

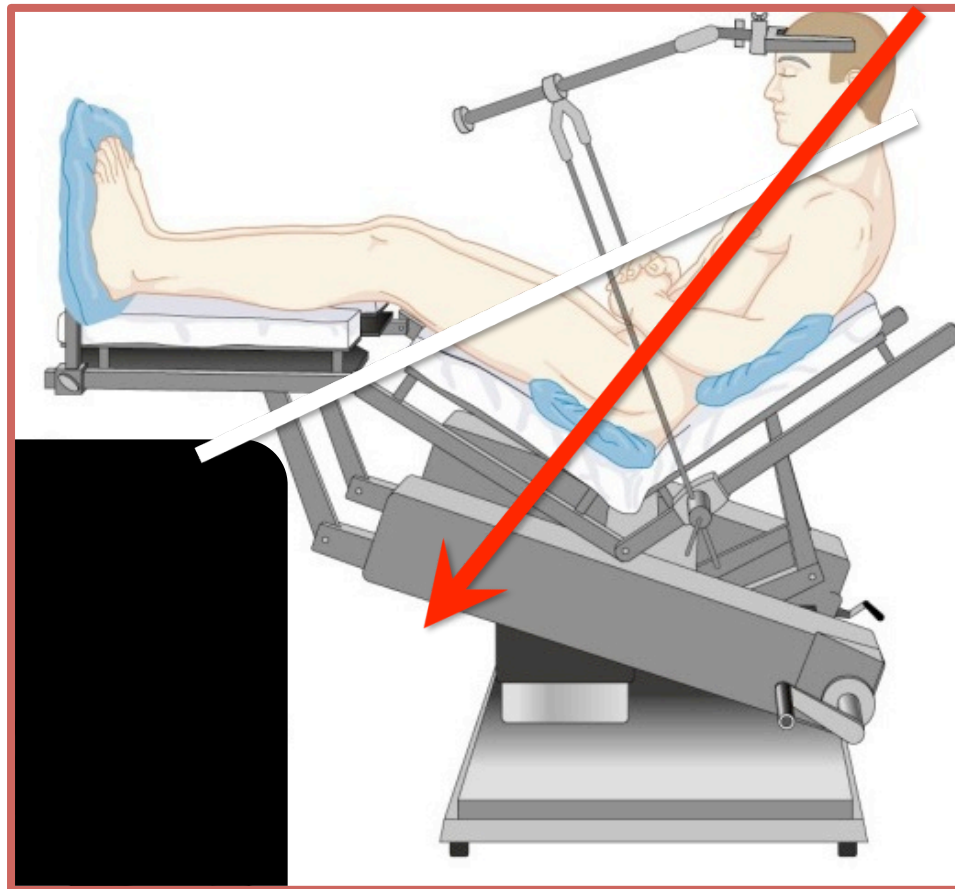
# Venous Air Embolism

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# Numbers

- 80% VAE from posterior fossa craniotomies
- 40% of C-sections entrain air
- 30% total hip arthroplasties entrain air
- 100-300 ml reported to be fatal in humans

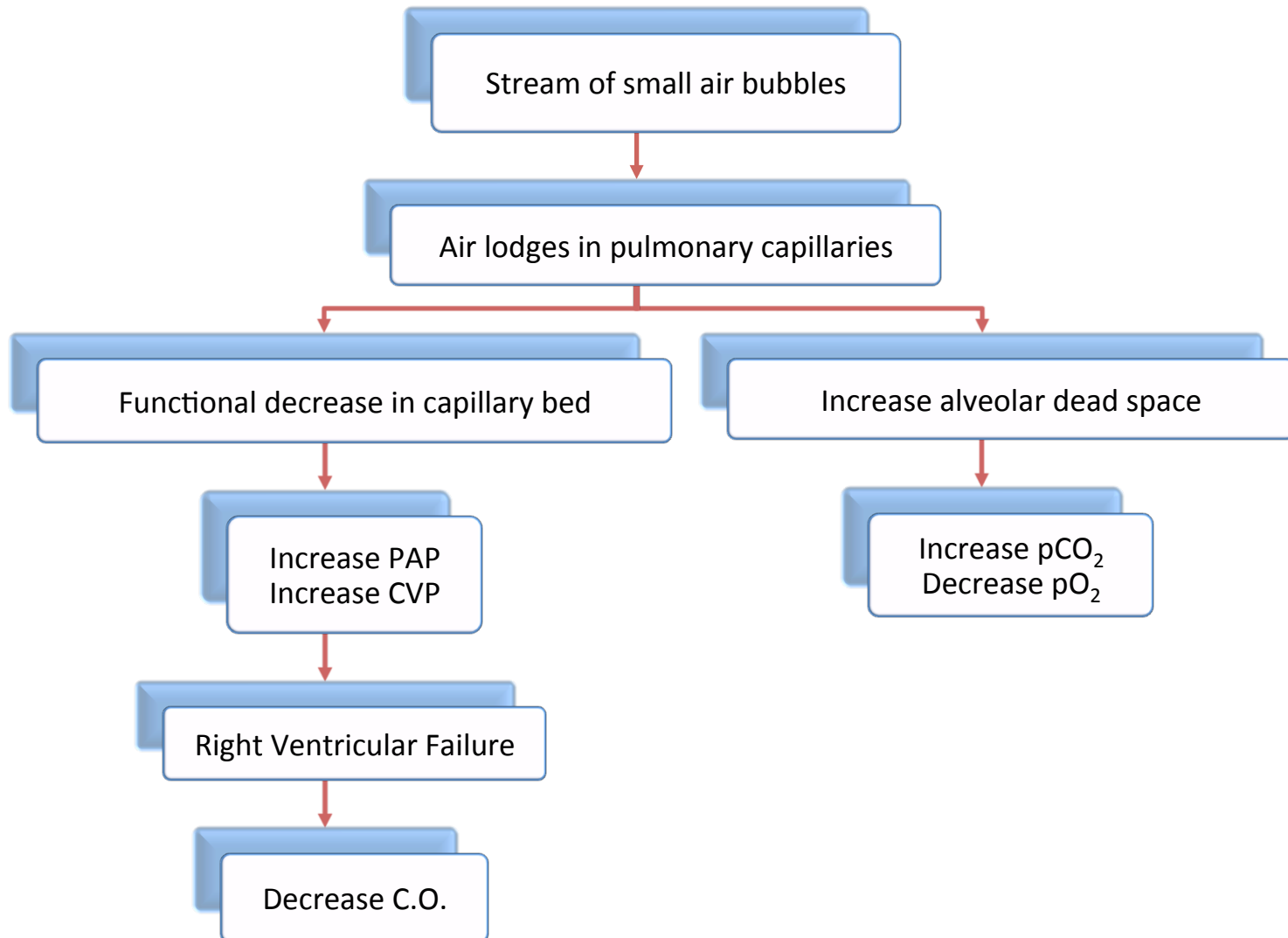
- Veins higher than RA have intravascular pressure  $<$  CVP
- $\geq 65^\circ$  tilt  $\rightarrow$  negative intravascular pressure



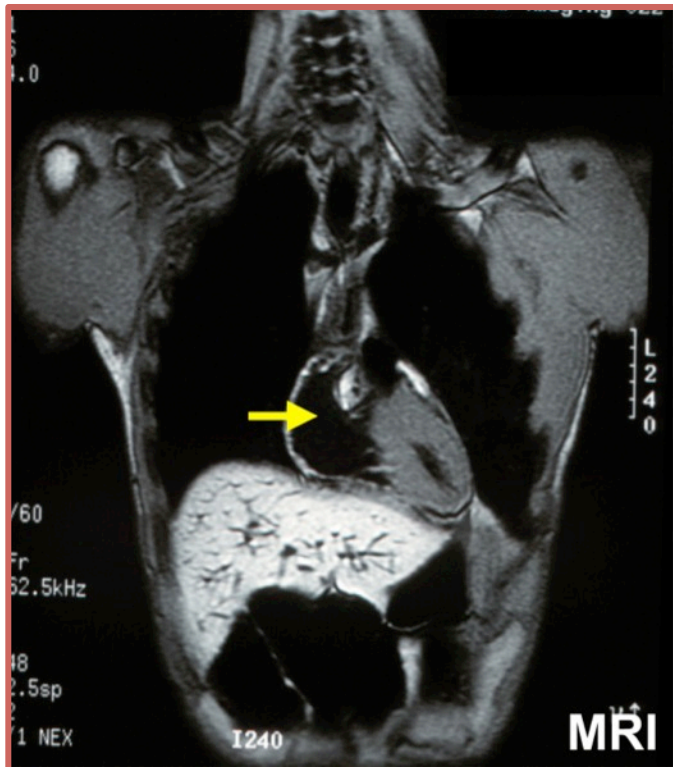
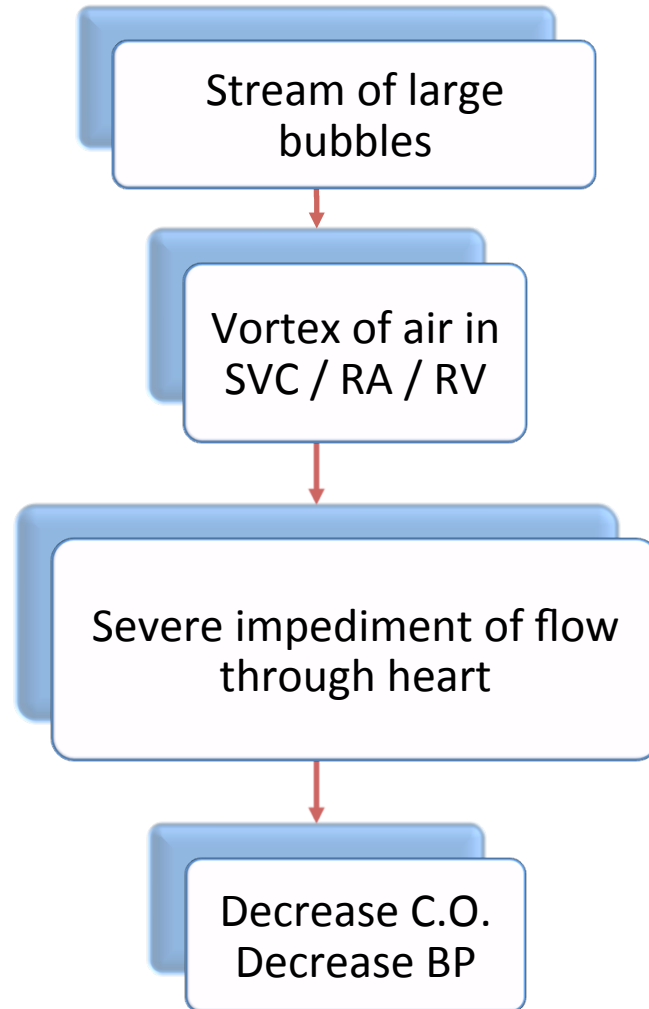
# Sitting craniotomy & VAE

- Detectable in 20-76 % of all sitting cases  
*(depending on mode of detection)*
- 50% occur within 60 minutes of incision:
  - dissection of neck muscles
  - turning of cranial flap
  - dissection of tumor bed

# Slow entrainment

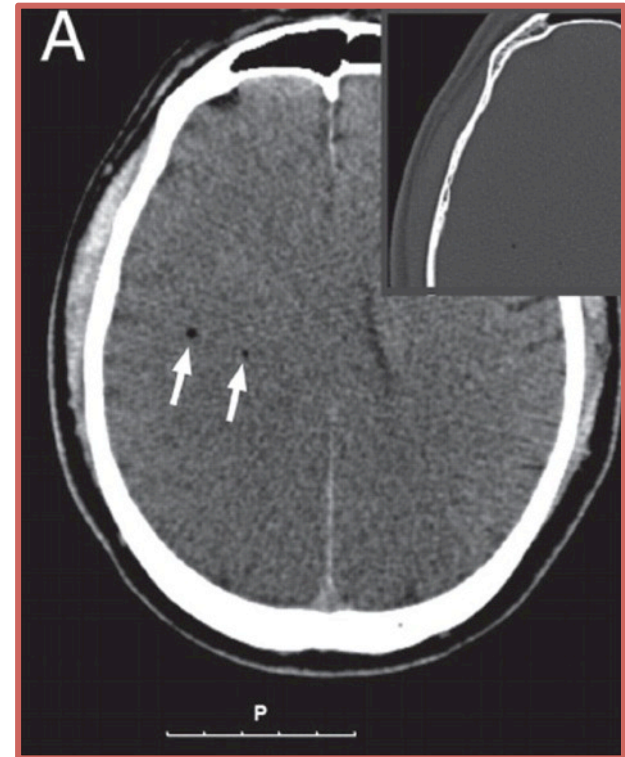


# Rapid entrainment



# Isixob6r69 air embolism

- If: 20-30% patients have PPEO  
23% of patients have VAE }  $\approx 5\%$  at risk for PAE
- But only: 0.54% of all patients  
2.3% of VAE patients
- Why?
  - early detection ?
  - no neurological sequelae ?



25 %

No  
physiol  
changes

Modest  
physiol  
changes

Clinically  
apparent  
changes

Cardio-  
vascular  
collapse

0.5 ml

0.25 ml

T-echo

Doppler

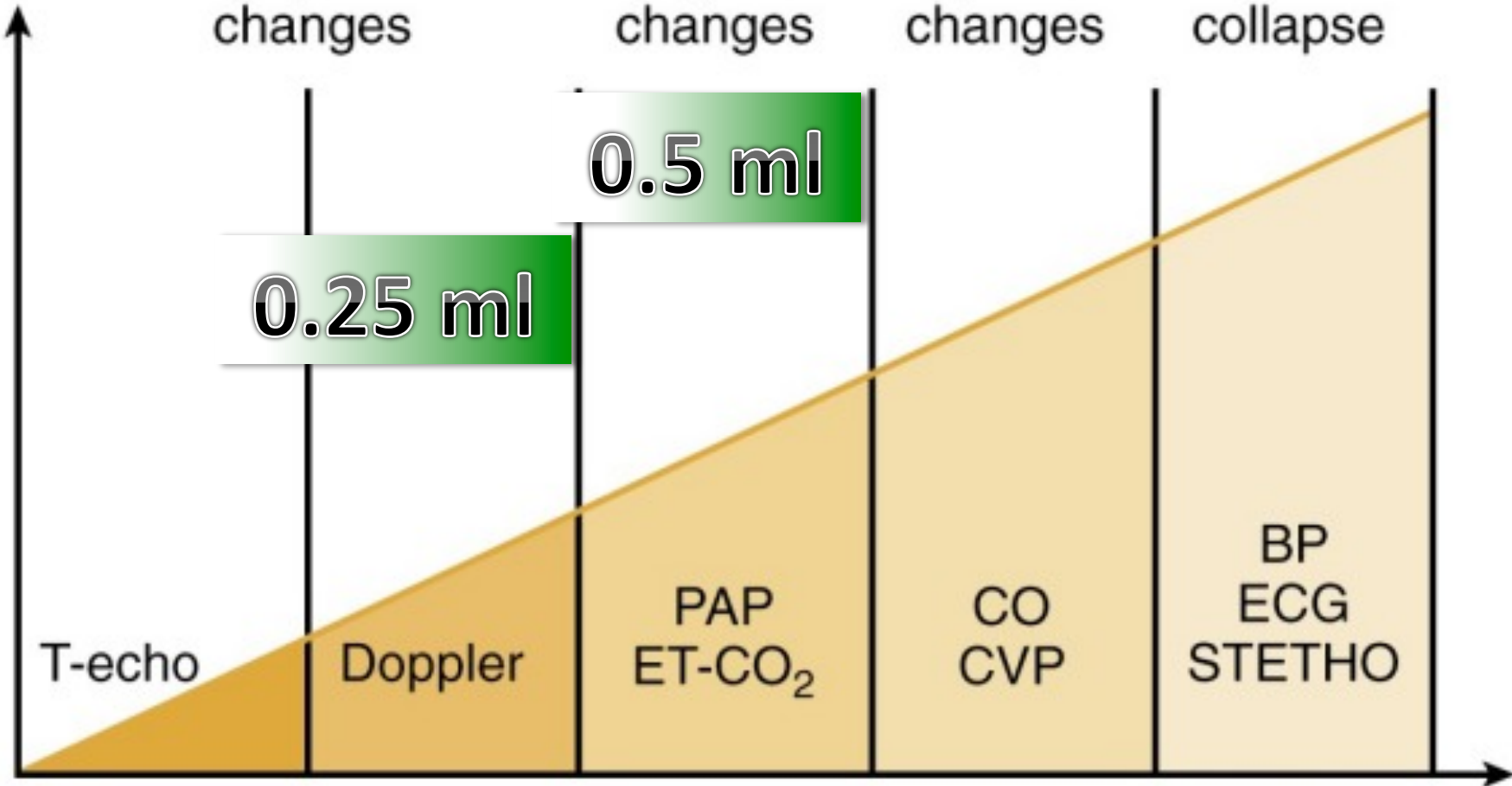
PAP  
ET-CO<sub>2</sub>

CO  
CVP

BP  
ECG  
STETHO

VAE volume

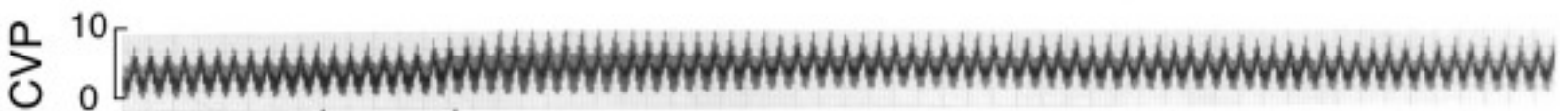
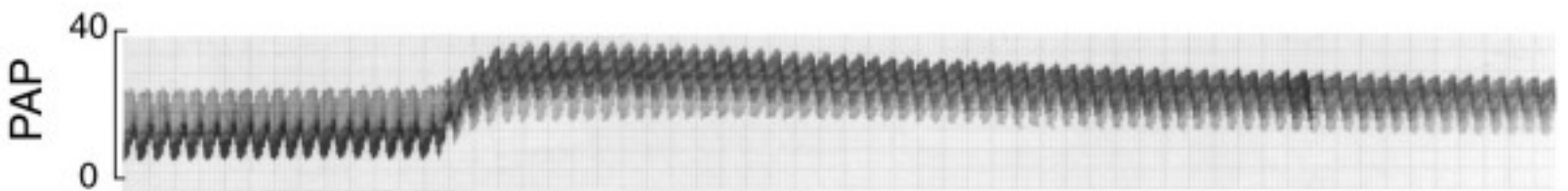
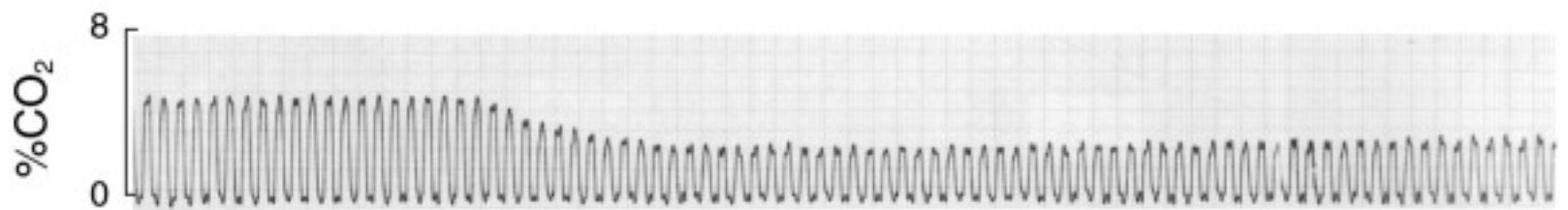
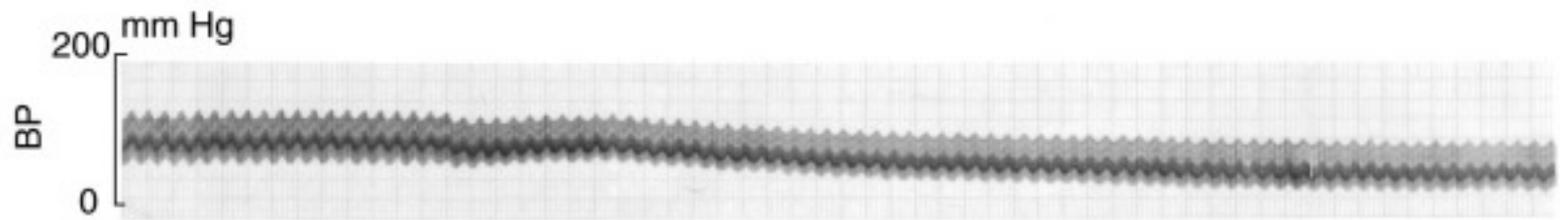
Decreasing sensitivity  
(increasing volume of air)





11 kg. dog

10 mL Air Injection



30sec.

# Treatment of VAE

- Notify surgeon
- d/c N<sub>2</sub>O
- Surgeon will close any open veins
  - if no obvious open veins – Valsalva:
    - ↑ cerebral venous pressure
    - bleeding (*easier visualization*)
- If hypotension - ephedrine & fluid
  - improve BP & push air into pulmonary circulation
- Left lateral decubitus position with 15° head down
  - release air lock (*recent studies question this*)

thank you