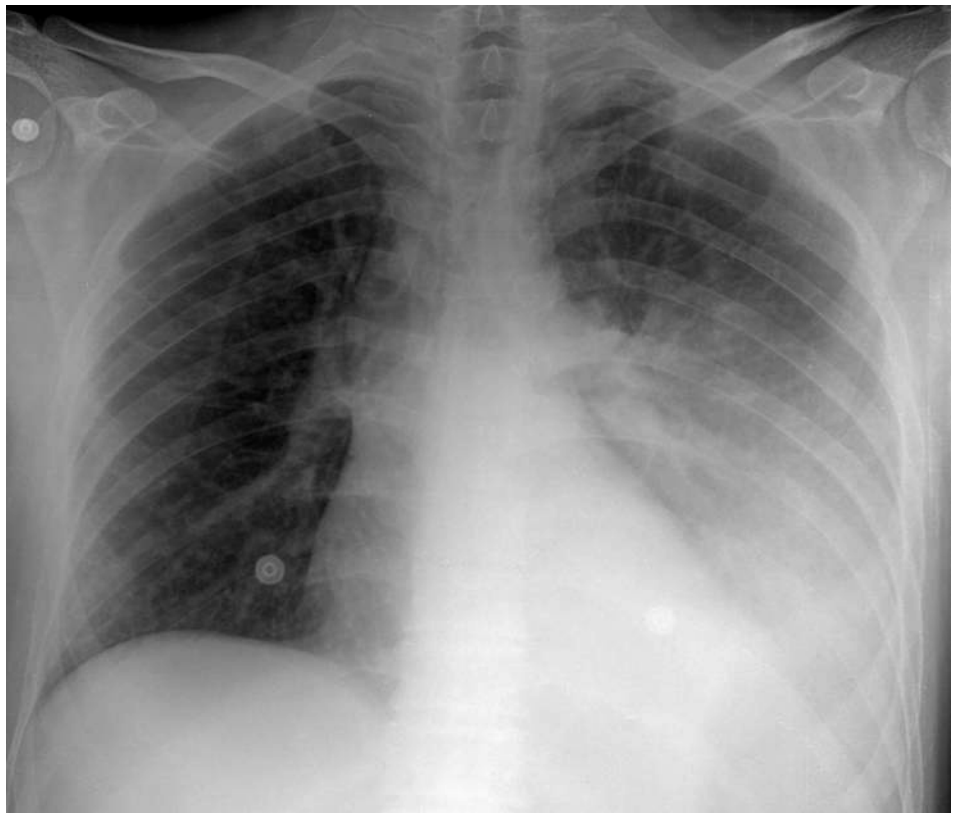
FEEA course Nº1 Respiratory System & Thorax
June 26-29, 2007 Arkhangelsk, Russia

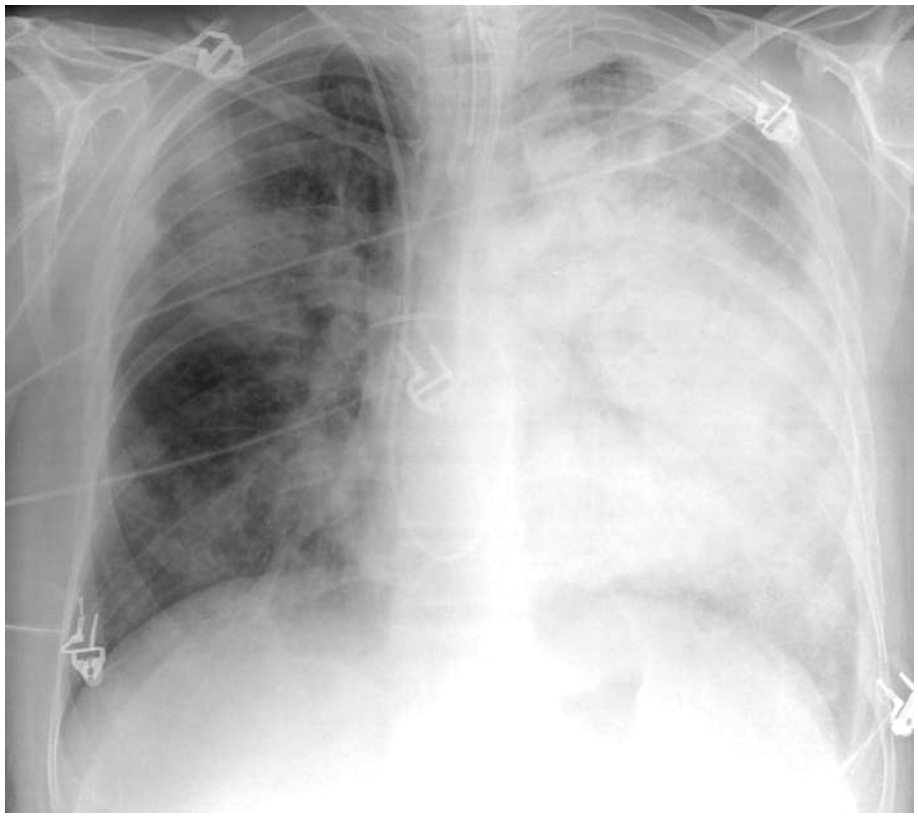
Одностороннее легочное поражение в отделении интенсивной терапии

Lluis Blanch MD, PhD
Senior Critical Care Center
Scientific Director Corporació Parc Taulí
Universitat Autónoma de Barcelona
Sabadell, Spain

Односторонняя пневмония

Пневмония
+
Двусторонняя инфильтрация





26 / 08 / 2005

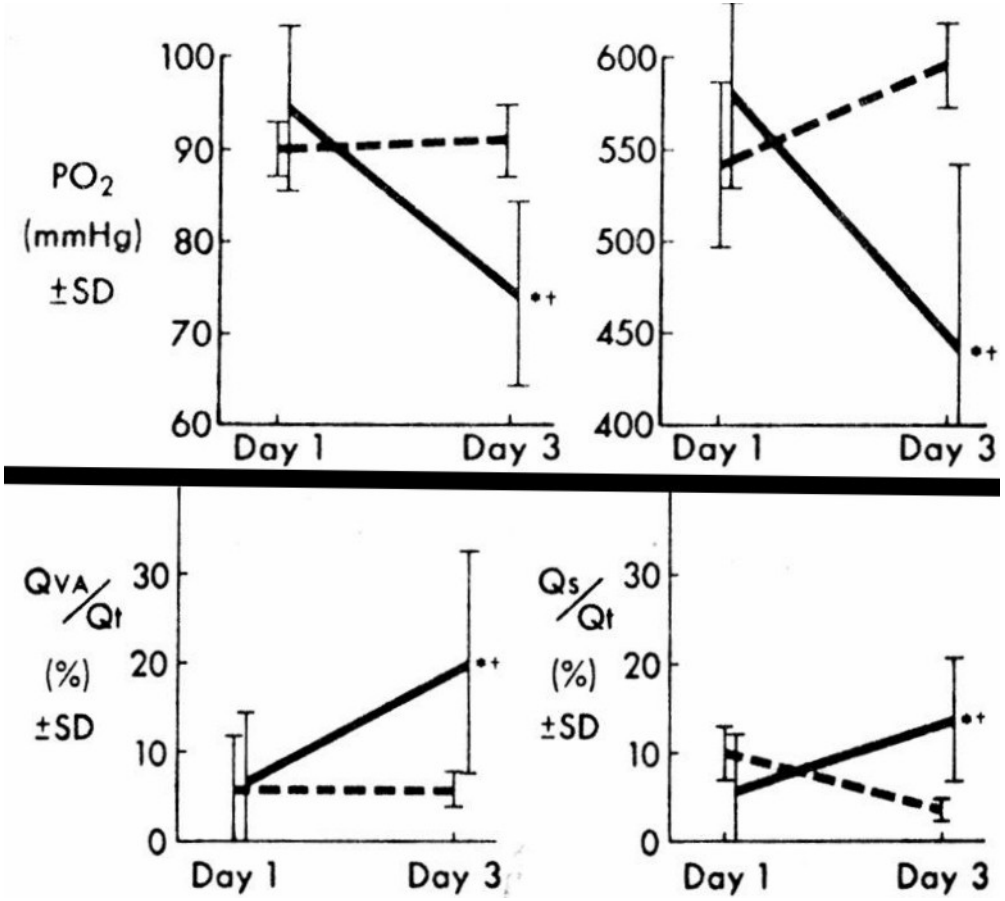
31 / 08 / 2005

Существуют ли различия между односторонним поражением и двусторонним острым повреждением легких?

Pathophysiology of gas exchange and pulmonary perfusion in pneumococcal lobar pneumonia in dogs

J Appl Physiol 1981;50:524-530

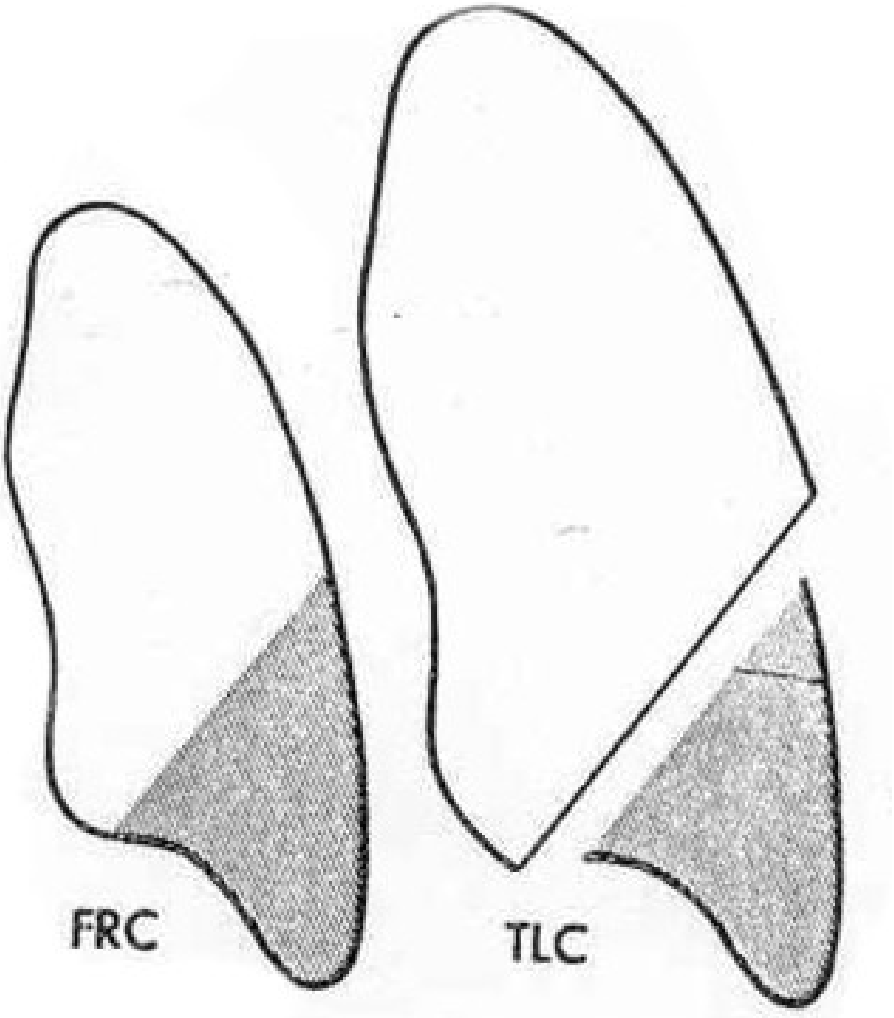
R. B. LIGHT, S. N. MINK, AND L. D. H. WOOD
Sections of Respiratory and Infectious Diseases, Department of Medicine, University of Manitoba, Winnipeg, Manitoba R3E OZ3, Canada



Контроль – – –

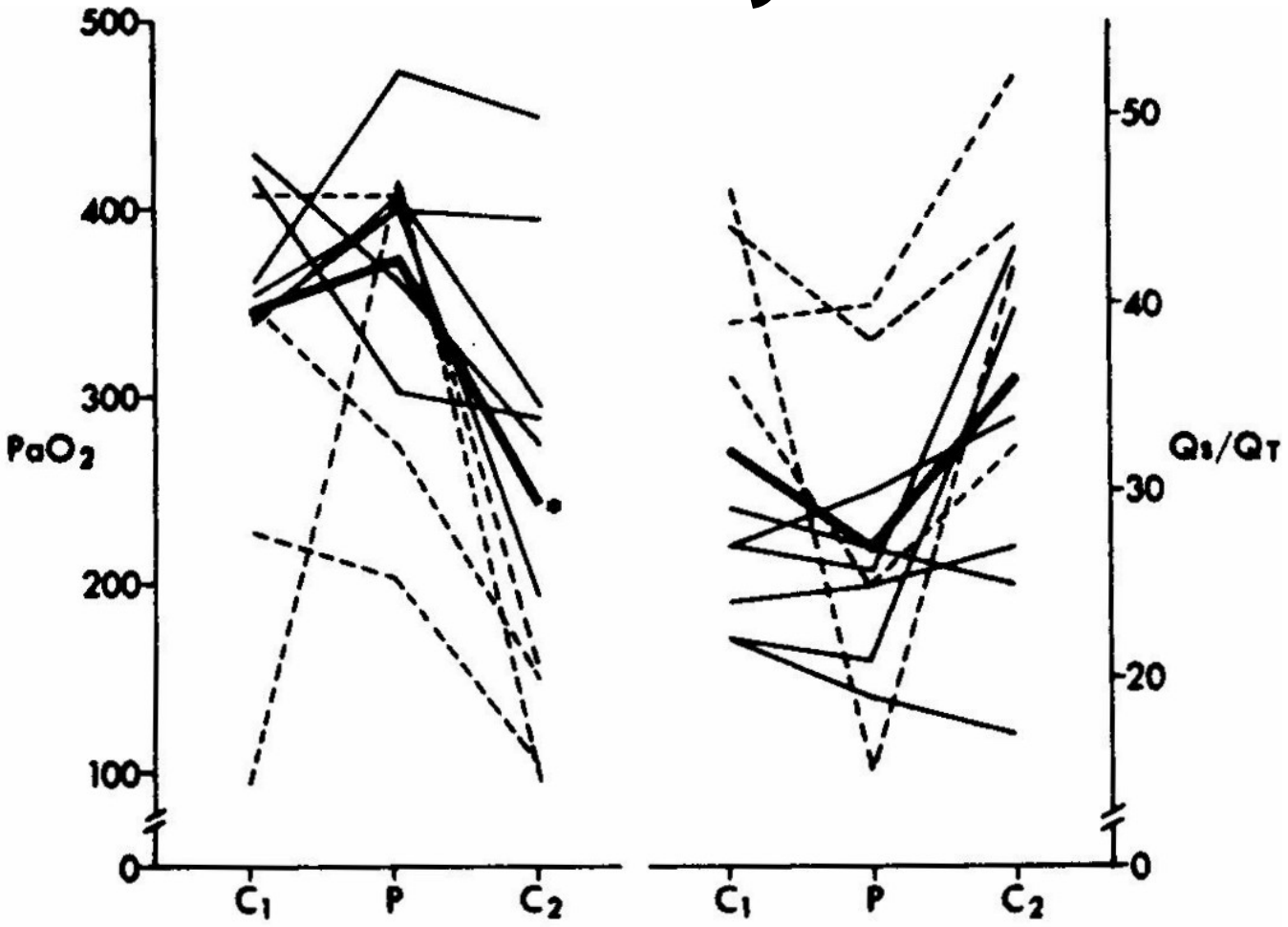
Пневмония ———

Эффект долевой пневмонии у собак на механику легких



Mink SN et al. J Appl Physiol 1981;50:283-291

Влияние ПДКВ на газообмен и перфузию легких при долевой пневмонии у собак



Mink SN et al. J Appl Physiol 1981;50:283-291

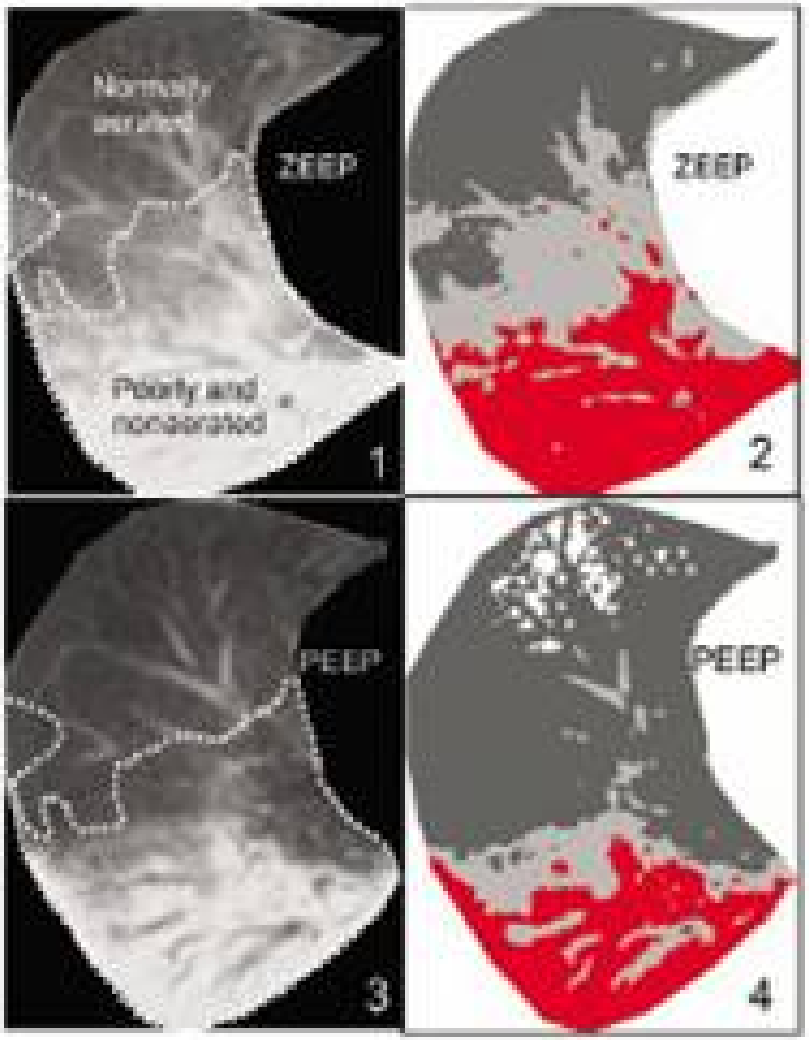
Research

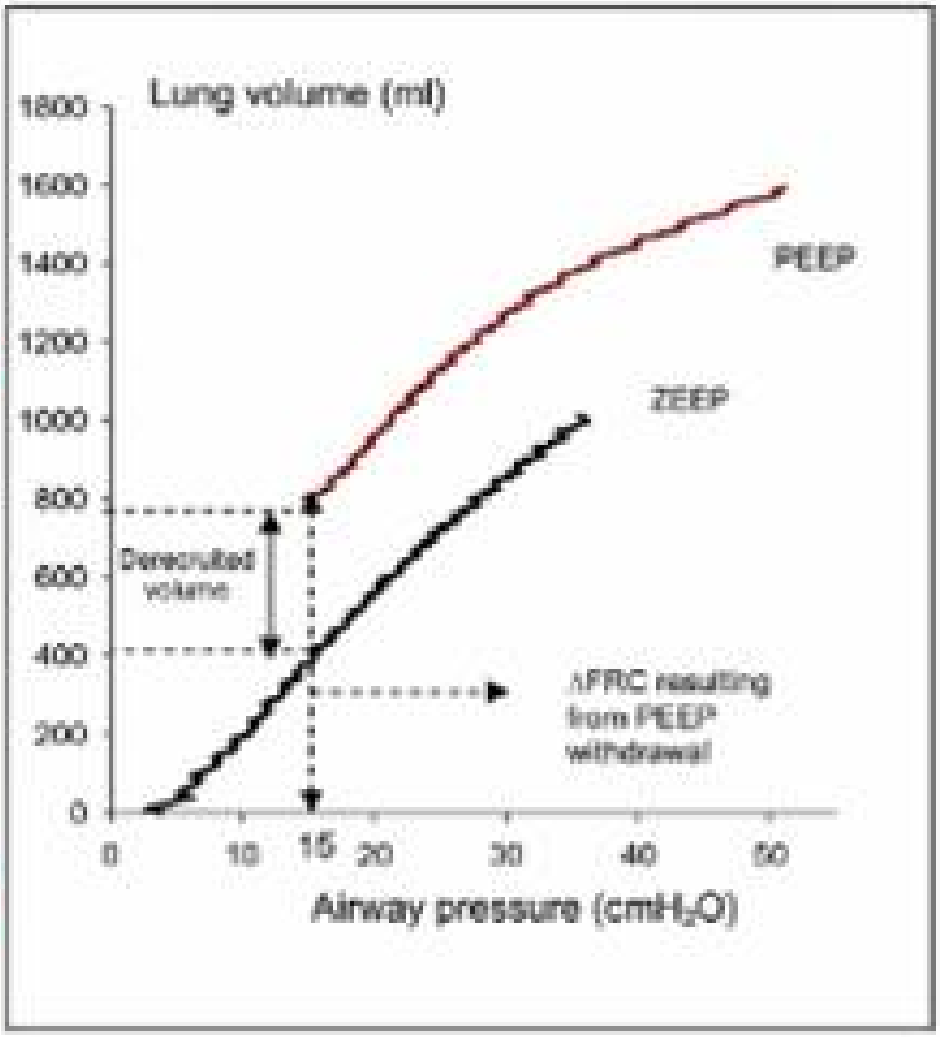
Critical Care 2006, 10:R95 (doi:10.1186/cc4956)

Open Access

Measurement of alveolar derecruitment in patients with acute lung injury: computerized tomography versus pressure–volume curve

Qin Lu[1,6], Jean-Michel Constantin[2,6], Ania Nieszkowska[3,6], Marilia Elman[4,6], Silvia Vieira[5,6] and Jean-Jacques Rouby[1,6]



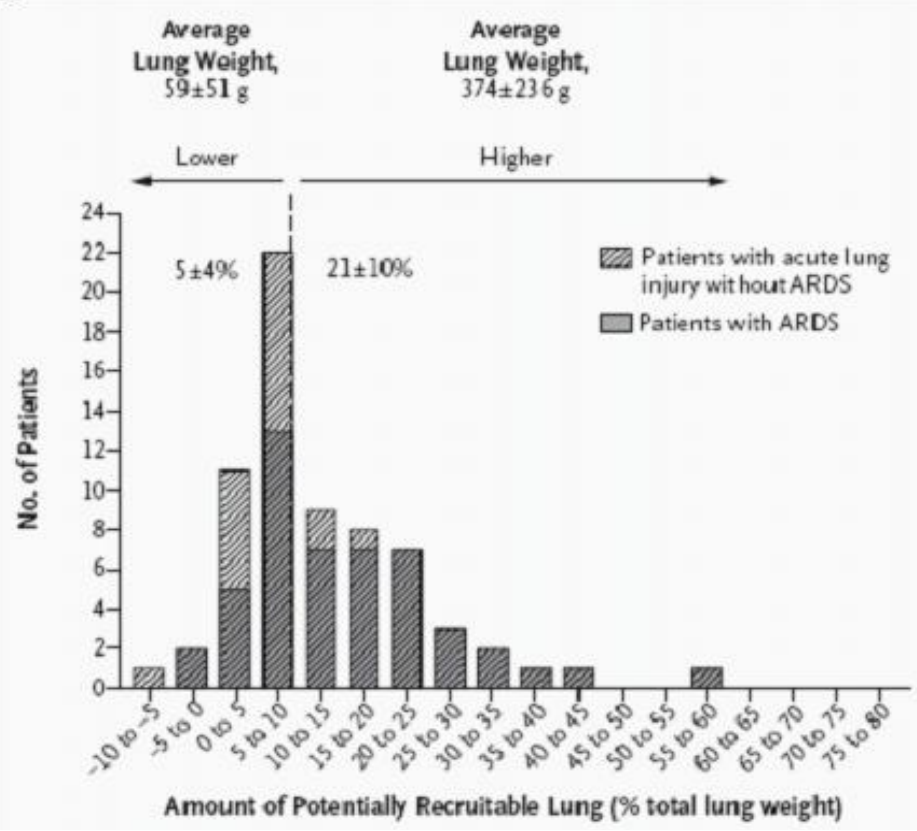


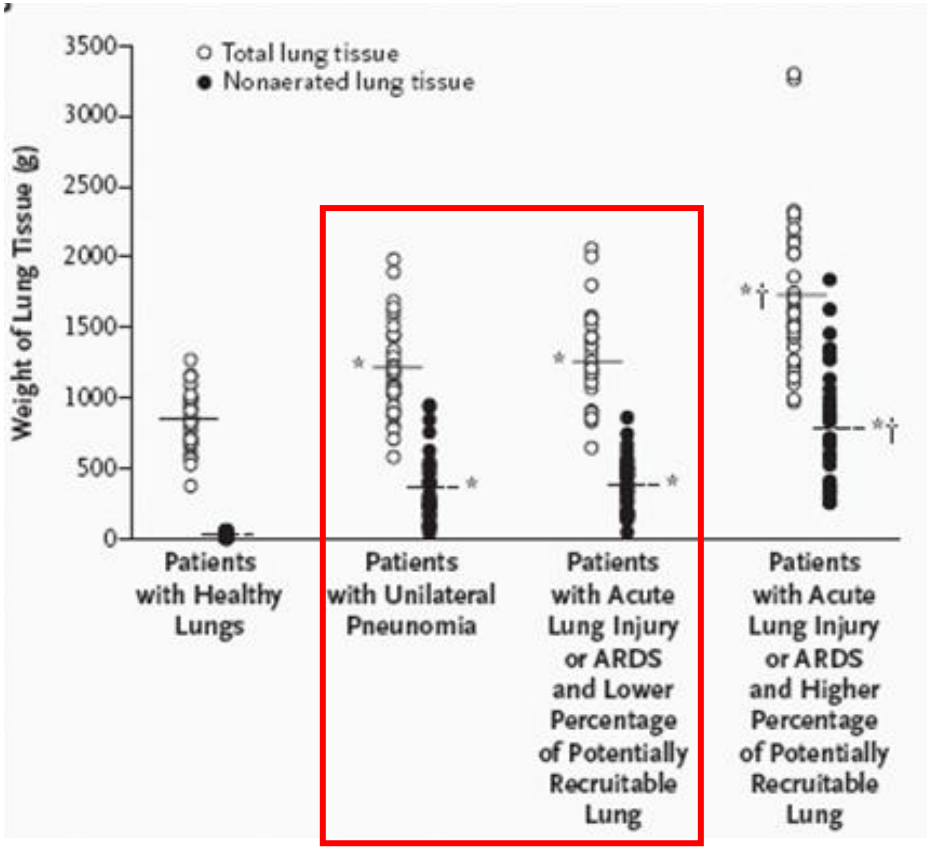
ESTABLISHED IN 1812 APRIL 27, 2006 VOL. 354 NO. 17

The NEW ENGLAND JOURNAL of MEDICINE

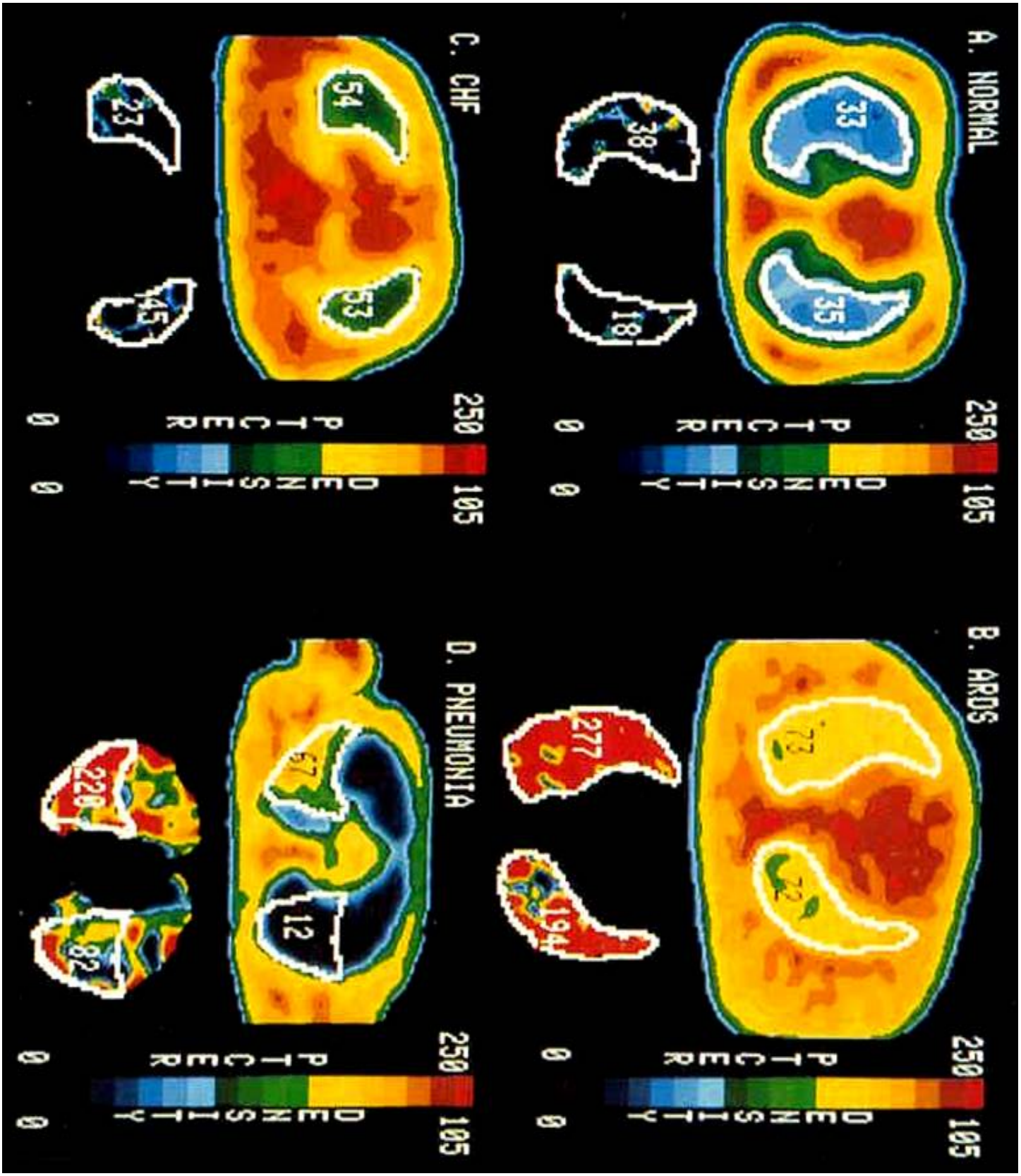
Lung Recruitment in Patients with the Acute Respiratory Distress Syndrome

Luciano Gattinoni, M.D., F.R.C.P., Pietro Caironi, M.D., Massimo Cressoni, M.D., Davide Chiumello, M.D., V. Marco Ranieri, M.D., Michael Quintel, M.D., Ph.D., Sebastiano Russo, M.D., Nicolò Patroniti, M.D., Rodrigo Cornejo, M.D., and Guillermo Bugedo, M.D.





Взаимное влияние между поврежденной и контралатеральной и/или здоровой (удаленной) легочными тканями



Kaplan et al
ARRD 1991

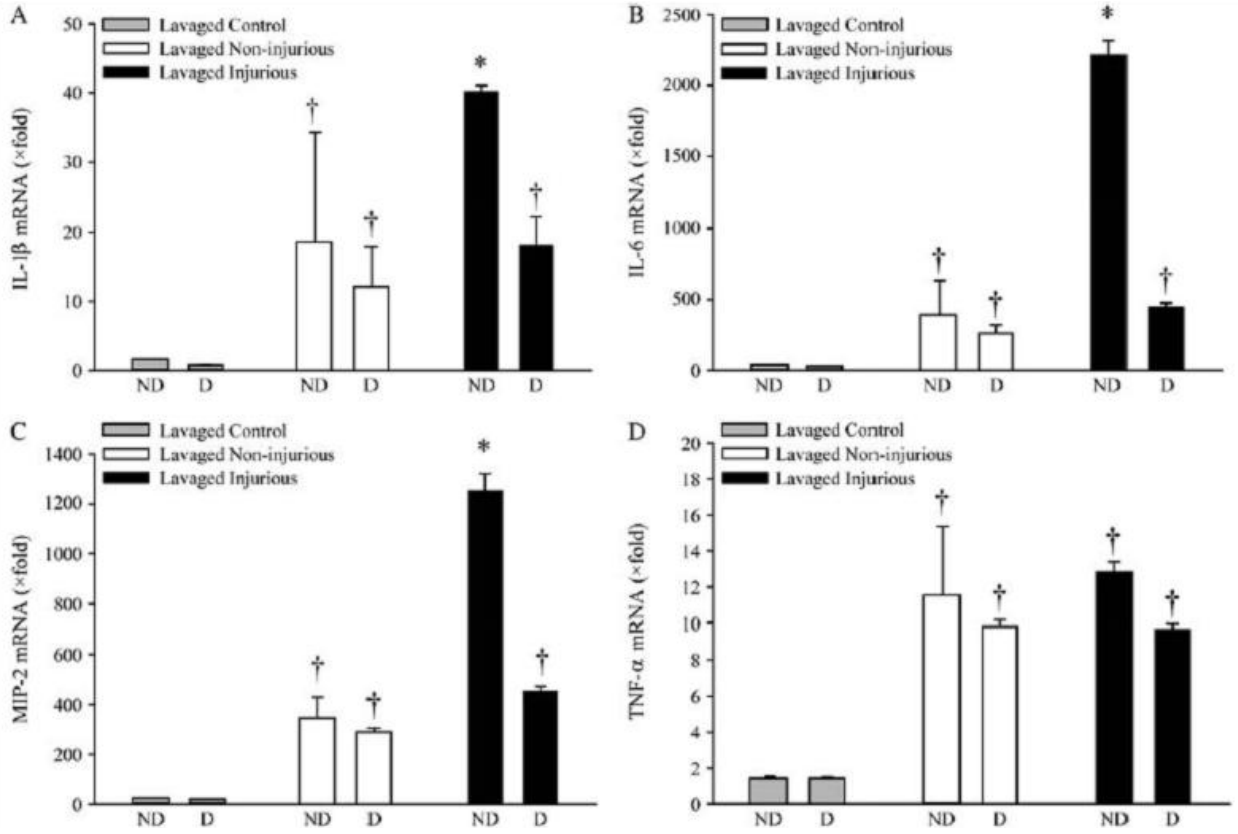
Atelectasis Causes Alveolar Injury in Nonatelectatic Lung Regions

Am J Respir Crit Care Med Vol 174. pp 279–289, 2006

Shinya Tsuchida, Doreen Engelberts, Vanya Peltekova, Natalie Hopkins, Helena Frndova, Paul Babyn, Colin McKerlie, Martin Post, Paul McLoughlin, and Brian P. Kavanagh

Lung Biology Program, and Departments of Critical Care Medicine and Radiology, Hospital for Sick Children; Departments of Anesthesia, Laboratory Medicine, and Physiology, and the Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Ontario, Canada; and School of Medicine and Medical Sciences, Conway Institute, University College Dublin, Dublin, Ireland

Expression of cytokine mRNA in Lung Tissue



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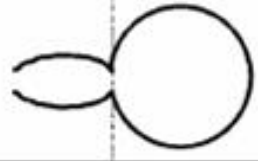
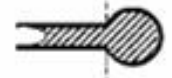
location	airway	alveolus
end-expiration		
end-inspiration		
injury	+++	+++
region	dependent (atelectatic)	
location	airway	alveolus
end-expiration		
end-inspiration		
injury	+++	+

Surg Today (2004) 34:47–54
DOI 10.1007/s00595-003-2652-x

SURGERY TODAY
© Springer-Verlag 2004

Ultrastructural Changes in the Contralateral Lung Tissue Following Unilateral Lung Ischemia: An Experimental Study in Rabbits

TURAN KANMAZ[1], MURAT CAKMAK[2], OZGUL TAP[3], UFUK METE[3], MEHMET KAYA[3], and SELCUK YUCESAN[1]

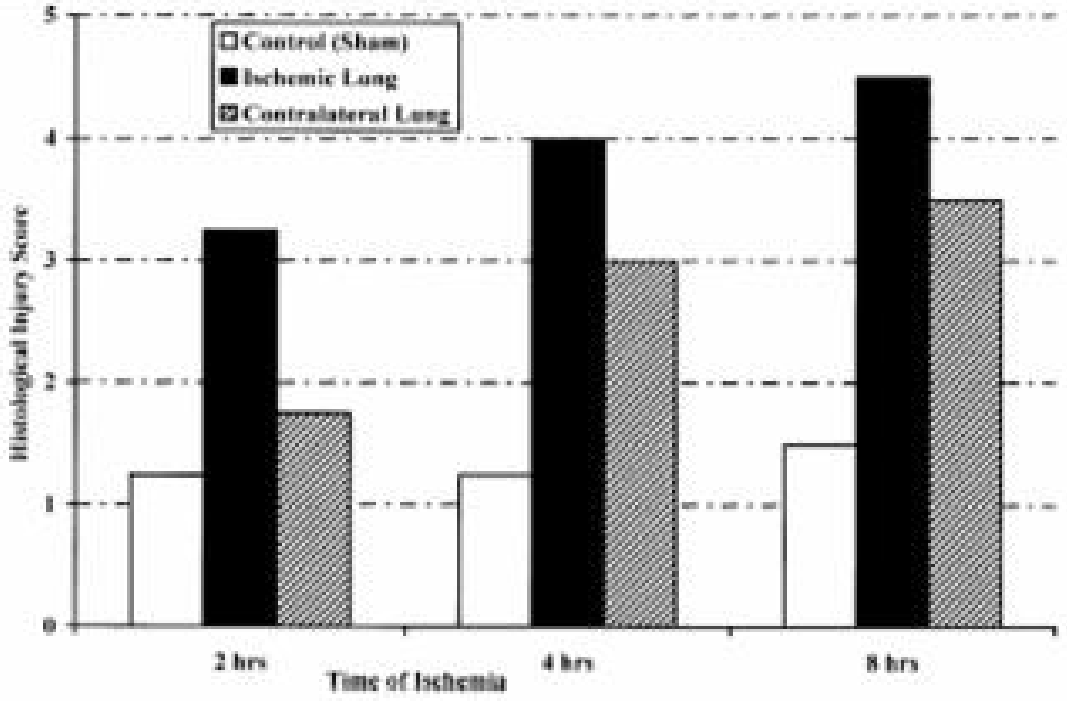


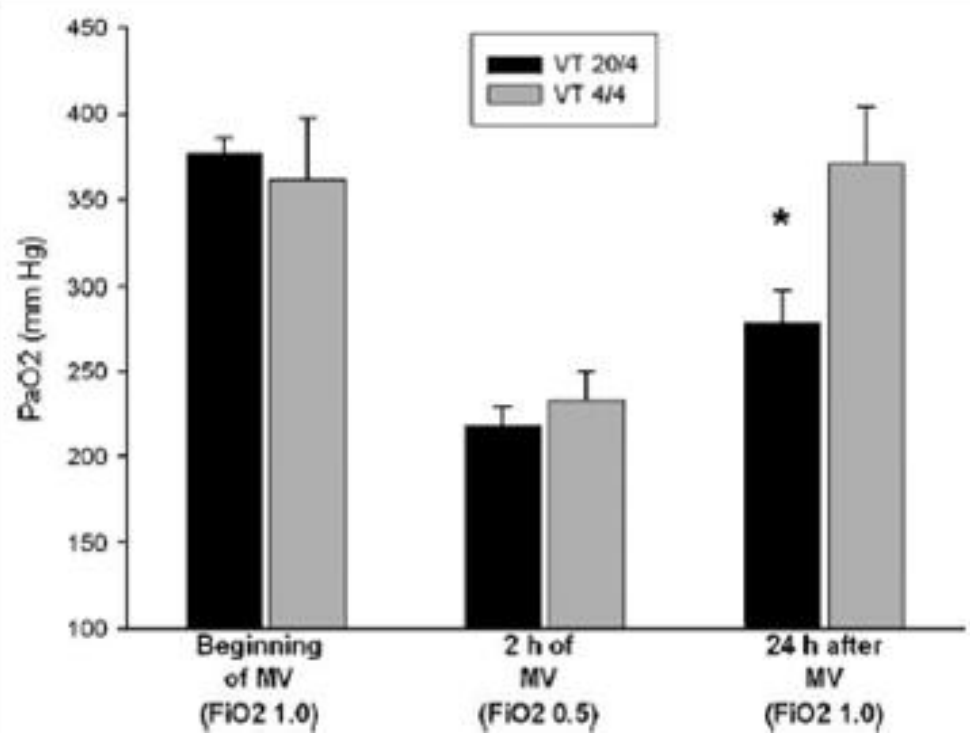
Fig. 6. Mean histological injury scores of each group. The contralateral lung injury was significantly correlated with the duration of ischemia

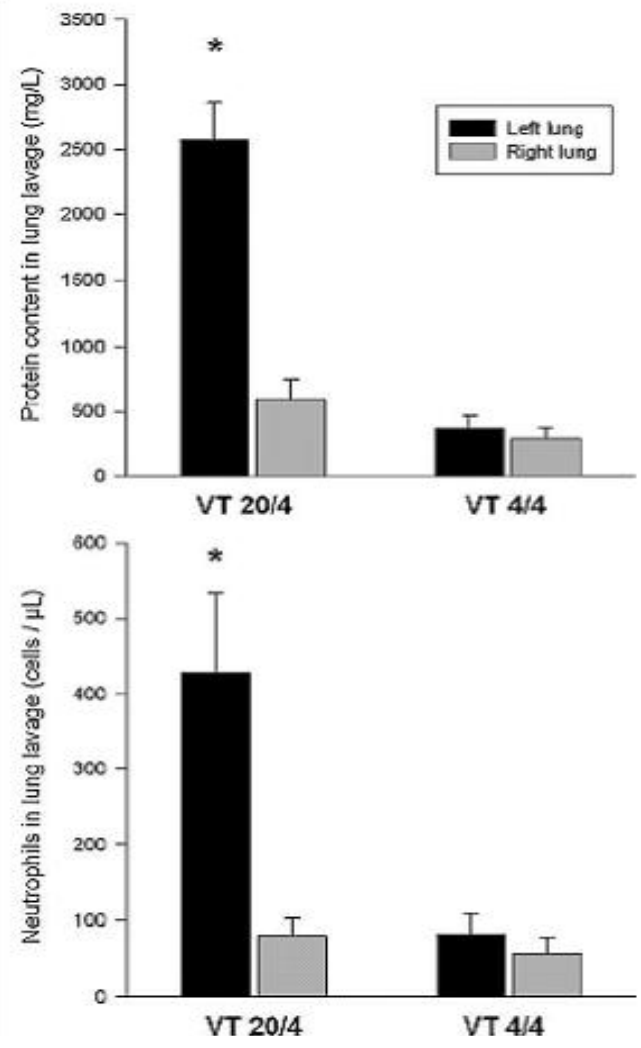
Ишемия с одной стороны вызывает двустороннее легочное повреждение

SHOCK, Vol. 26, No. 1, pp. 50–54, 2006

A NOVEL MODEL OF SELECTIVE LUNG VENTILATION TO INVESTIGATE THE LONG-TERM EFFECTS OF VENTILATION-INDUCED LUNG INJURY

Torsten Schreiber,* Christian Niemann,† Barbara Schmidt,* and Waheedullah Karzai†





Воспаления и гистологические изменения сохраняются спустя 24 часа после односторонней повреждающей ИВЛ

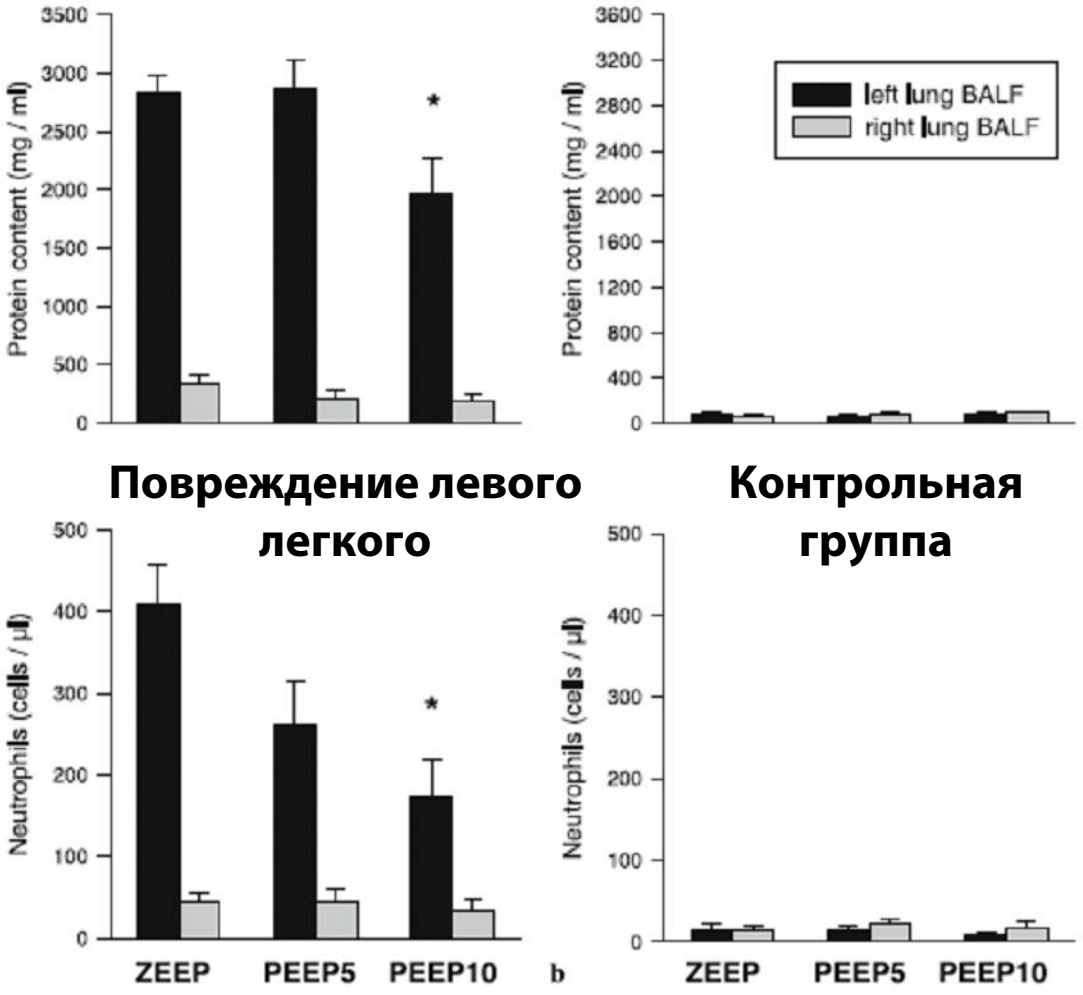
Intensive Care Med (2006) 32:740–749
DOI 10.1007/s00134-006-0117-6

EXPERIMENTAL

Torsten Schreiber
Lars Hueter
Elke Gaser
Barbara Schmidt
Konrad Schwarzkopf
Helga Rek
Waheedullah Karzai

PEEP has beneficial effects on inflammation in the injured and no deleterious effects on the noninjured lung after unilateral lung acid instillation

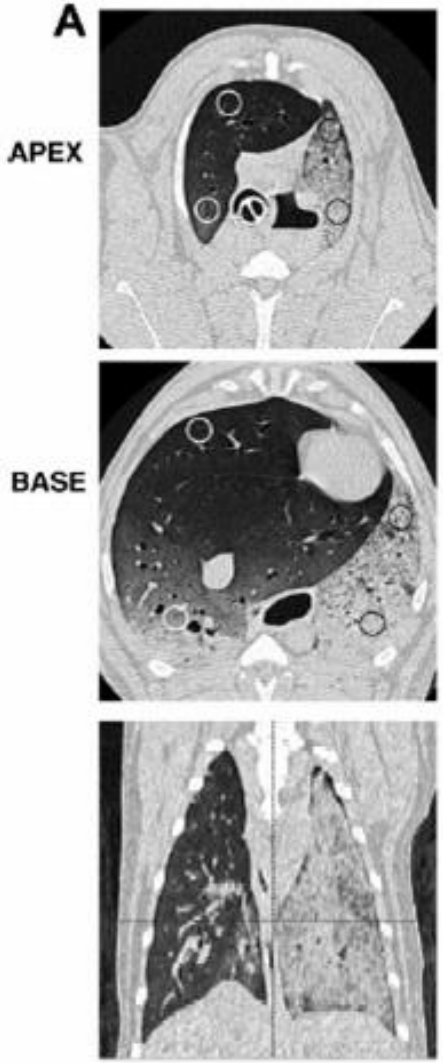
При одностороннем повреждении **высокий уровень ПДКВ** ослабляет воспалительный ответ клеток в поврежденных легких, поддерживает оксигенацию и не оказывает негативного влияние на противоположное легкое

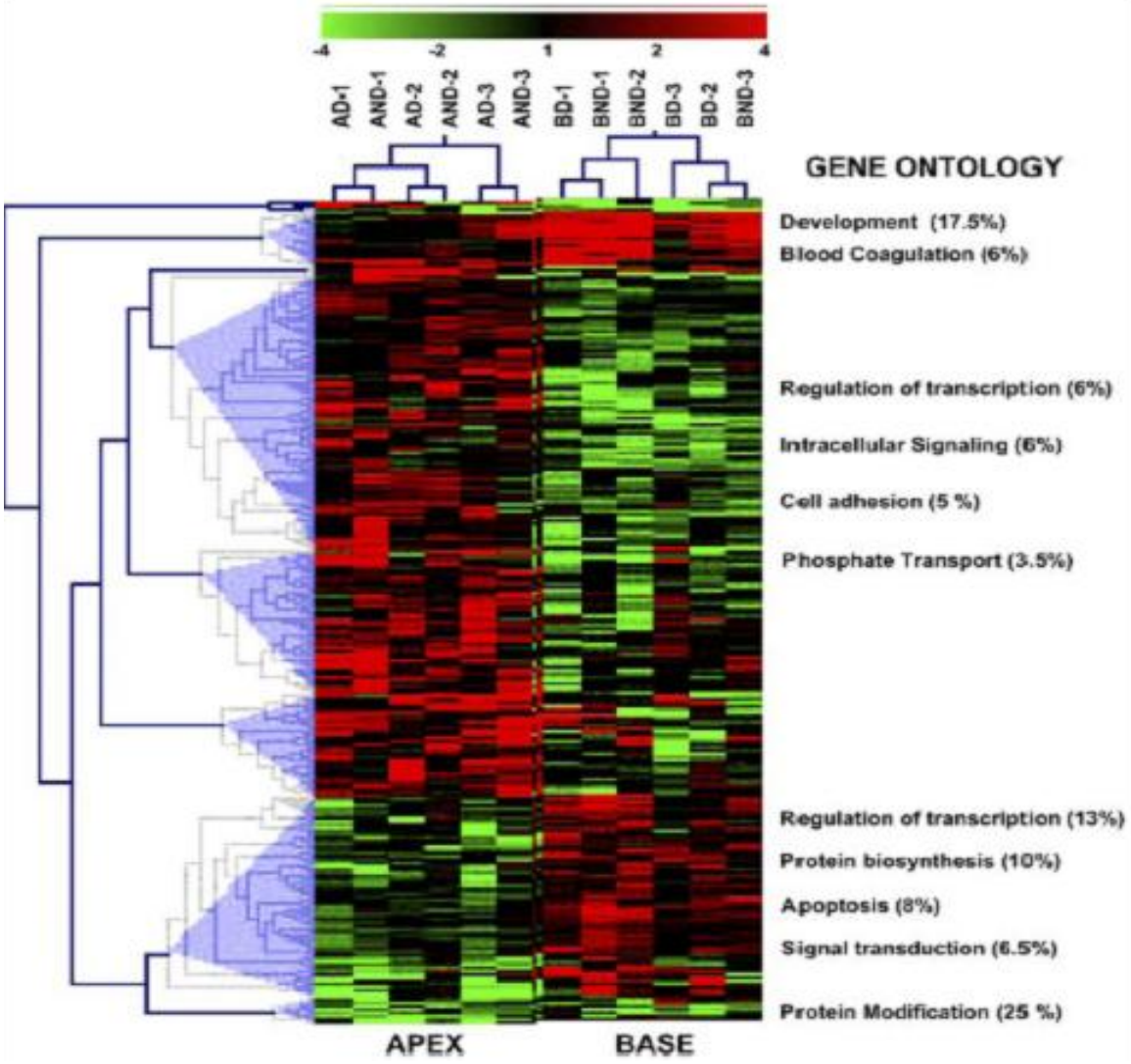


Microarray analysis of regional cellular responses to local mechanical stress in acute lung injury

Brett A. Simon, R. Blaine Easley, Dmitry N. Grigoryev, Shwu-Fan Ma, Shui Q. Ye, Tera Lavoie, Rubin M. Tuder and Joe G. N. Garcia

Am J Physiol Lung Cell Mol Physiol 291:851-861, 2006. First published Jun 16, 2006;
doi:10.1152/ajplung.00463.2005





Microarray analysis of regional cellular responses to local mechanical stress in acute lung injury

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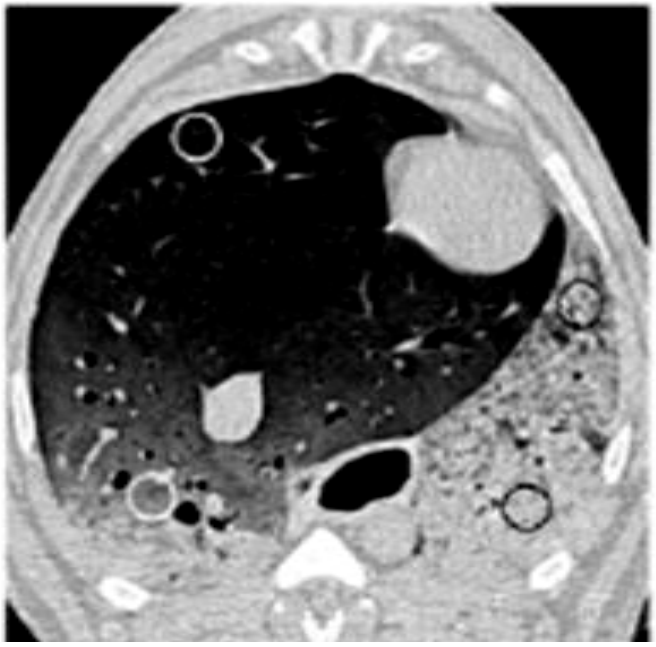
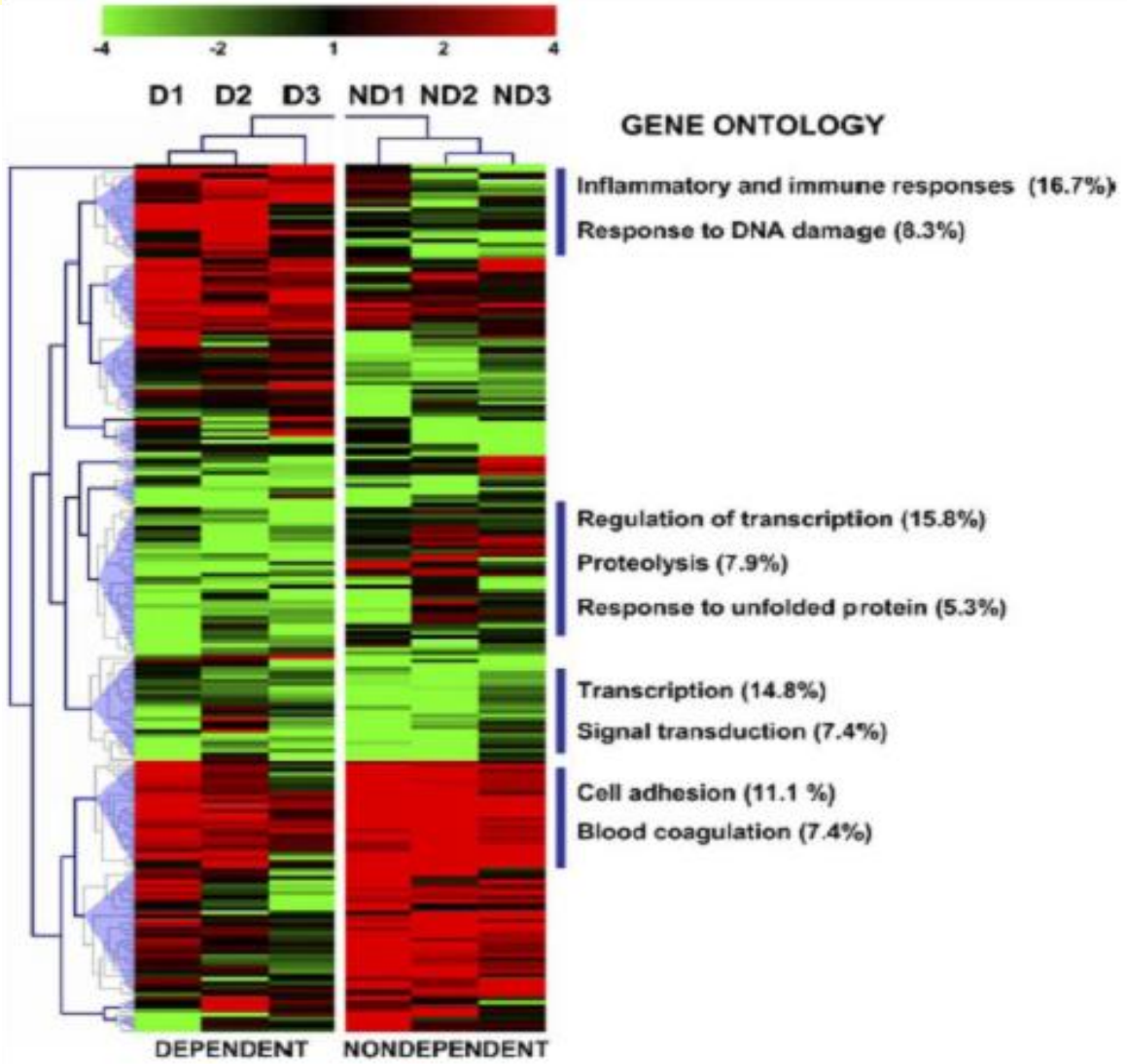
Am J Physiol Lung Cell Mol Physiol 291:851-861, 2006. First published Jun 16, 2006;
doi:10.1152/ajplung.00463.2005

Независимые зоны



Зависимые зоны



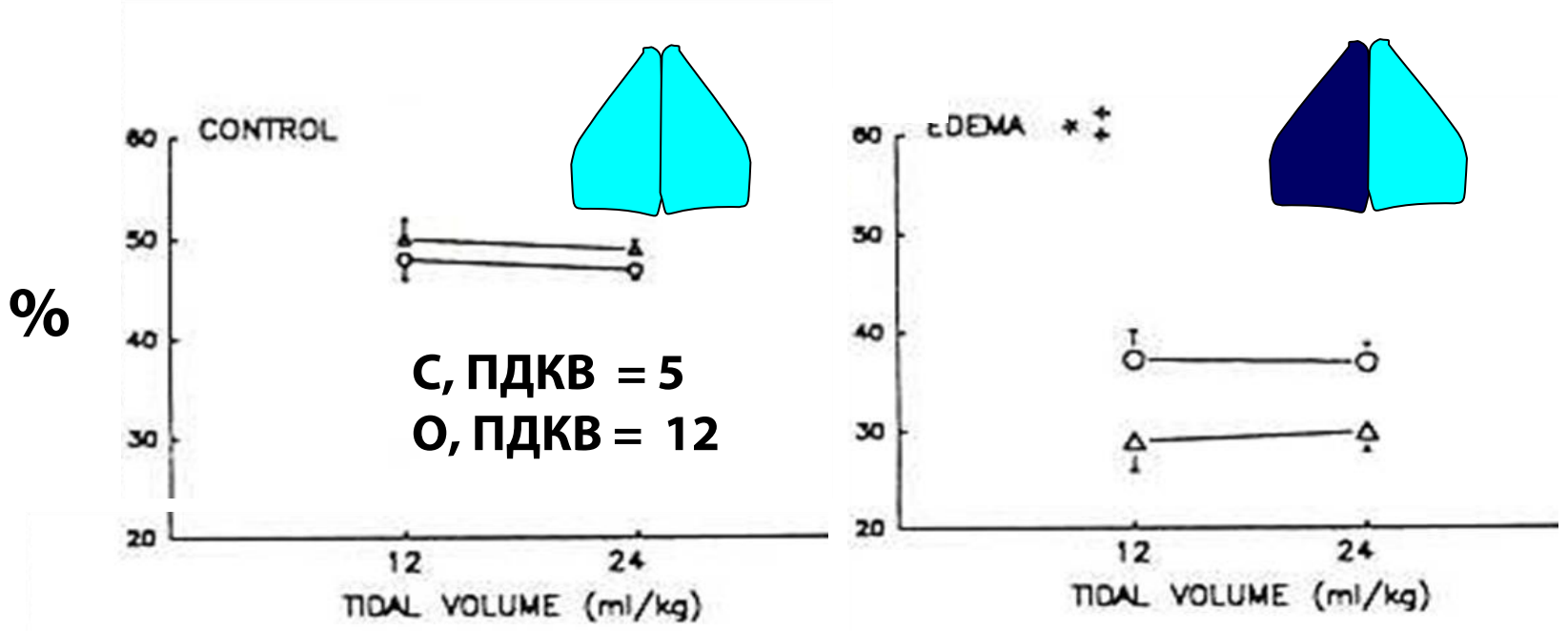
Искусственная вентиляция
и
Одностороннее легочное поражение

Effect of tidal volume and PEEP in ethchlorvynol-induced asymmetric lung injury

J Appl Physiol 1992; 73:108-116.

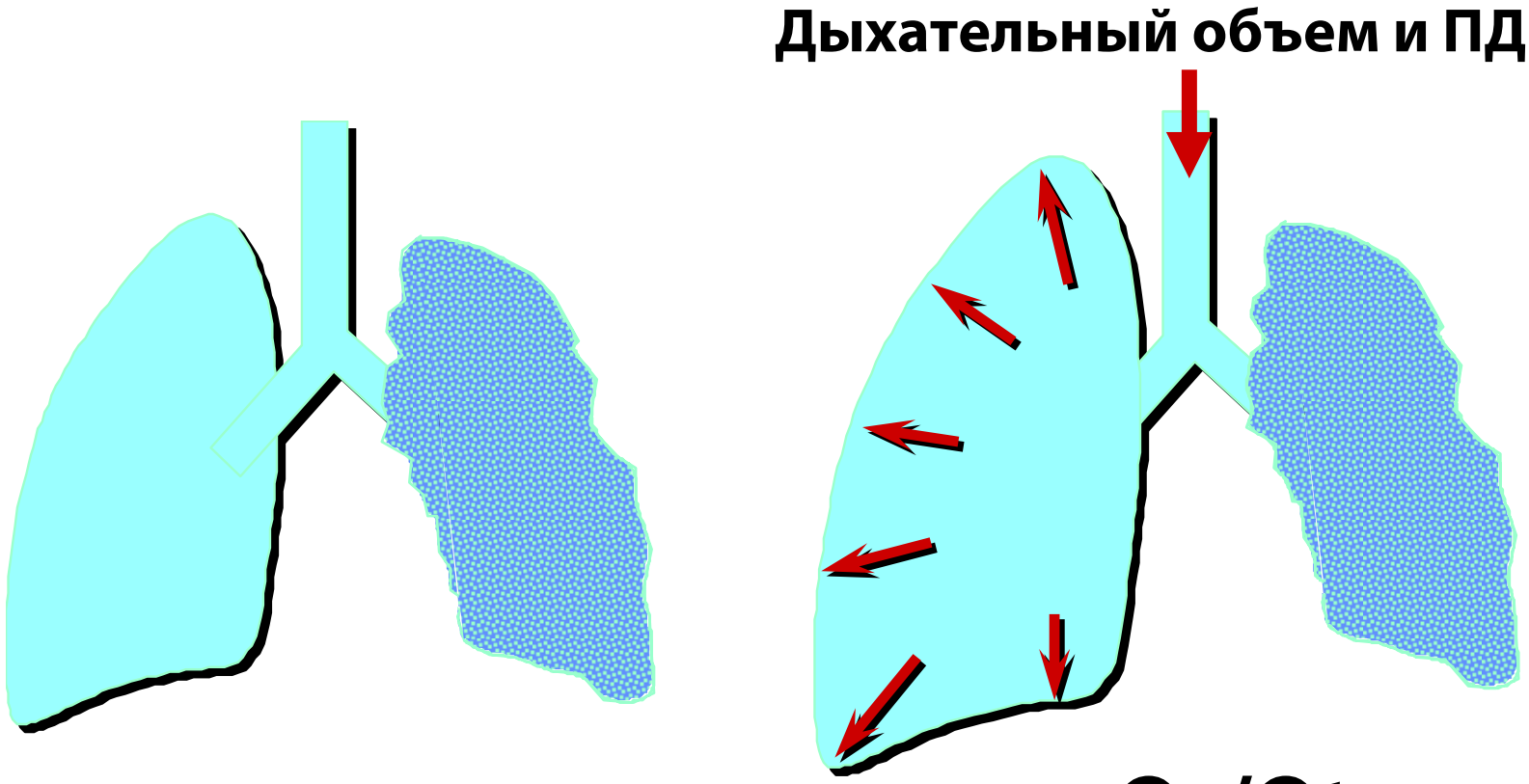
LLUIS BLANCH, CHARIS ROUSSOS, STEVE BROTHERTON, RENE P. MICHEL, AND MARK R. ANGLE
Critical Care Division, Royal Victoria Hospital, and Department of Medicine and Meakins-Christie Laboratories, McGill University, Montreal, Quebec H3A 1A1, Canada

Распределение VT: VTпр./ VTобщ.



ИВЛ и одностороннее повреждение

Эффекты ПДКВ и дыхательного объема



Влияние ПДКВ и дыхательного объема на одностороннее или локализованное легочное поражение

Craven KD et al. J Appl Physiol 1979, 47:729-737.
Mink, Light, Wood. J Appl Physiol 1981; 50: 283-291 & 517-523.
Zandstra DF et al. Intensive Care Med 1989; 15: 458-463.
Blanch L et al. Am J Respir Crit Care Med 2001;164:642-647.

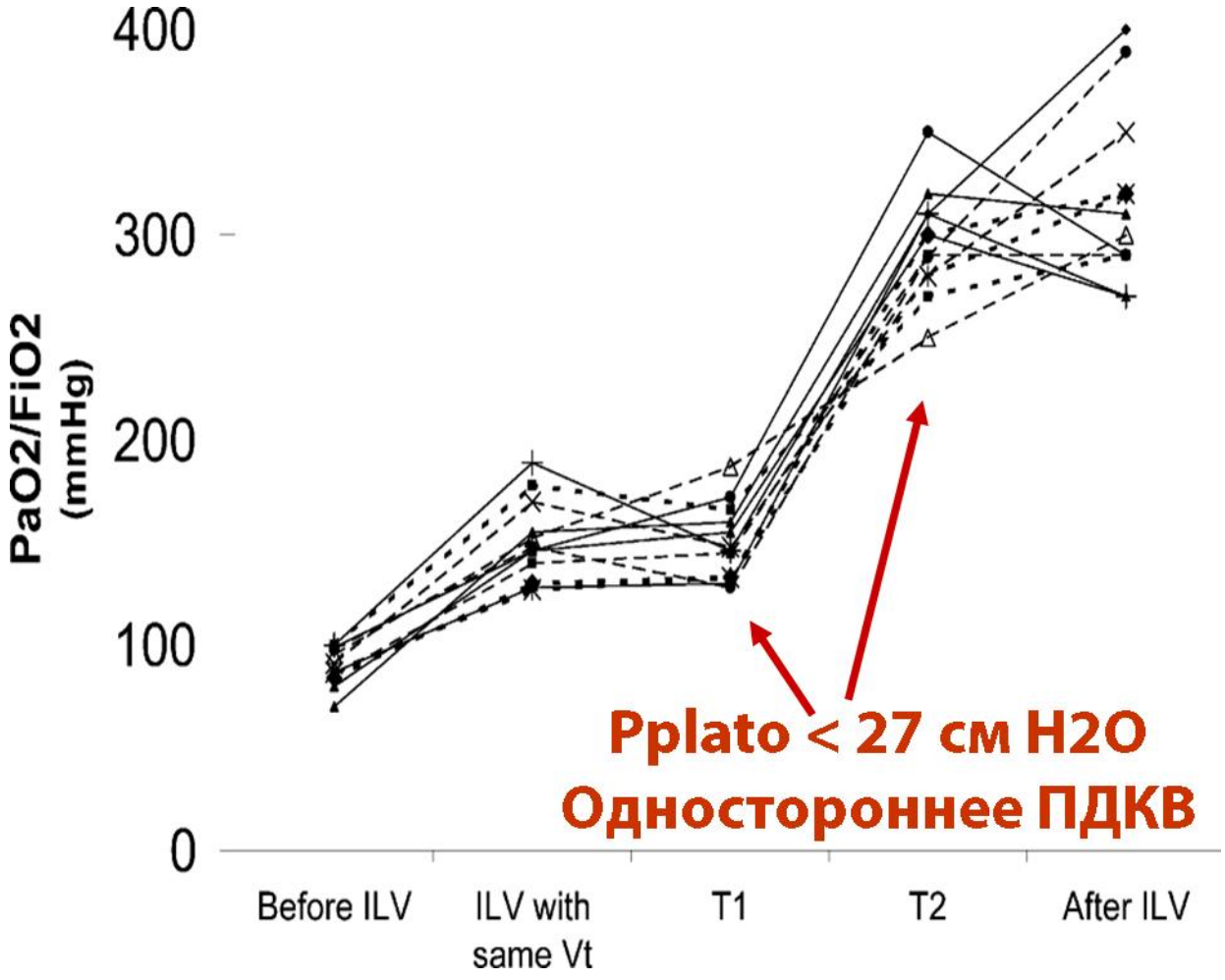
- Перераздутие интактного, более податливого легкого
- Перераспределение легочного кровотока к поврежденному легкому

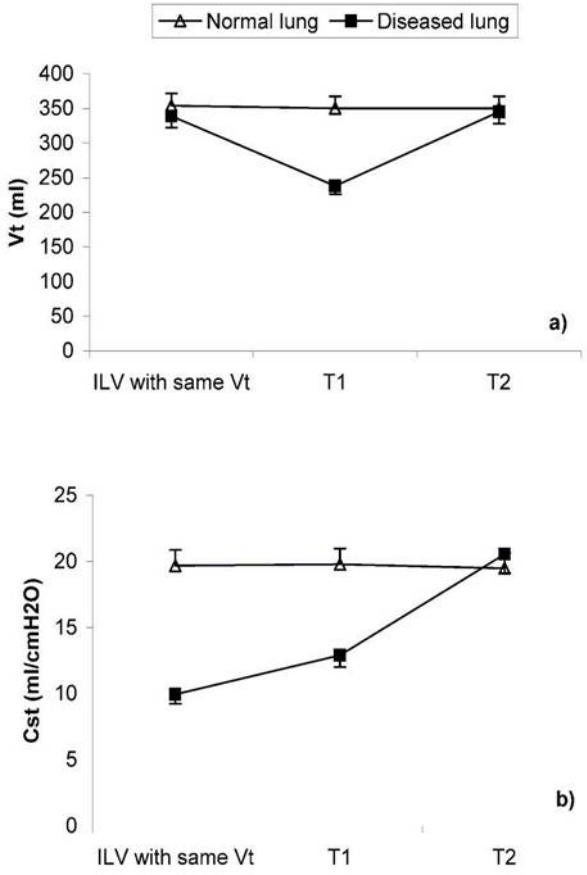
↓

- Ухудшение V/Q соотношений
- Ухудшение оксигенации
- Повышение потенциального риска вентилятор-индуцированного ОПЛ и правожелудочковой недостаточности

Независимая ИВЛ у пациентов с односторонним ушибом легких

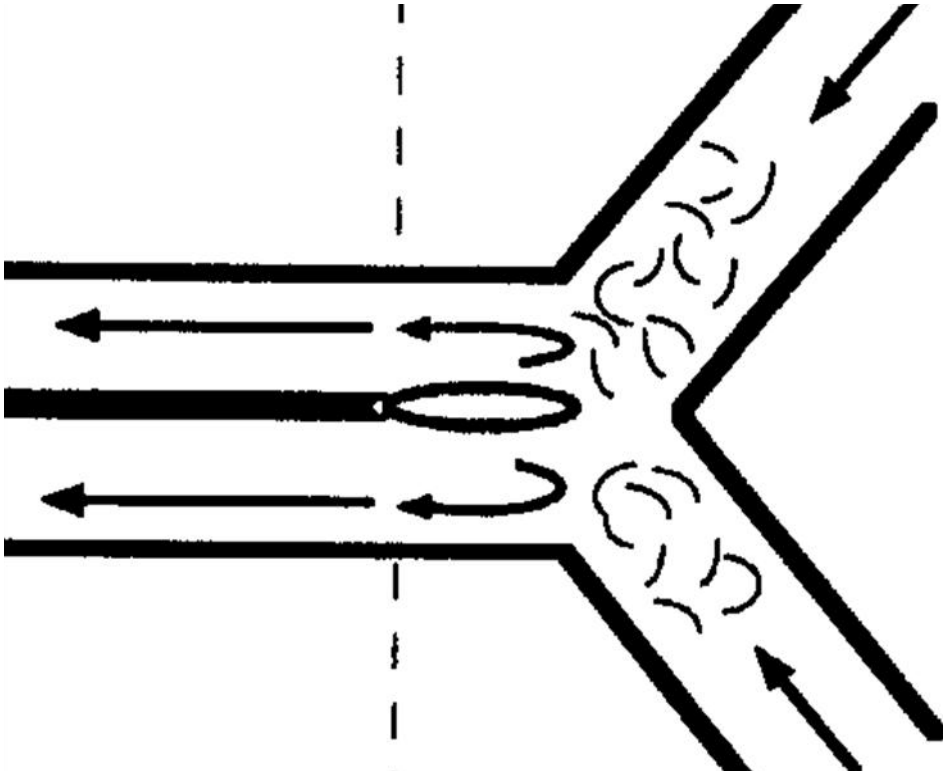
Cinnella G. Intensive Care Med 2001;27:1860-1867



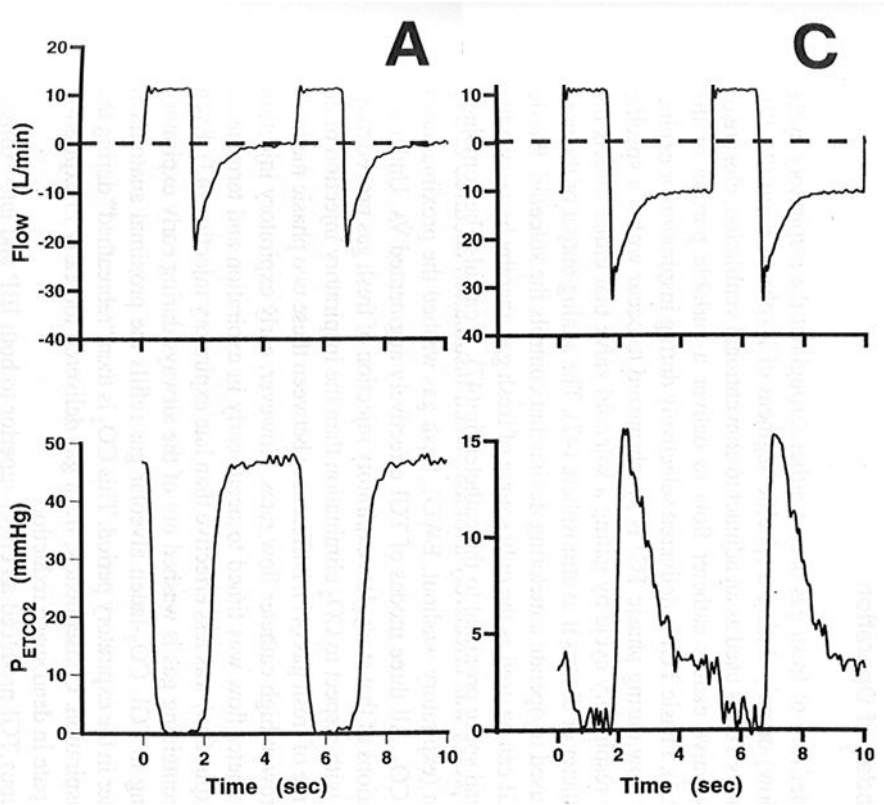


Физиологические эффекты трахеальной инсуффляции газа (TGI)

TGI: Вымывает CO_2 который остается в анатомическом и аппаратном мертвом пространстве



Контроль **Фазовое TGI**

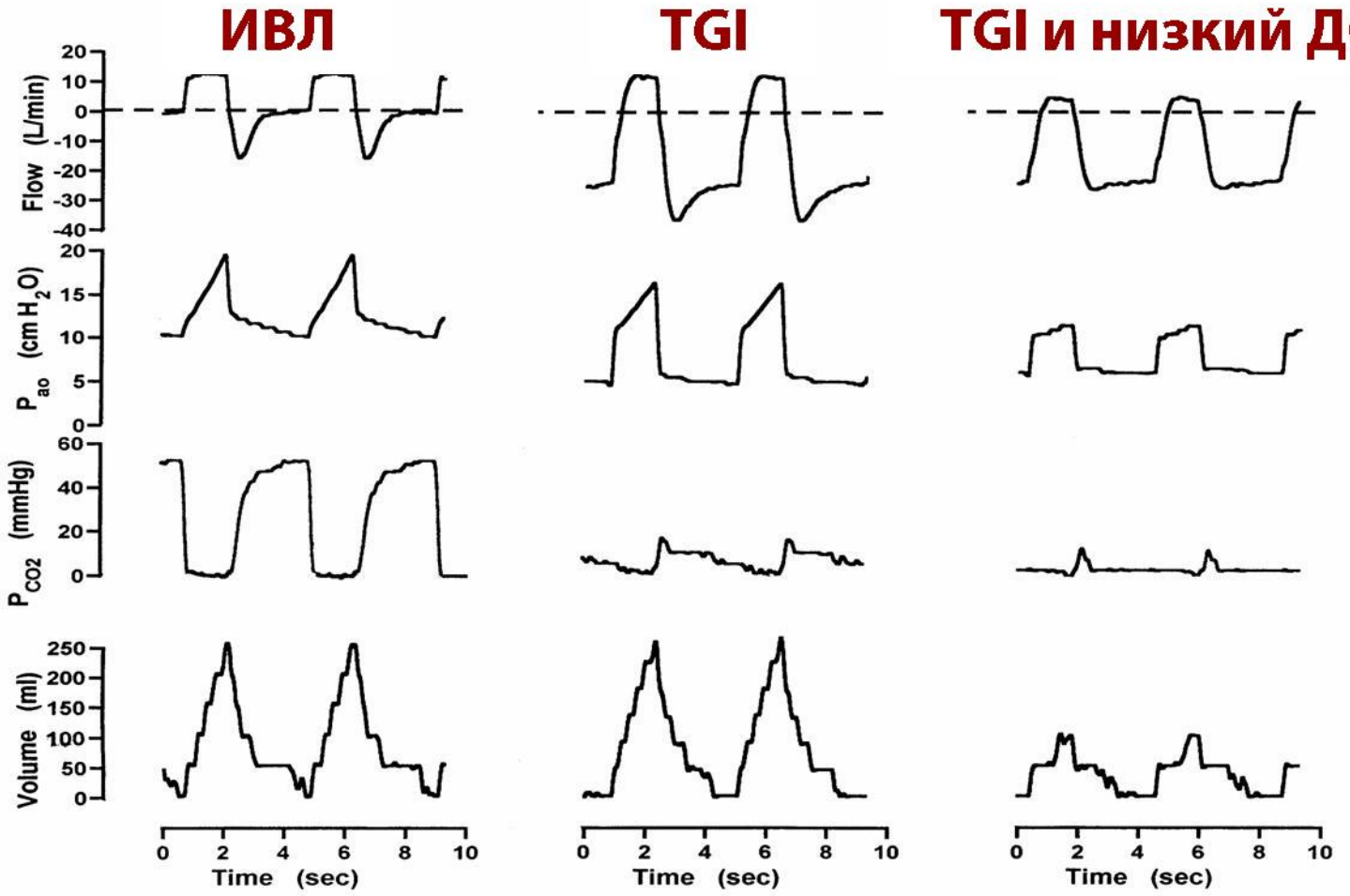


Blanch L, Nahum A. Transtracheal Gas Insufflation. In: Principles & Practice of Mechanical Ventilation. Tobin M, ed (2nd ed). McGraw-Hill 2006

Application of Tracheal Gas Insufflation to Acute Unilateral Lung Injury in an Experimental Model

LLUIS BLANCH, THOMAS E. VAN der KLOOT, A. MELYNNE YOUNGBLOOD, GASTON MURIAS, ALBERTO NAVEIRA, ALEX B. ADAMS, PABLO V. ROMERO, and AVI NAHUM Am J Respir Crit Care Med Vol 164. pp 642–647, 2001

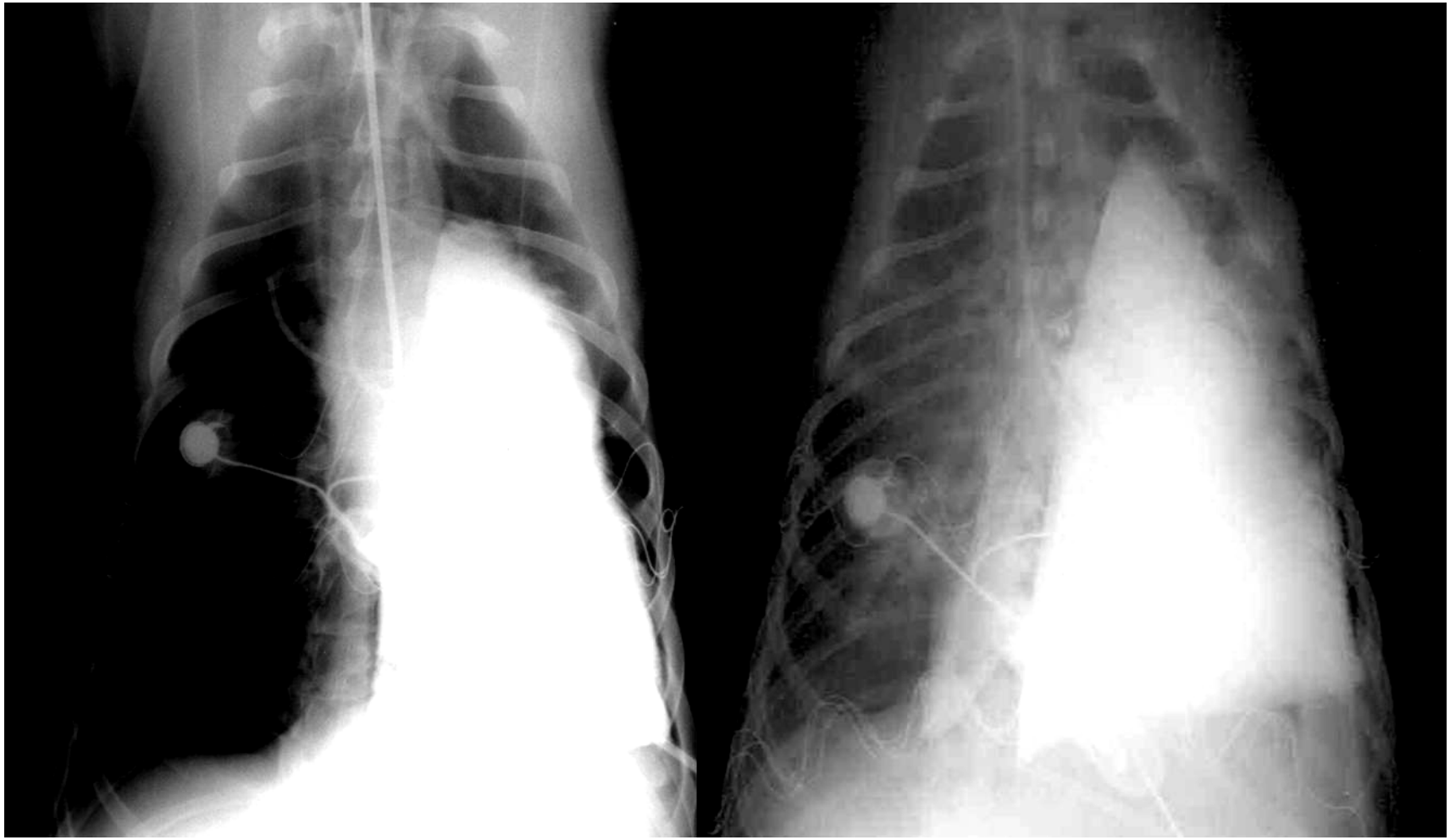
Department of Pulmonary and Critical Care Medicine, University of Minnesota, Regions Hospital, St. Paul, Minnesota; Servei de Medicina Intensiva, Hospital de Sabadell, Corporació Parc Tauli, Sabadell, Spain; and Servei de Pneumologia i Unitat de Recerca Experimental, Hospital Universitari de Bellvitge, Hospitalet de Llobregat, Barcelona, Spain



Selective tracheal gas insufflation during partial liquid ventilation improves lung function in an animal model of unilateral acute lung injury

Crit Care Med 2001; 29:2251-2257.

Lluis Blanch, MD, PhD; Thomas E. Van der Kloot, MD; A. Melynne Youngblood, MD; Alex B. Adams, RRT; Alberto Naveira, MD; Gaston Murias, MD; Pablo V. Romero, MD, PhD; Avi Nahum, MD, PhD



Intensive Care Med (2004) 30:693–701
DOI 10.1007/s00134-003-2147-7

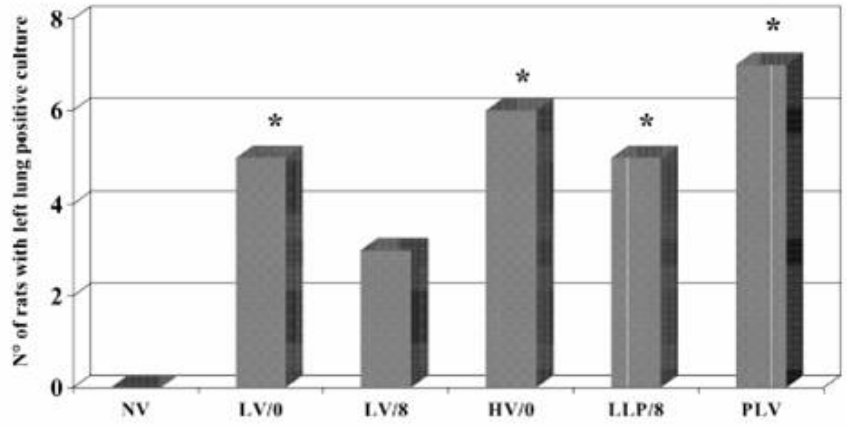
EXPERIMENTAL

Frédérique Schortgen
Lila Bouadma
Marie-Laure Joly-Guillou
Jean-Damien Ricard
Didier Dreyfuss
Georges Saumon

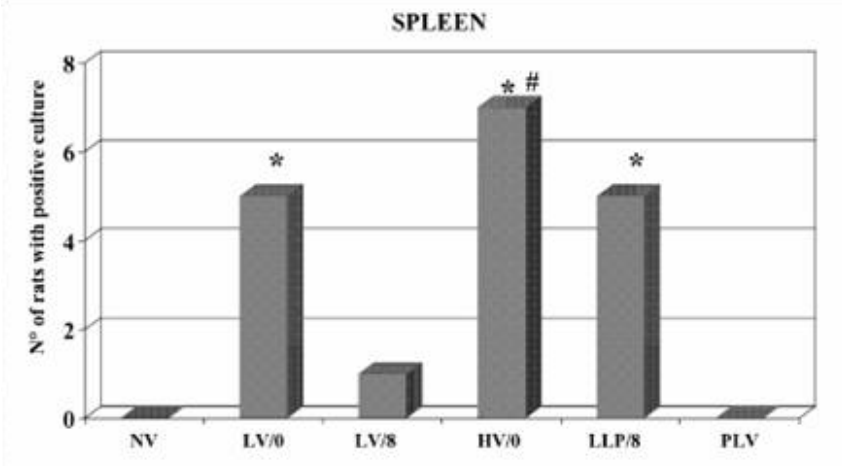
Infectious and inflammatory dissemination are affected by ventilation strategy in rats with unilateral pneumonia

Модель: Пневмония (*Pseudomonas aeruginosa*) правого легкого
Дизайн: ДО 6 мл/кг (ПДКВ = 0, 8, 8+LLP, PLV) и высокий ДО

Бактериальная контаминация левого легкого



Захват бактерий в селезенке

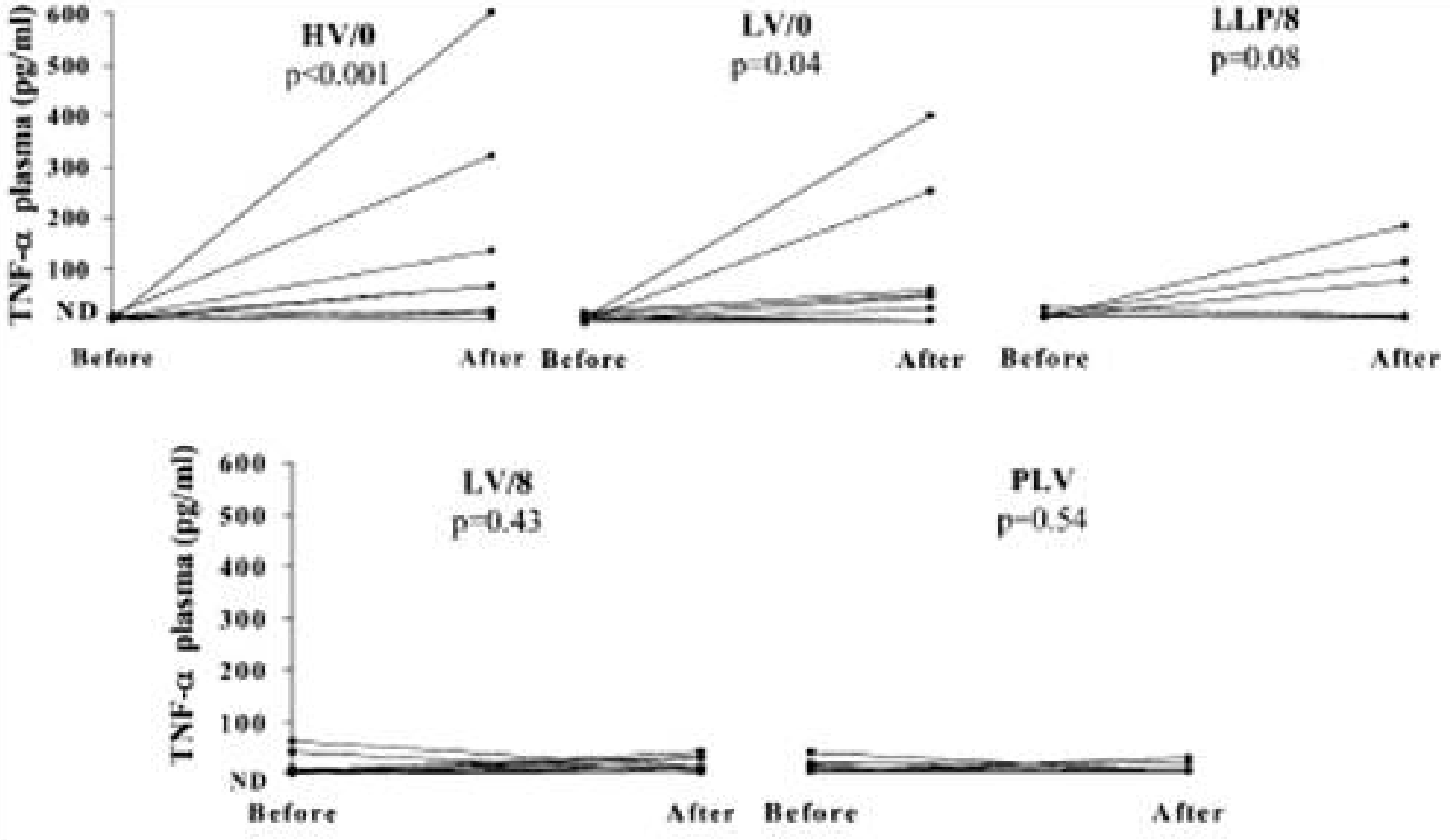


Intensive Care Med (2004) 30:693–701
DOI 10.1007/s00134-003-2147-7

EXPERIMENTAL

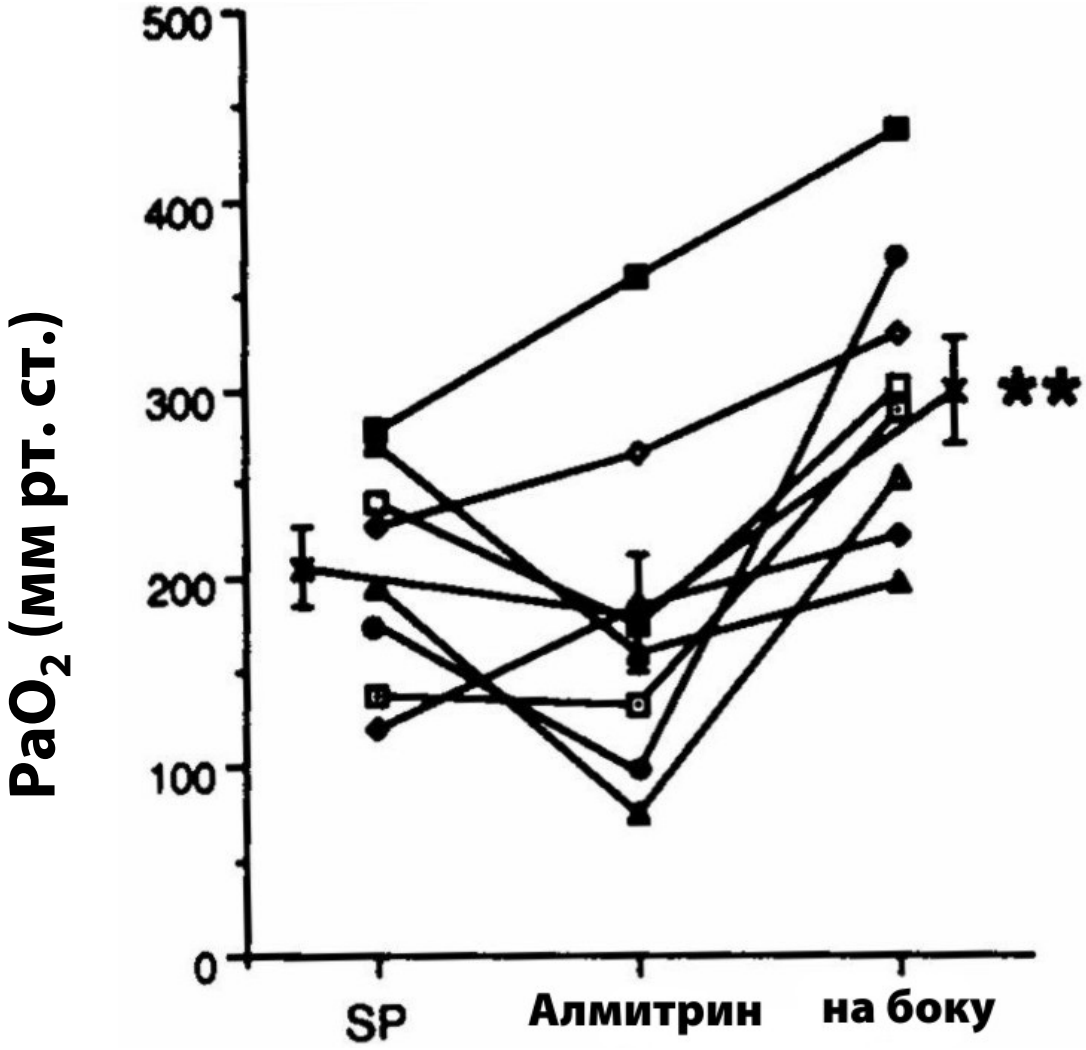
Frédérique Schortgen
Lila Bouadma
Marie-Laure Joly-Guillou
Jean-Damien Ricard
Didier Dreyfuss
Georges Saumon

Infectious and inflammatory dissemination are affected by ventilation strategy in rats with unilateral pneumonia



Эффекты алмитрина и положения на боку при односторонней пневмонии

Dreyfuss D. Am Rev Respir Dis 1992;146:295-299



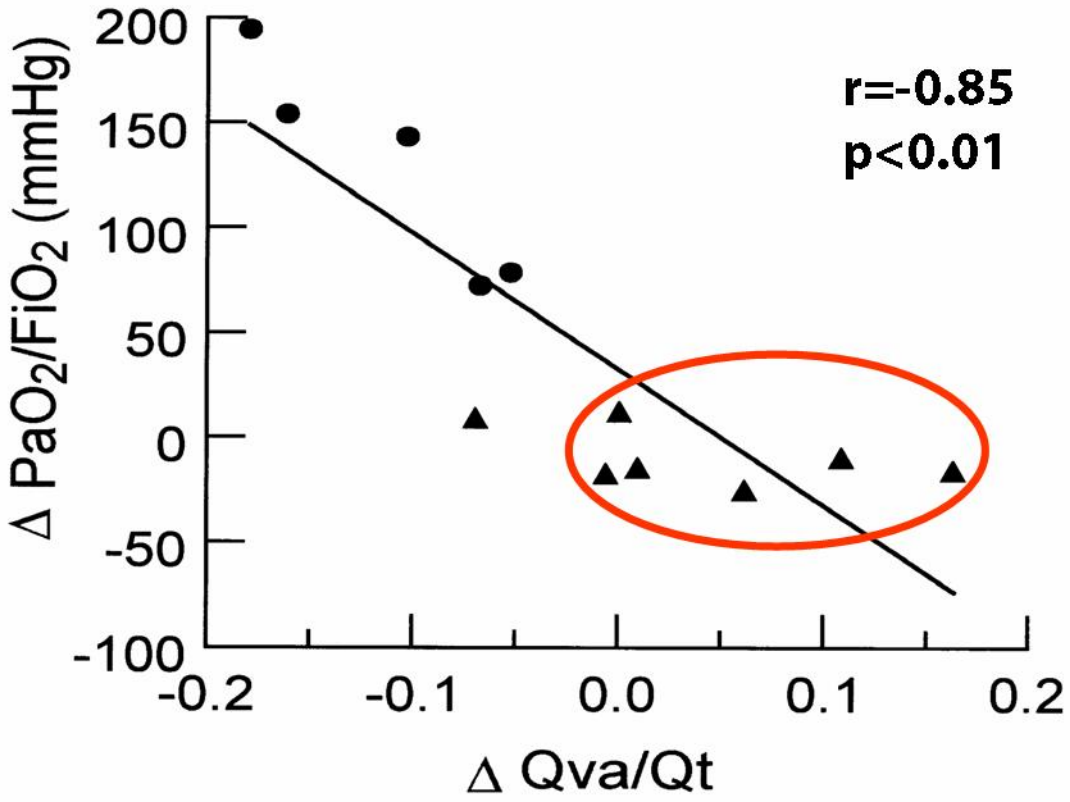
Recruitment Maneuvers during Lung Protective Ventilation in Acute Respiratory Distress Syndrome

ANA VILLAGRÁ, ANA OCHAGAVÍA, SARA VATUA, GASTÓN MURIAS, MARIA DEL MAR FERNÁNDEZ, JOSEFINA LOPEZ AGUILAR, RAFAEL FERNÁNDEZ, and LLUIS BLANCH

Critical Care Center, Hospital de Sabadell, Corporacio Parc Tauli, Sabadell, Spain

Am J Respir Crit Care Med 2002; 165:165-70.

Изменения PaO_2/FiO_2 и Q_{va}/Q_t в следствие рекрутмента



Класть ли «здоровым легким» кверху или книзу?

Легочное кровотечение?
Пневмония?
Полости/абсцессы?

ИВЛ у пациентов с односторонним поражением легких

- Главным образом, вспомогательный метод Протективная ИВЛ (рекомендуются низкий ДО и умеренное ПДКВ)
- Рекрутмент: спорно
- Положение на боку и изолированная ИВЛ: Принятые методы терапии, которые трудно реализовать (только в опытных руках)
- Положение на животе: не навредит , рекомендуется (?)
- Новые методы нуждаются в новых исследованиях: односторонняя инсуффляция газа (TGI), селективное ограничение давления, сурфактант и т.д.