Anaesthetic risk with Anterior Mediastinal Masses: Respiratory and CVS concerns

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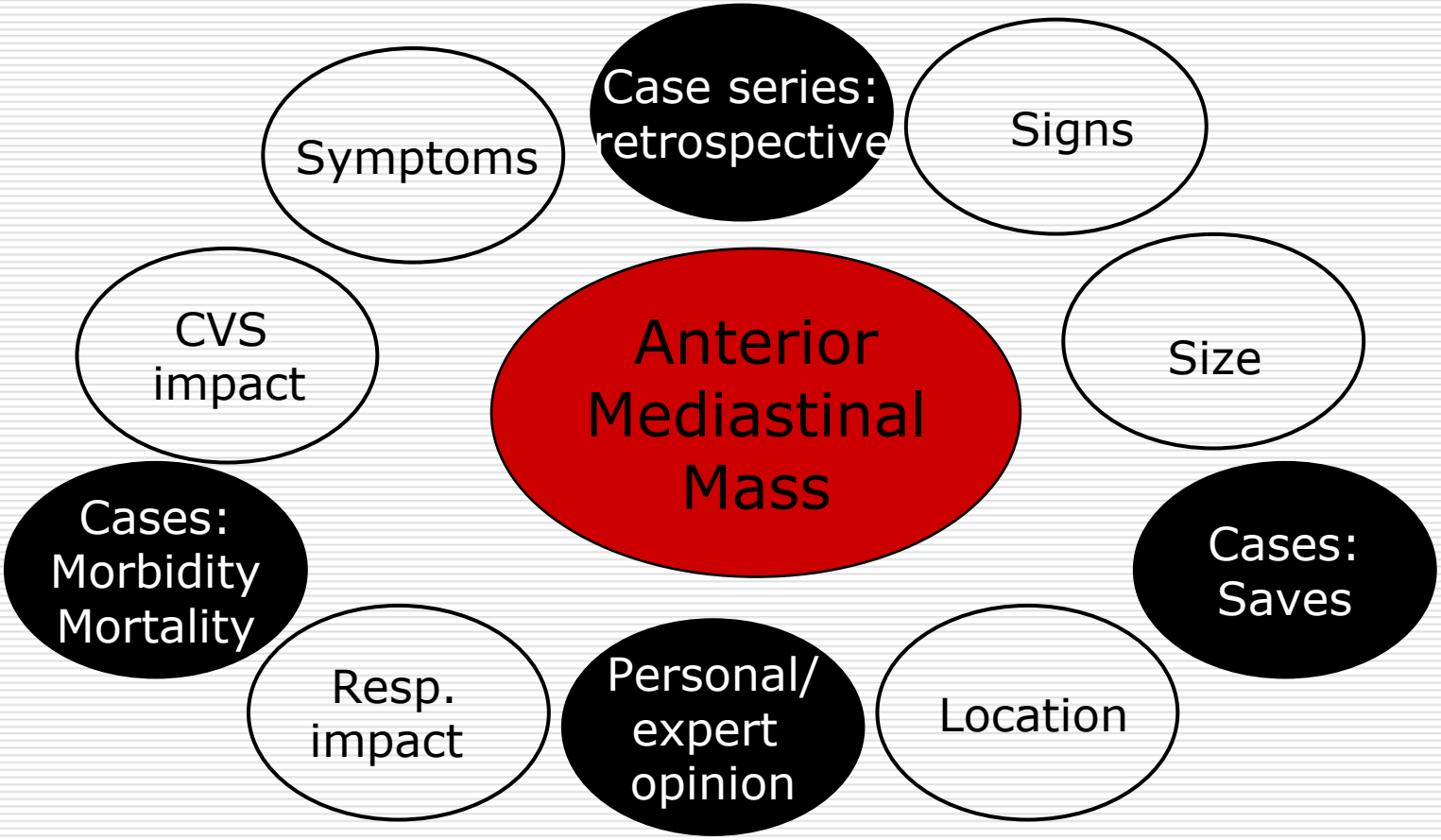
Anaesthetic Risk: Information overload



Today's objectives

- Case series- and what they tell us
- "Living" anatomy review
- CVS concerns- hidden problems
- Why things go bad with anesthesia
- Looking back to the future- learning from an unfortunate case.

Surgical perspective

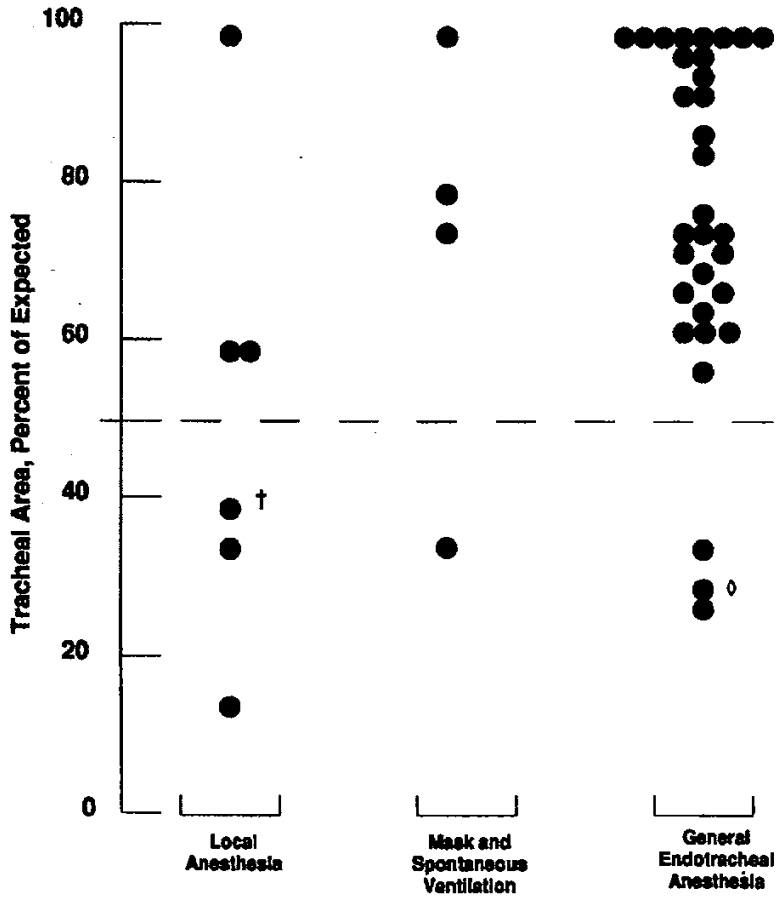
Perger L, Lee EY, Shamberger RC
J Ped Surg (2008) 43,190-97

- *Children with anterior mediastinal masses are at risk for airway compromise. This can be exacerbated by supine position and induction of general anesthesia. General anesthesia should be avoided in patients with tracheal cross-sectional area (TCA) or peak expiratory flow rate (PEFR) less than 50% of predicted for age and sex. Patients with less respiratory compromise can generally safely undergo general anesthesia*

CT scans: Tracheal compression and complications: n=42

- Minimal correlation between symptoms and tracheal CSA
- Both pts with orthopnea had CSA <35%
- No anaesthetic complications when CSA >50%
- But….. Preselection bias!

Shamberger RC et al 1991



Anaesthetic perspective: Resp

Hack HA, Wright NB, Wynn RF

Anaesthesia 2008,63, 837-46 n= 56

- Poor relationship between clinical signs and tumour size or tracheal compression on CT scan
- 20% complication rate (easily managed)
- 5% serious complications(rapid response to avoid disaster)
- Peri-operative respiratory complications were confined to patients with an isolated tracheal cross-sectional area < 30% normal or < 70% + bronchial compression.
- Stridor: only sign that predicted anaesthetic complication

Anaesthetic perspective: CVS

Hack HA, Wright NB, Wynn RF

Anaesthesia 2008,63, 837-46 n= 56

- Syncope/LOC: 2pts
- 29/56 CTs showed evidence of cardiovascular pathology
- 6/13 cardiac echo's showed pericardial effusion, vessel compression
- Except for SVC obstruction, CVS symptoms and signs were uncommon.
- Incidence of CVS complications was low (1 pt)

Anaesthetic perspective

Stricker PA, GurnaneyHG, Litman RS

J Clin Anes 2010, 22,159-63 *n=46*

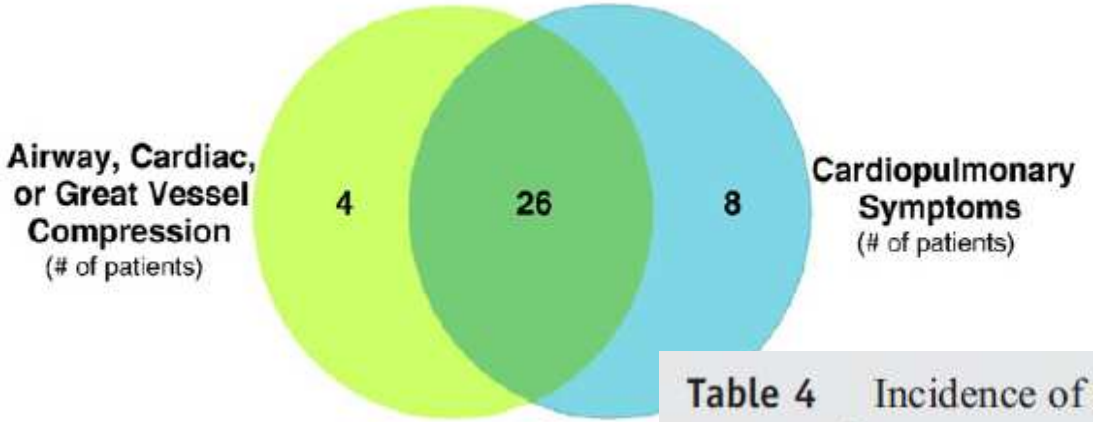


Table 4 Incidence of tracheobronchial and cardiovascular compression

Tracheal compression or deviation:	Number of patients/Total
Severe compression (>50%)	3/45
Moderate compression (20% to 50%)	3/45
Mild compression (0% to 20%)	12/45
No deviation/compression	27/45
Great vessel/cardiac compression: Present	24/45
Absent	21/45

Echocardiography in children with anterior mediastinal masses:

- 41% (16/39) significant ‘distortion of heart and great vessels’
- 23%(9/39) pericardial effusion
  - All had ‘impaired cardiac function’

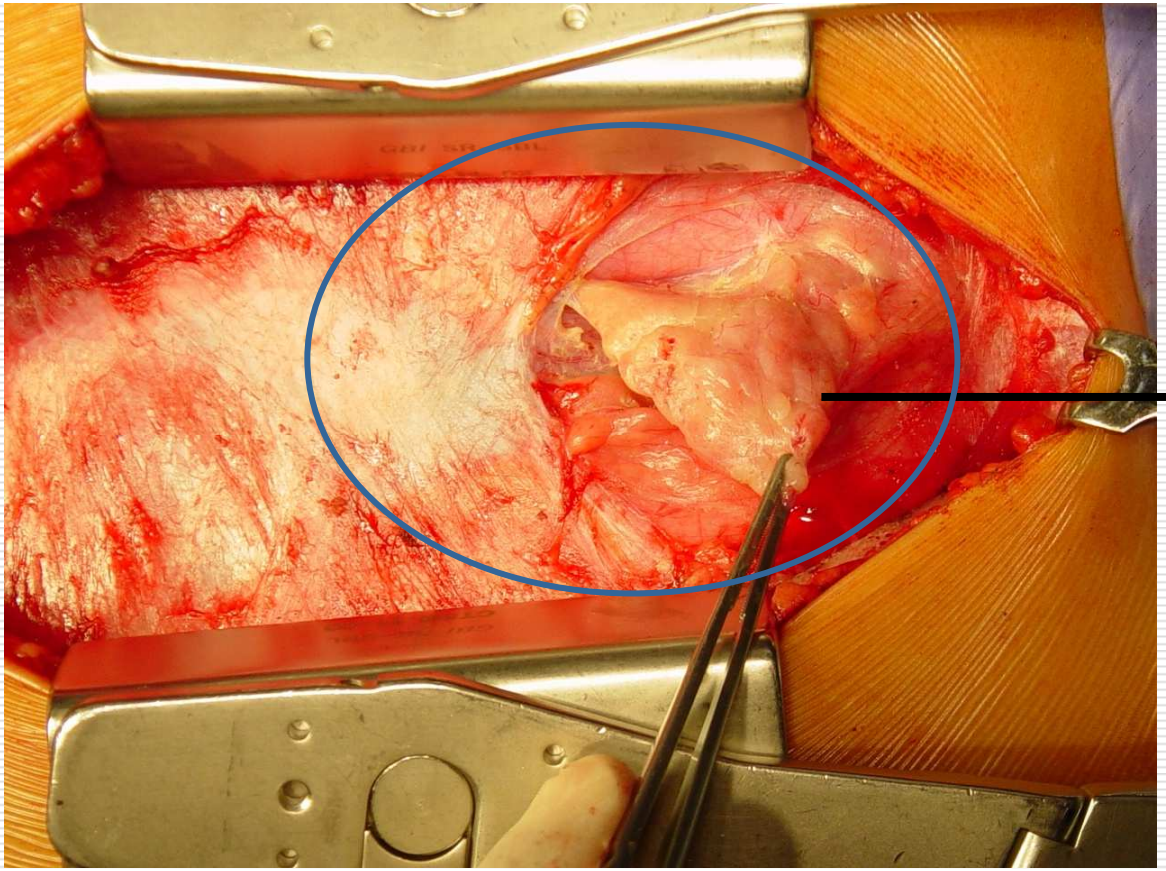
- No attempt at correlation with symptoms, tumour size or tracheal compression

King DR et al 1997

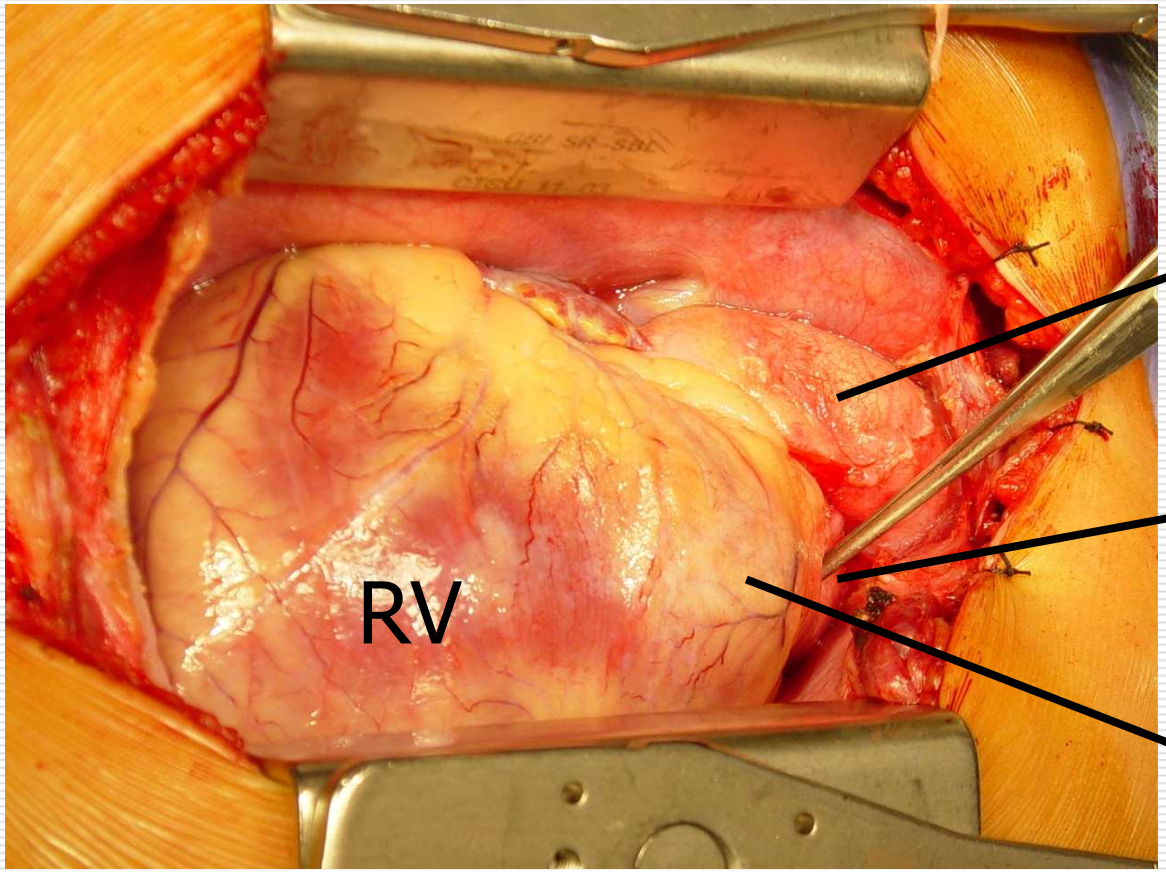
Sinister symptoms & signs with Anterior Mediastinal Masses

- Orthopnoea:
  - Most common reported symptom with adverse events
- Wheezing: Distal airway involvement
- Stridor: proximal airway obstruction
- Syncope: decreased cardiac output
- Upper body oedema/vein distension: SVC obstruction
- Systolic murmer: RVOT/PA compression

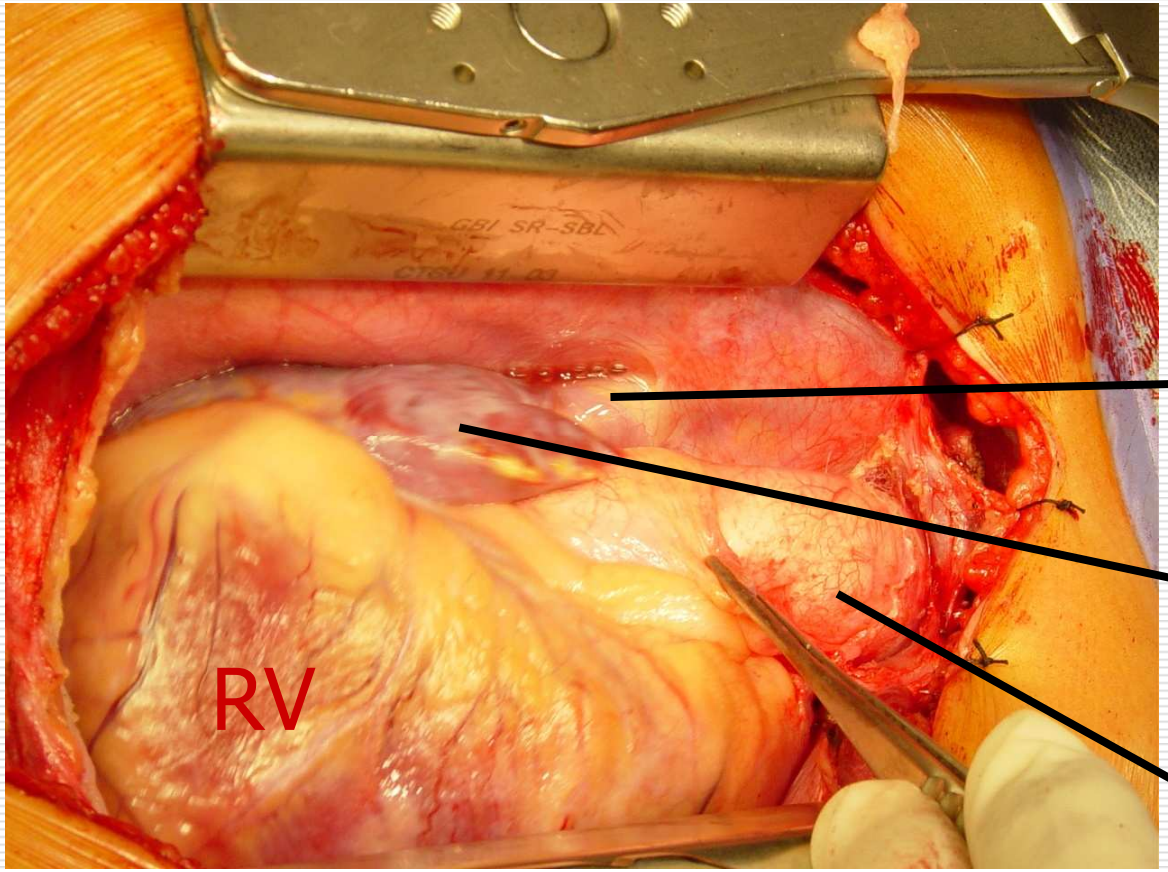
Anterior mediastinum



Anterior mediastinum



Anterior mediastinum



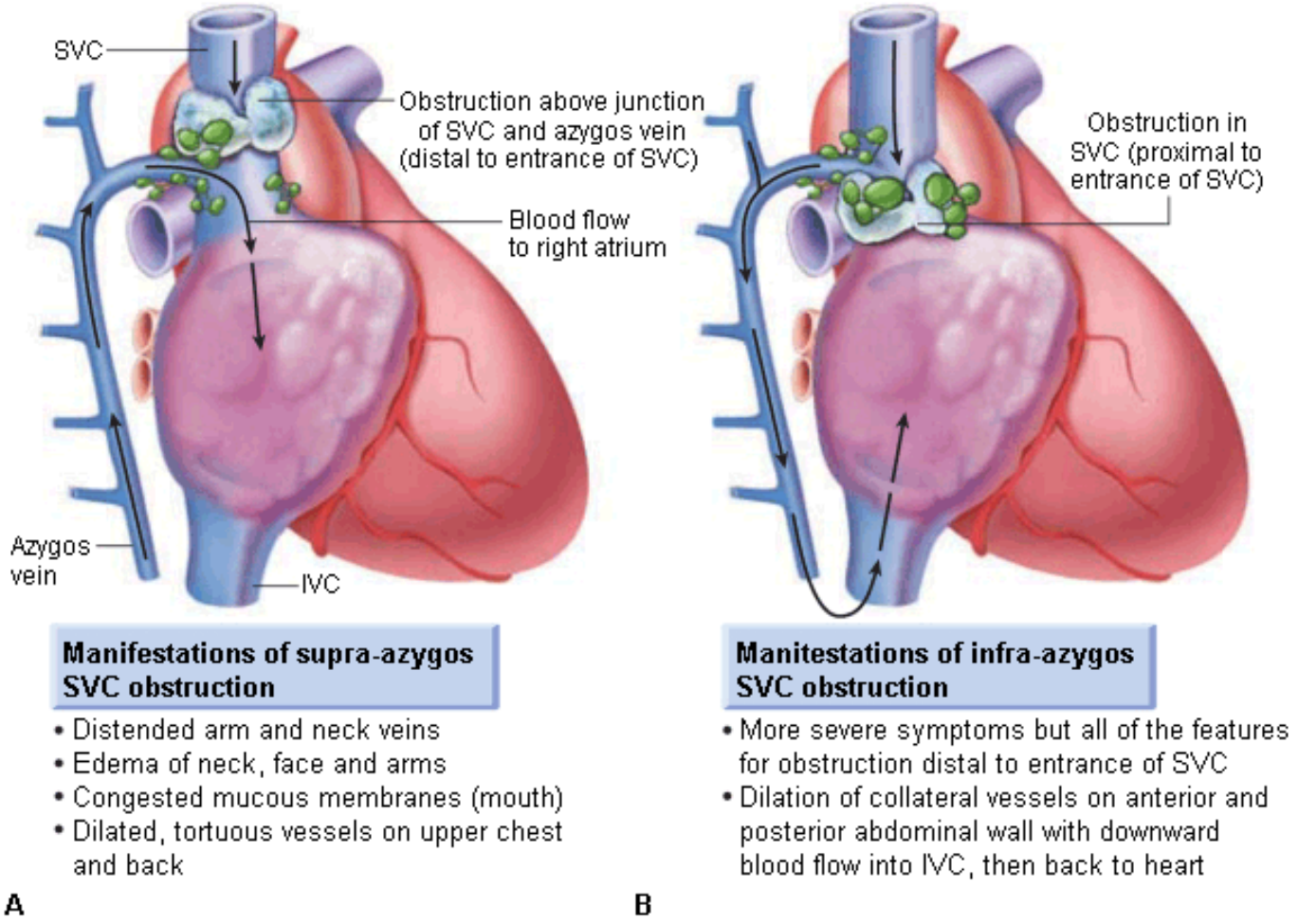
Anterior mediastinum: key anatomical points

- R sided lesions likely to affect the SVC
- L sided lesions more likely to affect RVOT/PA
- Azygos vein enters SVC at level of tracheal bifurcation
- Pulmonary artery/RVOT only likely to be involved with tumours extending distal to carina
- R atrial compression also likely in tumour causing RVOT signs

Things to worry about: problem list

1. Proximal airway obstruction
2. Distal airway compression
3. SVC compression/obstruction
4. PA compression/obstruction
5. RVOT/RV compression/obstruction
6. Cardiac compression/pericardial effusion

SVC compression- not always a problem?



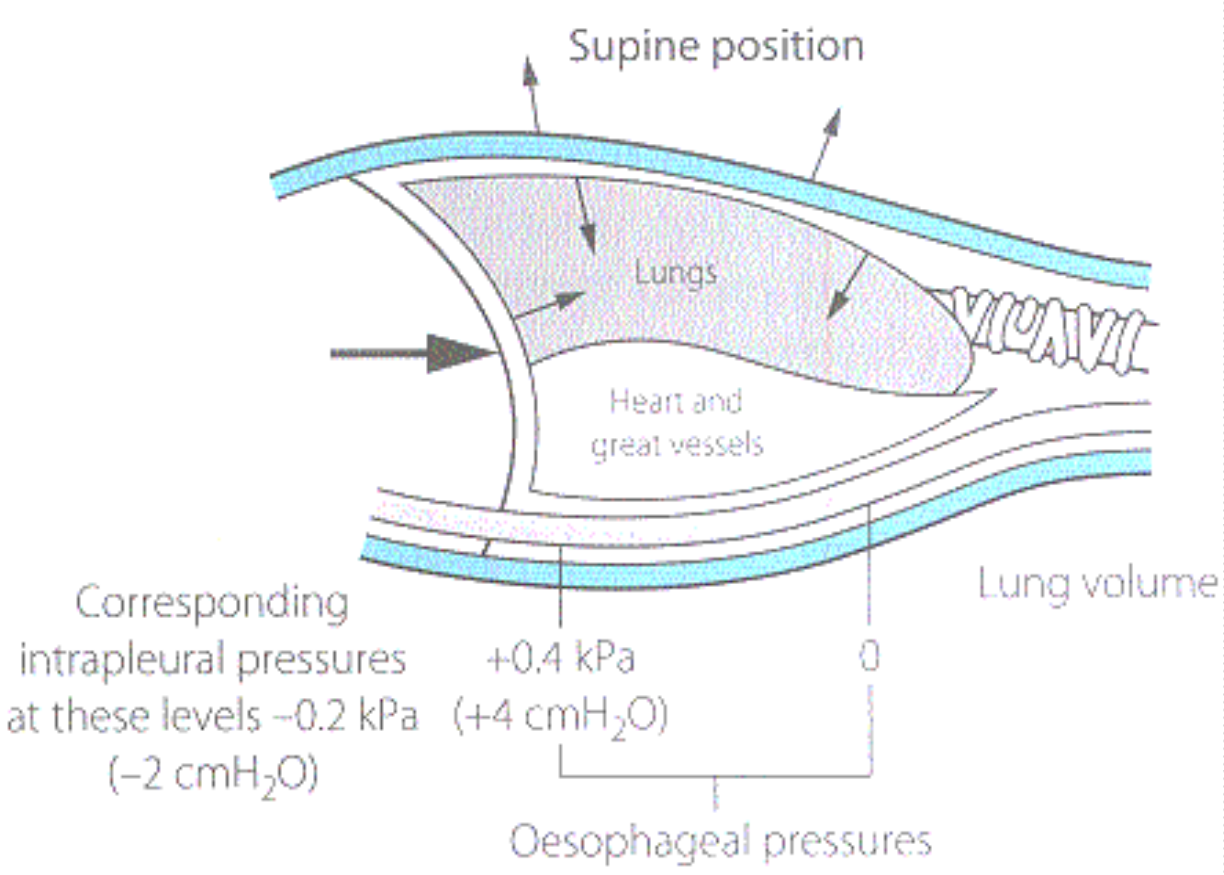
Case reports: CVS mortality

Symptoms	Problem	Cause(compression)
O Co S Cy	ineff. CPR	PA LMB peric eff.
O Co S	ineff. CPR	PA PV peric inf.
O Co Cy	ineff. CPR	PA
O S	ineff. CPR	(no PM)
O Co St	ineff. CPR	Cardiac Trachea
O St	ineff. CPR	SVC and Trachea

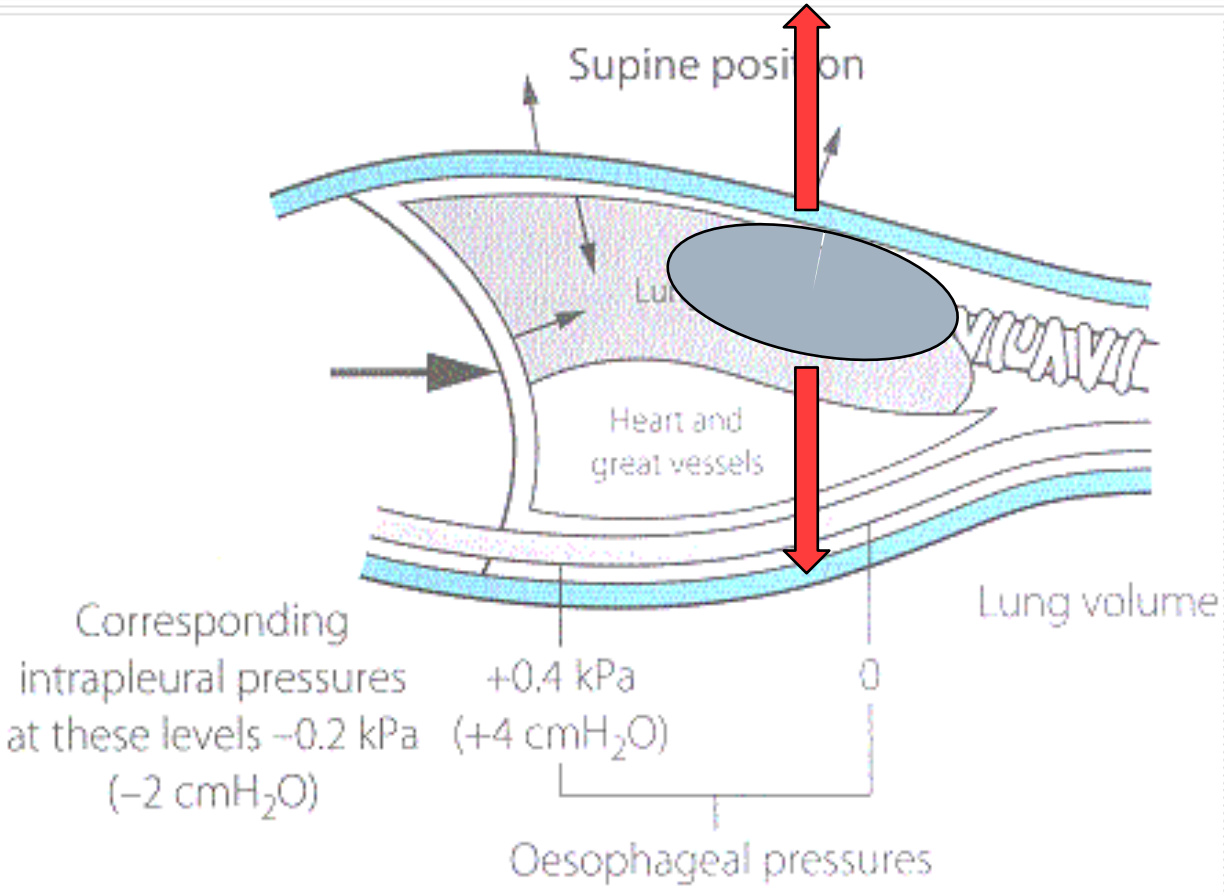
Key Points

- Anterior mediastinal masses may affect cardiovascular function as well as causing tracheo-bronchial compression.
- This may occur due to:
  - SVC obstruction
  - PA/RVOT compression
  - Pericardial infiltration/effusion
- If clinical deterioration occurs from cardiovascular causes, conventional CPR is unlikely to be effective

Thoracic contents and anaesthesia

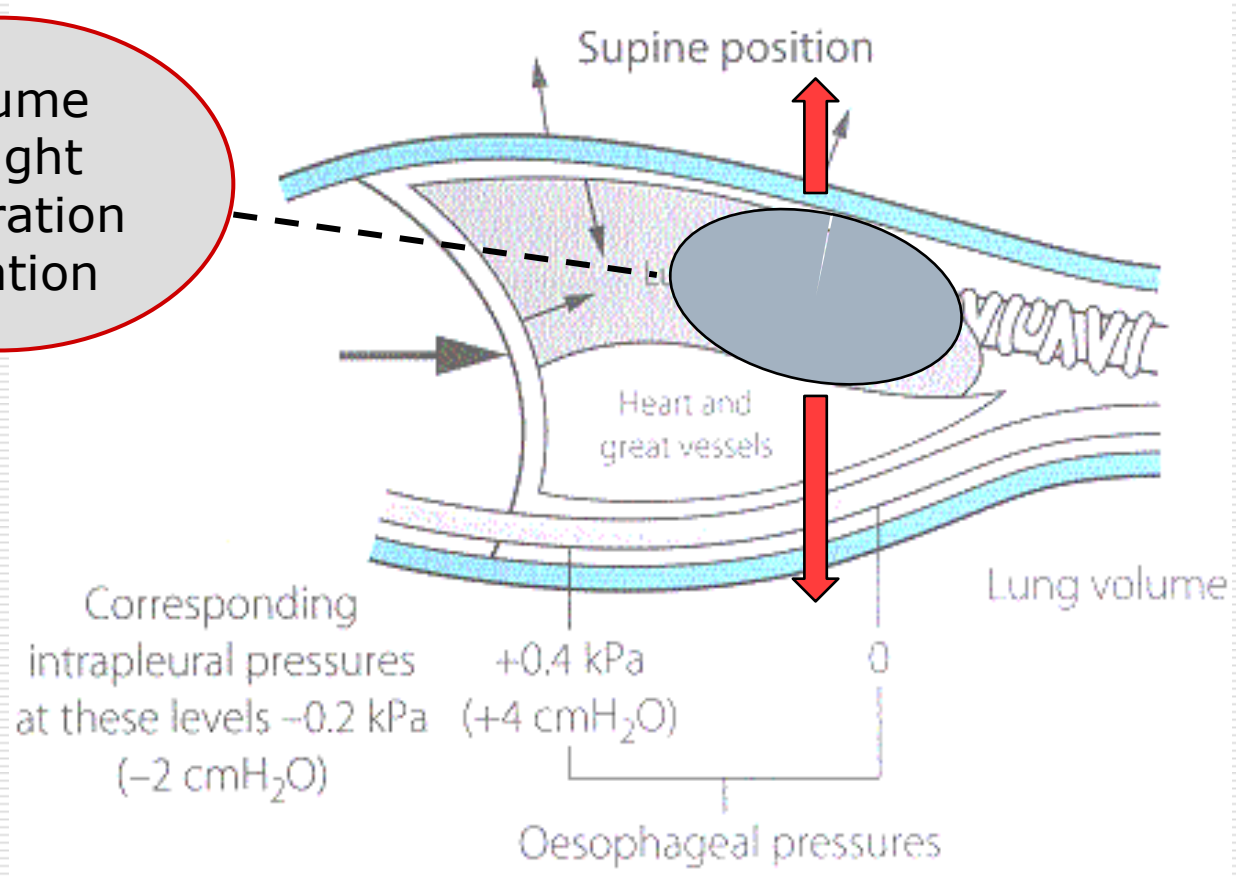


Thoracic contents: Supine awake

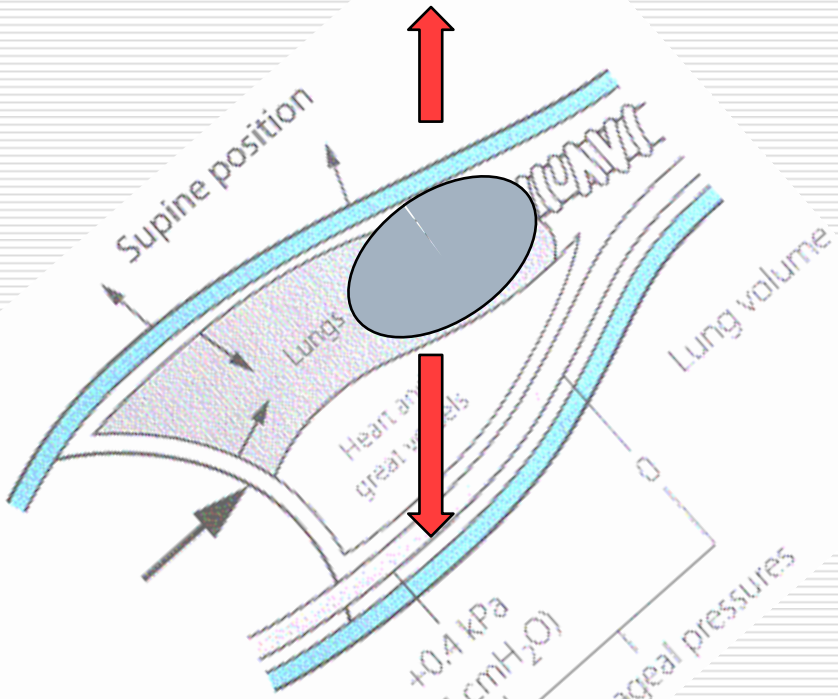


Thoracic contents: Supine Anaes

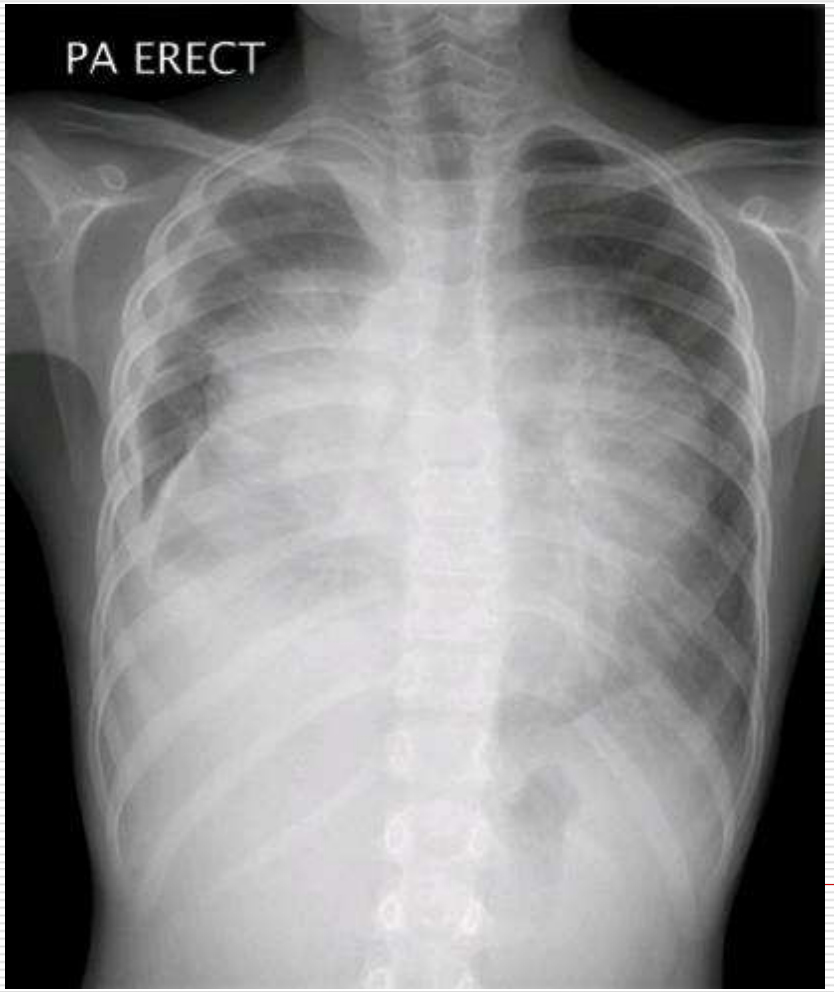
Volume
Weight
Infiltration
Location

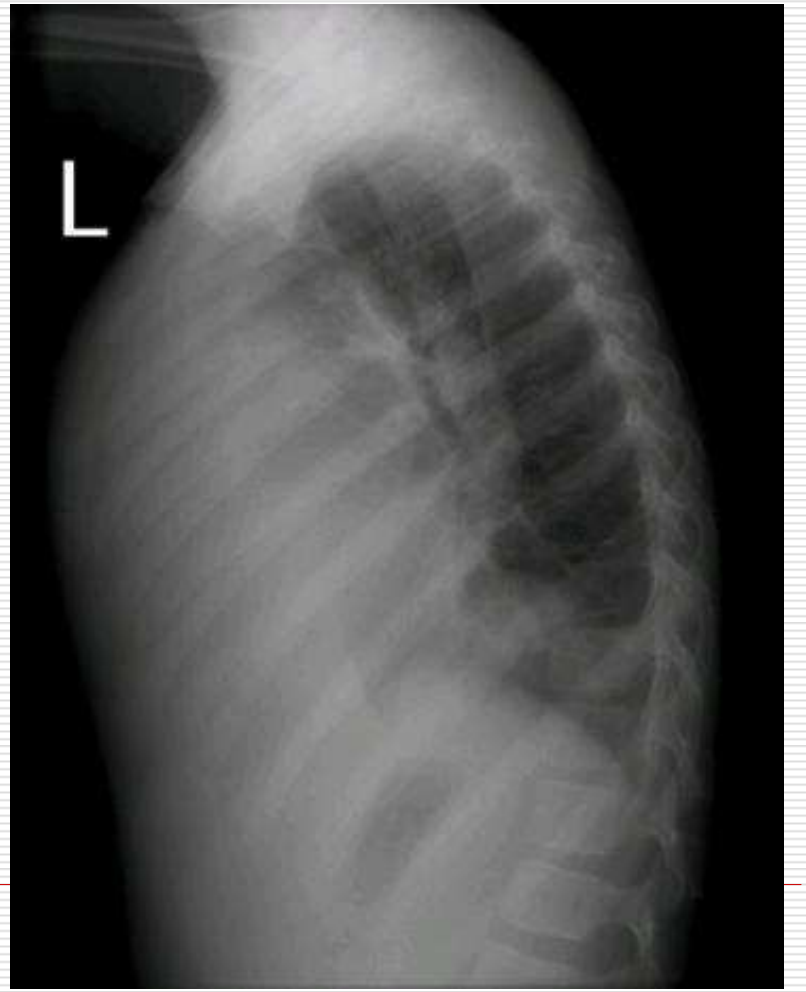


Thoracic contents: Fowler Anaes



- 9-year-old girl, previously well
- 5 weeks lethargy, dyspnoea, weight loss
- Initial diagnosis: mycoplasma?
- Blasts on FBC in Japan
- Parents declined further management
- Homeopathy and Complan from Germany
- First seen at Starship on the previous day
- Reluctantly agreed to be admitted


PA ERECT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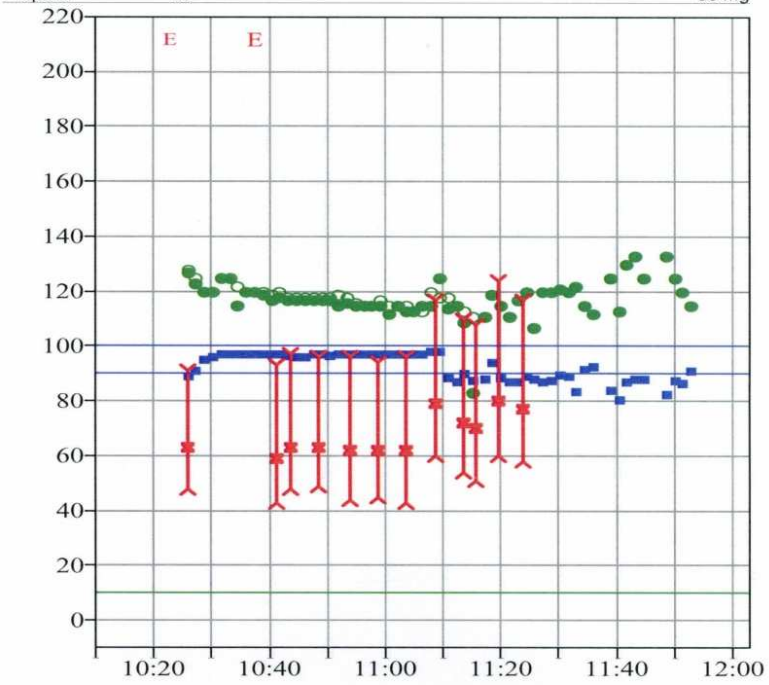
Pre-op management

- CXR and bloods – no other investigations
- No mention of SVC syndrome
- Commenced steroids + hyperhydration
- Listed for BMA, LP and PICC line
- Not referred to anaesthetist pre-op

Assessment in pre-op

- Comfortable, well-saturated sitting up
- 'Cannot breathe' supine - OK on left side
- No stridor
- Distended hand veins – no oedema
- IV in left hand
- CXR: Large anterior mediastinal mass
  : trachea slightly pushed left
  : small right pleural effusion

		Total/Unit
Dexamethasone	16	16 mg
Morphine		2 2 mg
Propofol	50	50 mg



SpO2	89	97	97	97	97	98	88	88	92	88	87
INO2%	93	93	94	94	94	94	93	94	95	97	97
RR	28	20	20	20	20	46	41	42	42	0	0
ETCO2%	5.6	6.7	6.5	6.7	6.7	4.7	9.0	8.8	3.0	0.0	0.0
MAC	1.8	1.5	1.4	1.4	1.3	1.2	1.2	0.8	0.0	0.0	0.0
ETN2O%	0	0	0	0	0	0	0	0	0	0	0
ETSEV%	3.8	3.0	2.9	2.8	2.6	2.4	2.4	1.7	0.0	0.0	0.0

CR4019

ANAESTHETIC RECORD

What actually happened

- Unable to lie flat for gas induction
- IV induction – LMA
- Left lateral; dexamethasone top-up
- IPPV + PEEP better than spontaneous
- Well-saturated during procedure
- CVS stable throughout
- Waking: recurrent desats needing bagging
- Transiently very agitated
- Much improved when awake

Post-op course

- Left recovery with SpO2 97% on 5 lpm
- PICU updated; documented in notes
- On air and comfortable 3 hours later
- Collapse that evening – “Vasovagal”
- Seen for tachypnoea 1 hr later - resolved
- 2 hours later: moribund, lying prone
- Gasping, blue, SpO2 = “99%”, good A/E
- BP unrecordable, GCS = 5

Code Blue

- Cardiac arrest on commencing IPPV
- Intubated – easy ventilation
- PICC line blocked; peripheral IV removed
- First rhythm = asystole
- EJ cannula sited, 7 doses of adrenaline
- ROSC after 15 mins
- Transferred to PICU

Communication and team work: The way forward

- Full discussion
- Complete evaluation
  - History and Physical exam
  - CT scan
  - Echocardiogram
- Joint assessment of risks
- Agreement to proceed
- Its not just about the peri-operative period