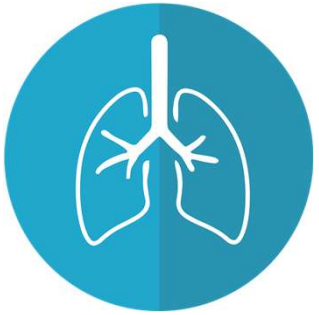
Ventilation: les shunts !

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Hôpital Femme Mère Enfant - Hospices civils de Lyon
florent.baudin@chu-lyon.fr



Transport de l'oxygène !

Délivrance en Oxygène :

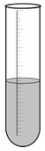
$$DO_2 = CaO_2 \times DC$$

VES x FC

Contenu artériel en oxygène :

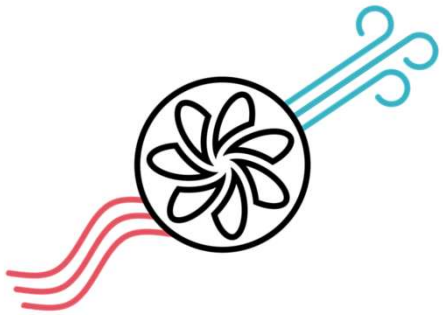
CaO_2 = Oxygène dissout + Oxygène lié à Hb

CaO_2= 0.003 x PaO_2 + 1.34 * [Hb] * SaO_2





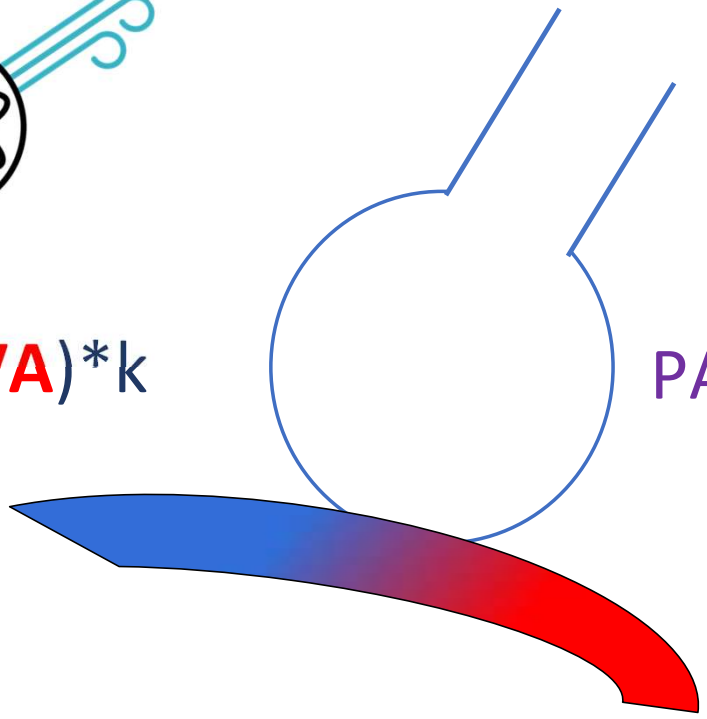
Equation des gaz alvéolaires



$PiO_2 = (Pb-47)*\mathbf{FiO2}$



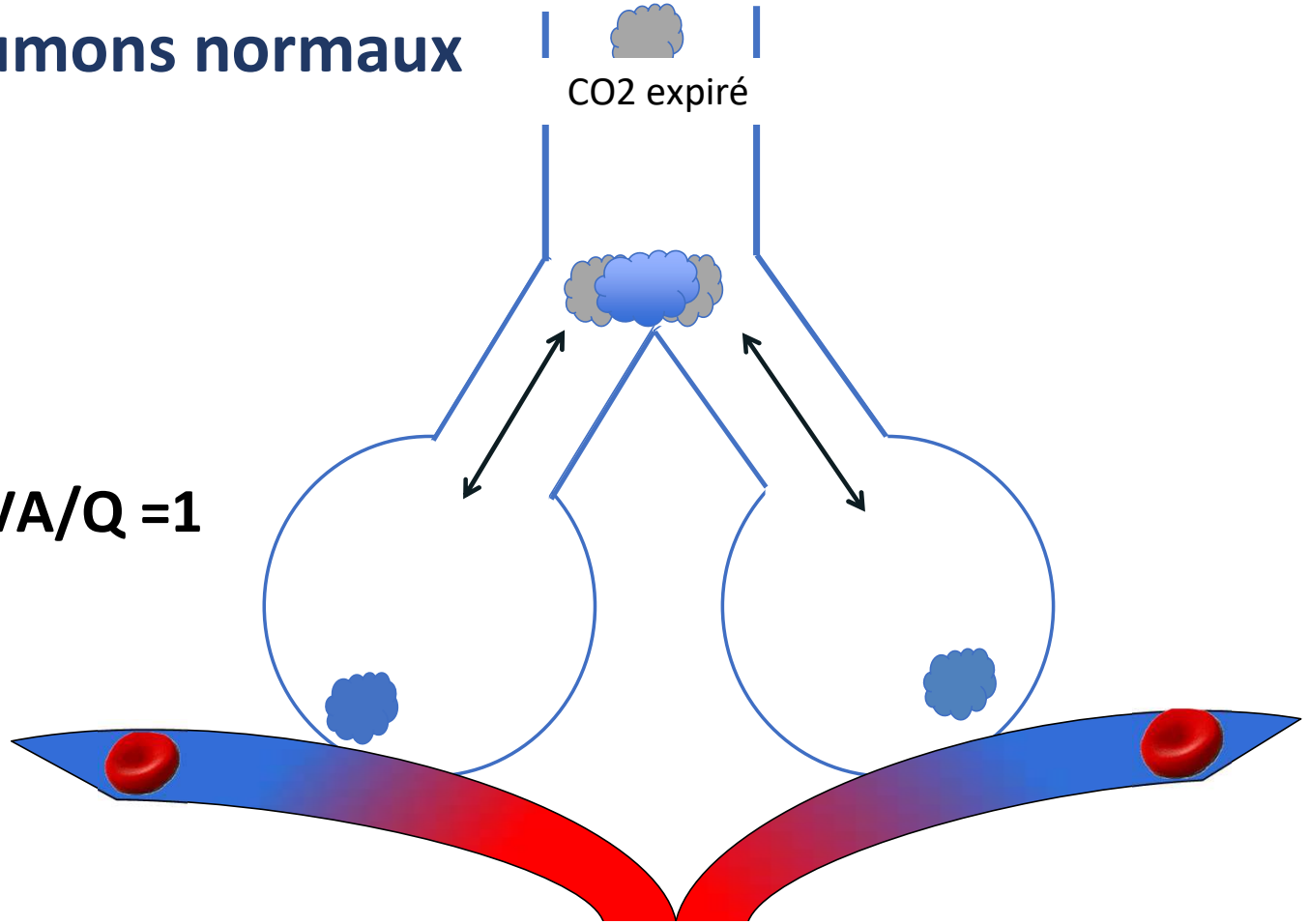
$PACO_2 = (VCO_2 / \mathbf{VA})*k$



$PAO_2 = PiO_2 - PaCO_2/R$

CO_2 dépendant de la ventilation
O_2 dépendant de la surface et FiO_2

Poumons normaux

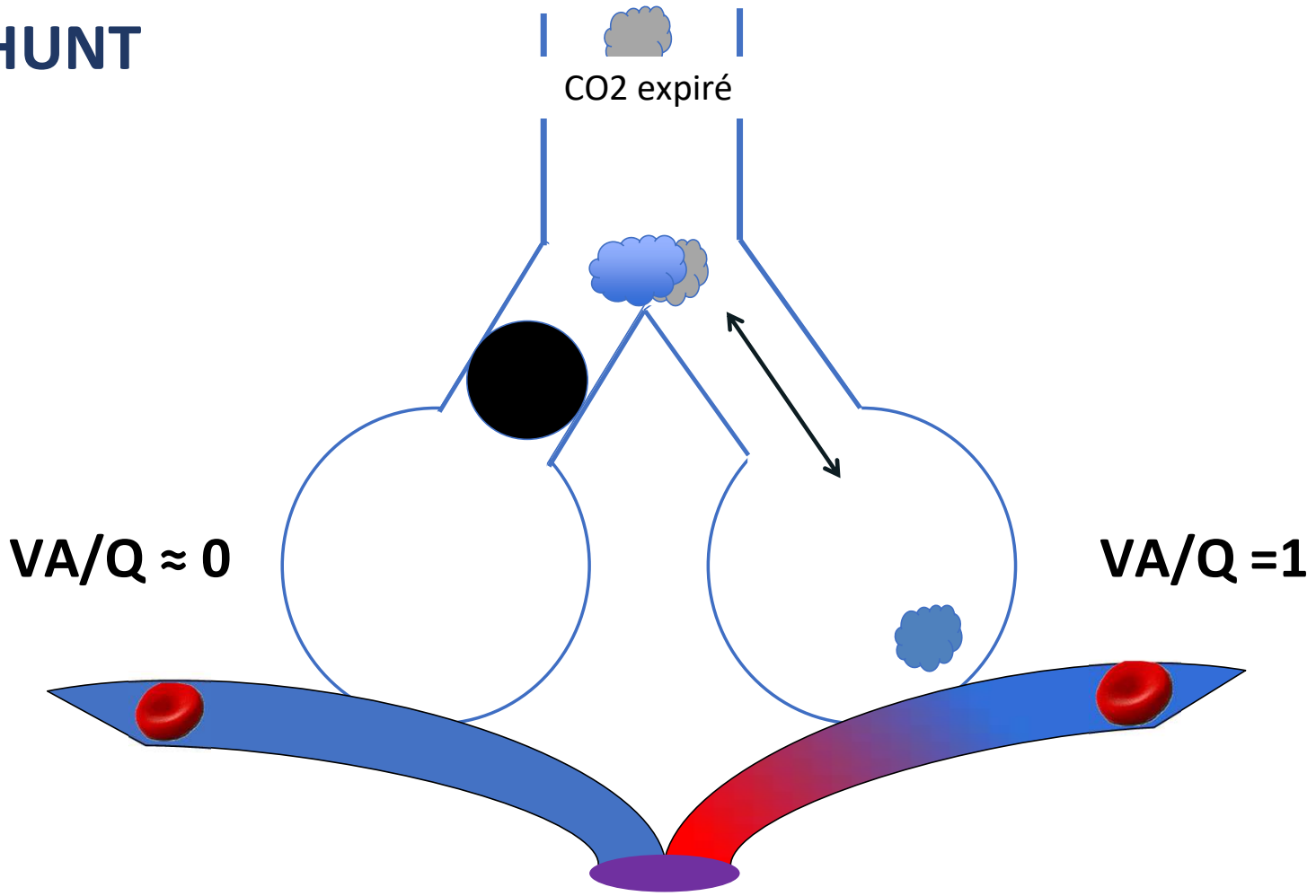


VA/Q =1

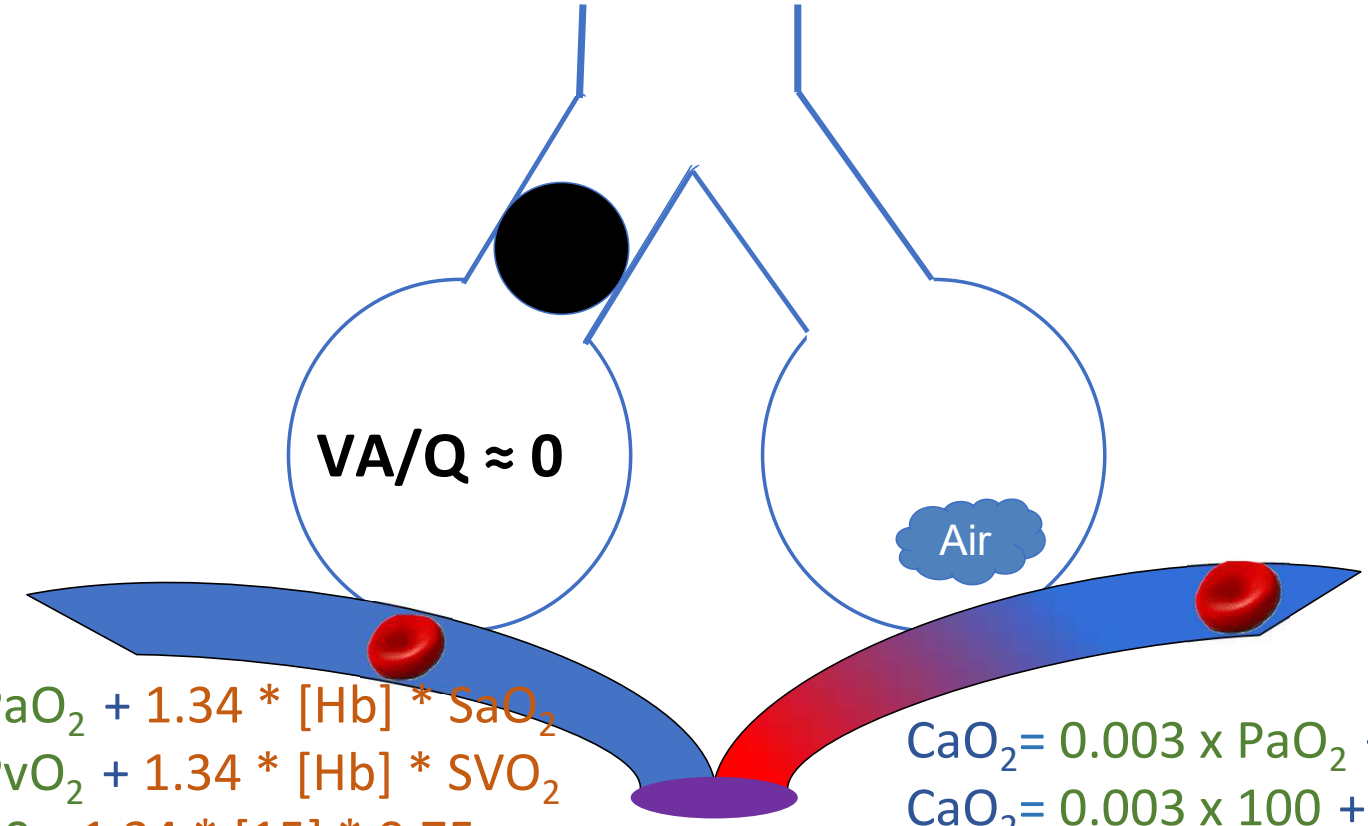
PaO_2 ~100 mmHg / $PaCO_2$ ~ 40 mmHg

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SHUNT



SHUNT



Exemple pour 100ml

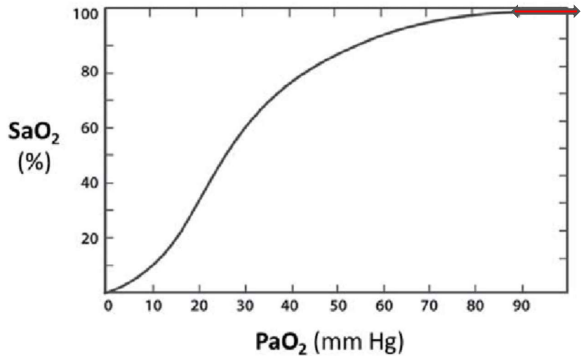
$CaO_2 = 0.003 \times PaO_2 + 1.34 * [Hb] * SaO_2$
$CaO_2 = 0.003 \times PvO_2 + 1.34 * [Hb] * SVO_2$
$CaO_2 = 0.003 \times 40 + 1.34 * [15] * 0,75$
$CaO_2 = 0.1\ ml + 15\ ml$

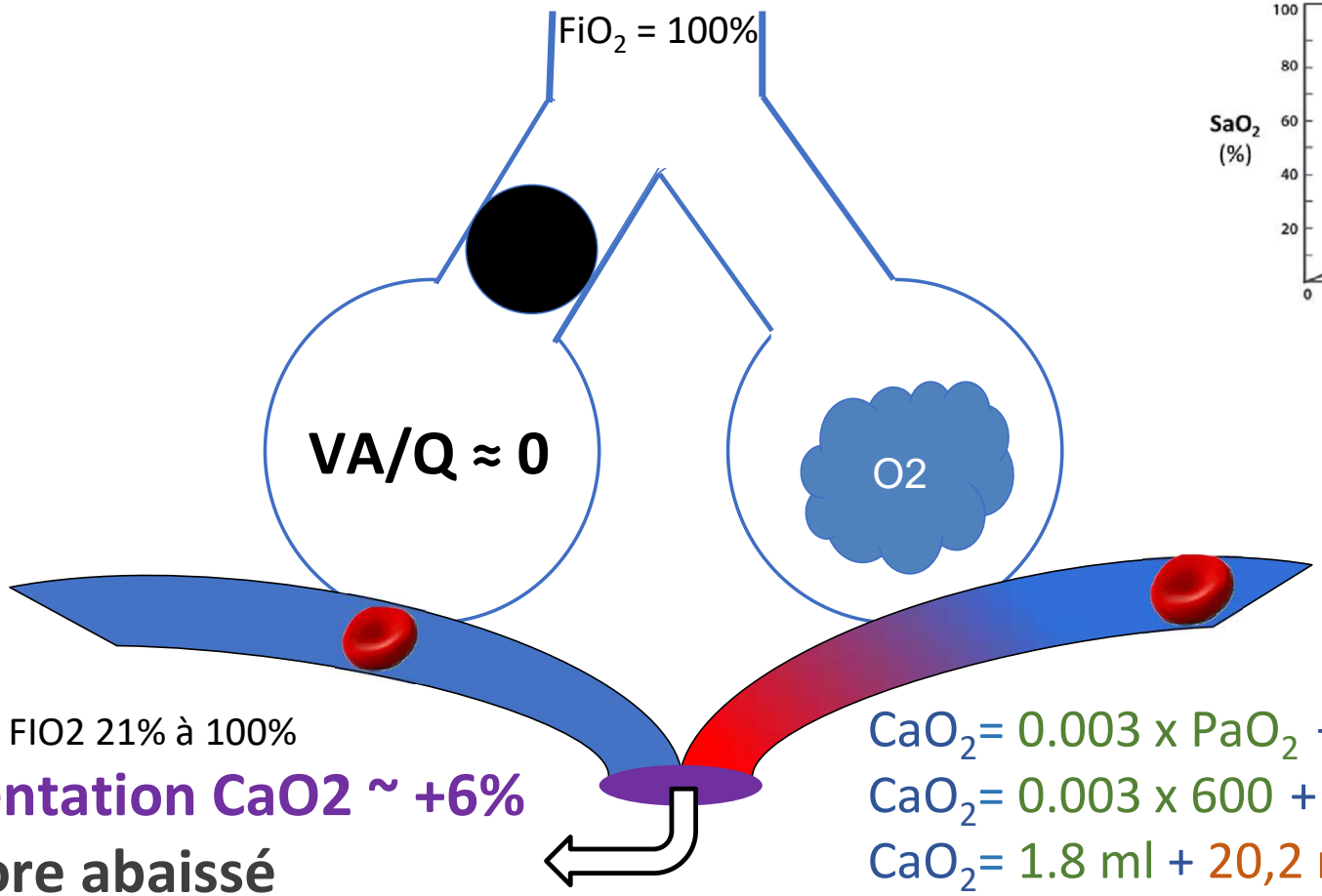
$CaO_2 = 0.003 \times PaO_2 + 1.34 * [Hb] * SaO_2$
$CaO_2 = 0.003 \times 100 + 1.34 * [15] * 0,98$
$CaO_2 = 0.3\ ml + 19.7\ ml$

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SHUNT et Oxygène





Exemple pour 100ml

Passage de FIO2 21% à 100%

Augmentation CaO2 ~ +6%

Et encore abaissé

$CaO_2 = 0.003 \times PaO_2 + 1.34 * [Hb] * SaO_2$

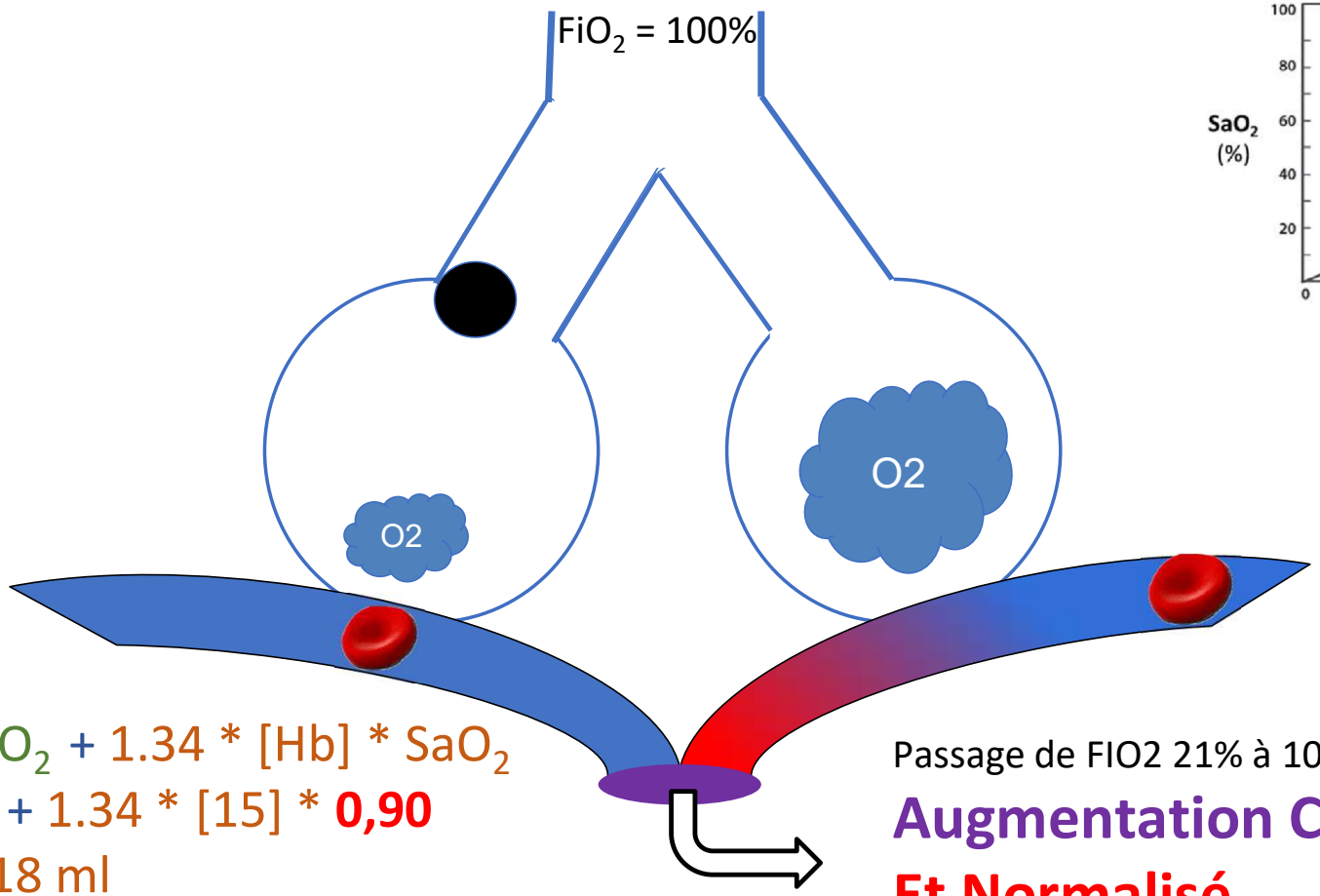
$CaO_2 = 0.003 \times 600 + 1.34 * [15] * 1$

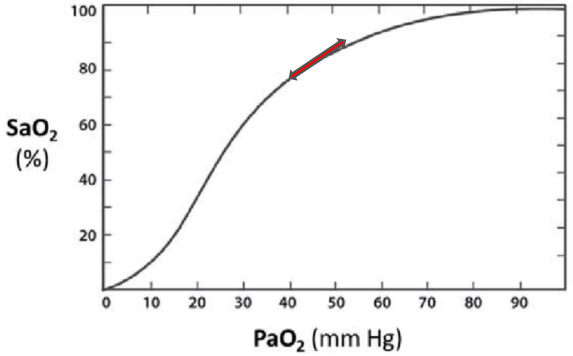
$CaO_2 = 1.8\ ml + 20{,}2\ ml$

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Effet shunt





Exemple pour 100ml

$CaO_2 = 0.003 \times PaO_2 + 1.34 * [Hb] * SaO_2$

$CaO_2 = 0.003 \times \mathbf{60} + 1.34 * [15] * \mathbf{0,90}$

$CaO_2 = 0.18\ ml + 18\ ml$

Passage de FIO2 21% à 100%

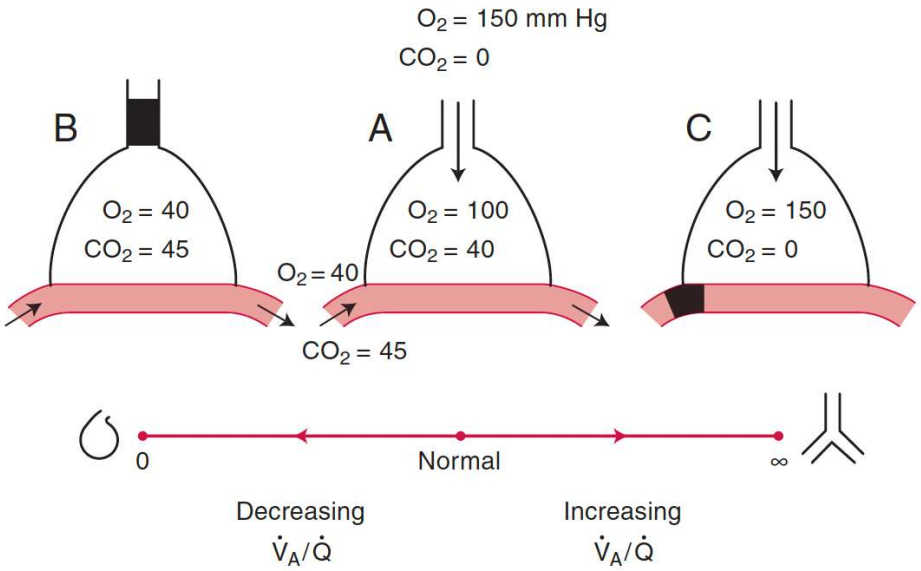
Augmentation CaO2 ~ + 15%

Et Normalisé

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De l'espace mort au shunt …



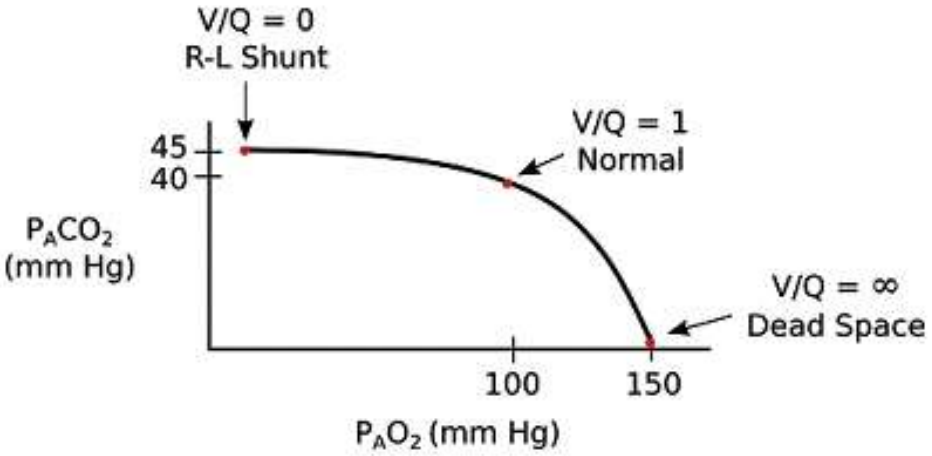
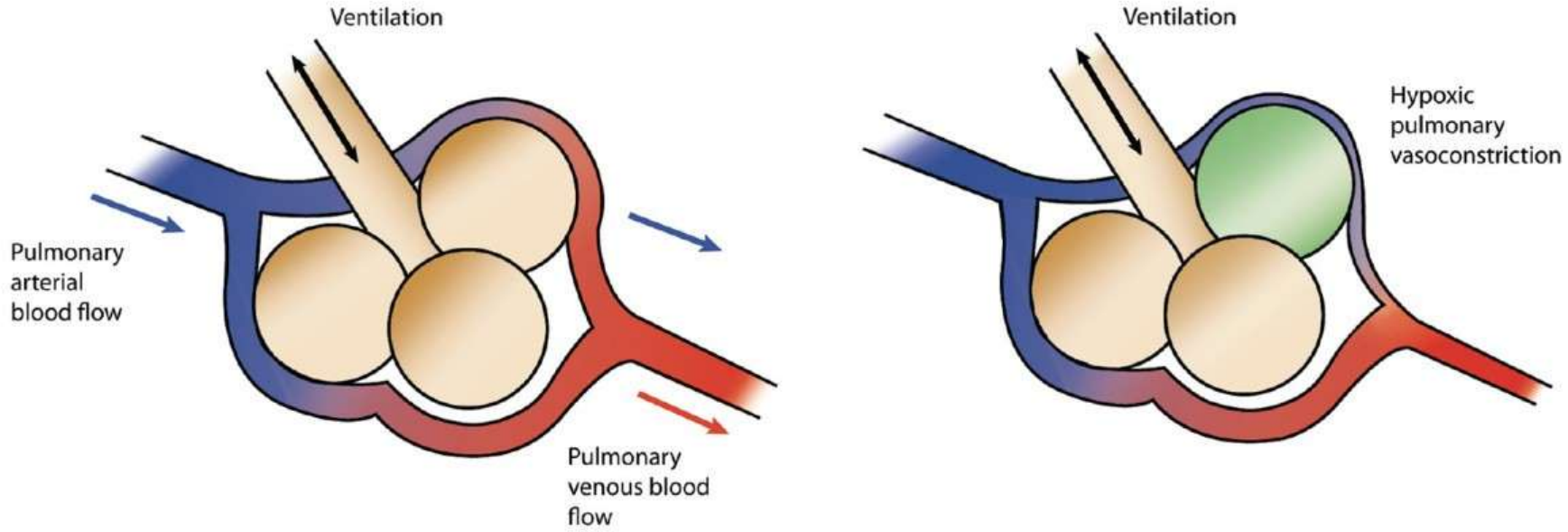


Figure 5-6. Effect of altering the ventilation-perfusion ratio on the P_{O_2} and P_{CO_2} in a lung unit.

Vasoconstriction pulmonaire hypoxique



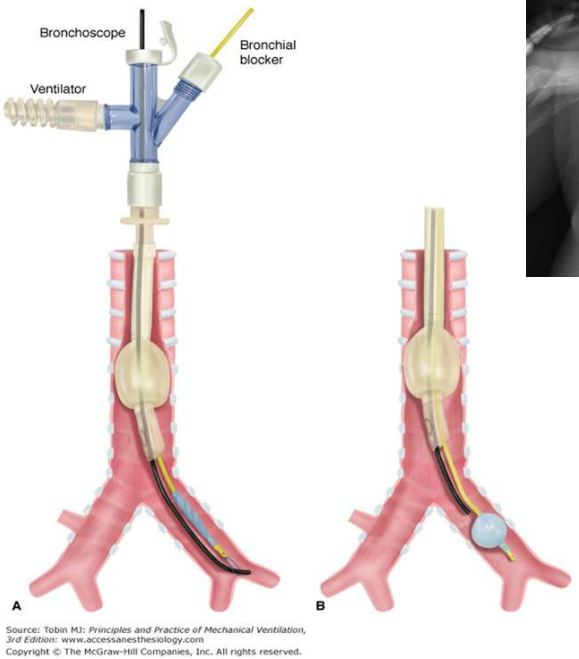
Anesthésique ?
Vasodilatateur
Alcalose
Hypothermie

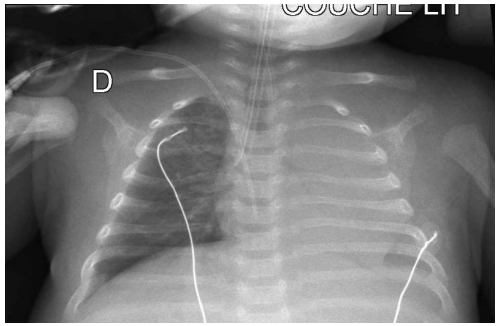
Almitrine

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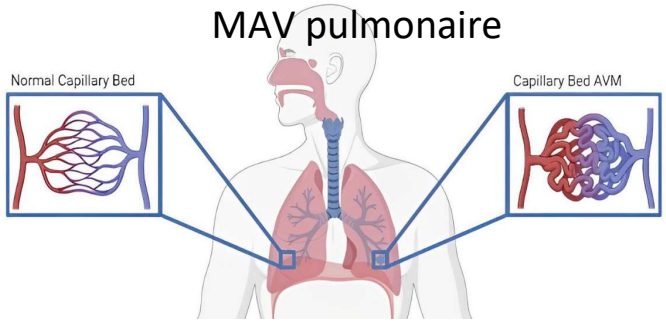
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Situation clinique





MAV pulmonaire



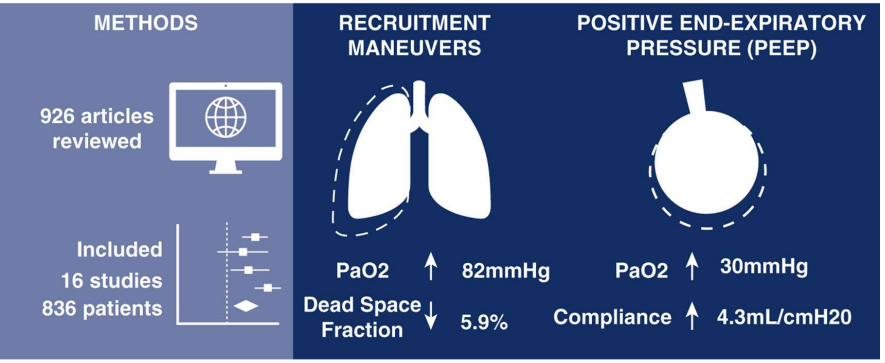
VA/Q ≈ 0

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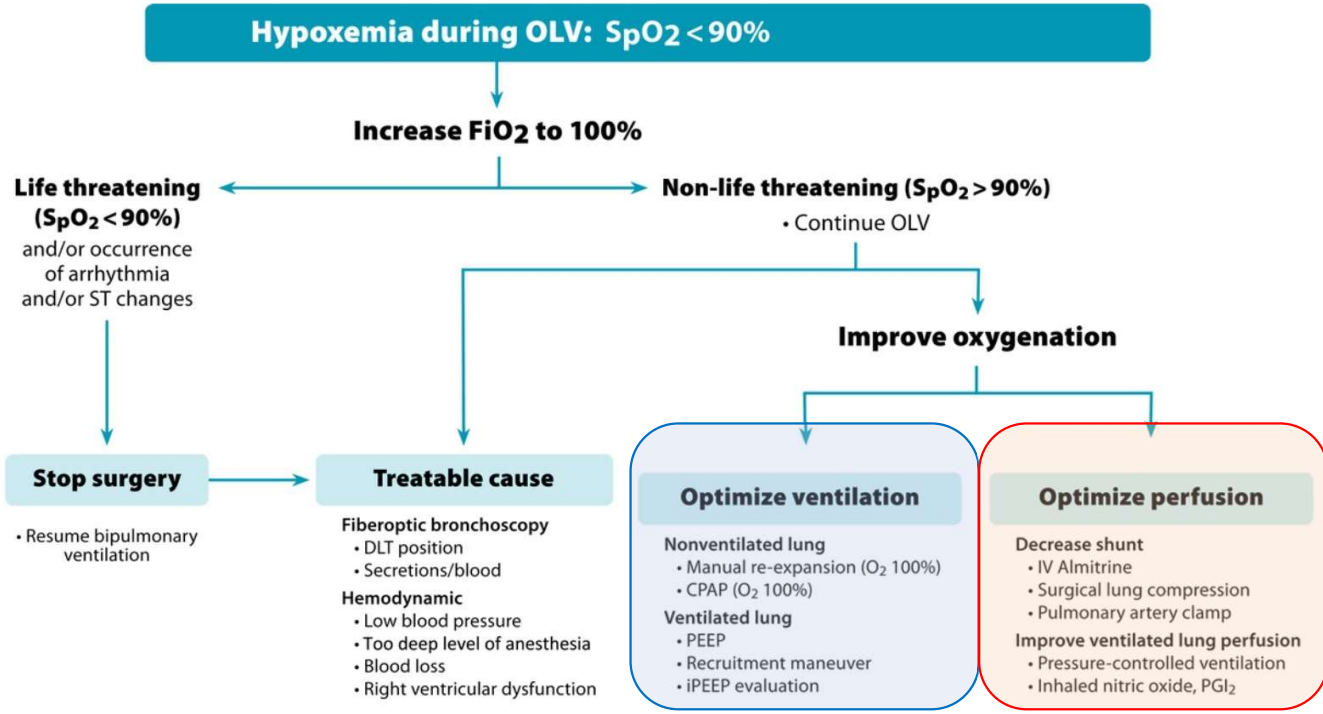
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Ventilation unipulmonaire

Positive end-expiratory pressure and recruitment maneuvers during one-lung ventilation: A systematic review and meta-analysis



Peel JK, Funk DJ, Slinger P, Srinathan S, Kidane B. *JTCVS*. 2020.



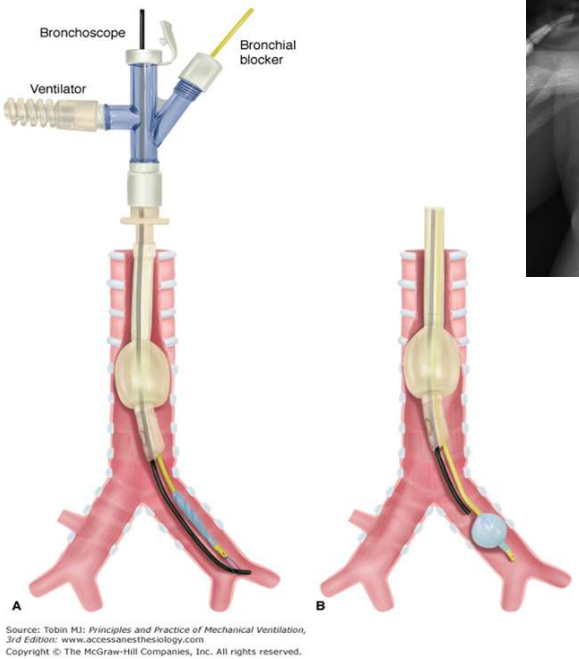
Roze et al. Anesthesiology 2011

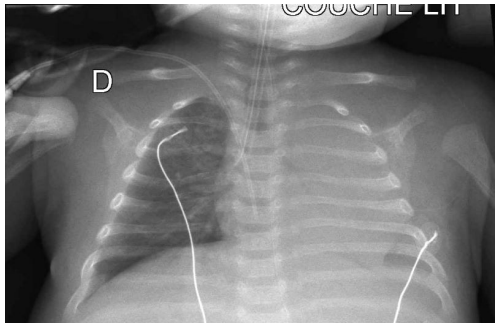
Caro Club Anesthésie-Réanimation en Obstétrique

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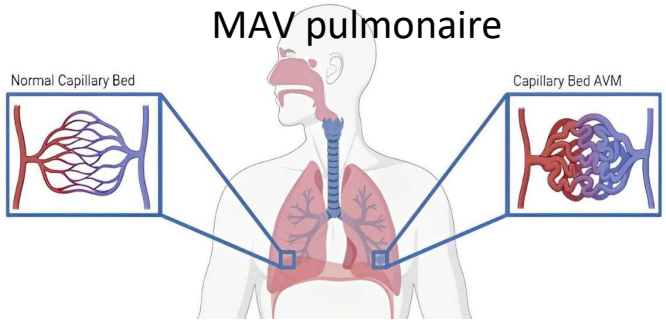
Situation clinique

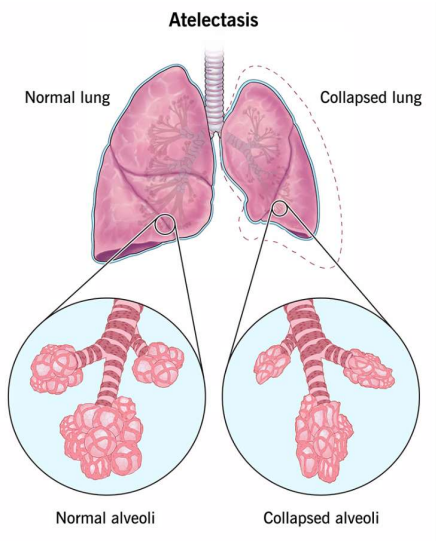
VA/Q < 1





MAV pulmonaire



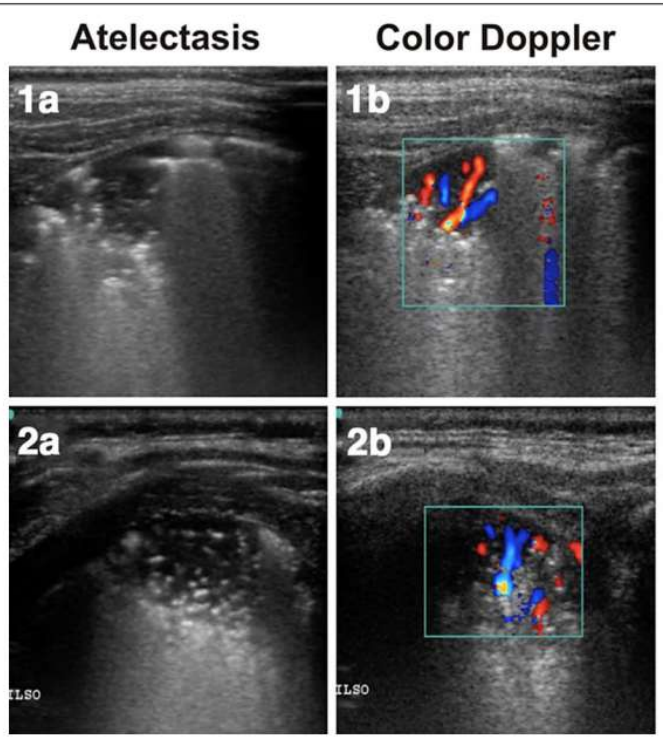


VA/Q ≈ 0

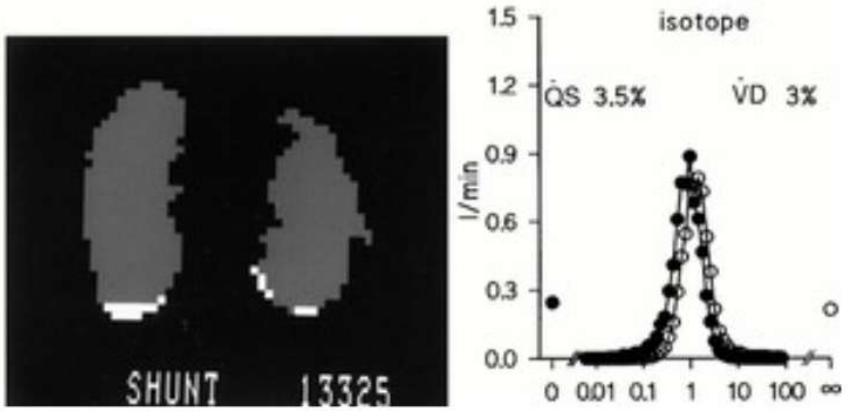
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Atélectasie



Tokics et al. JAP 1996



Doppler images of intra-pulmonary shunt within atelectasis in anesthetized children

Cecilia M. Acosta[1*], Gerardo Tusman[1], Mauro Costantini[1], Camila Echevarría[2], Sergio Pollioto[3], Diego Abrego[3], Fernando Suarez-Sipmann[4,5] and Stephan H. Böhm[6]

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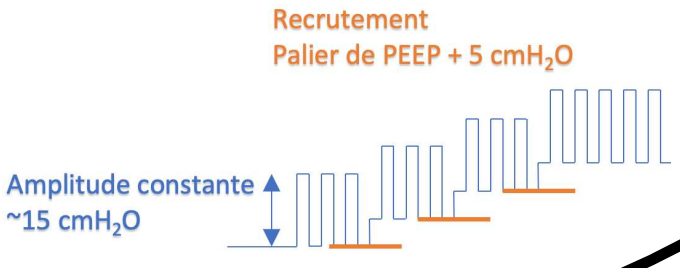
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… donc si j'ai un effet shunt !

↗ FiO2 ne sert pas vraiment…



PEEP ≥ 5 cmH_2O



Recrutement

CONCLUSION

- **Distinguer le shunt et l'effet shunt**
- **Comprendre que l'O_2 n'est pas la réponse**
- **Importance de la vasoconstriction hypoxique**
- **Rôle de la PEEP et du recrutement**