THE 2 PCO2 MISTERY TOUR

F.Schiraldi

schirald@gmail.com

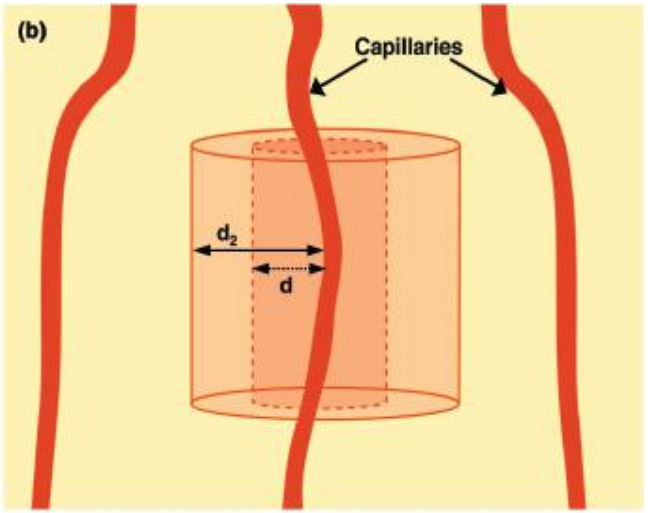
….a look from inside….
in "occult" hypoperfusion

ScvO2

LACTATE

DELTA PCO2

…helps to evaluate therapy effects…

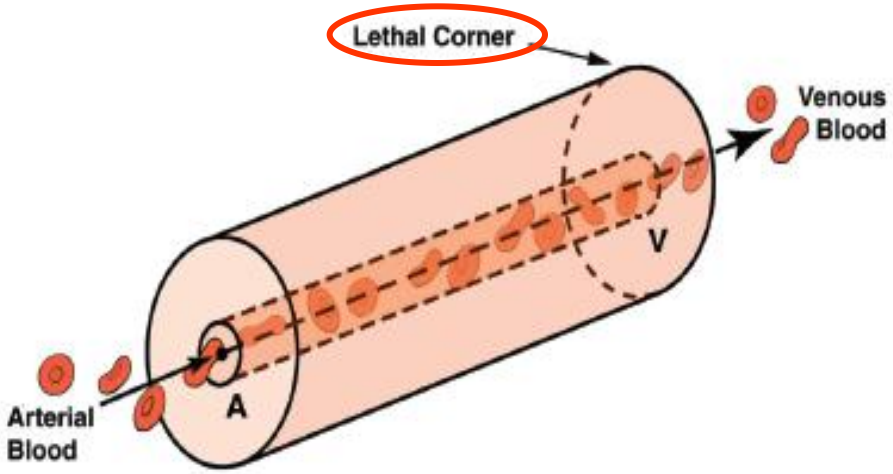


"The Krogh model"

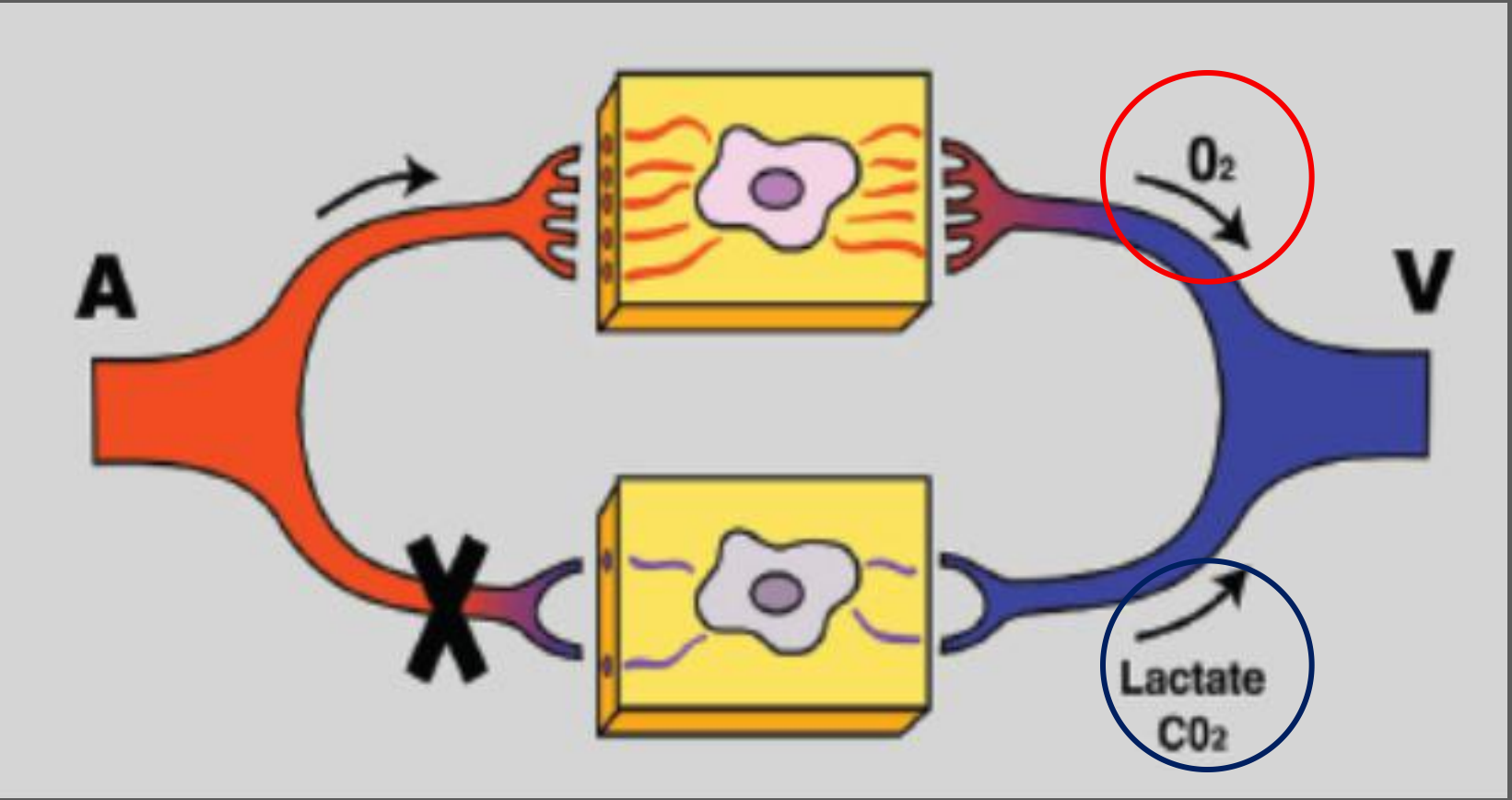
Krogh A.

"The **number** and the **distribution** of capillaries in muscle with the calculation of the oxygen pressure necessary for supplying tissue".

Physiol 1919, 52:409-515.



The microcirculatory shunting model of sepsis



Trzeciak S and Rivers EP. Critical Care 2005, 9:S20-S26

DELTA cv-a PCO2 (nv 2-4 mmHg)

The *arterial* PCO2

- Metabolic CO2 production
- CO2 lung presentation
- Alveolar ventilation

'RESPIRATORY'

The *central venous* PCO2

Metabolic (local) CO2 production

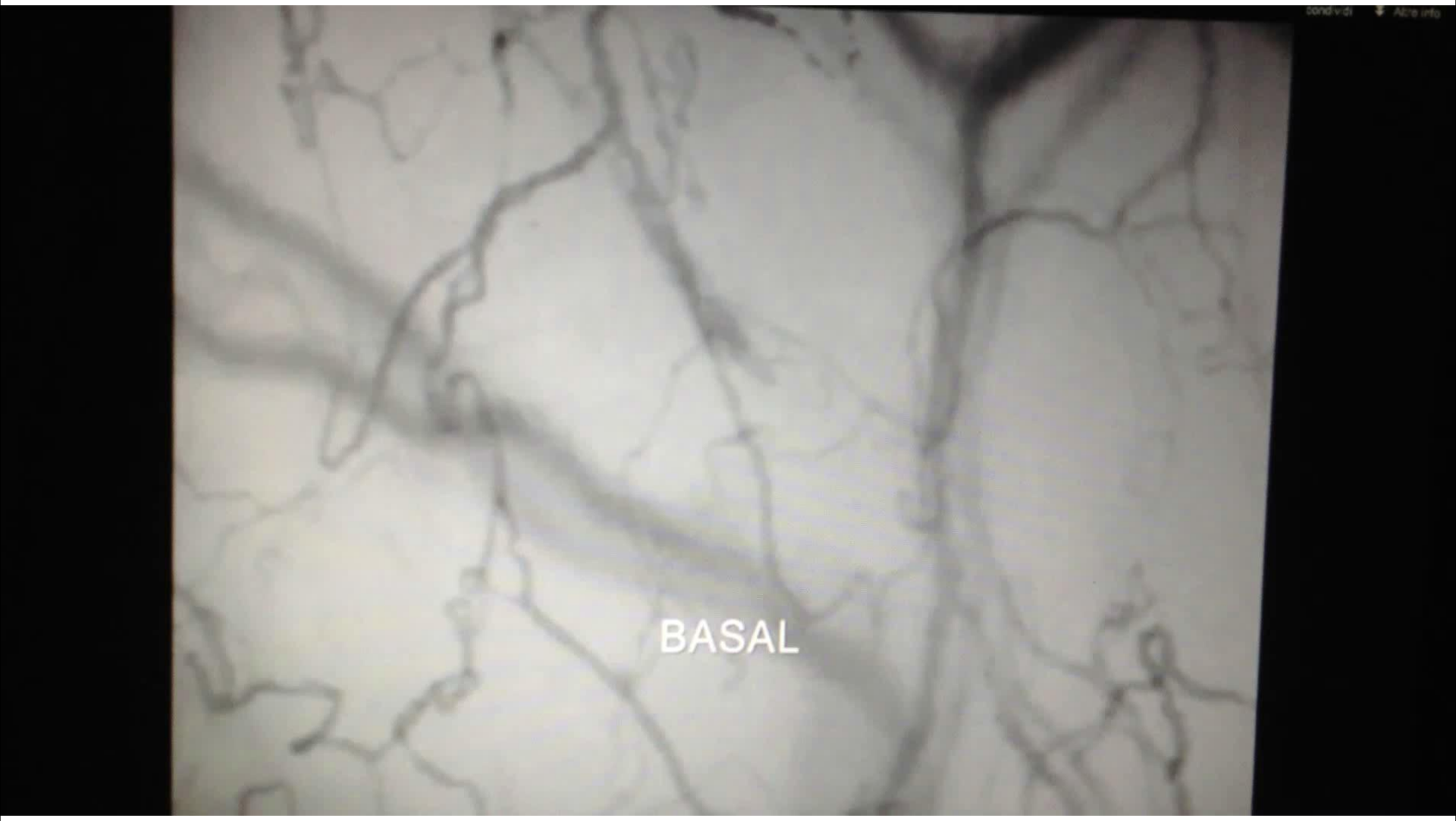
Tissue-cv blood CO2 diffusion

CO2 lung presentation

'CIRCULATORY/METABOLIC'

MICRO & SEPSIS

MICRO & SEPSIS

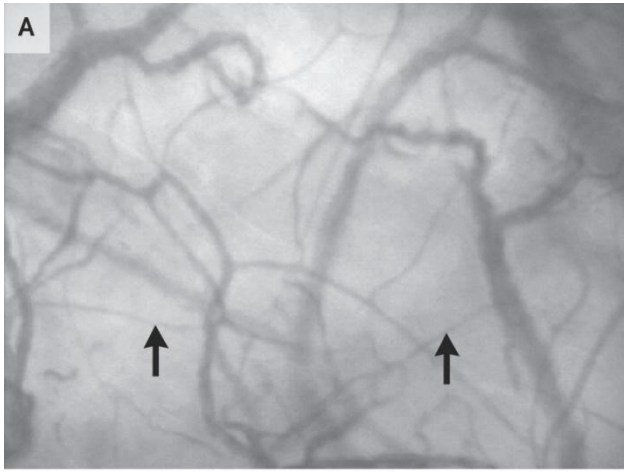


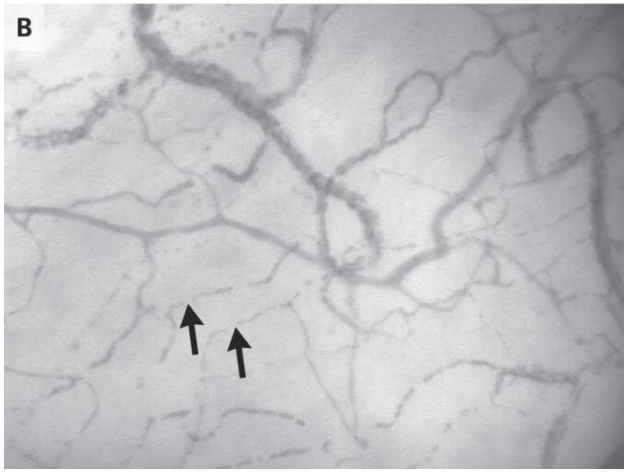
MICRO & HEART

CURRENT OPINION

New insights into the pathophysiology of cardiogenic shock: the role of the microcirculation

Jesse F. Ashruf[a,b], Hajo A. Bruining[c], and Can Ince[a]





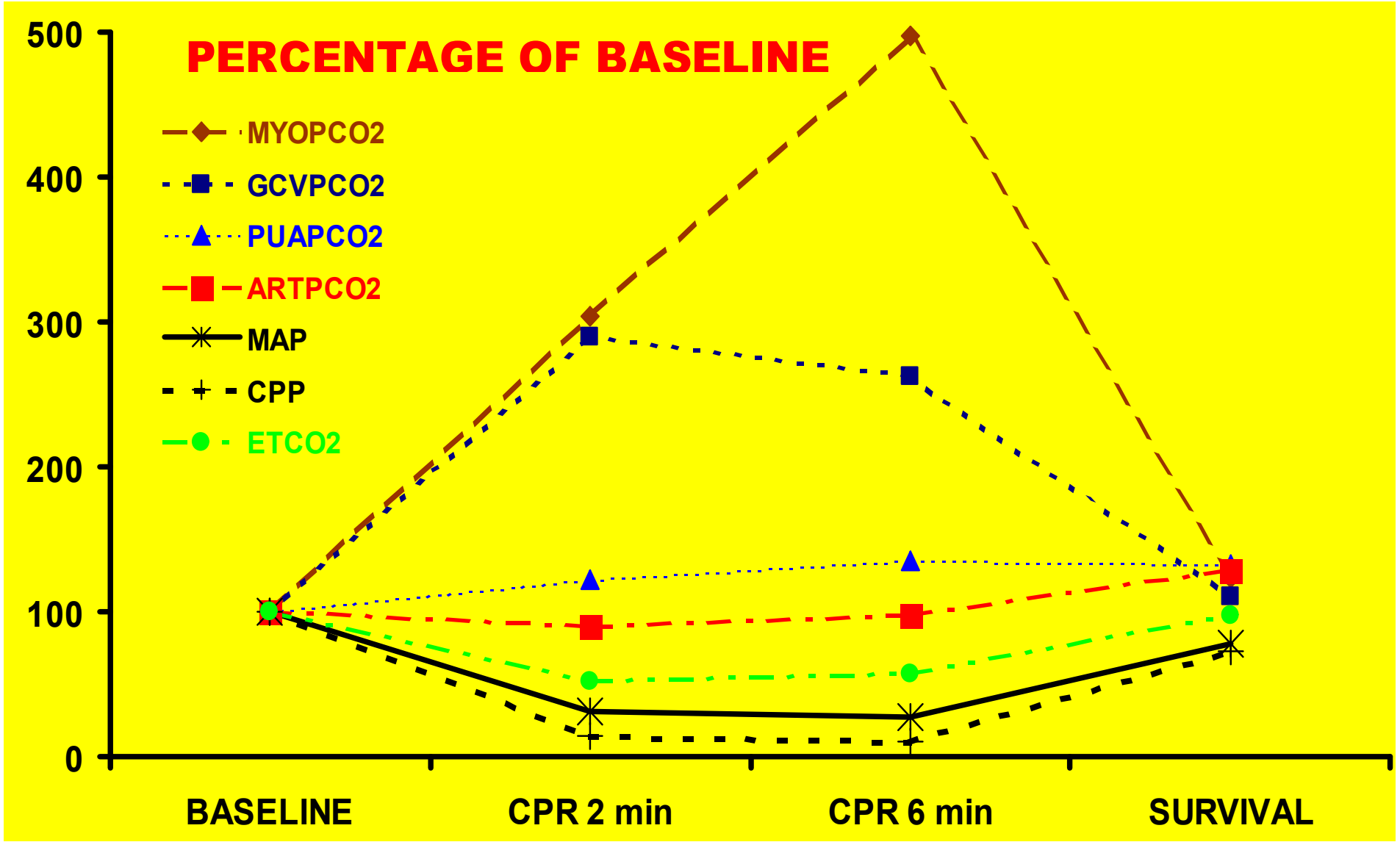
COCC 2013

Myocardial Acidosis Associated With CO_2 Production During Cardiac Arrest and Resuscitation

Martin von Planta, MD, Max Harry Weil, MD, PhD, Raul J. Gazmuri, MD,
Joe Bisera, MSEE, and Eric C. Rackow, MD

Circulation 1989;80:684-692

CO_2 AS MONITOR OF PERFUSION

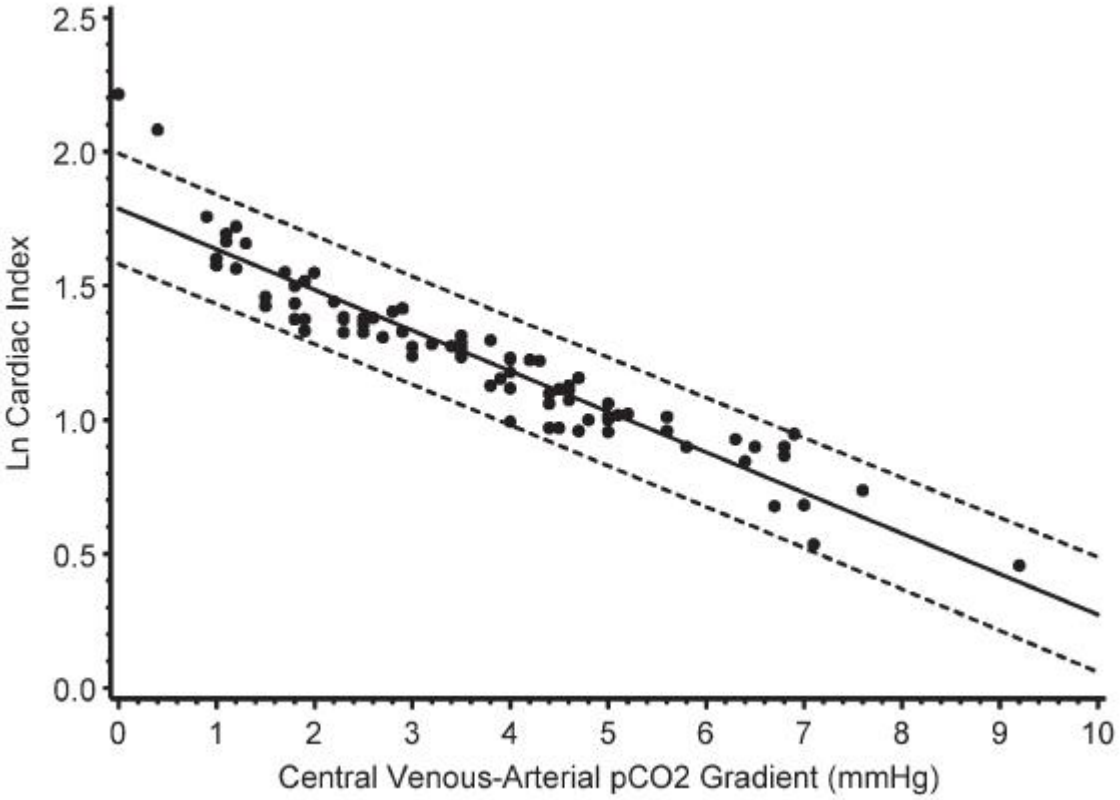


Intensive Care Med (2005) 31:818–822
DOI 10.1007/s00134-005-2602-8

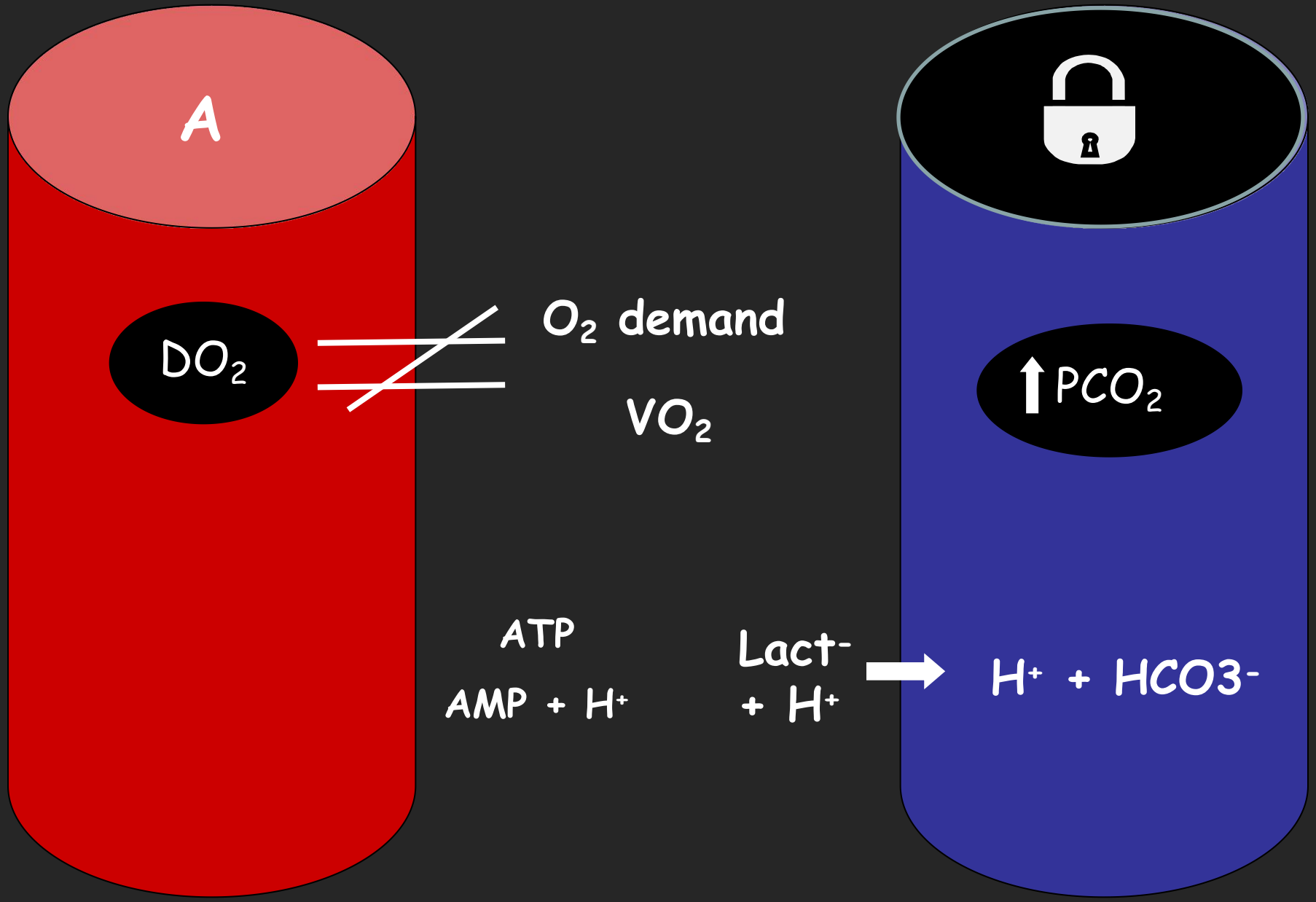
ORIGINAL

Joseph Cuschieri
Emanuel P. Rivers
Michael W. Donnino
Marius Katilius
Gordon Jacobsen
H. Bryant Nguyen
Nikolai Pamukov
H. Mathilda Horst

Central venous-arterial carbon dioxide difference as an indicator of cardiac index



The CO_2 lung presentation & low flow



P.R. 69 y.♀ 17th OCt 1992

	h. 12.15 art.	h. 12.15 c.ven.		h. 12.30 art.	h. 12.30 c.ven.	
pH	7.14	7.114		7.440	7.393	
PCO_2	30.9	40.1	ΔCO_2 = 9.2	34.7	40	ΔCO_2 = 5.3
PO_2	199.6	45.3		75.3	31.7	
HCO_3	11.8	12.2		23.3	24	
SAT	99.1	63.2	OER = 36	94.5	61.4	OER = 33.5

FS 1993

Anna, 85 anni

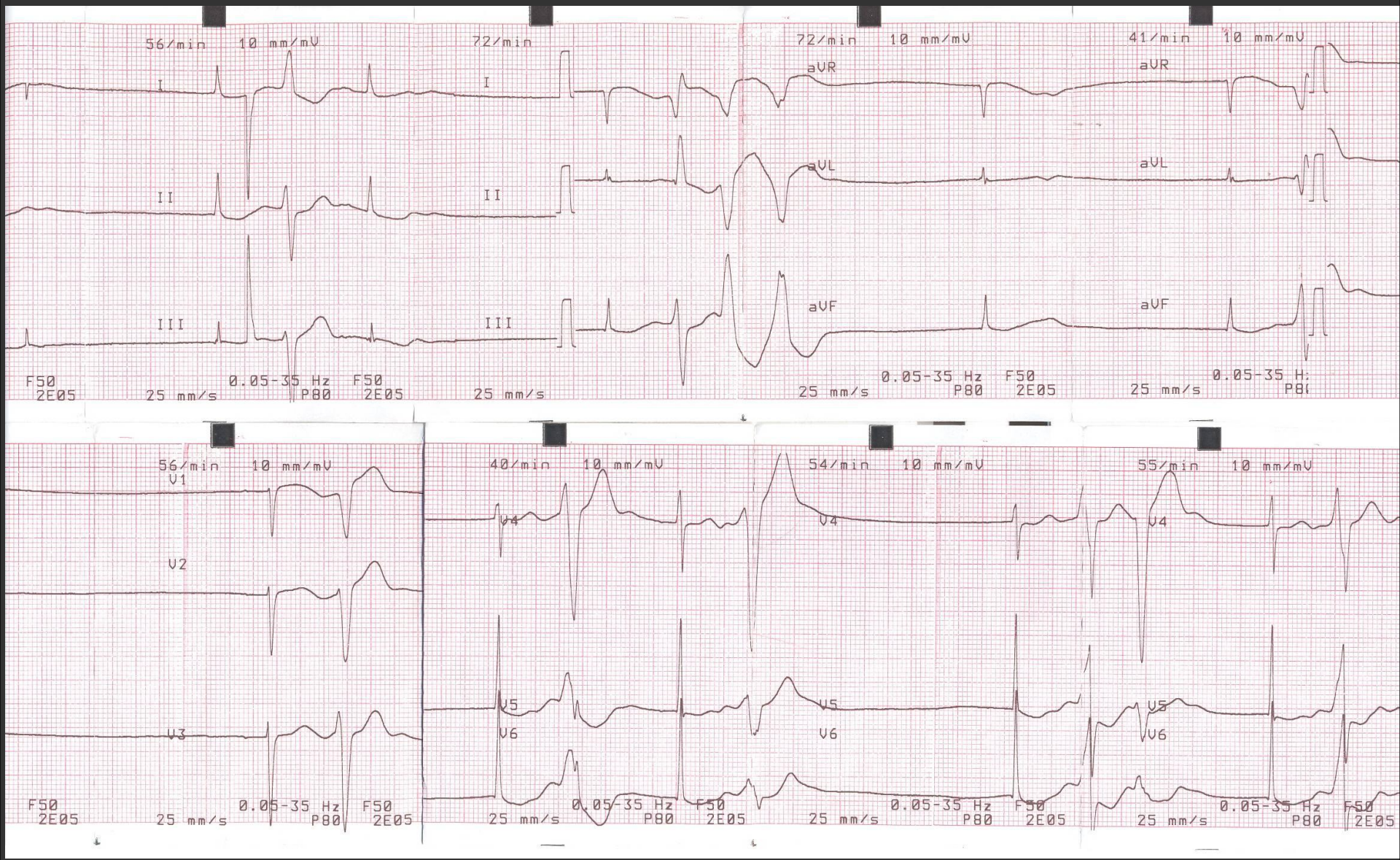
vertigini

PA 90/50

FC 35

SpO2 97% in AA

FR 24



FiO_2 21%

FR 24

$\Delta CO_2 = 11$

OER = 37%

Misurati (37.0C)		
pH	7.36	
pCO2	53	mmHg
HCO3-	29.9	mmol/L
HCO3std	26.4	mmol/L
TCO2	31.5	mmol/L
BEecf	4.5	mmol/L
BE(B)	3.2	mmol/L
SO2c	61	%
THbc	14.3	g/dL
?A-aDO2	-----	
?pAO2	-----	
?paO2/pAO2	-----	

Misurati (37.0C)		
pH	7.39	
pCO2	42	mmHg
HCO3-	25.4	mmol/L
HCO3std	25.2	mmol/L
TCO2	26.7	mmol/L
BEecf	0.4	mmol/L
BE(B)	0.3	mmol/L
SO2c	97	%
THbc	13.0	g/dL
A-aDO2	54	mmHg
pAO2	147	mmHg
paO2/pAO2	0.63	

$\Delta CO_2 = 3$

OER = 23%

Misurati (37.0C)		
pH	7.37	
pCO2	47	mmHg
pO2	40	mmHg
Na+	136	mmol/L
K+	4.3	mmol/L
Ca++	1.07	mmol/L
Glu	296	mg/dL
Lat	1.1	mmol/L
Hct	43	%

Parametri derivati		
Ca++(7.4)	1.06	mmol/L
HCO3-	27.2	mmol/L
HCO3std	25.3	mmol/L
TCO2	28.6	mmol/L
BEecf	1.9	mmol/L
BE(B)	1.3	mmol/L
SO2c	73	%
THbc	13.3	g/dL
?A-aDO2	-----	
?pAO2	-----	
?paO2/pAO2	-----	

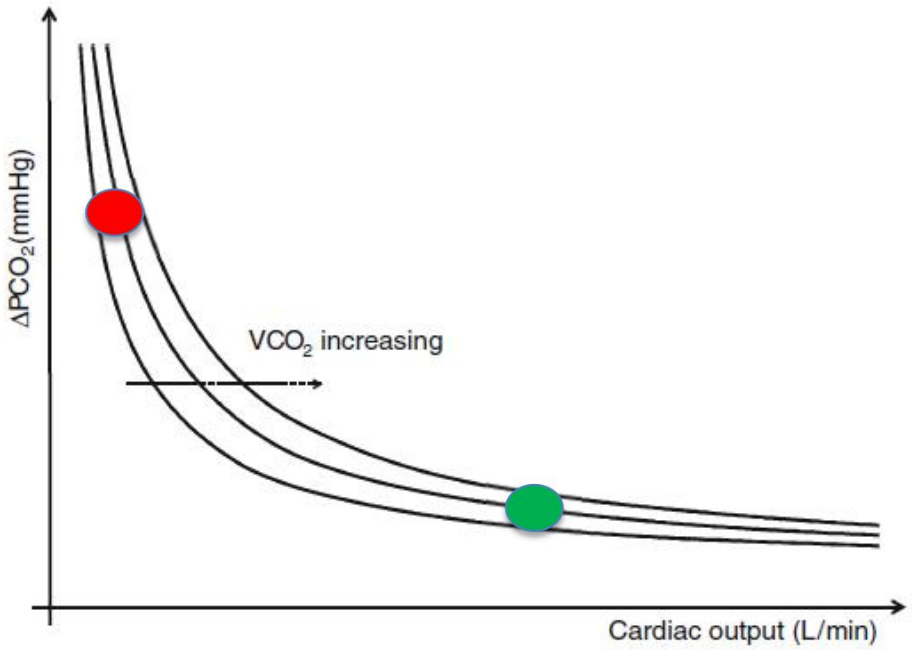
Misurati (37.0C)		
pH	7.39	
pCO2	44	mmHg
pO2	76	mmHg
Na+	135	mmol/L
K+	4.3	mmol/L
Ca++	1.08	mmol/L
Glu	331	mg/dL
Lat	1.0	mmol/L
Hct	44	%

Parametri derivati		
Ca++(7.4)	1.08	mmol/L
HCO3-	26.6	mmol/L
HCO3std	25.8	mmol/L
TCO2	28.0	mmol/L
BEecf	1.6	mmol/L
BE(B)	1.2	mmol/L
SO2c	95	%
THbc	13.6	g/dL
?A-aDO2	-----	
?pAO2	-----	
?paO2/pAO2	-----	

INVITED REVIEW

Hemodynamic management of cardiovascular failure by using PCO_2 venous-arterial difference

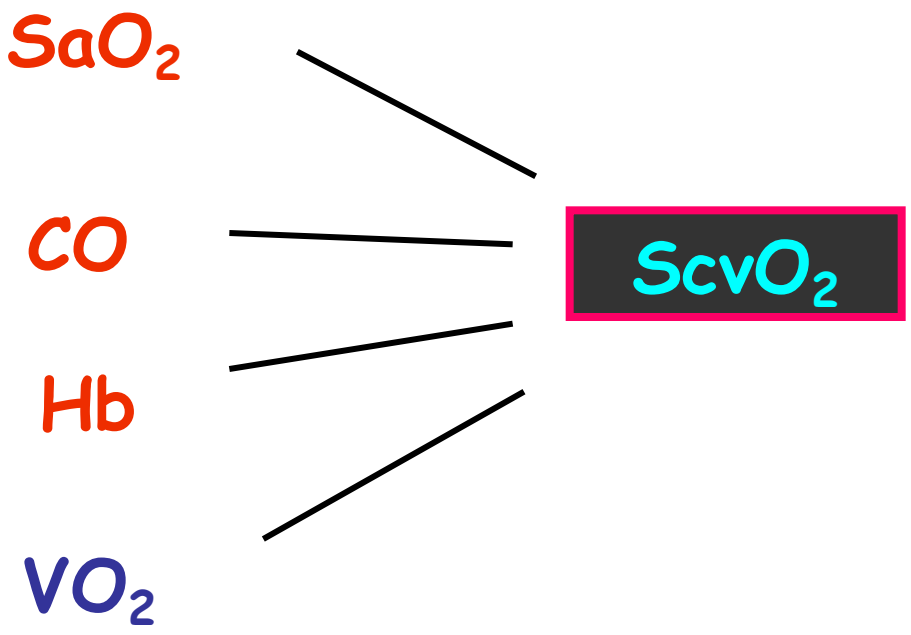
Martin Dres · Xavier Monnet · Jean-Louis Teboul



J Clin Monit Comput 2012

"instantaneous" LACTATE CONCENTRATION

PRODUCTION vs LIVER & KIDNEY METABOLISM

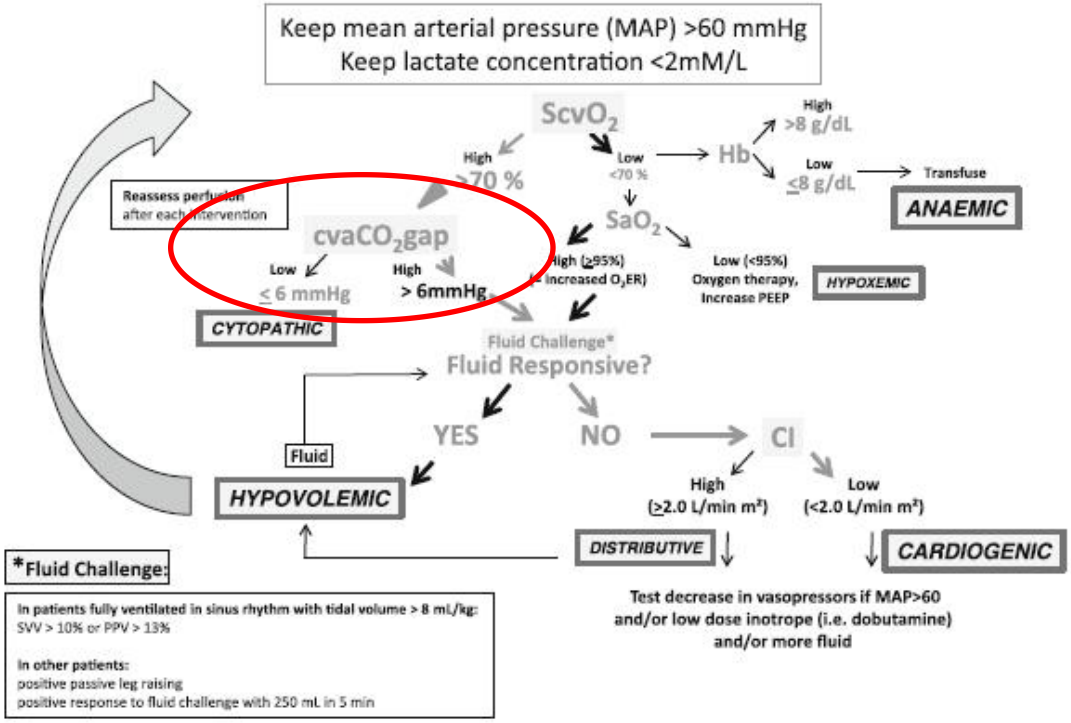

SaO_2
CO
Hb
VO_2
$ScvO_2$

Intensive Care Med (2013) 39:1653–1655
DOI 10.1007/s00134-013-2998-5

EDITORIAL

B. Vallet
M. R. Pinsky
M. Cecconi

Resuscitation of patients with septic shock: please "mind the gap"!



KEY POINTS

$\frac{VO_2}{DO_2}$ ÷ $ScvO_2$ If low = O_2 debt

$\frac{O_2\ Demand}{DO_2}$ + low pH = lactic acidosis

$\frac{VCO_2}{flow}$ ÷ $\Delta_{va}PCO_2$ + low pH = tissue acidosis ?

↓micro-flow ÷ $\Delta_{ta}PCO_2$ = the future…?


Fernando Schiraldi • Giovanna Guiotto
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