

Deployment Knob
(unscrew / steady pull)

Early (30-day) outcome EUROSTAR Registry

	Atherosclerotic aneurysm (n = 249)		Aortic dissection (n = 131)		False anastomotic aneurysm (n = 13)		*Tritransected aorta*	
	n	%	n	%	n	%	n	%
Technical success	217	87.1	116	88.6	12	92.3	48	96.0
Intraoperative complications								
Device-related	39	15.7	3	2.3	6	45.1	6	12.0
Arterial	6	2.4	1	0.8	—		6	12.0
Complications from operation to discharge								
Neurologic	17	6.8	3	2.3	1	7.7*	3	6.0†
Paraplegia or paresis	10	4.0	1	0.8	—		—	
Stroke	7	2.8	2	1.5	—		1	2.0
Systemic	72	28.8	46	35.1	2	15.4	16	32.0
Endoleak								
Proximal	12	4.8	2	1.5	1	7.7	—	
Midgraft	4	1.6	2	1.5	—		—	
Distal	3	1.2	2	1.5	—		—	
Perfusion from side branches	4	1.6	2	1.5	—		—	
30-Day mortality	26	10.4	11	8.4	1	7.7	3	6.0

#4:

- Diagnosis:
  - Thoracic rupture
  - Emergency laparotomy and splenectomy
  - Angiogram
- R/ urgent stentgrafting

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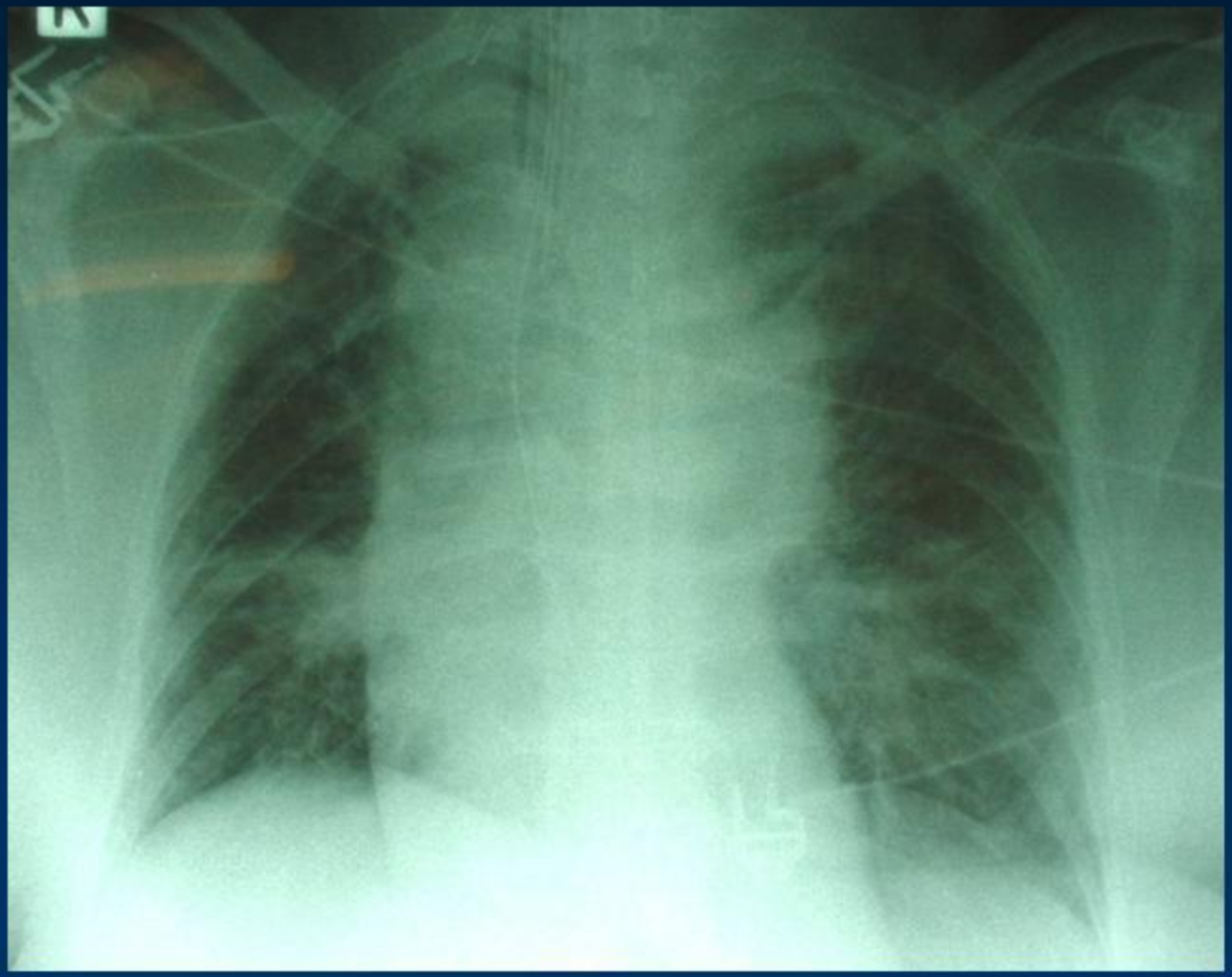
INCIDENCE

- Blunt trauma - deceleration
  - compression
  - direct injury

- estimated 20% all MVA deaths due to
  - ? declining
  - older patients
- major associated injuries

- relatively uncommon operative repair

#4:



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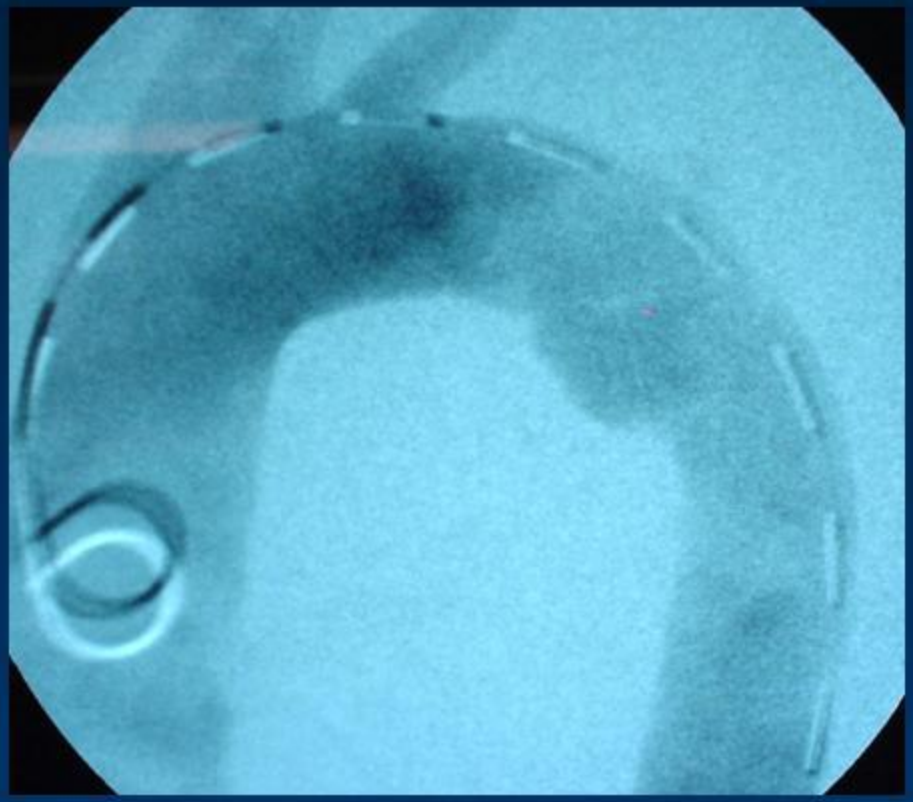

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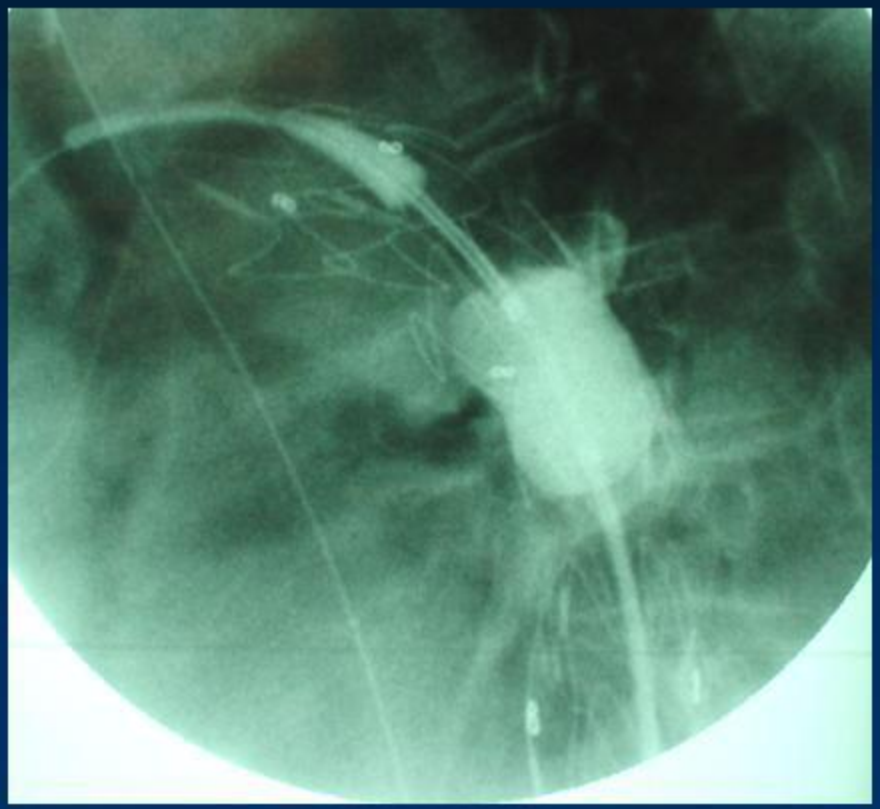
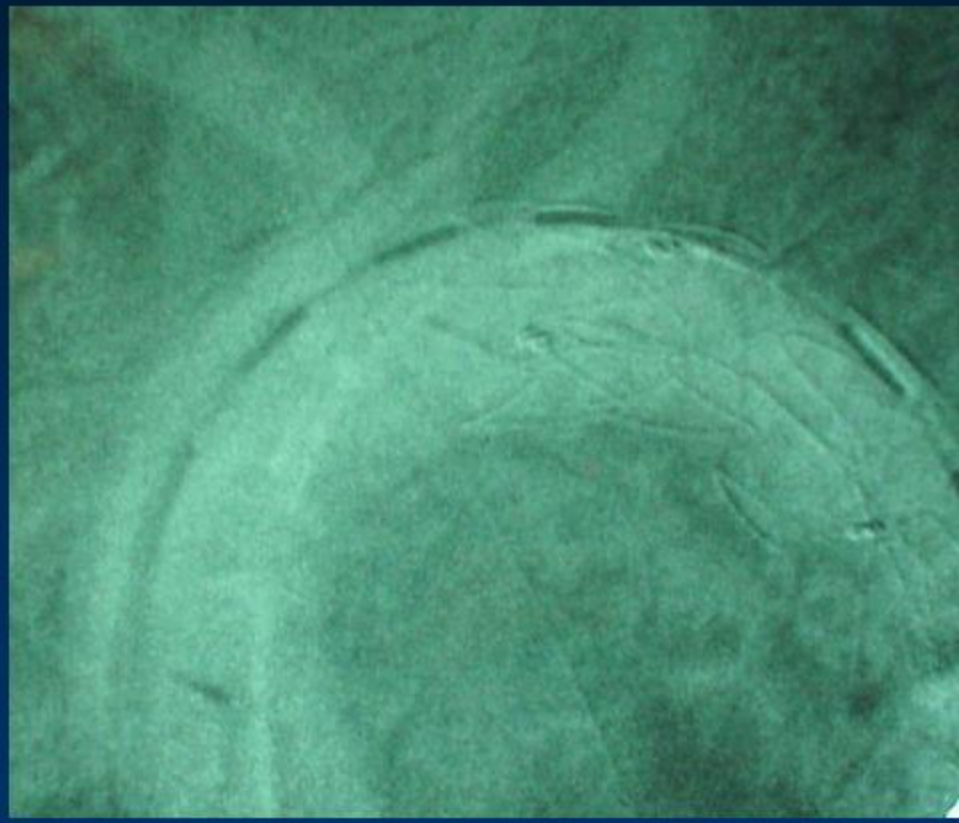




#5:

- Diagnosis:
  - Thoracic aortic rupture
  - associated with liverrupture, small bowel rupture and femurfractures
- R/ delayed thoracic stentgraft

#5:

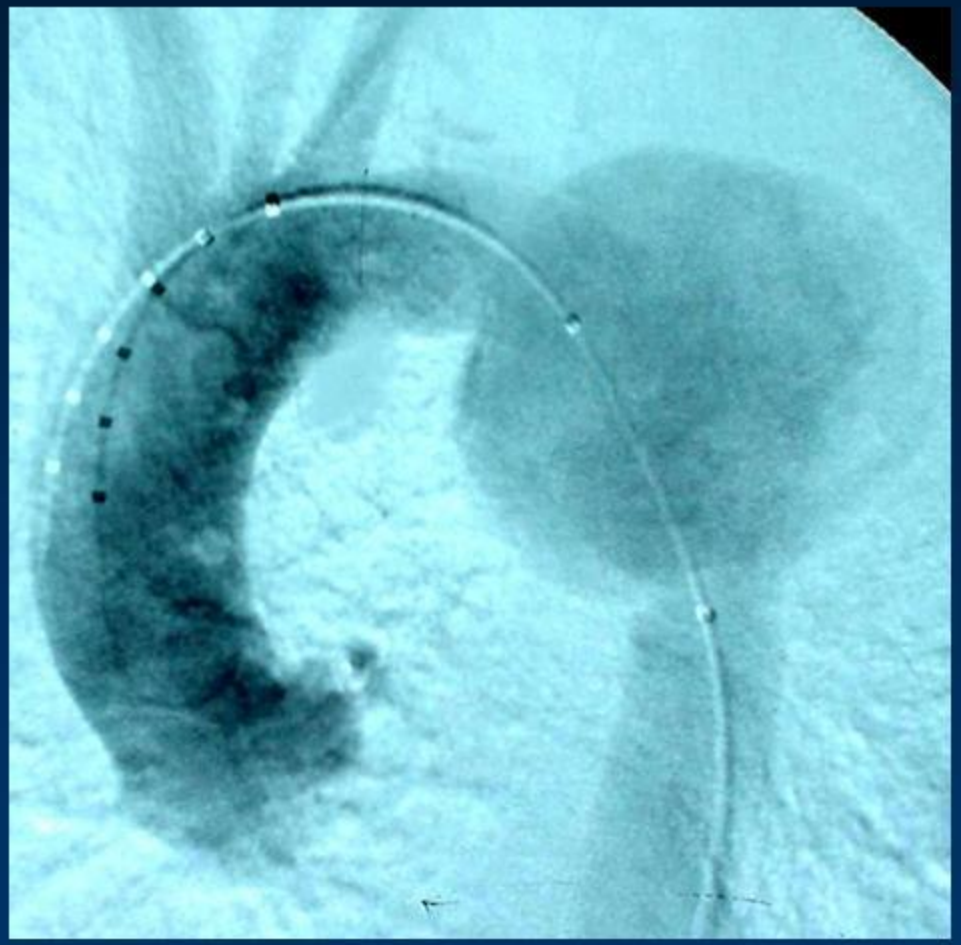
#5:

#6:

- Diagnosis:
  - Pseudoaneurysm
  - 20y. After thoracic rupture with successfull surgical repair
  - Admitted electively, becoming symtomatic

- R/ urgent repair

#6:



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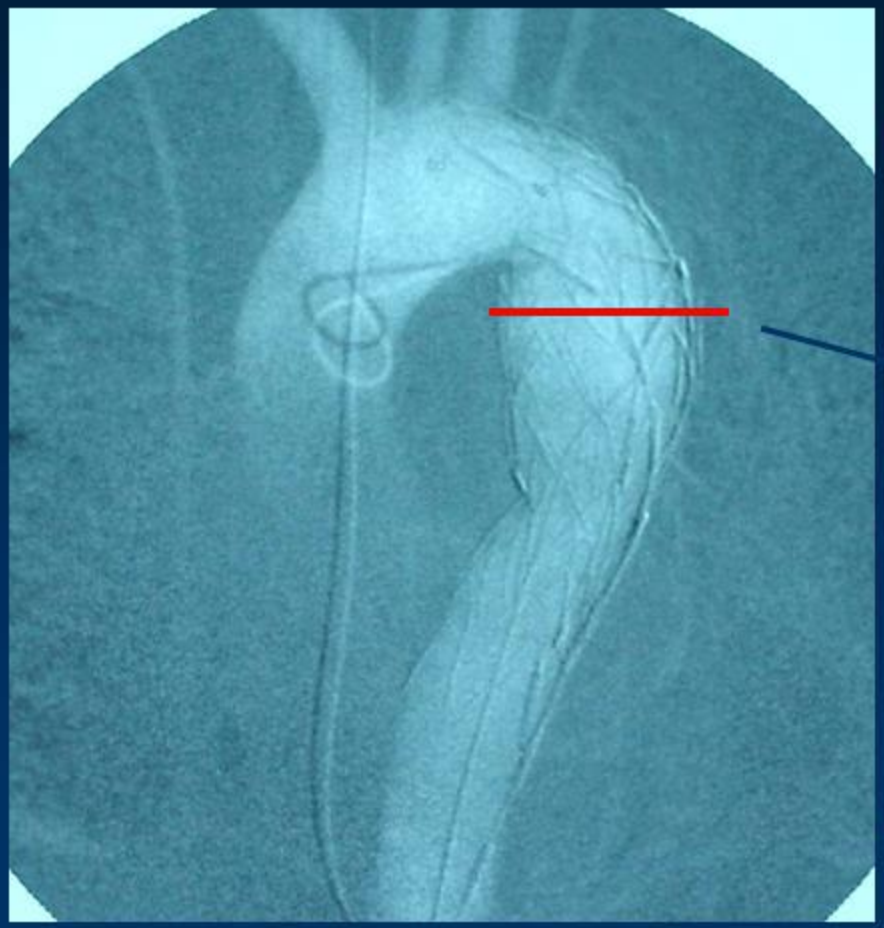
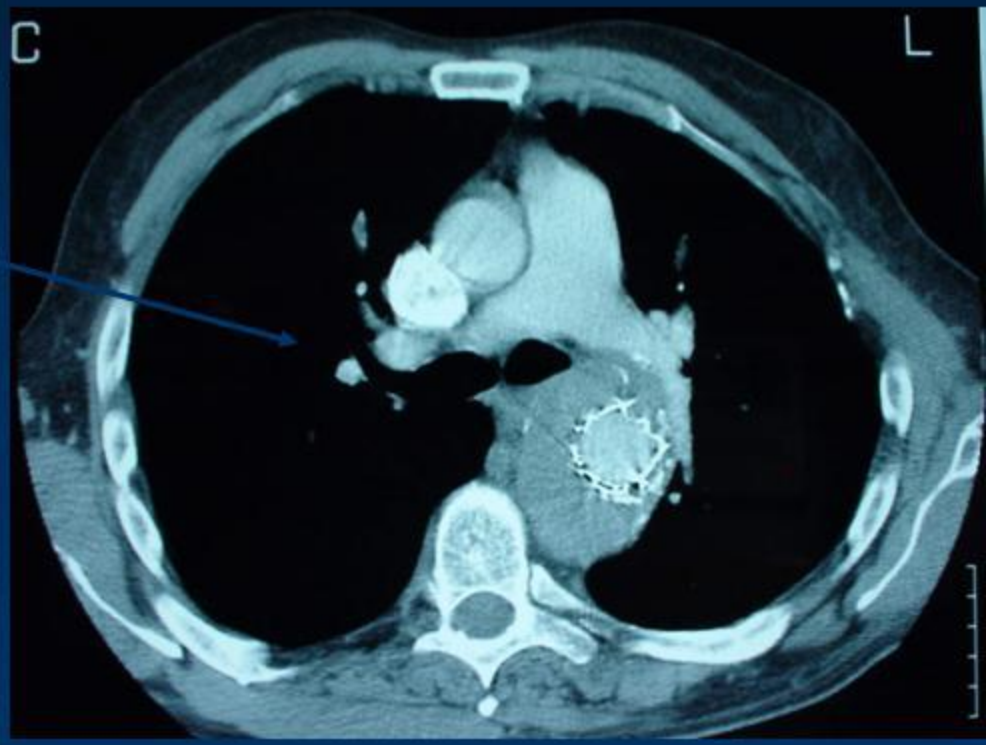
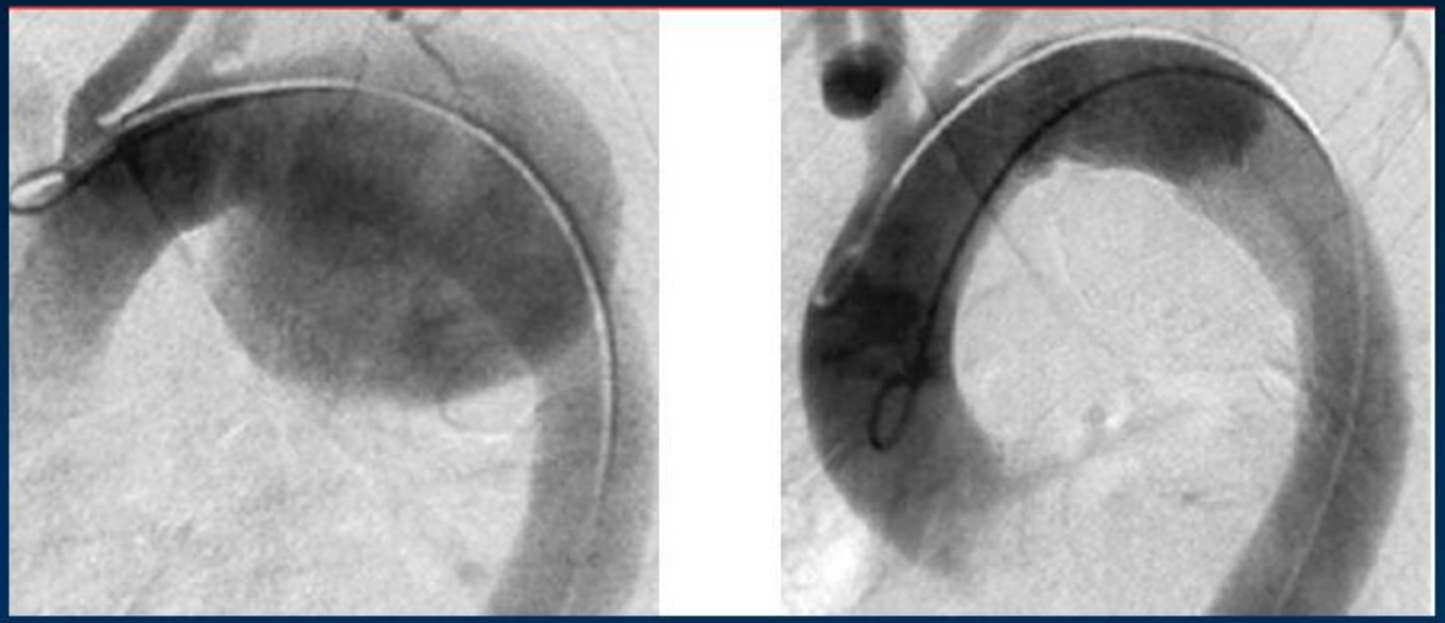






Aortic injury in vehicular trauma.

Williams JS et al. ATS 1994:57;726-730

- 530 post mortems. 105 aortic injuries in 90 victims
- site of tear/transection
  - 65% prox descending
  - 14% ascending and arch
  - 12% distal descending
  - 9% abdominal aorta
- associated injuries
  - 78% multiple rib fractures
  - 61% liver lacerations
  - 42% head injuries
  - 42% first rib fractures
  - 36% splenic lacerations
  - 34% heart lacerations
  - 28% sternal fractures
  - 26% cervical spinal fractures

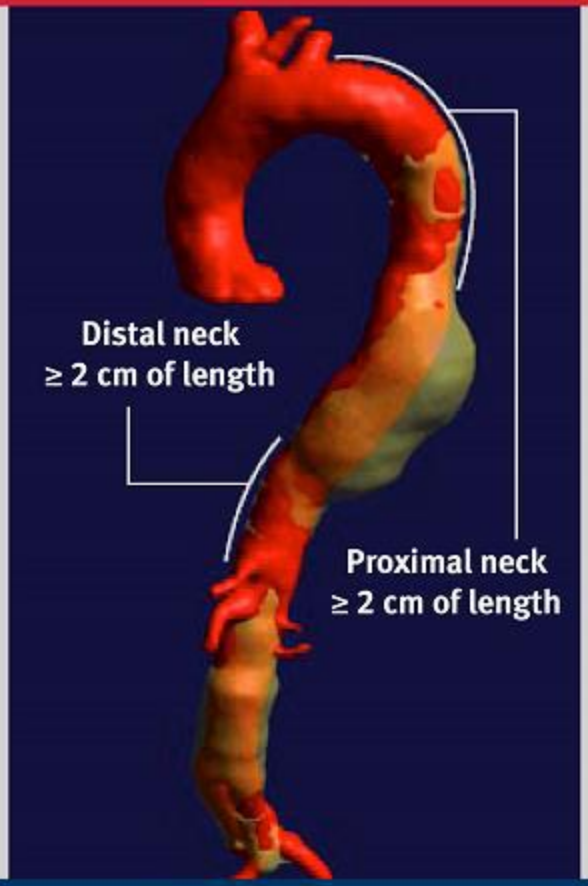
Conclusion

Endovascular Stent-Grafting

- Attractive minimally invasive alternative
- Long-term durability unknown
- Allows greater feasibility in multi-trauma patients


Where
thoracic
aortic therapy
is going.

US Pivotal Trial Design



Specific INCLUSION criteria:

- Aortic morphology meets IFU guidelines
  - Aortic diameter 23-37 mm
  - 2 cm healthy proximal neck
  - 2 cm healthy distal neck
- Able to comply with protocol requirements

Specific EXCLUSION criteria:

- Inability to compensate for taper with multiple devices
- Significant thrombus at proximal or distal landing zones
- Planned occlusion of the left carotid or celiac arteries
- Respiratory insufficiency precluding thoracotomy

TIMING OF REPAIR

- *Historical* emergent theatre

- recent papers have questioned this approach

- "…Although good results are reported by those who advocate delaying repair by a few days, no evidence currently validates delaying the repair of aortic rupture beyond the time required for the evaluation and treatment of other emergency conditions…"

Blunt trauma to the Heart and Great Vessels

Pretre R, Chilcott M. N Eng J Med 1997; 336:9, 626 - 632

Passive Shunt

- 8 - 10 mm heparinised tube - *GOTT*
- difficult to determine flows
- no heparin
- *arch to distal descending aorta*
- double pledgetted pursestrings

? Sufficient flows for adequate distal perfusion

Surgical Technique

- Double lumen tube
- high postero-lateral thoracotomy 4th space
- clamp above subclavian, subclavian, decending aorta - minimise distance
- partial tear - primary repair
- primary repair not possible - interposition graft

fragile aortic tissue

Left Heart Bypass

- LA/FA Bypass

- systemic heparin/ standard circuit
- Heparin bonded circuit/ no systemic hepari
- *LA/PA to descending aorta/ femoral artery*
- cell saver
- can add oxygenator/heat exchanger to circuit
- flows 1.2l/m^2 , MAP > 60mmHg lower body
- MAP > 90mmHg upper body.

Partial CPB

- Full heparinisation
- same cannulation as L. Heart Bypass
- add reservoir to circuit - blood/air interface
- easier return of shed blood
- option of converting to circ arrest

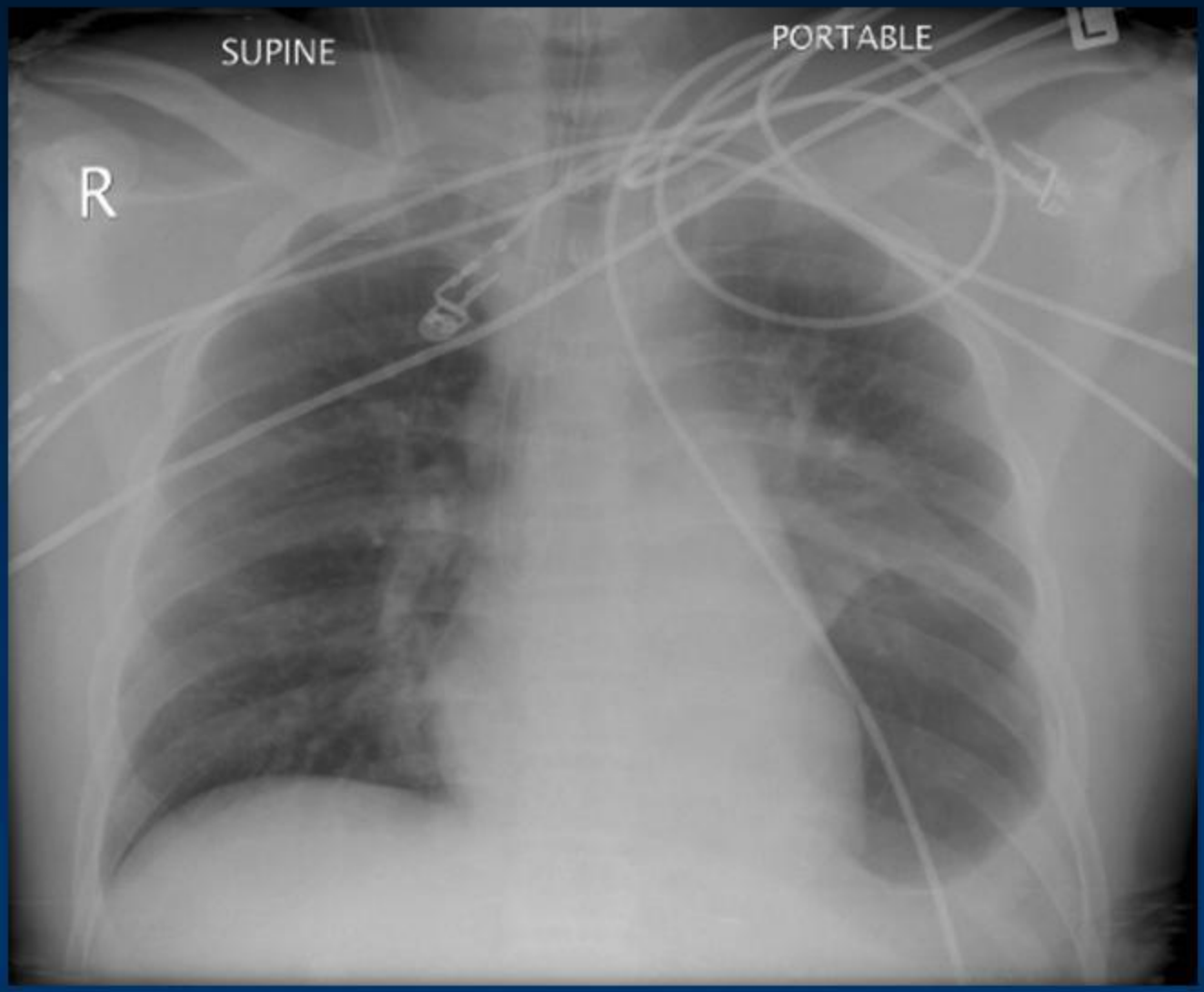
NATURAL HISTORY

- Majority dead at scene

- previous paper
  - 94% dead within first hour
  - 99% dead within 24 hours

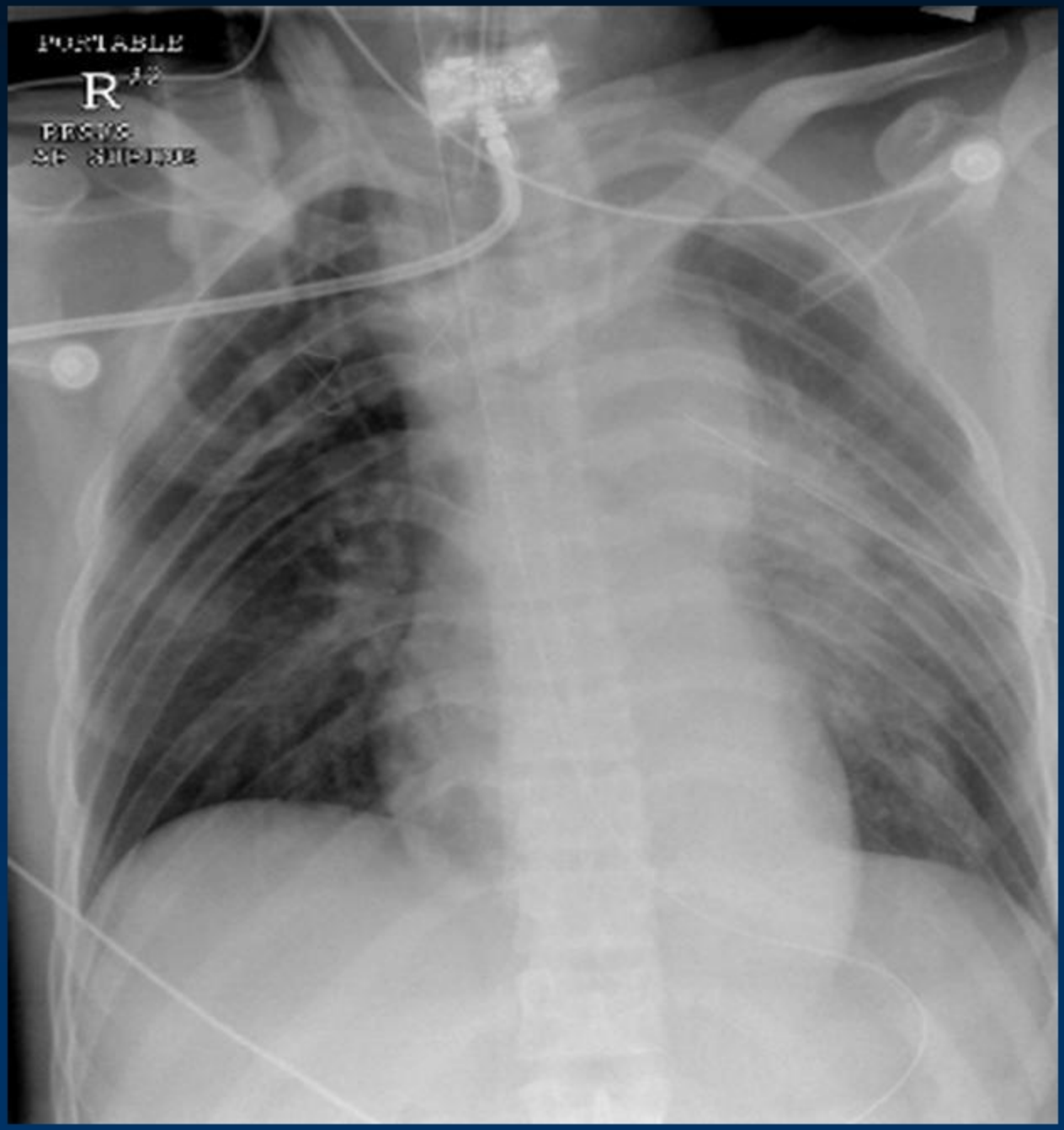
? What happens to those admitted to hospital

Transection Images



DIAGNOSIS

- Spiral CT with contrast +/- 3 D reconst.
  - diagnose injury
  - define site of injury - determines approach
  - no role for emergency OT with "blind" approach
  - helpful to exclude cervical spine injury
- aortography where equivocal
- TOE has been used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