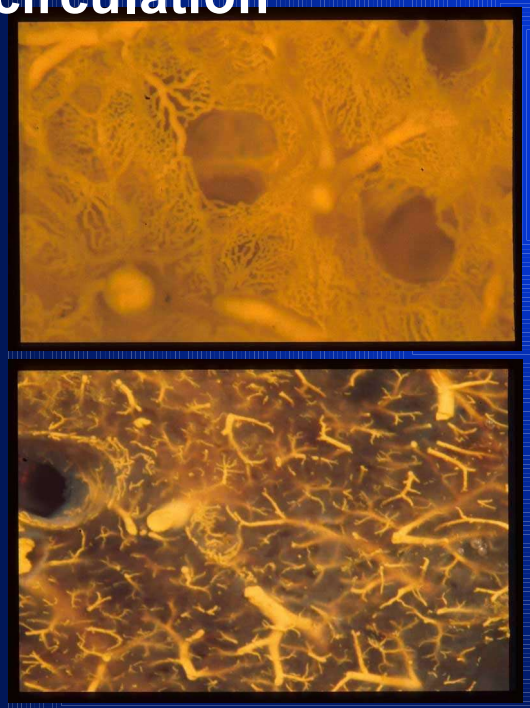
ECHOCARDIOGRAPHY IN PATIENTS WITH ARDS

Focus on RV function assessment

Antoine Vieillard-Baron, Boulogne, France

ARDS MAY DEGRADE RV FUNCTION BY INCREASING AFTERLOAD

- By causing damage to the pulmonary circulation



W Zapol

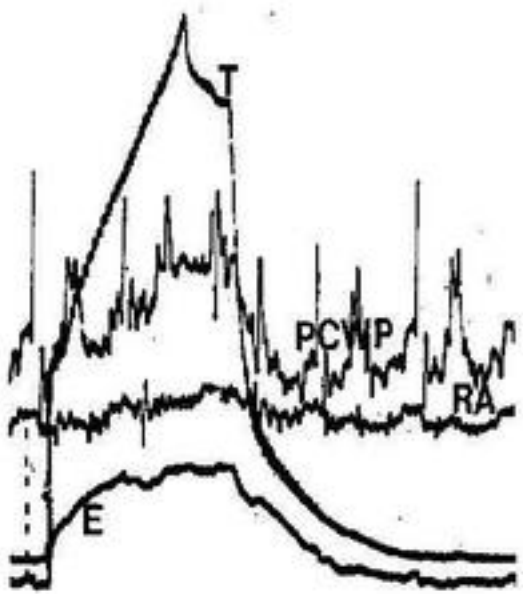
- By inducing pulmonary vascular remodeling

Table 1.–Factors contributing to pulmonary hypertension in acute respiratory distress syndrome

Functional	Mediator-induced vasoconstriction
	Hypoxic pulmonary vasoconstriction
Structural	Vascular compression by oedema fluid or fibrosis
	Vascular wall remodelling
	Thromboembolism
	Reduced lung volume

Moloney Eur Respir J 2003

MECHANICAL VENTILATION MAY ALSO DEGRADE RV FUNCTION



ZONE II
Condition

Trans-pulmonary pressure (tracheal pressure at end-inspiratory pause (T) minus esophageal pressure (E)) is greater than pulmonary venous pressure (pulmonary capillary wedge pressure, PCWP)

ZONE III
Condition

Trans-pulmonary pressure (tracheal pressure at end-expiratory pause (T) minus esophageal pressure (E)) is lower than pulmonary venous pressure (pulmonary capillary wedge pressure, PCWP)

Jardin ICM 2004

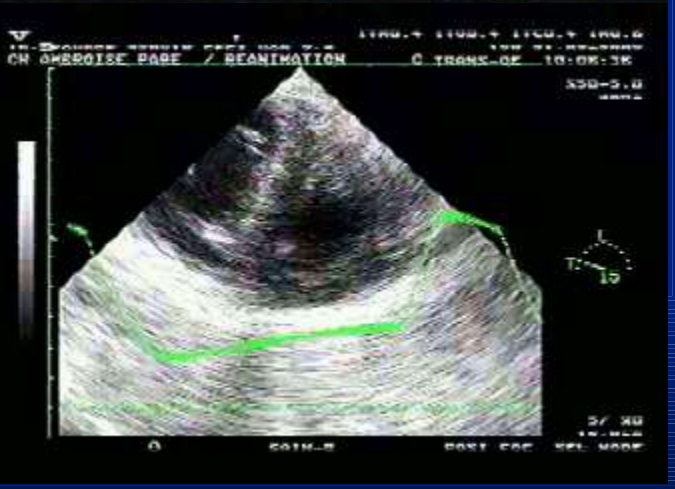
CONSEQUENCES OF SUCH EFFECTS: ACP

LV long axis view

LV short axis view

No ACP

ACP



RV diastolic overload

RV systolic overload

CONSEQUENCES FOR THE LV

- Because of the pericardium, the sum of the cardiac cavities remains stable in acute conditions
- Any dilatation of the RV induces a restriction of the LV with a relaxation impairment

INCIDENCE AND PROGNOSTIC VALUE OF ACP BEFORE 1990

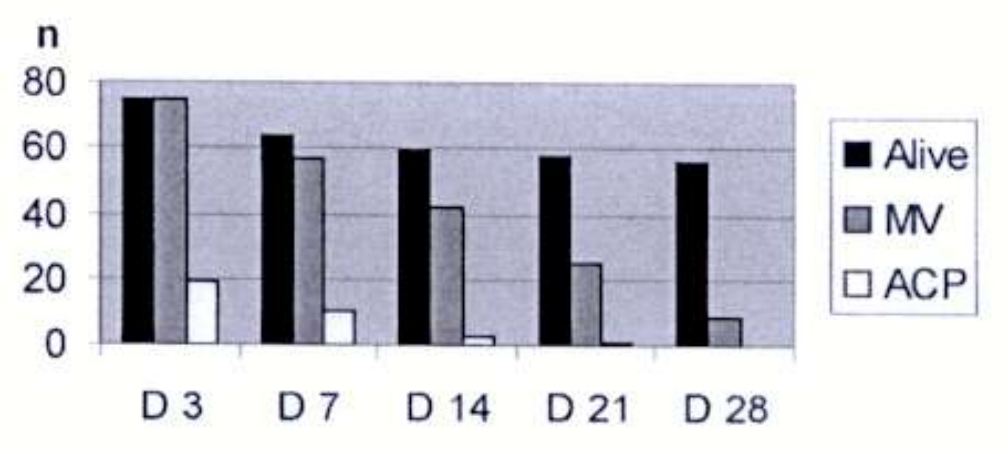
Jardin CCM 1985

- 23 patients
  - PP: 39 ± 4 cmH_2O
- ACP: 14/23 (61%)
  - mortality: 8/14 (57%) versus 33%
- Severe ACP: 5/23 (22%)
  - mortality: 5/5 (100%)

INCIDENCE AND PROGNOSTIC VALUE OF ACP AFTER 1996

Vieillard-Baron CCM 2001

- 75 patients
  - PP: 24 ± 5 cmH_2O
- ACP: 19/75 (25%)
  - mortality: 6/19 (32%) versus 32%



ECHOCARDIOGRAPHY PERMITS RESPIRATORY SUPPORT TO BE ADAPTED TO RV FUNCTION

I

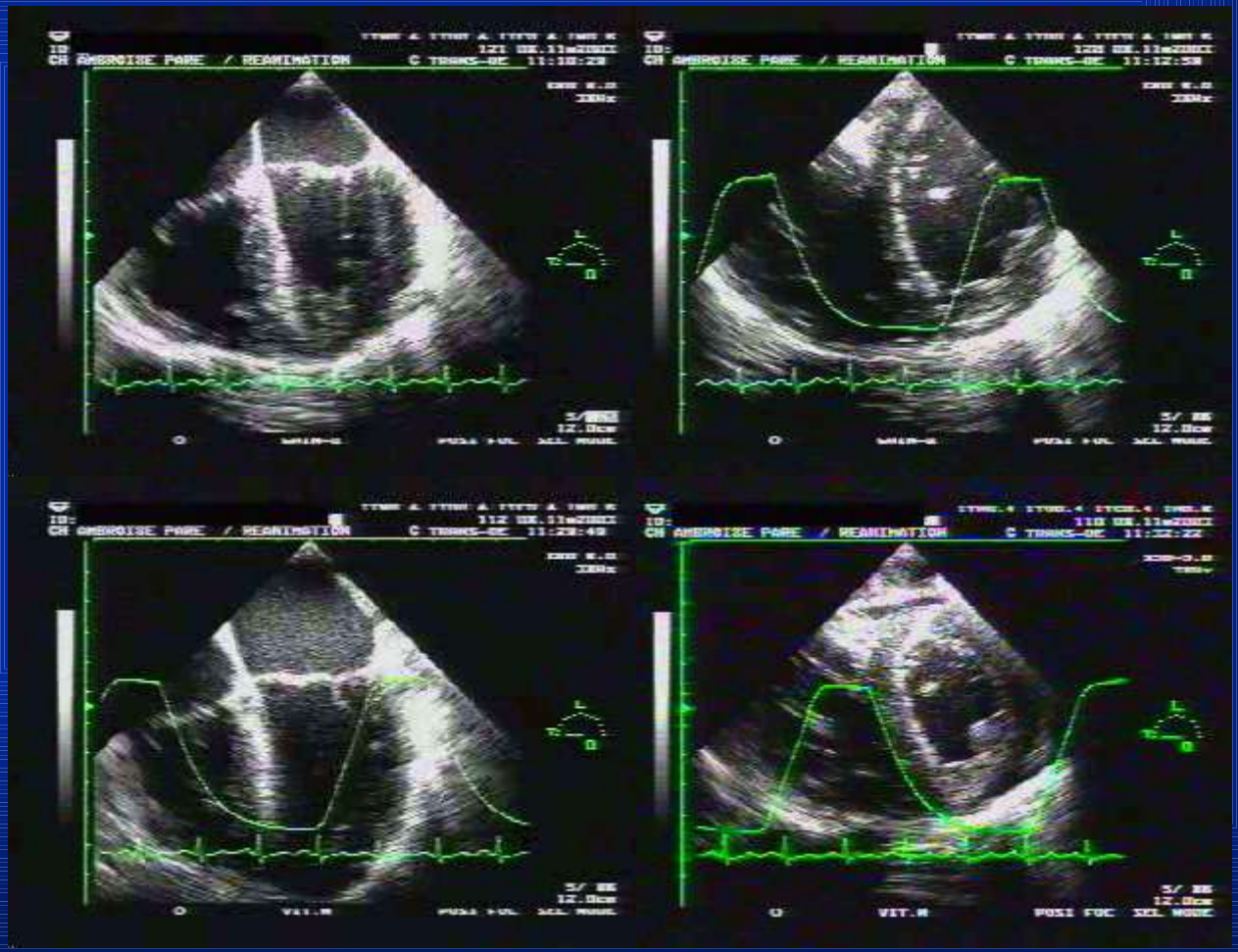
PLATEAU PRESSURE

400 x 25
PEEP 5
PP 33

SAP 92 mmHg

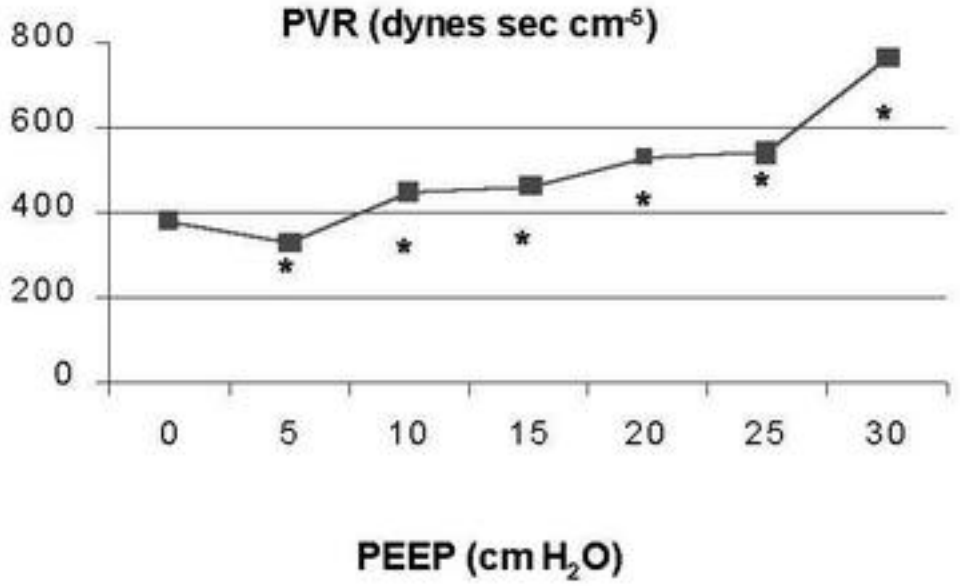
350 x 25
PEEP 5
PP 26

SAP 123 mmHg



II

PEEP



Jardin ICM 2004

PEEP 5 PP 27

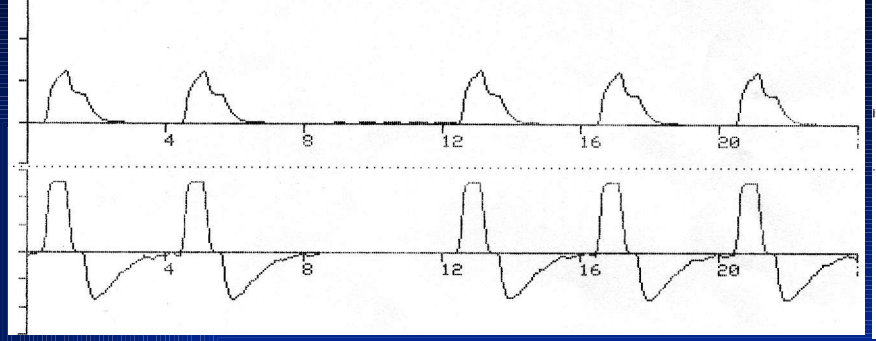
SI_{RV} 23 ml/m²
SAP 135 mmHg
HR 100/mn

PEEP 14 PP 27

SI_{RV} 12 ml/m²
SAP 115 mmHg
HR 121/mn

PEEP 5 PP 27

SI_{RV} 23 ml/m²
SAP 130 mmHg
HR 110/mn



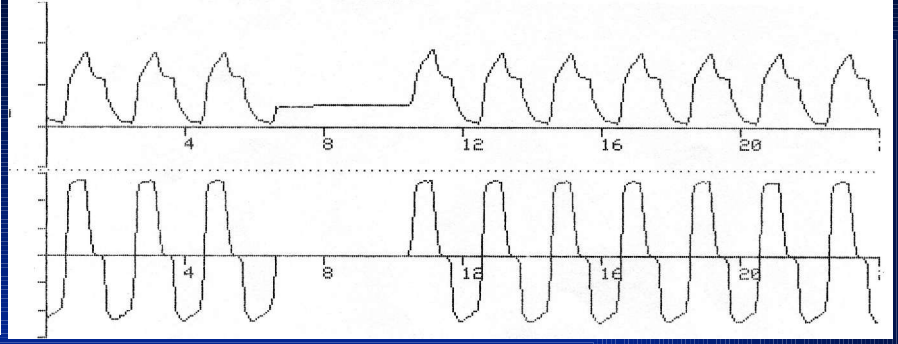


Table 4. Comparison between Doppler hemodynamic measurements obtained with a respiratory rate (RR) of 15 breaths/min (RR 15) and a respiratory rate of 30 breaths/min (RR 30)

	RR 15	RR 30
ICT, msec	46 ± 18	60 ± 18[a]
FP, msec	234 ± 36	230 ± 35[b]
V_{MAX}, m/sec	0.88 ± 0.20	0.79 ± 0.17[a]
PA_{VTI}, cm	12.9 ± 2.3	11.6 ± 2.6[a]
IVC diam, mm	18 ± 5	21 ± 5[a]
HR, beats/min	115 ± 11	115 ± 11
SI, cm^3/m^2	29 ± 5	26 ± 5[a]
CI, $L/min/m^2$	3.3 ± 0.7	2.9 ± 0.6[a]

ICT, isovolumic contraction time; FP, flow period; V_{MAX}, peak velocity; PA_{VTI}, pulmonary artery velocity-time integral; IVC diam, inferior vena caval diameter; HR, heart rate; SI, stroke index; CI, cardiac index.

[a] $p < .05$; [b] NS, not significant. Values are mean ± SD.

Vieillard-Baron CCM 2002

ECHOCARDIOGRAPHY PERMITS CHOICE OF THE RIGHT VASO-ACTIVE DRUG IN RV DYSFUNCTION

OPTION 1: LV SYSTOLIC FUNCTION IS NORMAL

D1

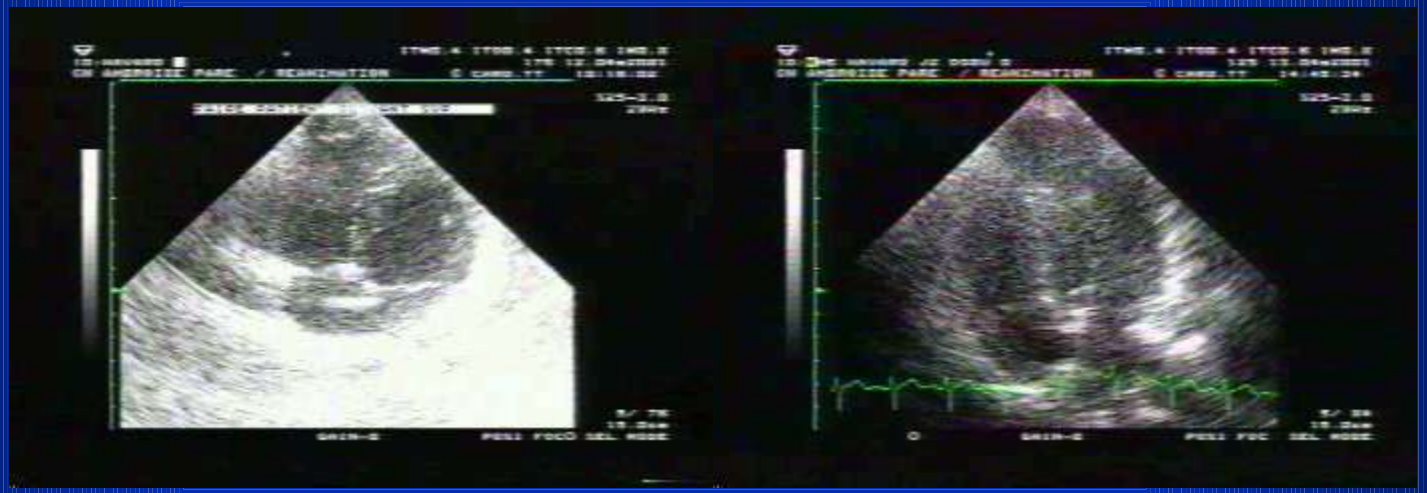
D1

under mechanical ventilation

D1

NE infusion

OPTION 2: LV SYSTOLIC FUNCTION IS ALTERED



D1

D1

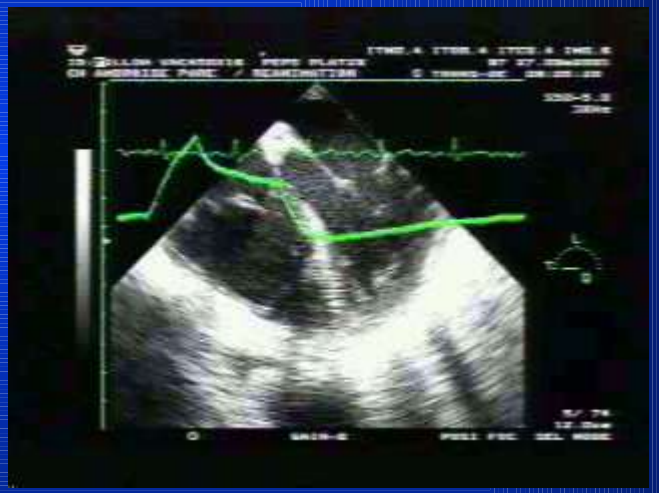
Dobu 5

LASTLY

ECHOCARDIOGRAPHY MAY BE USED TO CHECK THE EFFICACY OF NO INHALATION

F, 45 Y old
drug poisoning
ARDS related to aspiration

D3



D4
NO inhalation

THANK YOU