Hammamet – Samedi 20 mai 2017

Ventilation du patient traumatisé grave

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Conflict of interest

Consultants with honorarium

- Drager
- Hamilton
- Fisher-Paykel
- Baxter
- Xenios

Ventilation for severe trauma patients (ARDS…?)

1. **Risk Factors**
2. **Prevention**
3. **Treatment**

Acute Respiratory Distress Syndrome: Causes After Trauma

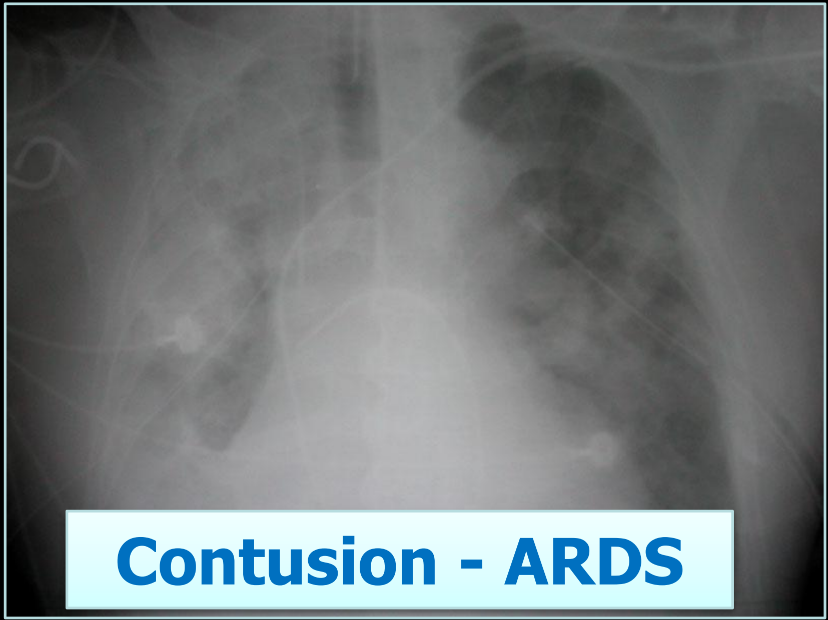
- Bilateral lung contusion/pulmonary hemorrhage
- Extensive aspiration
- Fat embolism
- Sepsis
- Massive traumatic tissue injury
- Iatrogenic
  - Drugs, transfusion-related

Chest trauma

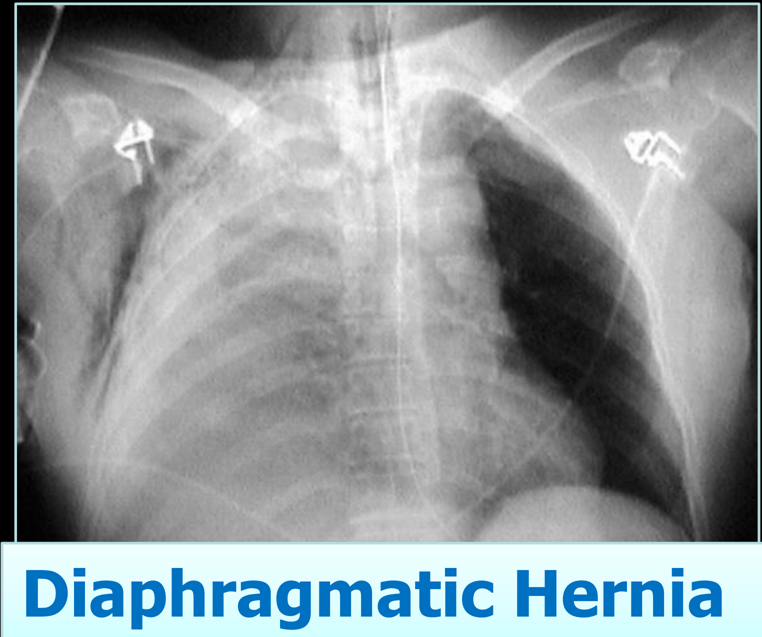
Blunt chest trauma is associated with a high risk of morbidity and mortality

Up to 25% of all deaths caused by trauma are related to chest injuries

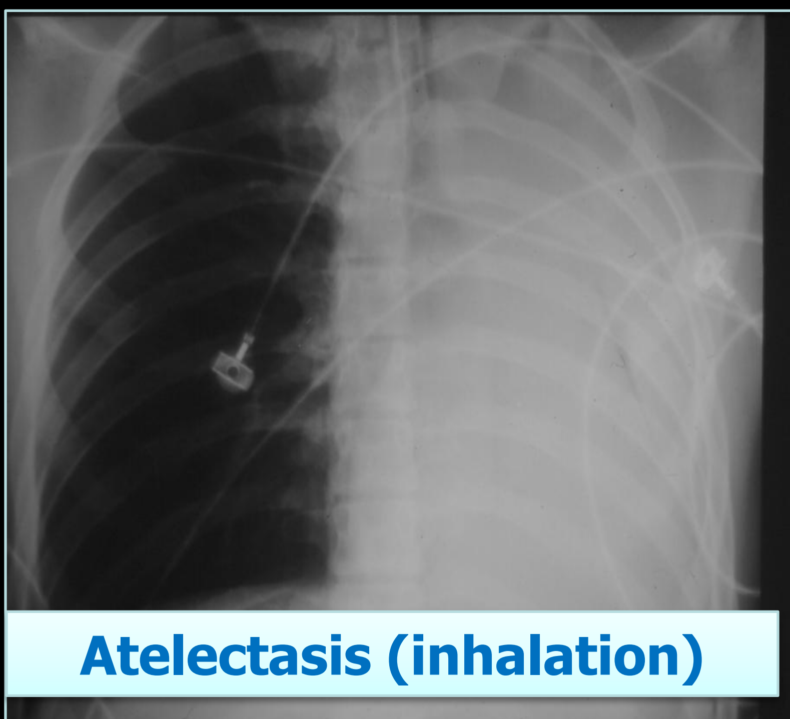
1. **Immediate deaths = myocard rupture / thoracic aorta**
2. **Early deaths = pneumothorax, cardiac tamponade, airway obstruction or uncontrolled thoracic hemorrhage**
3. **Late deaths = ARDS**



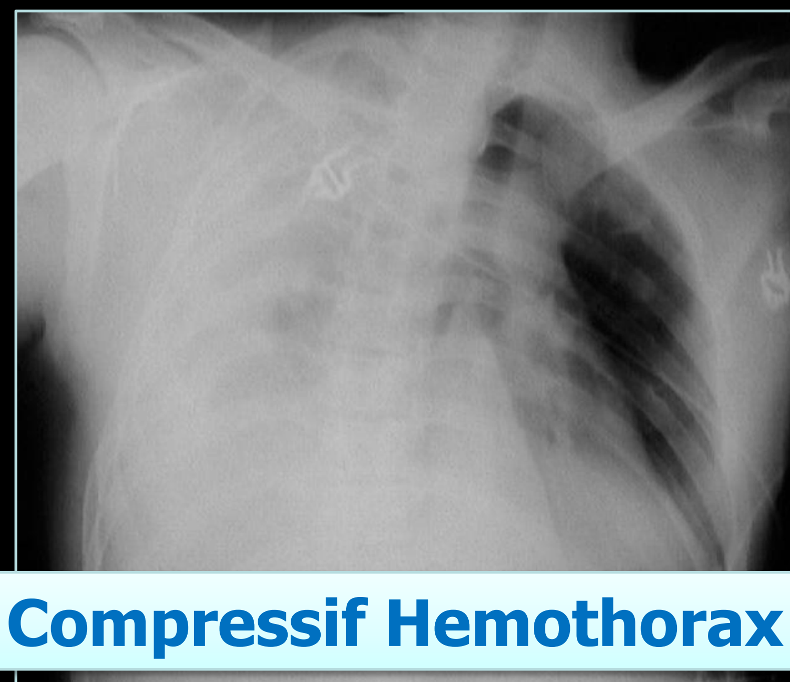
Contusion - ARDS



Diaphragmatic Hernia

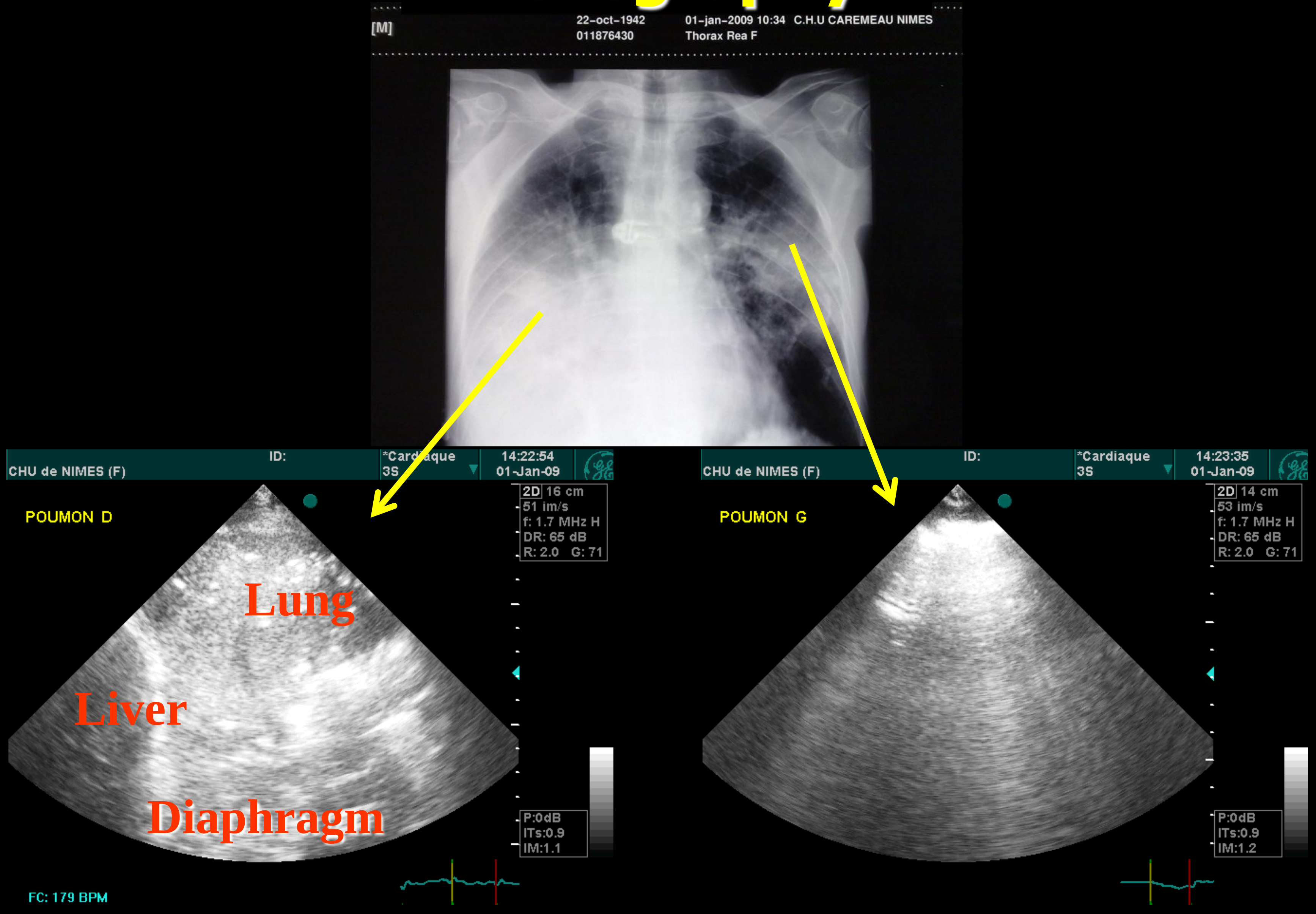


Atelectasis (inhalation)

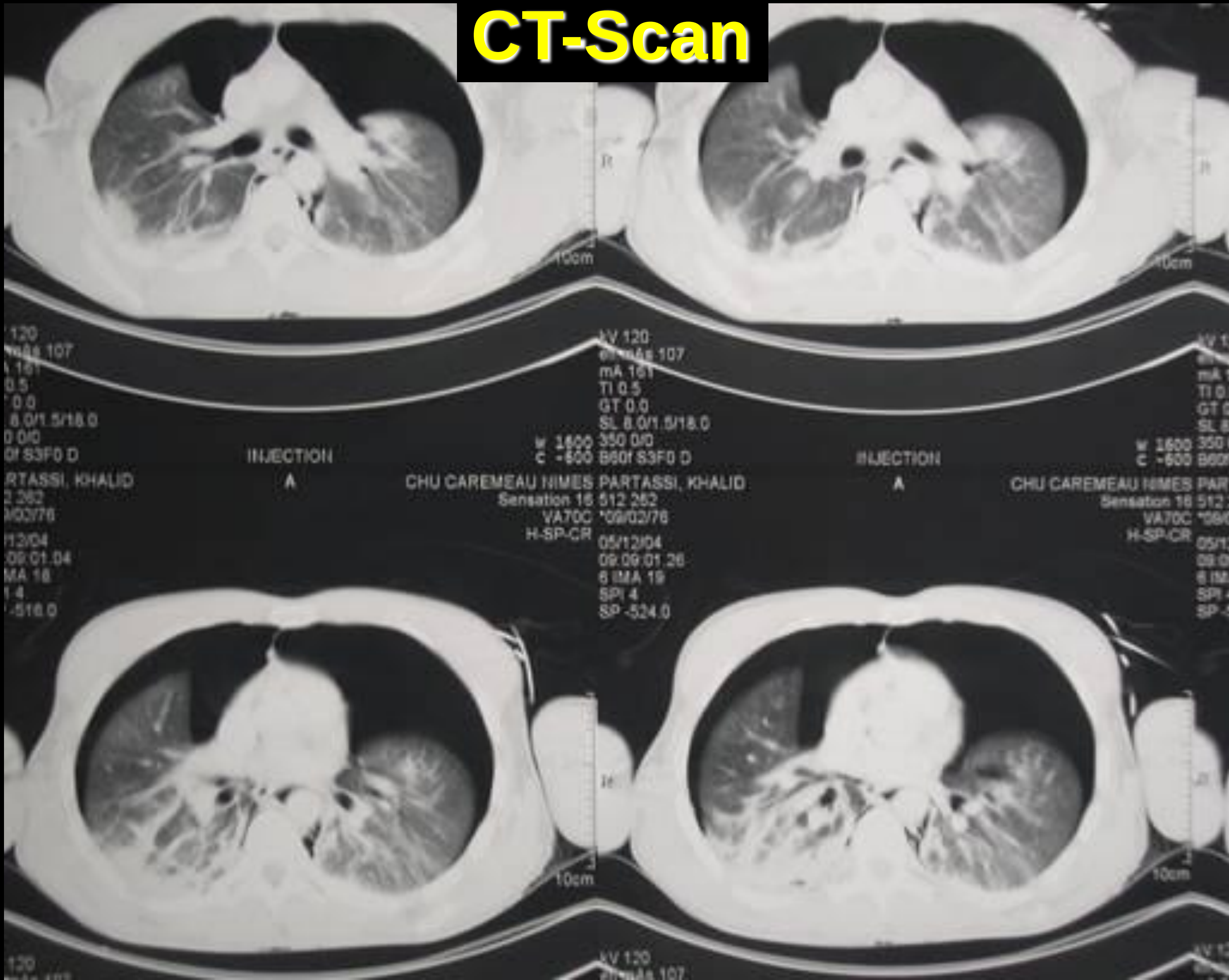


Compressif Hemothorax

Echography


[M]
22-oct-1942
011876430
01-jan-2009 10:34
Thorax Rea F
C.H.U CAREMEAU NIMES
CHU de NIMES (F)
ID:
*Cardiaque
3S
14:22:54
01-Jan-09
POUMON D
2D 16 cm
51 im/s
f: 1.7 MHz H
DR: 65 dB
R: 2.0 G: 71
Lung
Liver
Diaphragm
P:0dB
ITs:0.9
IM:1.1
FC: 179 BPM
CHU de NIMES (F)
ID:
*Cardiaque
3S
14:23:35
01-Jan-09
POUMON G
2D 14 cm
53 im/s
f: 1.7 MHz H
DR: 65 dB
R: 2.0 G: 71
P:0dB
ITs:0.9
IM:1.2

CT-Scan

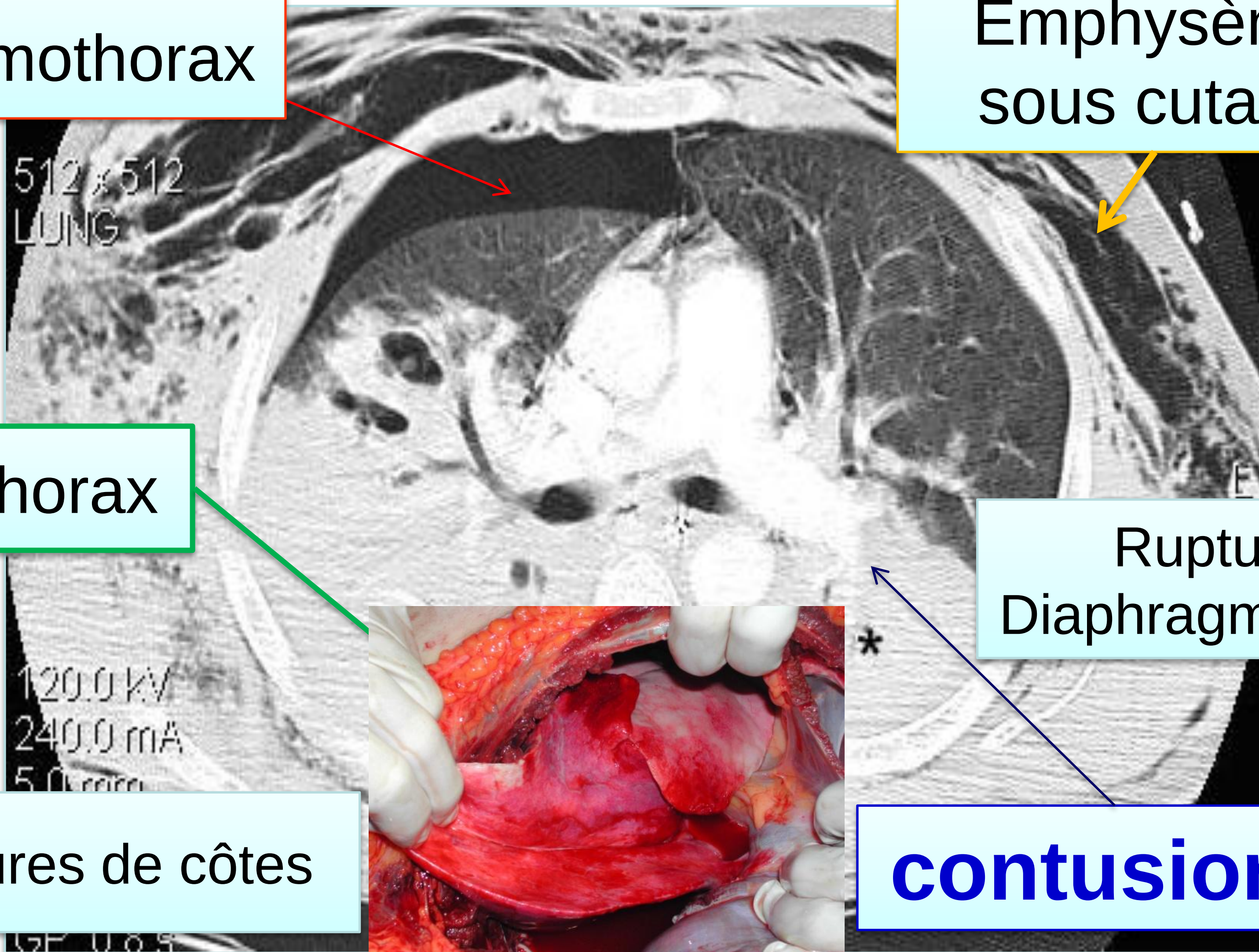


kV 120
effmAs 107
mA 161
TI 0.5
GT 0.0
SL 8.0/1.5/18.0
W 1600
C -600
350 0/0
B60f S3F0 D
INJECTION
A
CHU CAREMEAU NIMES
PARTASSI, KHALID
Sensation 16
512 262
VA70C
*09/02/76
H-SP-CR
05/12/04
09:09:01.26
6 IMA 19
SPI 4
SP -524.0
10cm

Lésions Thoraciques initiales

pneumothorax

Emphysème sous cutané



hémothorax

Rupture Diaphragmatique

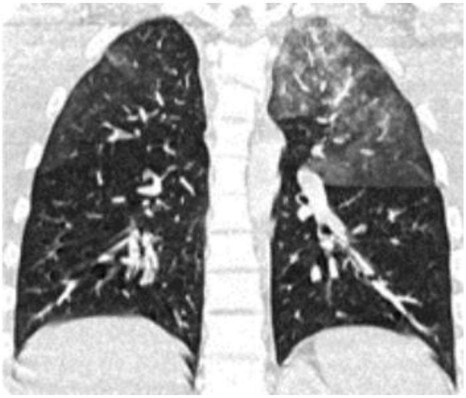
Fractures de côtes

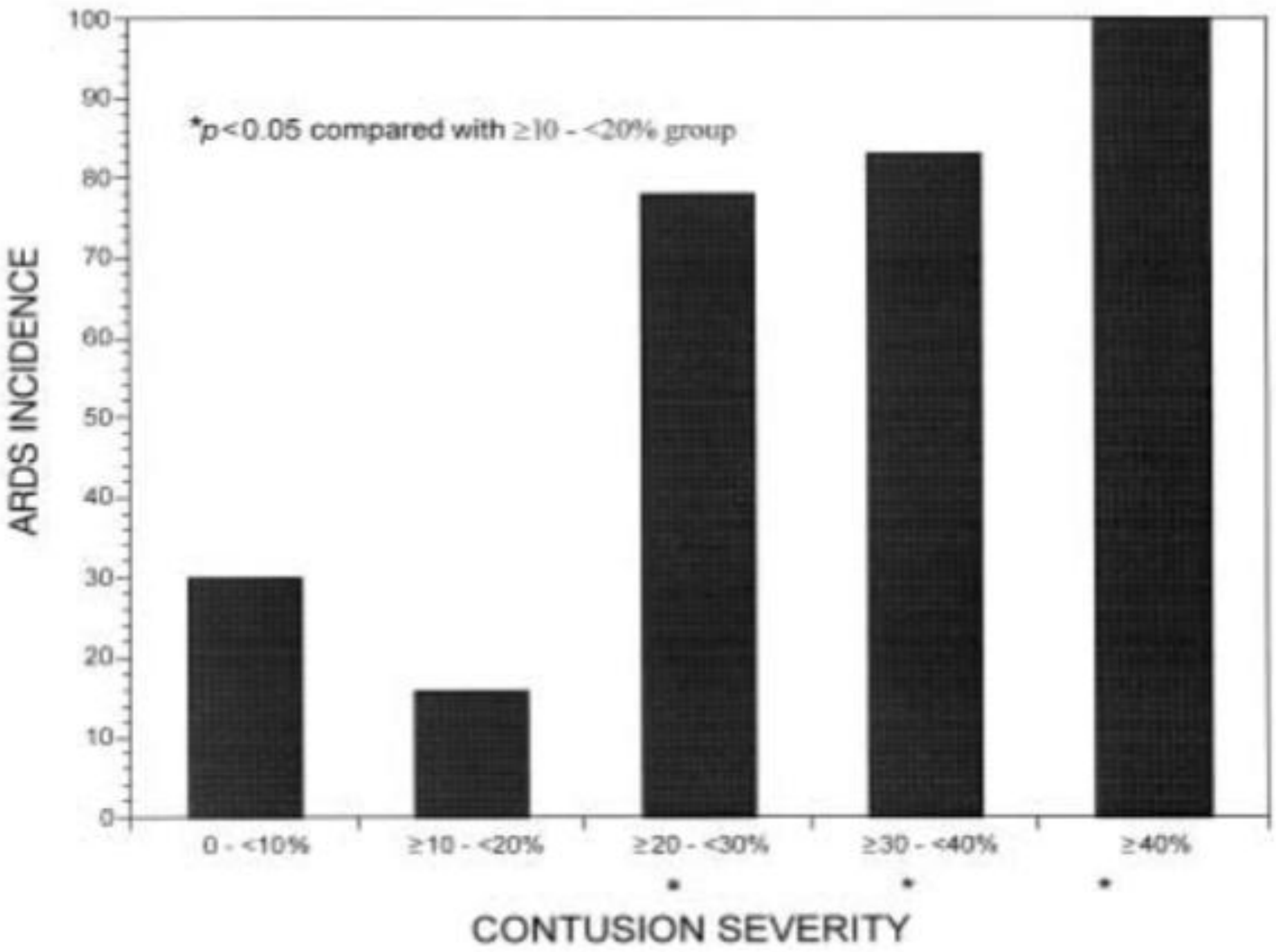
contusions

ARDS after Pulmonary Contusion: Accurate Measurement of Contusion Volume Identifies High-Risk Patients

Preston R. Miller, MD, Martin A. Croce, MD, Tiffany K. Bee, MD, Waleed G. Qaisi, MD, Chad P. Smith, MD, Gordon L. Collins, MD, and Timothy C. Fabian, MD

J Trauma. 2001;51:223–230.



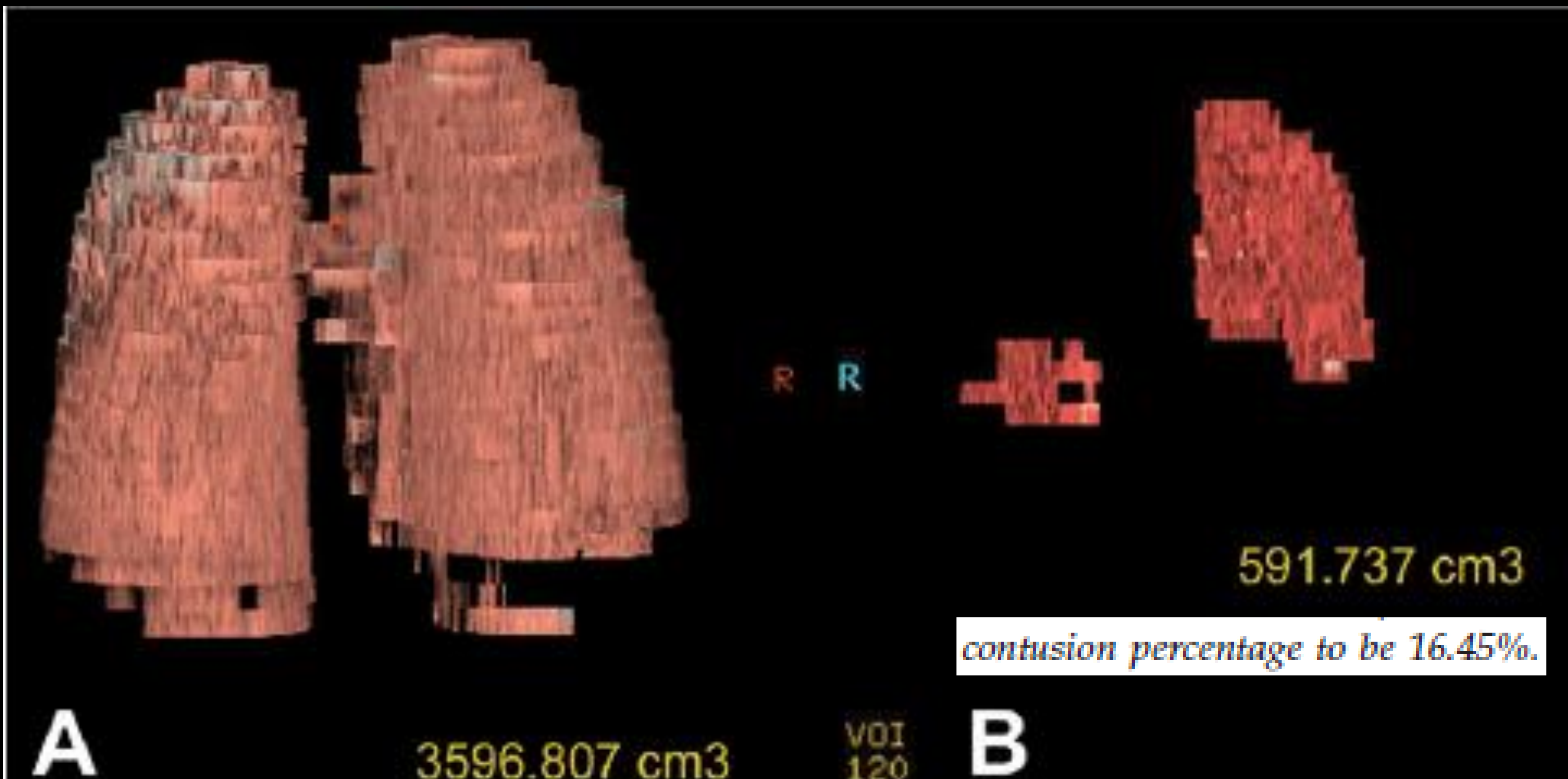


The Value of Pulmonary Contusion Volume Measurement With Three-Dimensional Computed Tomography in Predicting Acute Respiratory Distress Syndrome Development

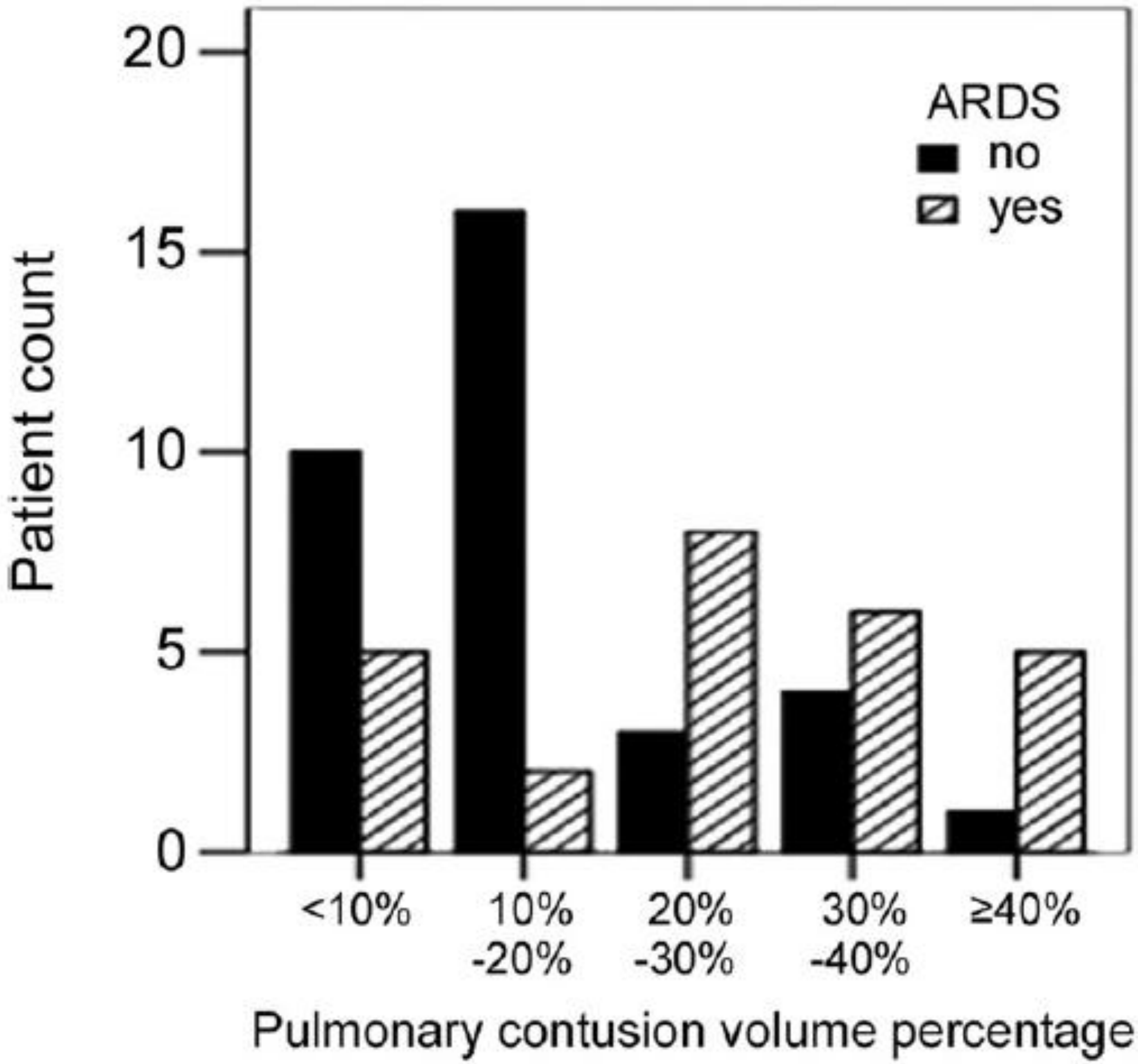
Ann Thorac Surg 2011;92:1977–83)

Shaohua Wang, MD, Zheng Ruan, MD, Jie Zhang, MD, and Wei Jin, MD

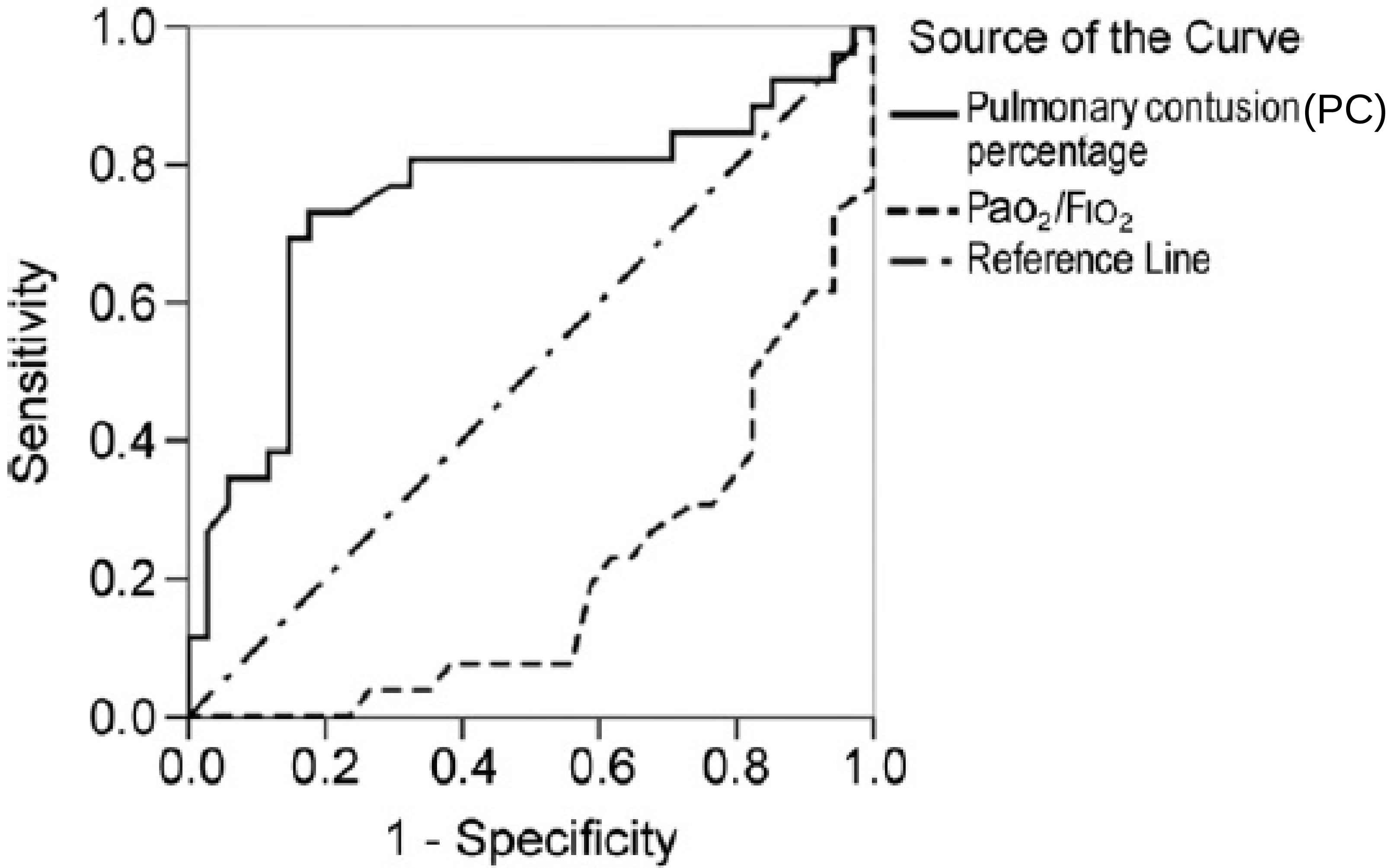
Departments of Thoracic Surgery, Radiology, and the Trauma and Emergency Center, The First People's Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China



contusion percentage to be 16.45%.



Wang et al. 2011



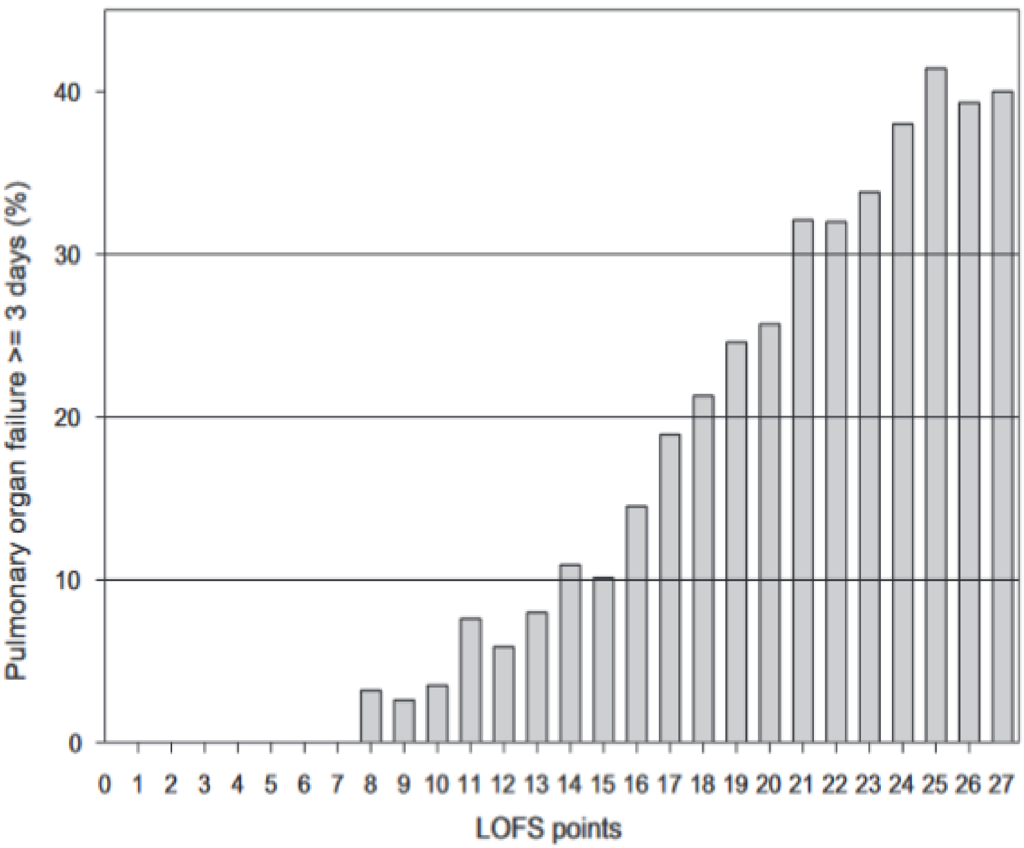
predictive factors of ARDS development. Patients with a PC volume percentage exceeding the best cutoff of 21.5% were defined as the severe PC group

Wang et al. 2011

Lung Organ Failure Score (LOFS): Probability of severe pulmonary organ failure after multiple injuries including chest trauma

Sebastian Wutzler [a,*], Arasch Wafaisade [b], Marc Maegele [b], Helmut Laurer [a], Emanuel V. Geiger [a], Felix Walcher [a], John Barker [a], Rolf Lefering [b], Ingo Marzi [a]

S. Wutzler et al. / Injury, Int. J. Care Injured 43 (2012) 1507–1512



Variable
Two or more (expected) surgical interventions
One (expected) surgical intervention
Emergency surgery (in addition to the above)
Severe thorax injury (AIS_{Thorax} = 5)
Severe thorax injury (AIS_{Thorax} = 4)
Severe head injury ($AIS_{Head} \geq 3$)
Male gender
Per each 2 l of volume
Per each 8 points of ISS
Per each 10 years of age

Thoracic Trauma Severity score on admission allows to determine the risk of delayed ARDS in trauma patients with pulmonary contusion

Injury 2015

Aurélien Daurat [a], Ingrid Millet [b], Jean-Paul Roustan [a], Camille Maury [a], Patrice Taourel [b], Samir Jaber [c,d], Xavier Capdevila [a,d], Jonathan Charbit [a,*]

Table 1
Thoracic Trauma Severity (TTS) score.

PaO_2/FiO_2	Rib fracture	Contusion	Pleural involvement	Age (years)	Points
>400	0	None	None	<30	0
300–400	1–3	1 lobe	Pneumothorax	30–41	1
200–300	4–6 unilateral	1 lobe bilateral or 2 lobes unilateral	Unilateral HT or HPT	42–54	2
150–200	>3 bilateral	<2 lobes bilateral	HT or HPT bilateral	55–70	3
<150	Flail chest	≥2 lobes bilateral	Tension pneumothorax	>70	5

All categories have to be added to achieve a score ranging from 0 to 25. HT, haemothorax; HPT, hemopneumothorax.

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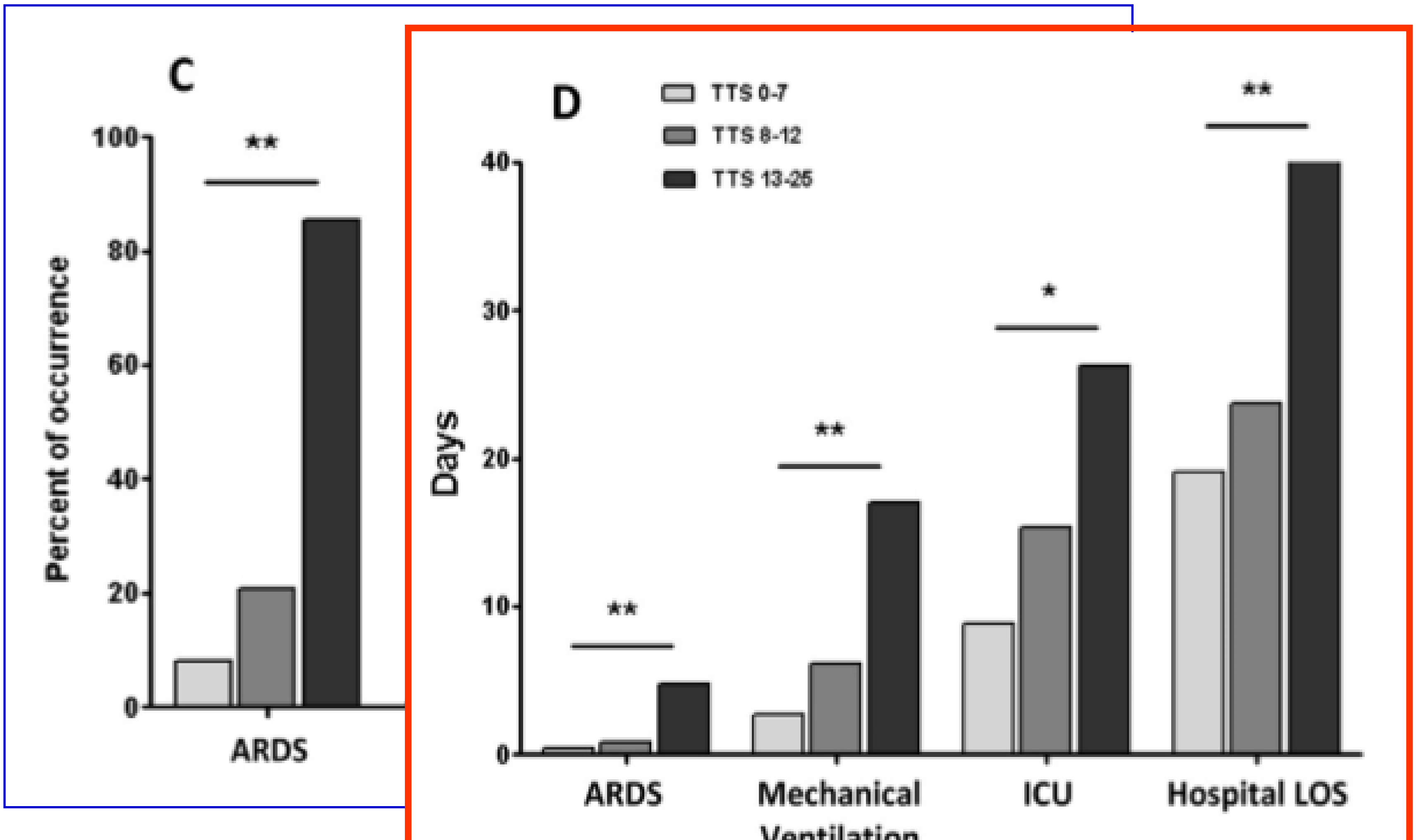

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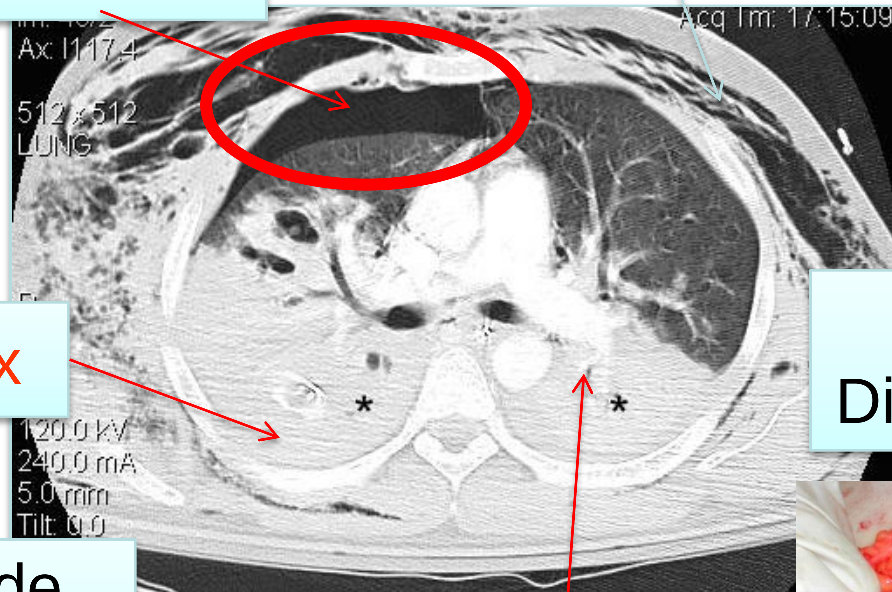
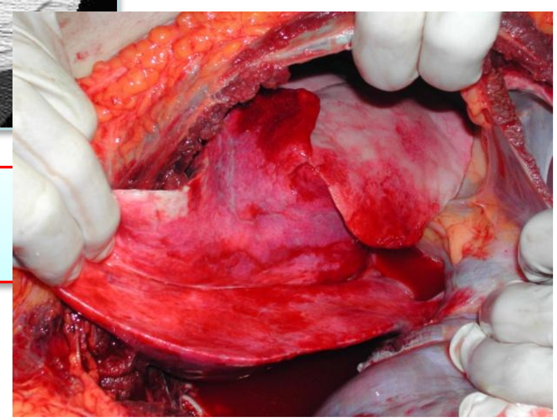


hémothorax

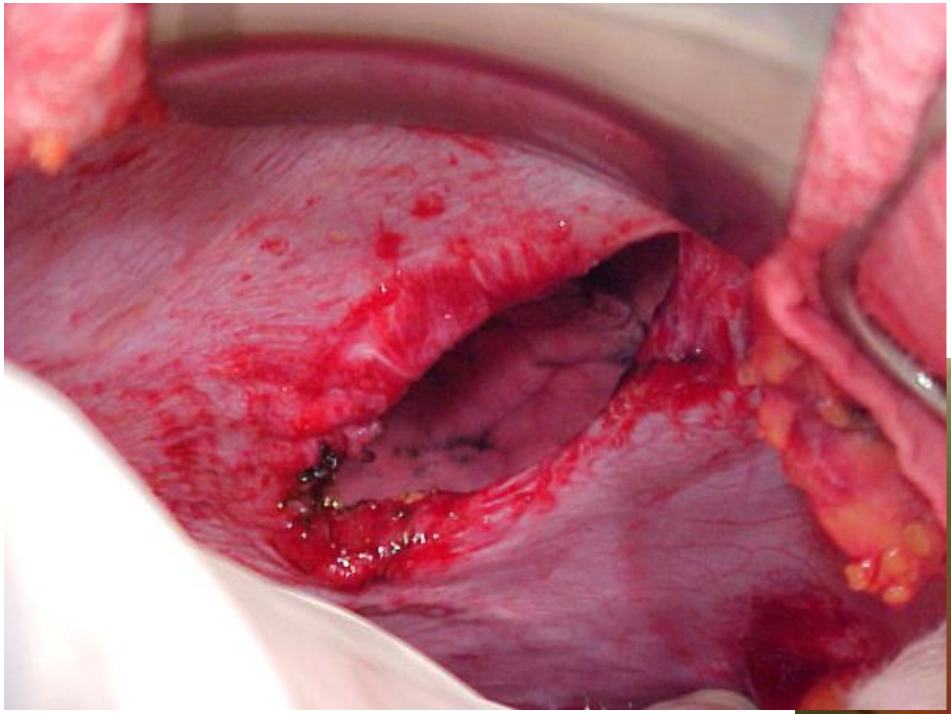
Rupture Diaphragmatique

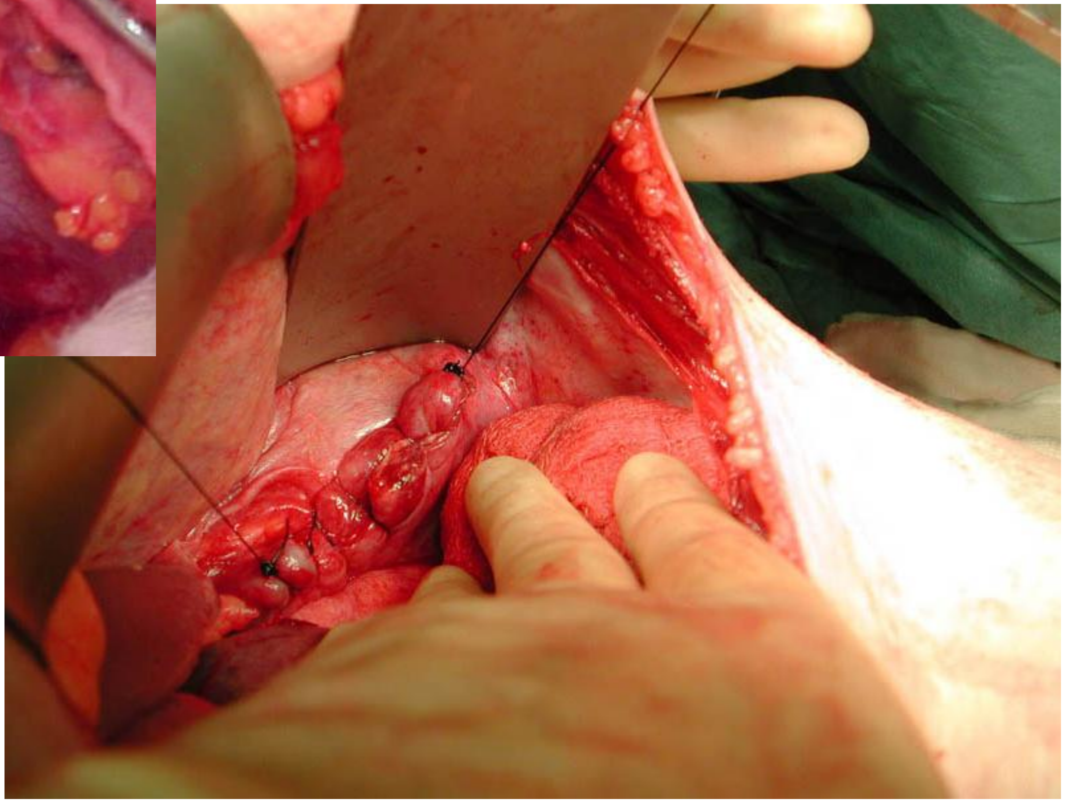
Fractures de côtes

contusions

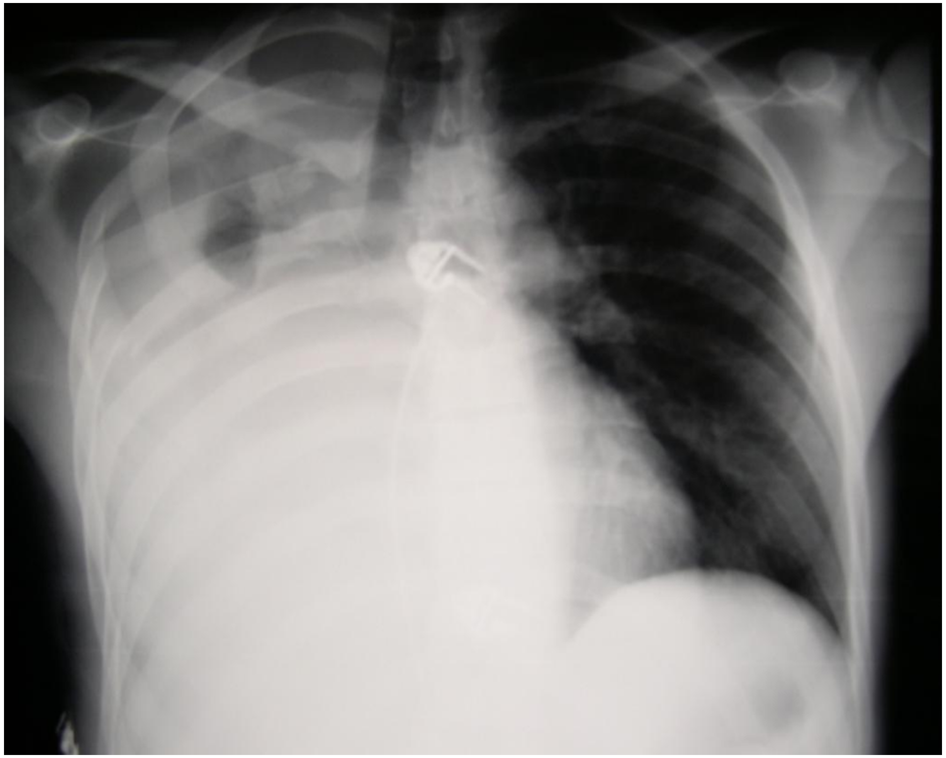


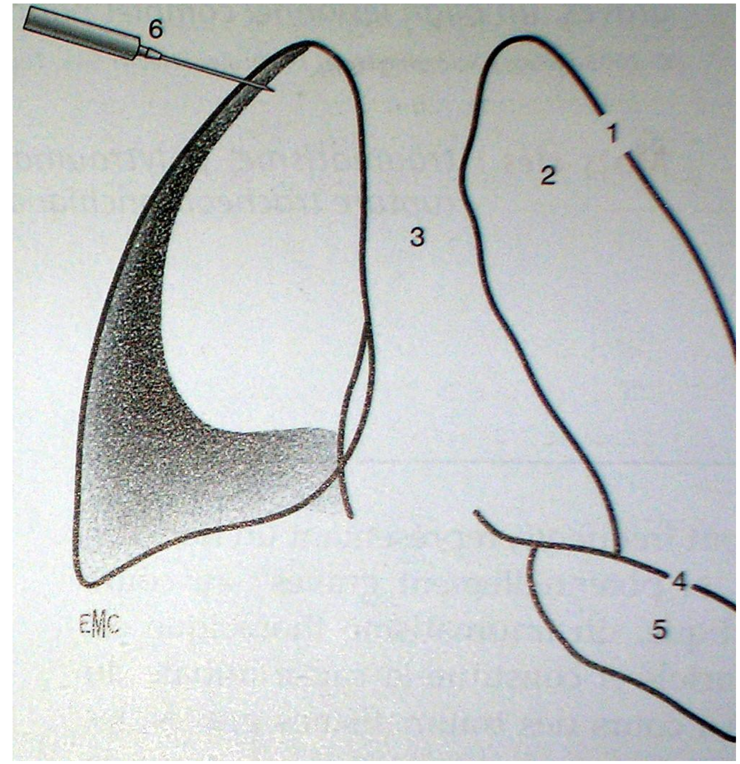
Rupture diaphragmatique





Hémothorax traumatiques : mécanismes

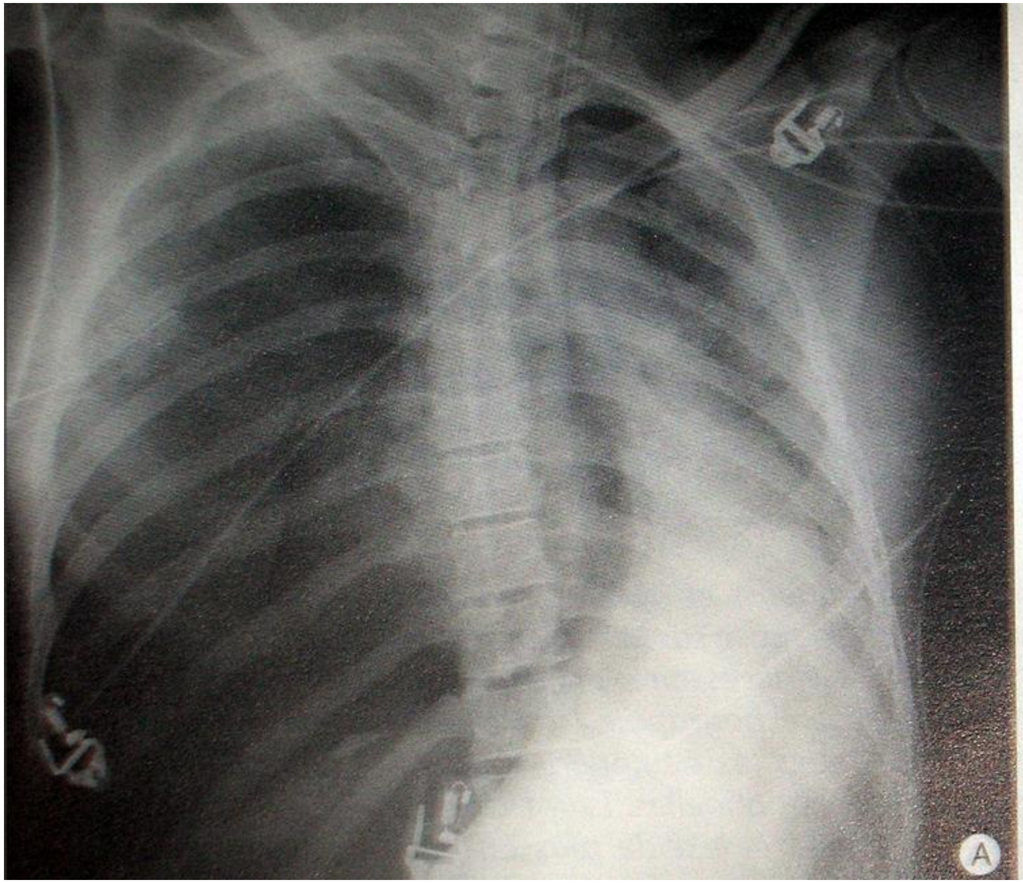


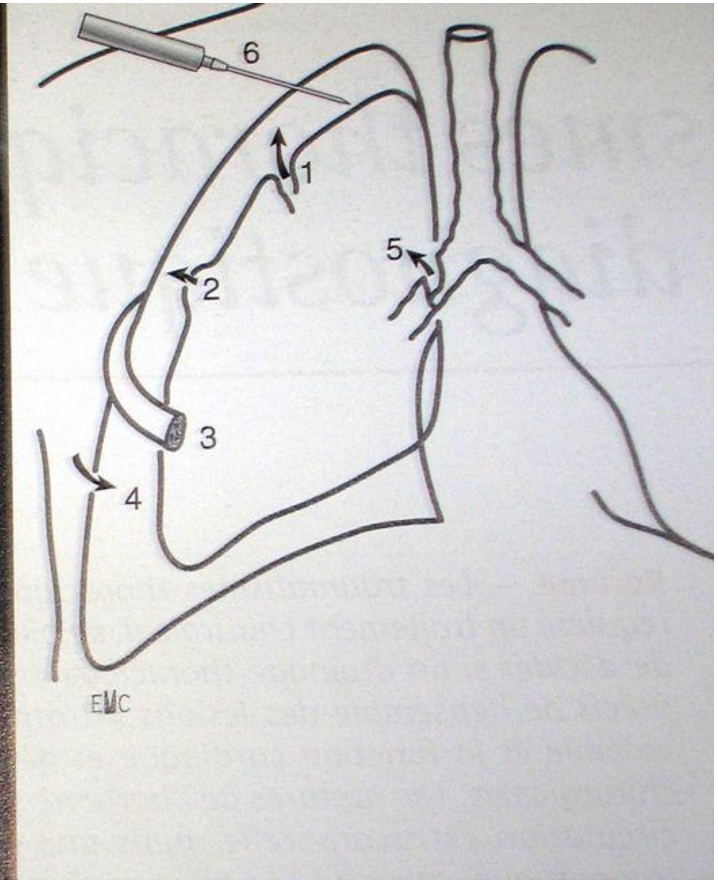


1 – Rupture artère intercostale et/ou mammaire interne, fracture costale
2 – Rupture pulmonaire
3 – saignement médiastinal

4 – Rupture diaphragmatique
5 – origine abdominale
6 - Iatrogène

Pneumothorax traumatiques : mécanismes





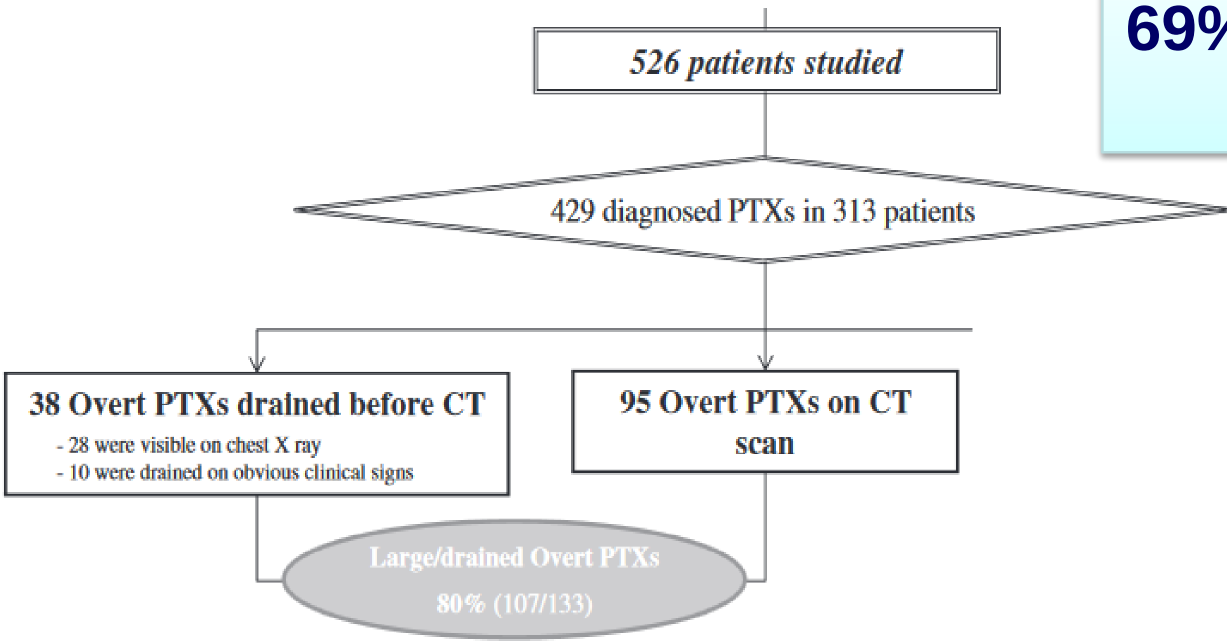
1 – Lacération pulmonaire
2 – Rupture de bulle
3 – Fracture de côte

4 – Traumatisme pénétrant
5 – Rupture trachée bronchique
6 - Iatrogène

Prevalence of large and occult pneumothoraces in patients with severe blunt trauma upon hospital admission: experience of 526 cases in a French level 1 trauma center☆,☆☆

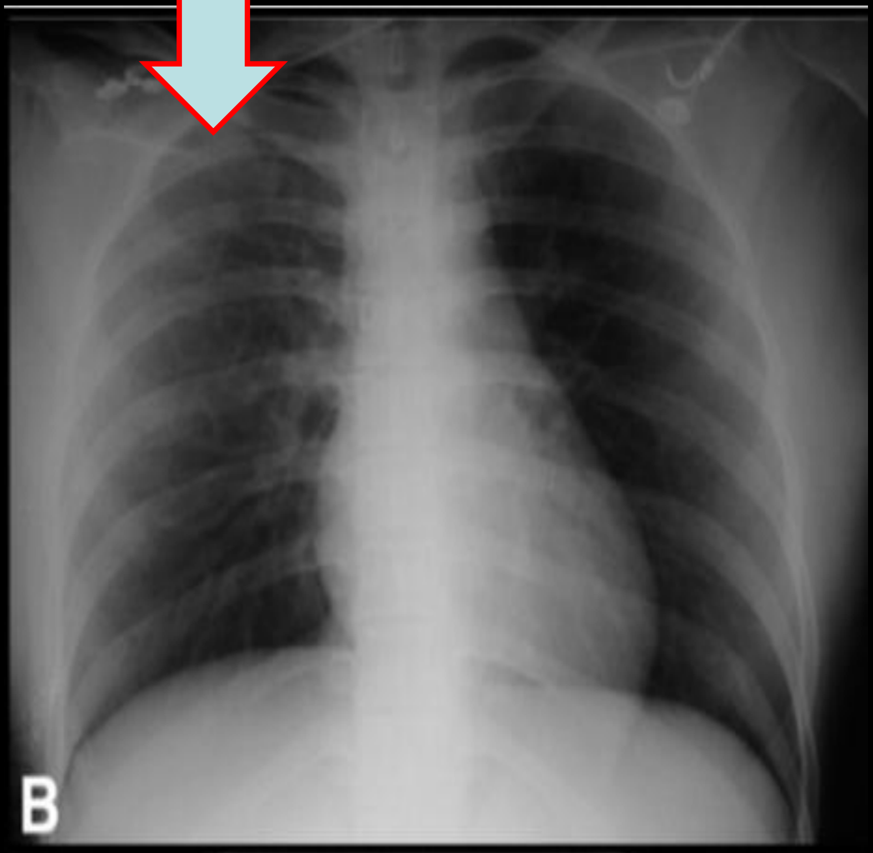
Jonathan Charbit, MD [a,b,*], Ingrid Millet, MD [b,c], Camille Maury, MD [a], Benjamin Conte, MD [a], Jean-Paul Roustan, MD [a], Patrice Taourel, MD, PhD [b,c], Xavier Capdevila, MD, PhD [a,b,d]

American Journal of Emergency Medicine 33 (2015) 796–801

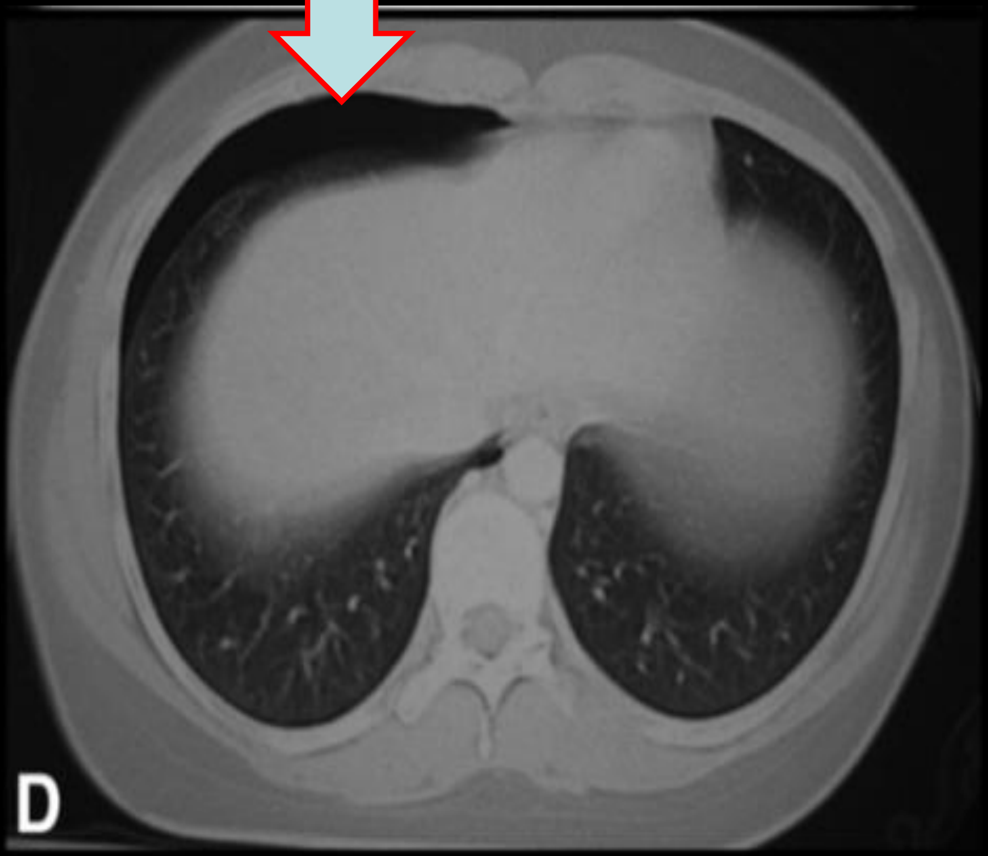


69% de Pneumothorax occultes

Pneumothorax antérieur
(non visible à la radio standard)



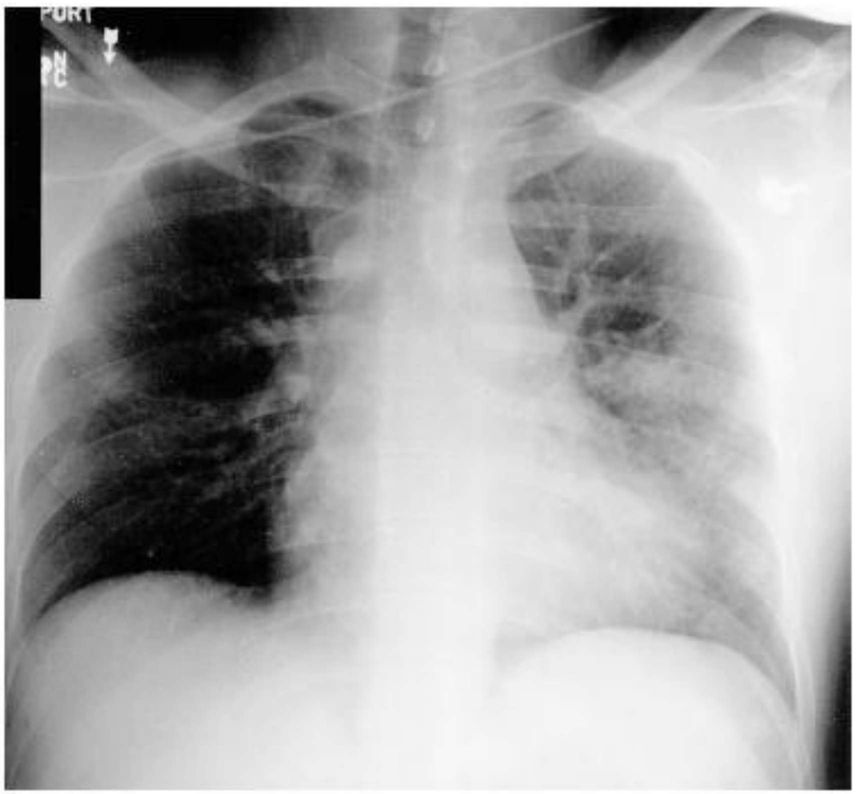
Pneumothorax antérieur
(visible au scanner)

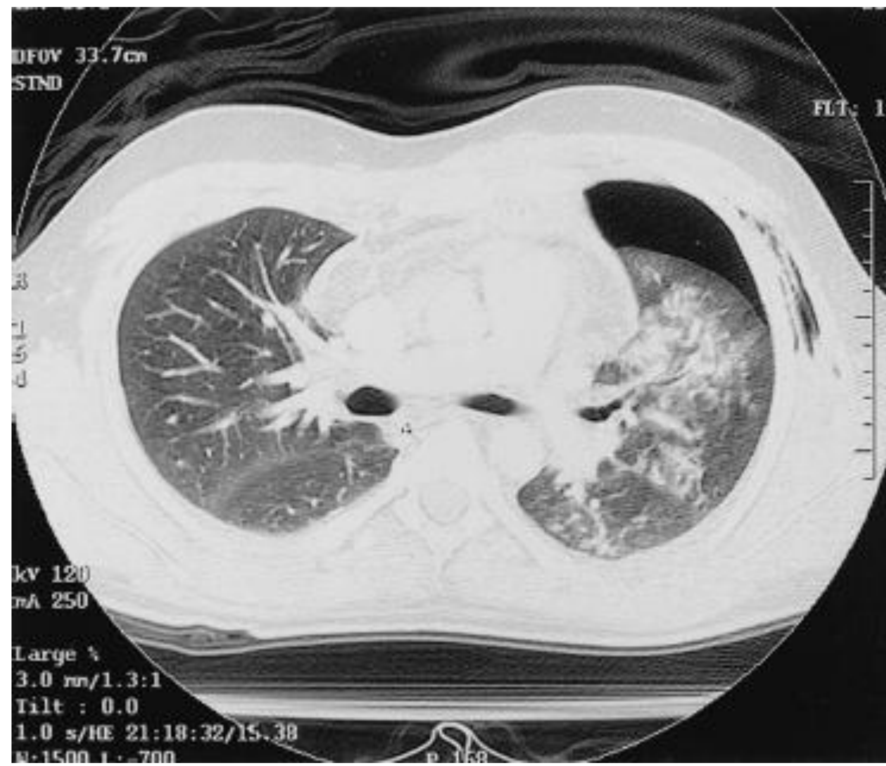


doi:10.1016/j.annemergmed.2010.08.012

Sonographic Diagnosis of a Pneumothorax Inapparent on Plain Radiography: Confirmation by Computed Tomography

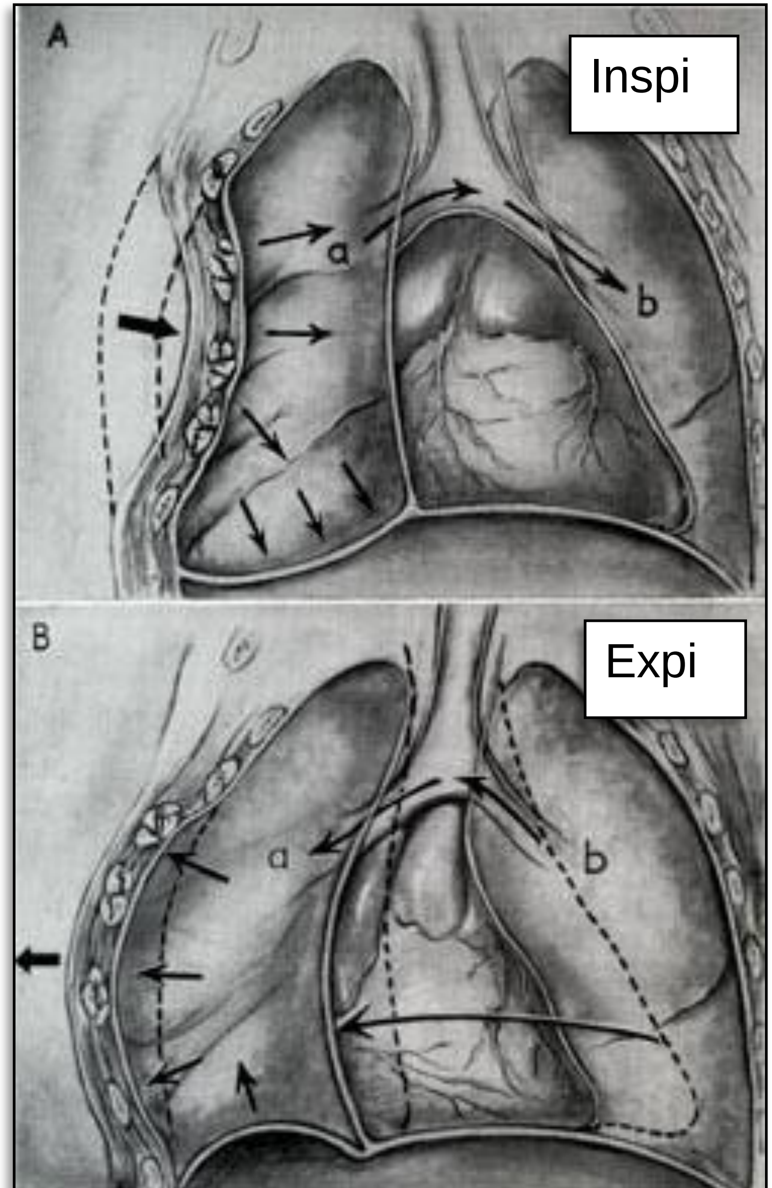
Andrew W. Kirkpatrick, MD, FRCSC, Alex K. T. Ng, MD, MBChB, FRACS, Scott A. Dulchavsky, MD, PhD, FACS, Ian Lyburn, MB, FRCR, Allison Harris, MB, FRCR, William Torregianni, MB, FRCR, Richard K. Simons, MD, FRCSC, FACS, and Savvas Nicolaou, MD, FRCPC



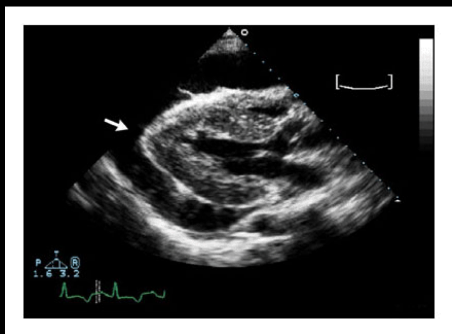


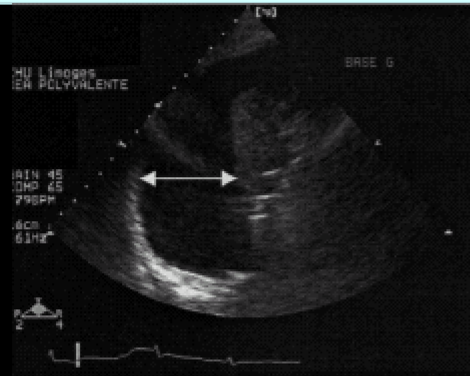
J Trauma. 2001;50:750–752.

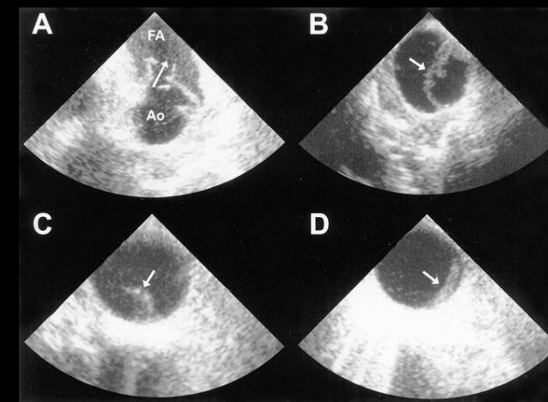
Volets thoraciques (flail chest) : mécanismes

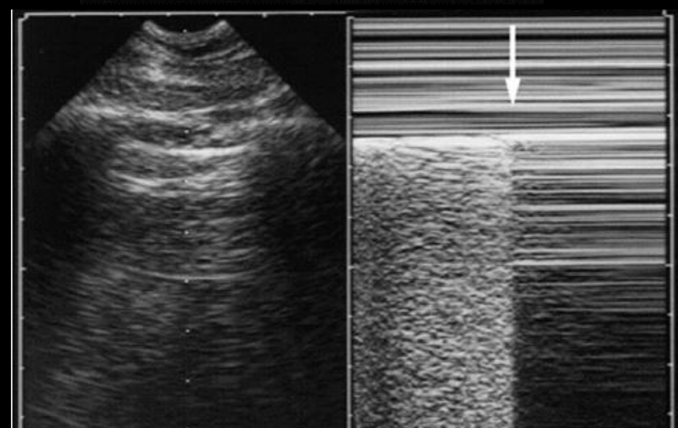


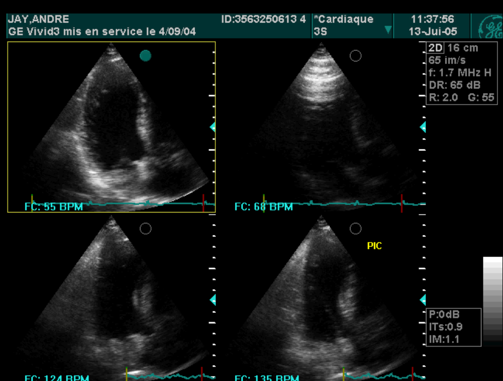
Trauma thoracique : échographie cardio pulmonaire

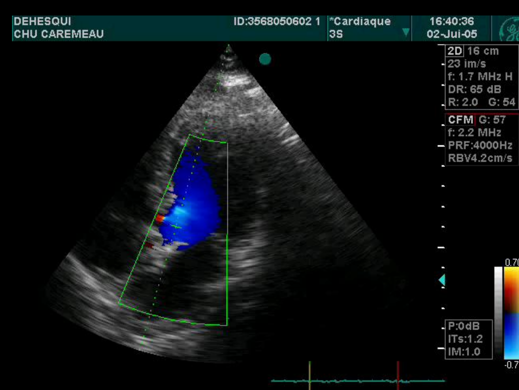


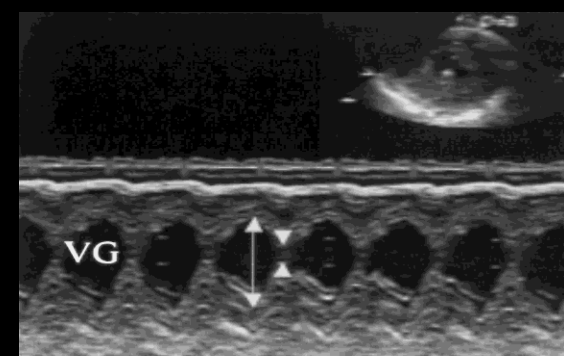












Main Risk Factors for ARDS

1) Direct (primary)

- **Pulmonary contusion**
- **Fractures**
- **Multiple transfusions**
- **Fat embolism**
- Pneumonia
- Gastric aspiration
- Shock
- Near-drowning
- Smoke inhalation
- …

2) Indirect (secondary)

- Sepsis
- Injury severity score > 16
- Trauma Brain Injury
- Blunt injury
- TRansfusion Associated Lung Injury (TRALI)
- Surgery to head
- Disseminated intravascular coagulation
- Pancreatitis

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Risk factors for respiratory failure in brain injury

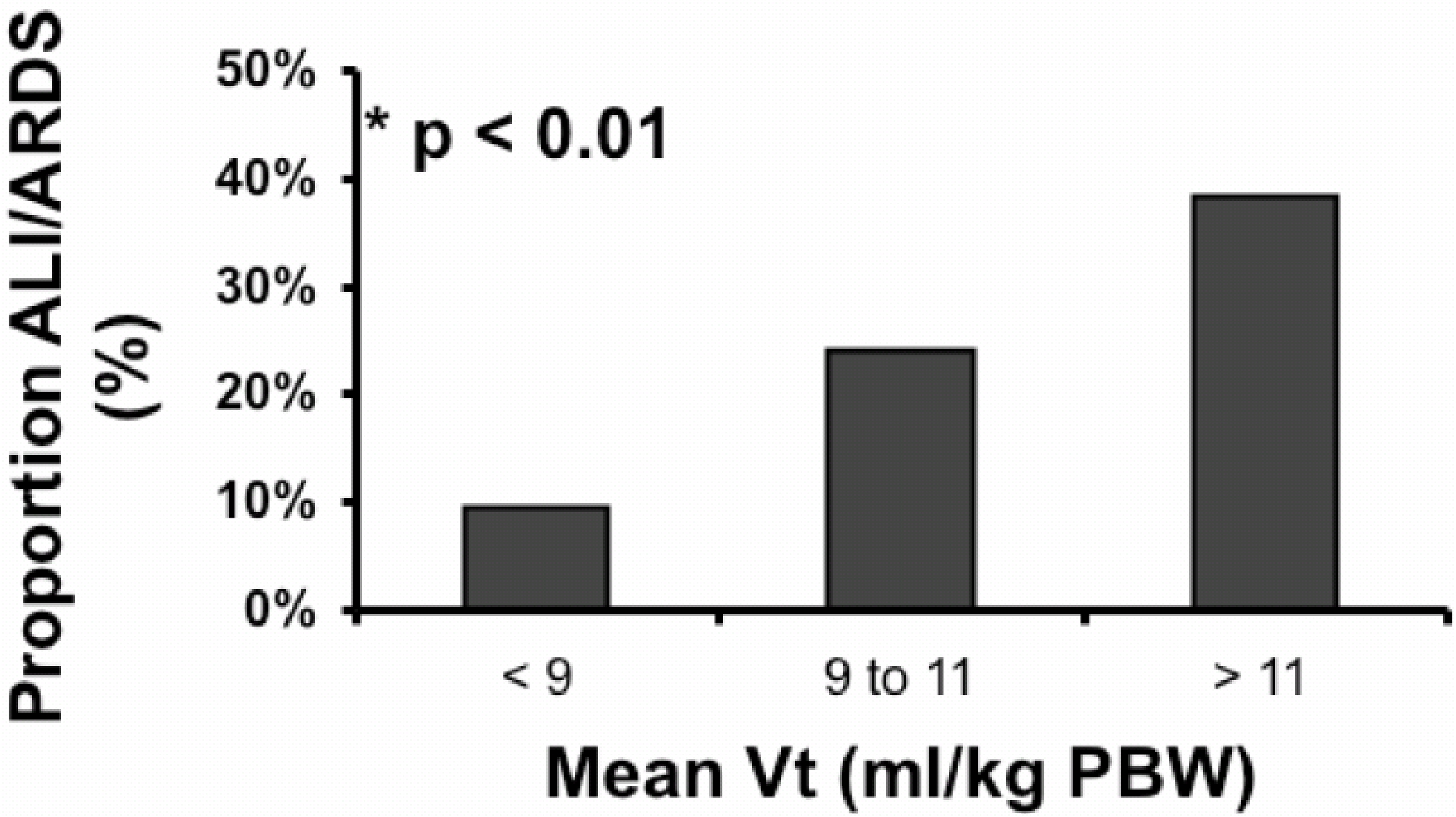
Pelosi P et al. Curr Opin Crit Care 2005;11:37-42

	Risk
Risk factors related to brain injury	
Altered consciousness	6.6
Risk factors associated with the treatment of brain injury	
Aspiration	7.0
Emergency intubation	6.4
Mechanical ventilation >3 days	2.3
Risk factors associated with treatment of a general population of critically ill patients	
Reintubation	5.4
Age >60 y	5.3
Supine position	4.8
Previous disease	3.6
Prior antibiotic use	2.9

High tidal volume is associated with the development of acute lung injury after severe brain injury: An international observational study*

Critical Care Medicine 2007; 35:1815-1820

Luciana Mascia, MD, PhD; Elisabeth Zavala, MD; Karen Bosma, MD; Daniela Pasero, MD; Daniela Decaroli, MD; Peter Andrews, MD; Donatella Isnardi, MD; Alessandra Davi, MD; Maria Jose Arguis, MD; Maurizio Berardino, MD; Alessandro Ducati, MD; on behalf of the Brain IT group



Ventilation for Severe trauma patients (ARDS…?)

1. Risk Factors

2. Prevention

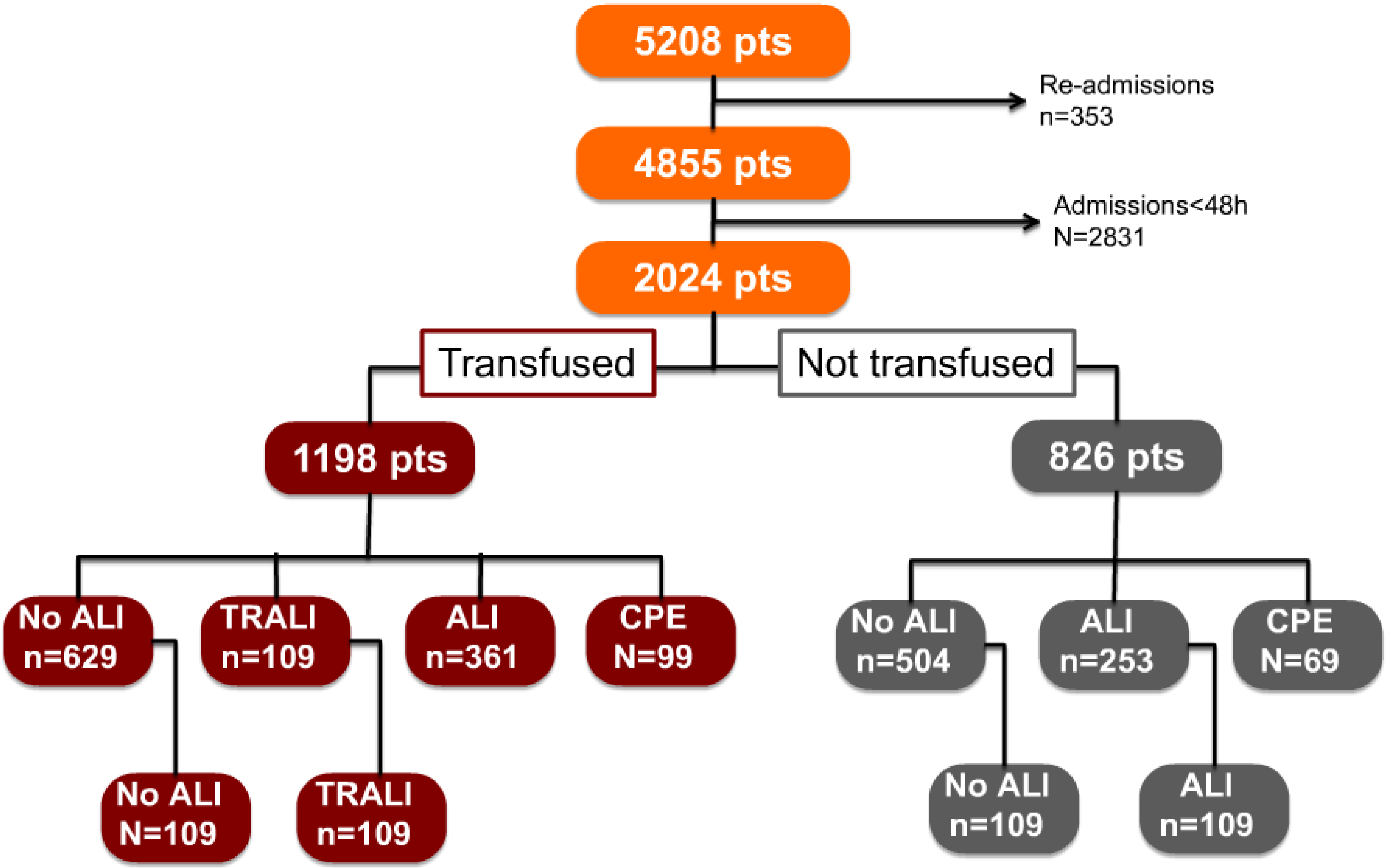
3. Treatment

Prevention for ARDS after Trauma

1. Limited over-load fuild
2. Limited transfusion
3. Non-Invasive Ventilation (NIV)
4. Lung protective ventilation
5. Optimal Analgesia

Risk factors and outcome of transfusion-related acute lung injury in the critically ill: A nested case–control study*

Alexander P. J. Vlaar, MD; Jan M. Binnekade, PhD; David Prins, MSc; Danielle van Stein, MD; Jorrit J. Hofstra, MD; Marcus J. Schultz, MD, PhD; Nicole P. Juffermans, MD, PhD

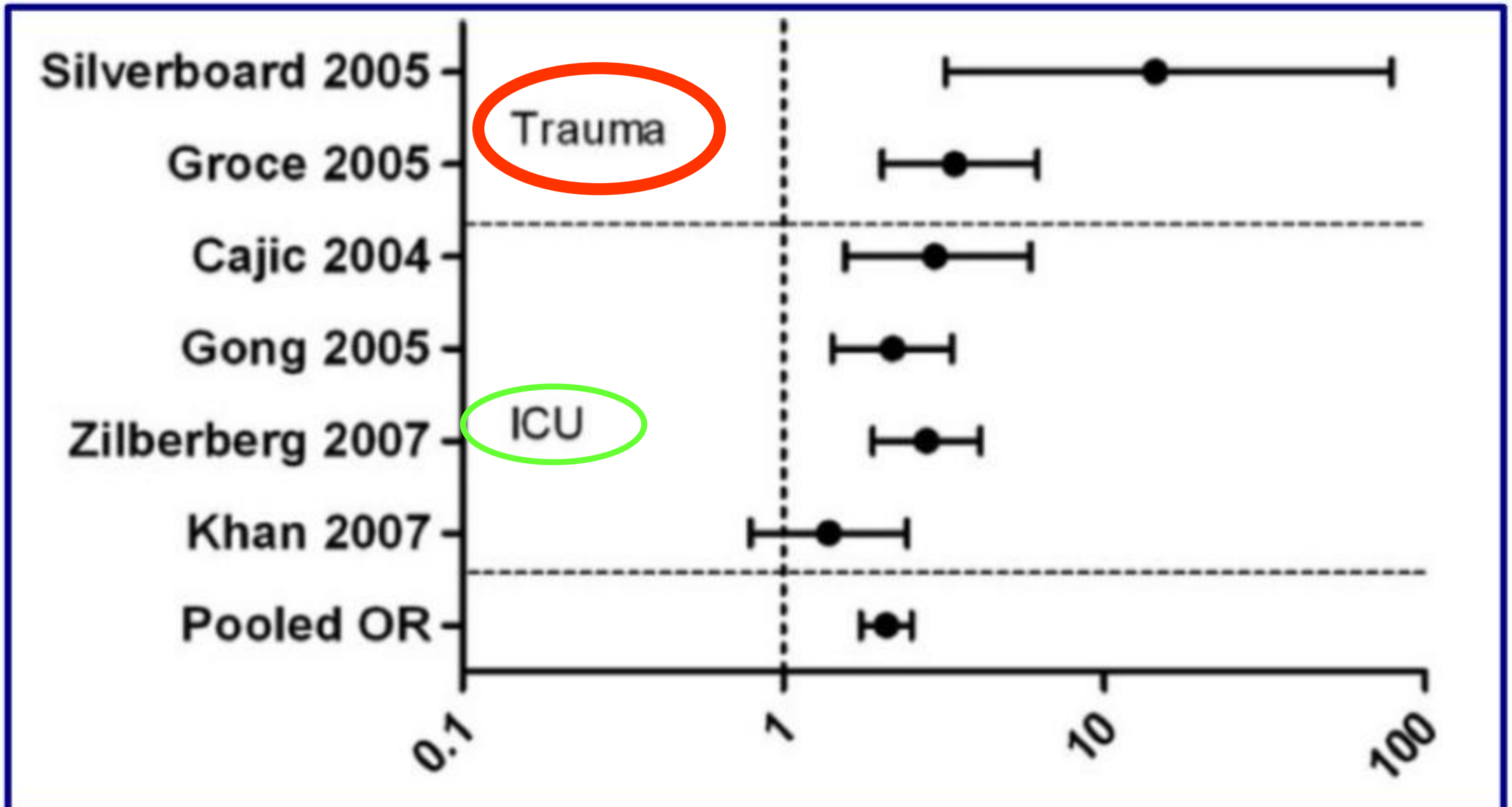


Crit Care Med 2010; 38: 771–778

Acute lung injury following blood transfusion: Expanding the definition

Paul E. Marik, MD, FACP, FCCM, FCCP; Howard L. Corwin, MD, FACP, FCCM, FCCP

Effect of blood transfusion on the risk of late TRALI



Crit Care Med 2008 Vol. 36, No. 11

Transfusion related acute lung injury: incidence and risk factors

Pearl Toy, Ognjen Gajic, Peter Bacchetti, Mark R. Looney, Michael A. Gropper, Rolf Hubmayr, Clifford A. Lowell, Philip J. Norris, Edward L. Murphy, Richard B. Weiskopf, Gregory Wilson, Monique Koenigsberg, Deanna Lee, Randy Schuller, Ping Wu, Barbara Grimes, Manish J. Gandhi, Jeffrey L. Winters, David Mair, Nora Hirschler, Rosa Sanchez Rosen and Michael A. Matthay

47,783 pts treated with blood product transfusion (463,207 BP in 176,499 episodes)

Continuous e-surveillance ABG with $PaO_2/FiO_2<300$ or $SpO_2<90\%$

14,472 alerts (11,612 pts)

162,027 NO alert (36,171 pts)

561 alerts reviewed by expert panel

Excluded: 13,147

- No edema 6,424
- Preexisting edema 3,335
- No inc in FiO_2 415
- No chest X-ray 570
- No qualifying product 1,140
- No research auth 584
- Others 1,279

166 TACO

153 ALI/possible TRALI

94 TRALI

47 TACO/TRALI

101 other

164 Controls

89 TRALI

Excluded: 5

- 2 TRALI from bacterial contamination
- 1 TRALI from anaphylaxis

Prepublished online November 23, 2011;

Transfusion related acute lung injury: incidence and risk factors

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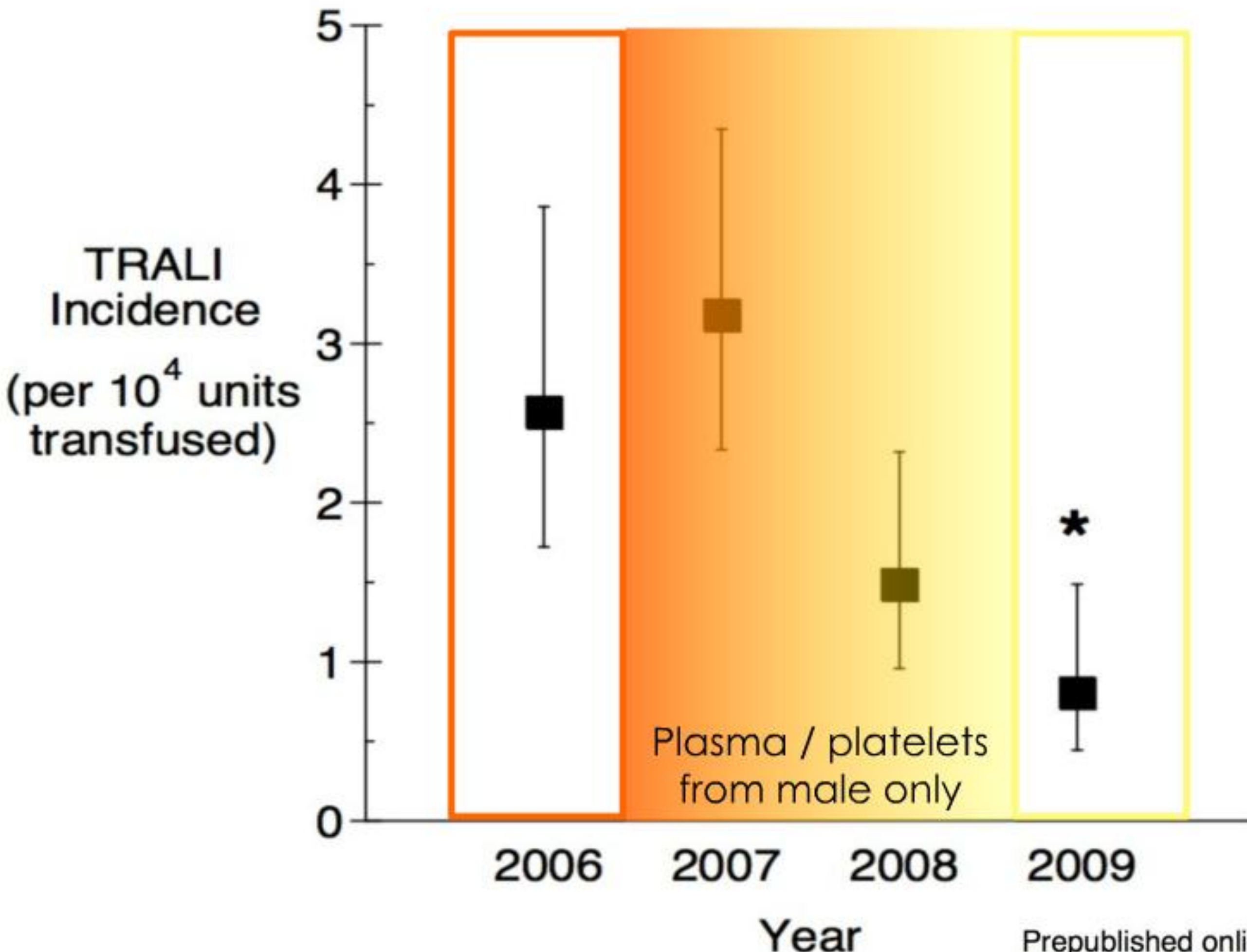
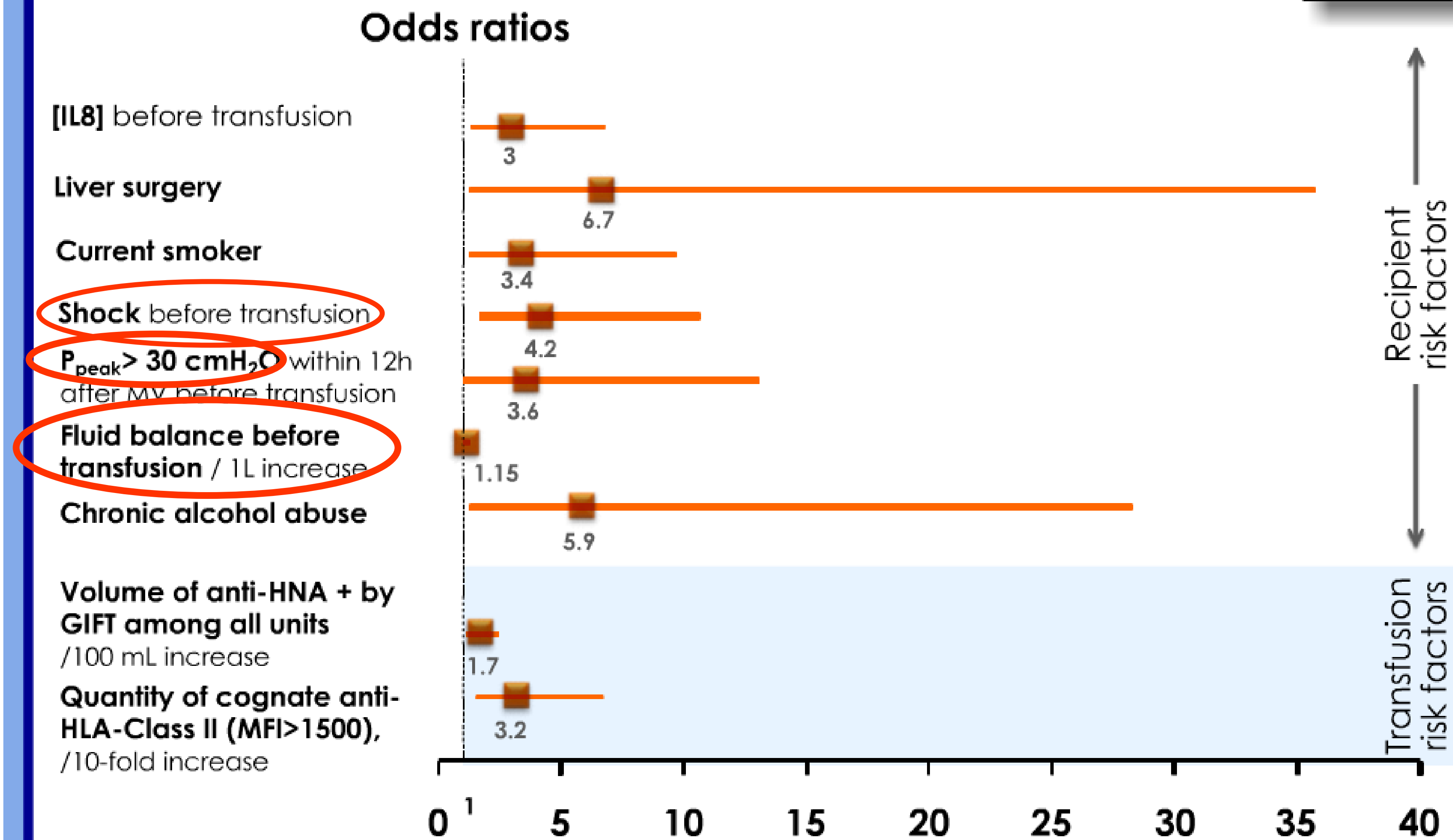


Prepublished online November 23, 2011

Primary multivariate model of TRALI risk factors: antibodies controlled for recipient risk factors



Prepublished online November 23, 2011;
doi:10.1182/blood-2011-08-370932

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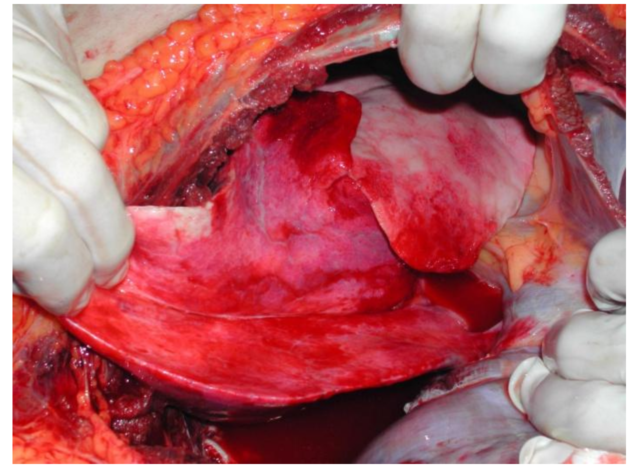
1. Risk Factors
2. Prevention
3. **Treatment**

Chest trauma

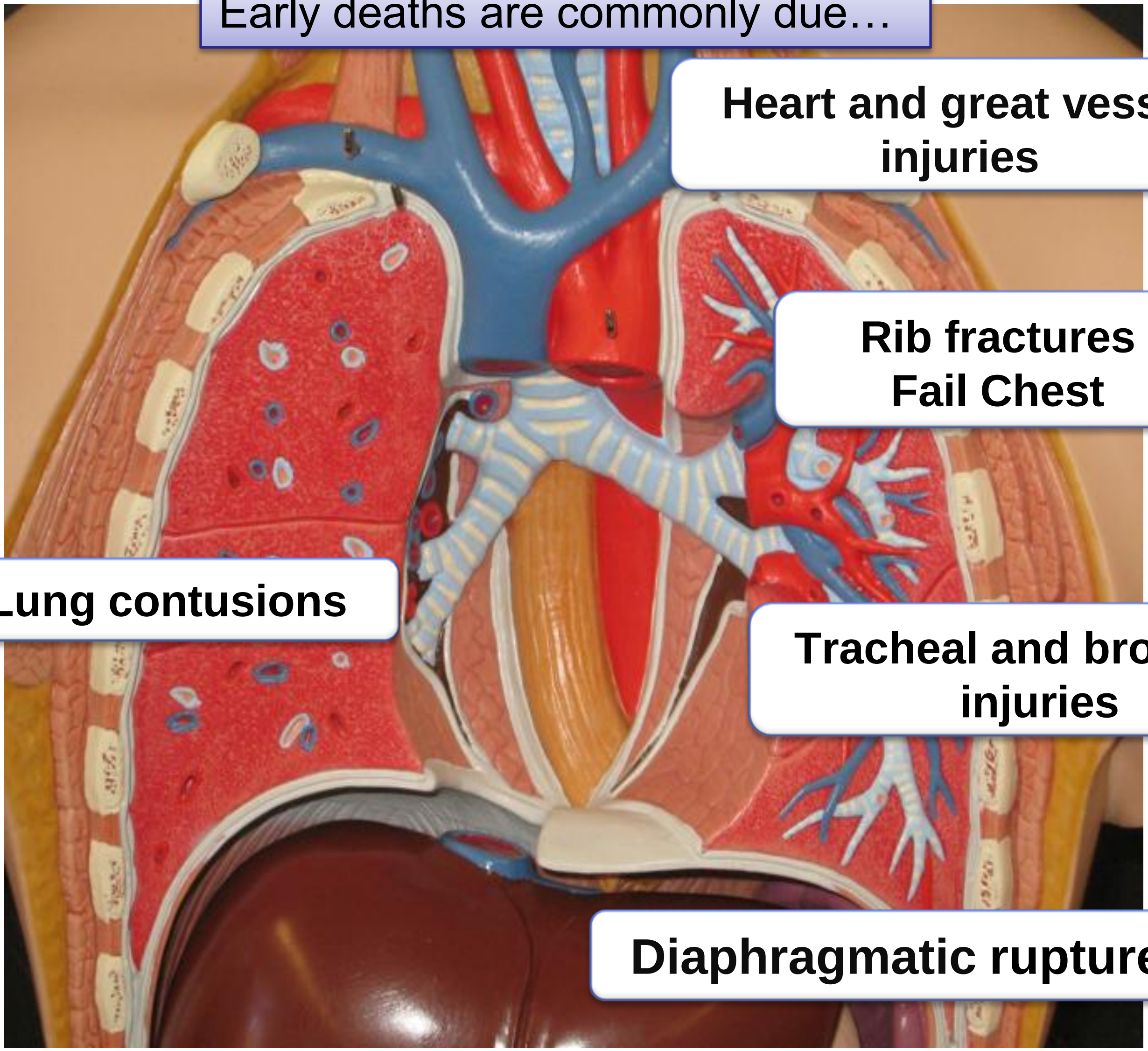


Ventilatory management = challenge because of the difficulty in achieving a balance between the avoidance of further harm to the lungs and sufficient ventilation

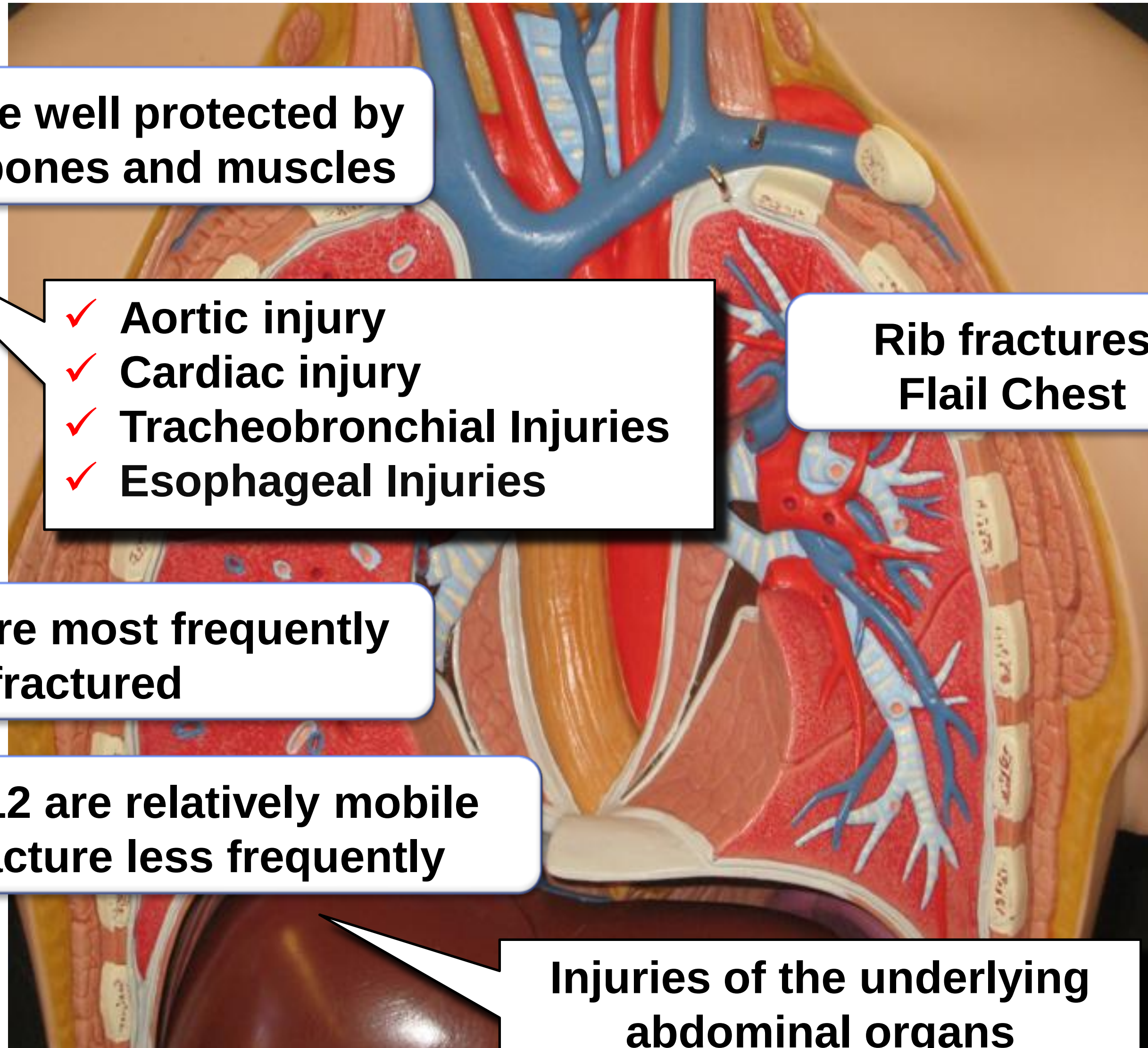
Be (very) protective !

Chest trauma

Early deaths are commonly due…



Chest trauma



Ribs 1-3 are well protected by shoulder bones and muscles

- Aortic injury
- Cardiac injury
- Tracheobronchial Injuries
- Esophageal Injuries

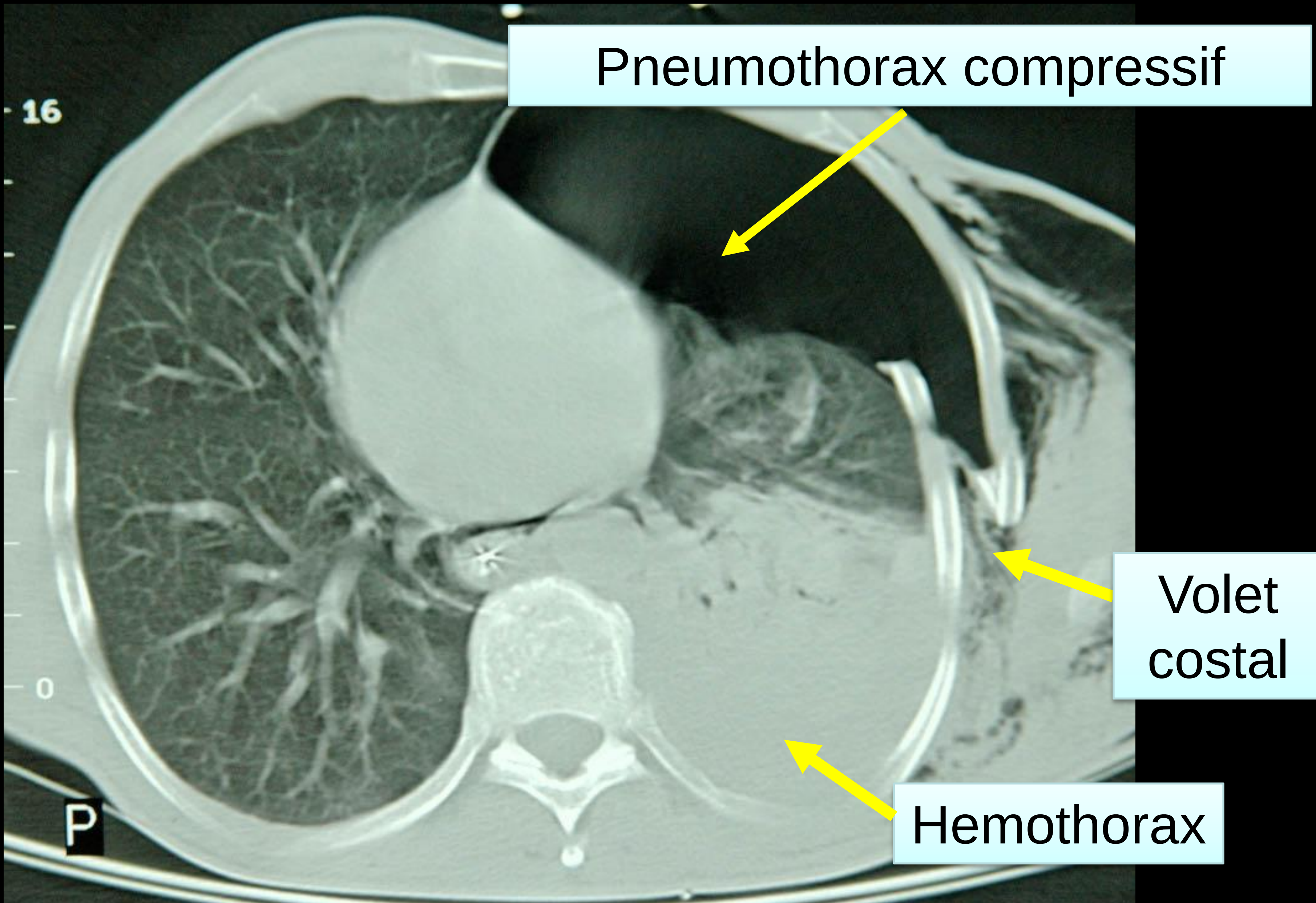
Rib fractures
Flail Chest

Ribs 4-9 are most frequently fractured

Ribs 10-12 are relatively mobile and fracture less frequently

Injuries of the underlying abdominal organs
Liver / Spleen / Kidneys

PRIORITE AUX DRAINAGES DES EPANCHEMENTS

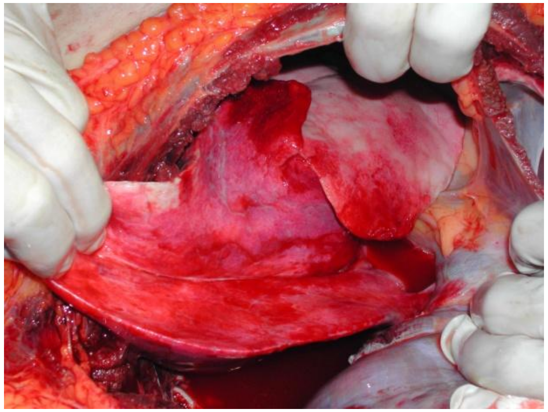


Pulmonary contusion

Pulmonary contusions : most common injuries : 30-75% of trauma patients

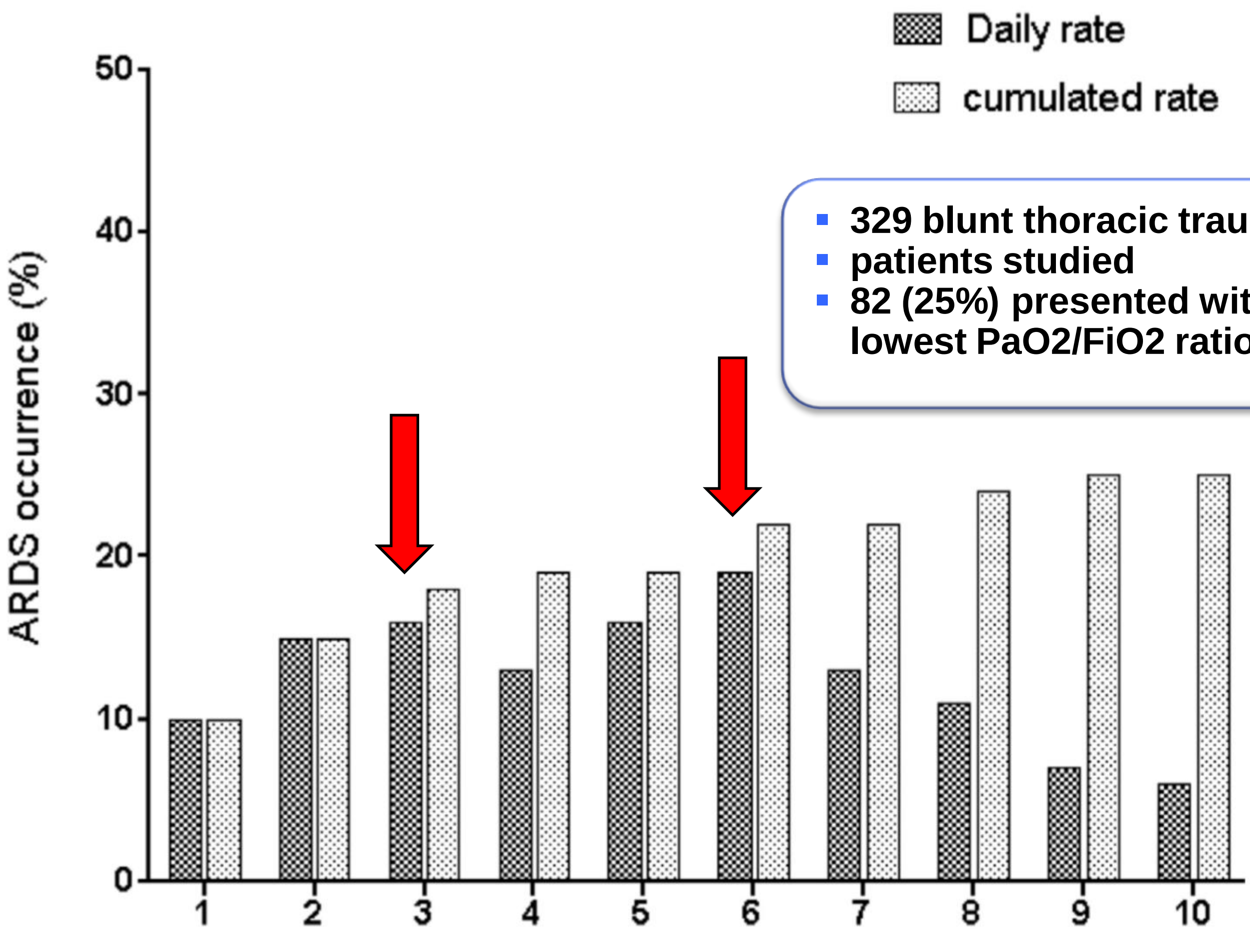
Initial assessment may underestimate the gravity of the situation

Score on admission for early prediction of ARDS in blunt thoracic trauma patients with pulmonary contusion



- Laceration to lung tissue
- Hemorrhage-filled alveoli
- Reduced compliance yielding reduced ventilation
- Increased shunt fraction with decrease in PO2, increase in AaDO2
- Increased pulmonary vascular resistance
- Decreased pulmonary blood flow
- Thickened alveolar septa with impaired diffusion

Thoracic Trauma Severity score on admission allows to determine the risk of delayed ARDS in trauma patients with pulmonary contusion



- 329 blunt thoracic trauma
- patients studied
- 82 (25%) presented with ARDS (mean lowest PaO2/FiO2 ratio of 131 [SD 34])

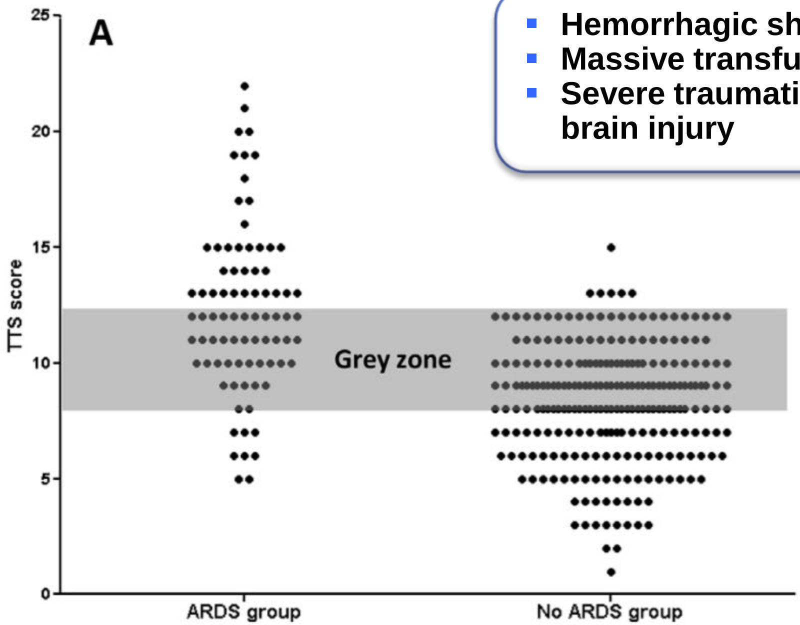
A. Daurat et al. Injury 2016

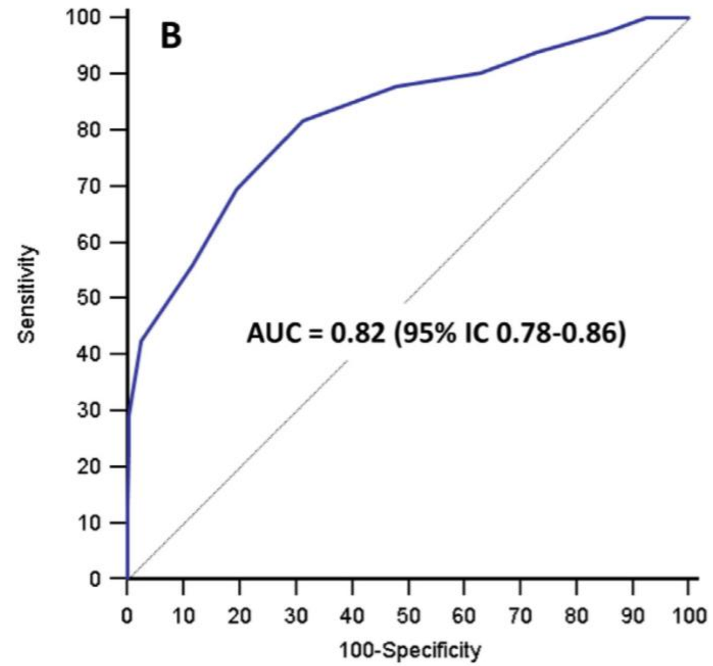
Thoracic Trauma Severity score on admission allows to determine the risk of delayed ARDS in trauma patients with pulmonary contusion

TTS scores between 8 and 12 belonged to the inconclusive grey zone. A TTS score of 13-25 was found to be independent risk factors of ARDS (OR 25.8 [95% CI 6.7–99.6] P < 0.001)

A. Daurat et al. Injury 2016

- **Hemorrhagic shock,**
- **Massive transfusion**
- **Severe traumatic brain injury**

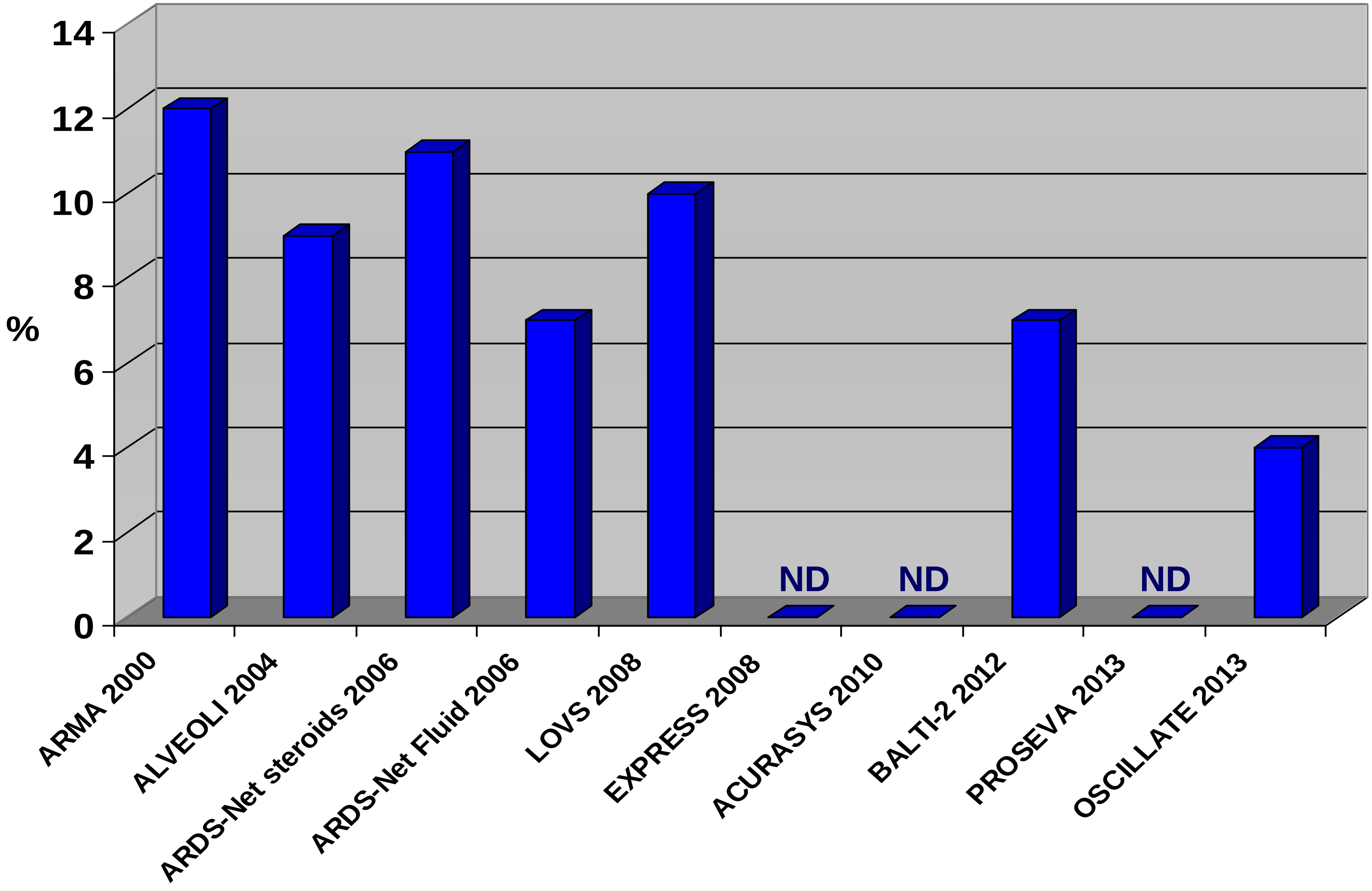




Thoracic Trauma Severity (TTS) score.

PaO_2/FiO_2	Rib fracture	Contusion	Pleural involvement	Age (years)	Points
>400	0	None	None	<30	0
300–400	1–3	1 lobe	Pneumothorax	30–41	1
200–300	4–6 unilateral	1 lobe bilateral or 2 lobes unilateral	Unilateral HT or HPT	42–54	2
150–200	>3 bilateral	<2 lobes bilateral	HT or HPT bilateral	55–70	3
<150	Flail chest	≥2 lobes bilateral	Tension pneumothorax	>70	5

ARDS after trauma in the main ARDS-trials = 5 to 10 %

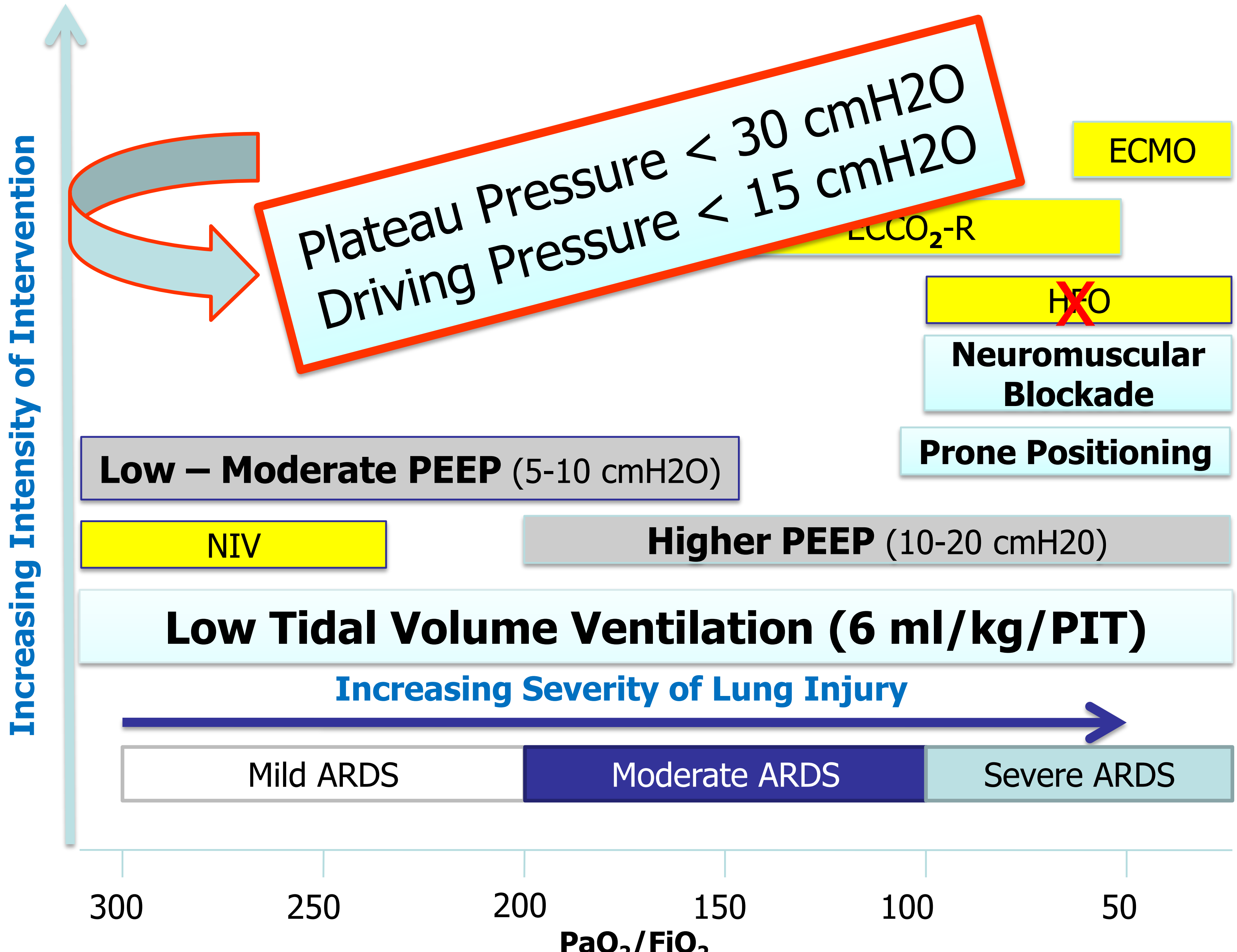


2012 « the Berlin Definition »

– international experts

	Léger	Modéré	Sévère
Timing	Début aigu < 1 semaine d'un contexte clinique compatible, nouveau/aggravation de symptômes cliniques		
Hypoxémie (mmHg)	$200 < PaO_2/FiO_2 \leq 300$	$100 < PaO_2/FiO_2 < 200$	$PaO_2/FiO_2 \leq 100$
Origine de l'œdème	Défaillance respiratoire non expliquée essentiellement par une défaillance cardiaque ou une surcharge volémique		
Anomalies radiologiques	Opacités bilatérales Non expliquées par des épanchements, atélectasies ou nodules		

JAMA 2012



Increasing Intensity of Intervention
Plateau Pressure < 30 cmH2O
Driving Pressure < 15 cmH2O
ECMO
ECCO$_2$-R
HFO
Neuromuscular Blockade
Prone Positioning
Low – Moderate PEEP (5-10 cmH2O)
NIV
Higher PEEP (10-20 cmH20)
Low Tidal Volume Ventilation (6 ml/kg/PIT)
Increasing Severity of Lung Injury
Mild ARDS
Moderate ARDS
Severe ARDS
300
250
200
150
100
50
PaO$_2$/FiO$_2$

Prevention for ARDS after Trauma

1. Limited over-load fuild
2. Limited transfusion
3. **Non-Invasive Ventilation (NIV)**
4. Lung protective ventilation
5. Optimal Analgesia

Safety and efficacy of noninvasive ventilation in patients with blunt chest trauma: a systematic review *Critical Care* 2013, **17**:R142

Abhijit Duggal[1], Pablo Perez[2], Eyal Golan[3,4], Lorraine Tremblay[2,3,5] and Tasnim Sinuff[2,3*]

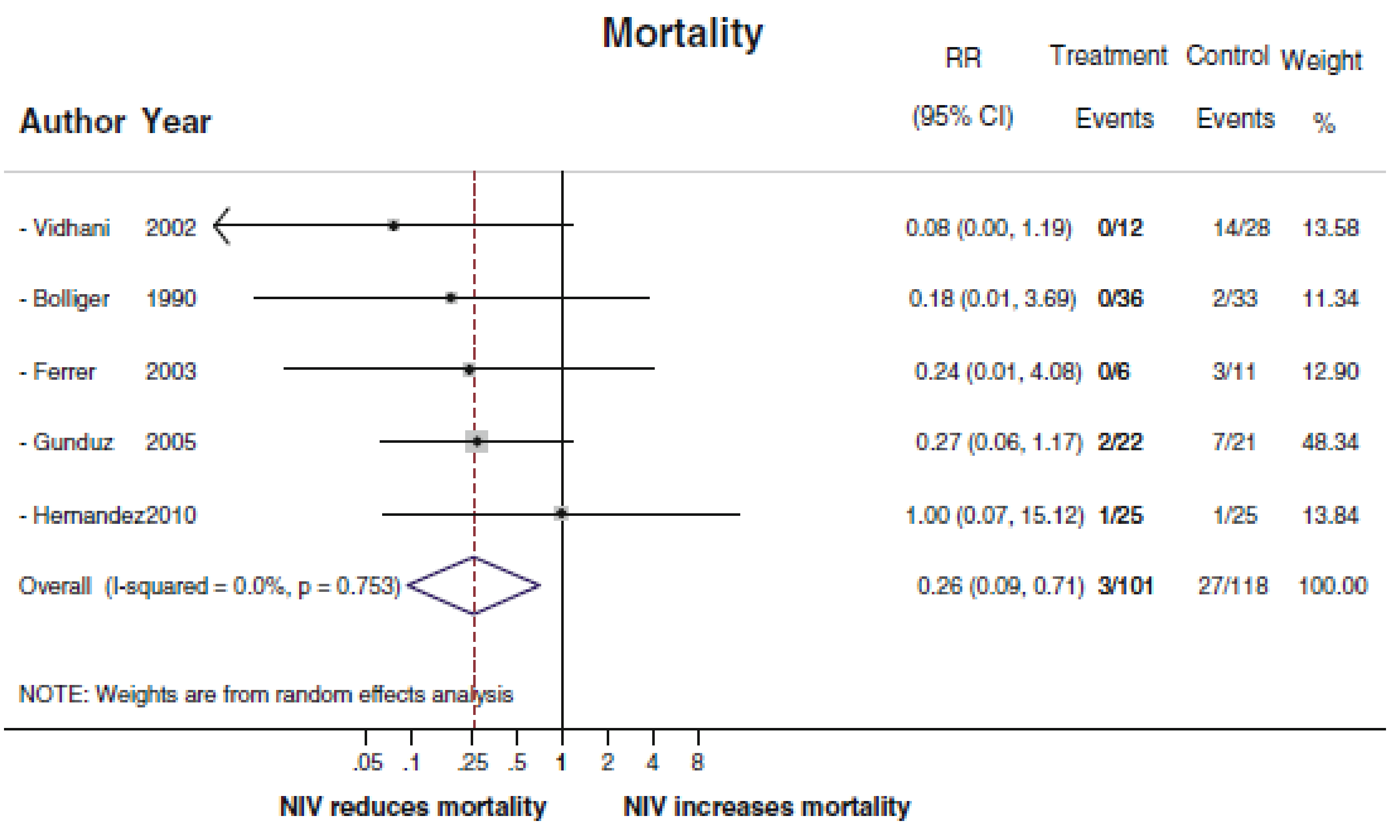
Conclusions: Early use of NIV in appropriately identified patients with chest trauma and without respiratory distress may prevent intubation and decrease complications and ICU length of stay. Use of NIV to prevent intubation in patients with chest trauma who have ALI associated with respiratory distress remains controversial because of the lack of good-quality data.

Intensive Care Med (2013) 39:1171–1180
DOI 10.1007/s00134-013-2901-4

SYSTEMATIC REVIEW

D. Chiumello
S. Coppola
S. Froio
C. Gregoretti
D. Consonni

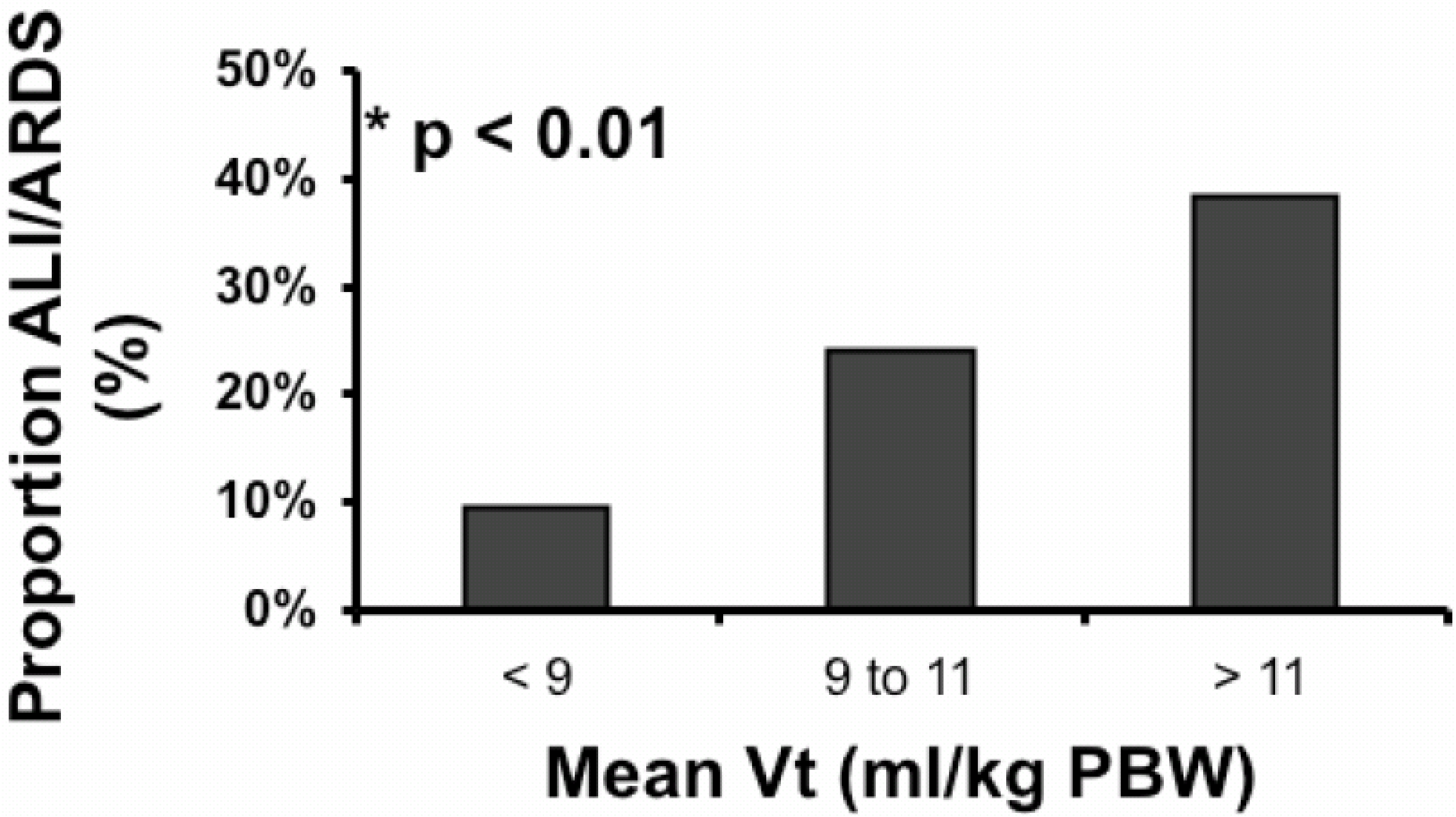
Noninvasive ventilation in chest trauma: systematic review and meta-analysis



Trauma patients and Weaning ?

High tidal volume is associated with the development of acute lung injury after severe brain injury: An international observational study* Critical Care Medicine 2007; 35:1815-1820

Luciana Mascia, MD, PhD; Elisabeth Zavala, MD; Karen Bosma, MD; Daniela Pasero, MD;
Daniela Decaroli, MD; Peter Andrews, MD; Donatella Isnardi, MD; Alessandra Davi, MD;
Maria Jose Arguis, MD; Maurizio Berardino, MD; Alessandro Ducati, MD; on behalf of the Brain IT group



Implementation of an Evidence-based Extubation Readiness Bundle in 499 Brain-injured Patients

A Before–After Evaluation of a Quality Improvement Project

AJRCCM 2013

Antoine Roquilly[1], Raphaël Cinotti[2], Samir Jaber[3], Mickael Vourc'h[2], Florence Pengam[1], Pierre Joachim Mahe[1], Karim Lakhal[2], Dominique Demeure Dit Latte[1], Nelly Rondeau[2], Olivier Loutrel[1], Jérôme Paulus[1], Bertrand Rozec[2], Yvonnick Blanloeil[2], Marie-Anne Vibet[4,5], Véronique Sebille[5,6], Fanny Feuillet[5,6], and Karim Asehnoune[1]

Table 1 – Evidence based weaning bundle

Lung protective ventilation	
1. Tidal volume	1. 6-8 $ml.kg^{-1}$ of ideal body weight
2. PEEP	2. > 3 cmH_2O
3. Respiratory rate	3. Set to achieve normocapnia or optional moderate hypocapnia
Nutrition support	
1. Day of initiation	1. Day-1
2. Input target	2. 25 $kCal.kg^{-1}.day^{-1}$ before Day-3
Probabilistic antibiotherapy for hospital acquired pneumonia*	
1. Low risk of MDR bacteria	1. Amoxicillin - clavulanic acid (2 g x 3/day iv.)
2. High risk of MDR bacteria	2. Cefepime (2 g x 3/day iv.) + tobramycin (5-6 mg/kg/day iv. once a day)
1. Ventilatory weaning	1. Early spontaneous breathing: tolerance of inspiratory support < 10 cm H_2O or spontaneous breathing and $FiO2 \leq 40\%$ for $\geq$ 30 min.
2. Tube removal	2. Glasgow Coma Scale $\geq$ 10 and cough (spontaneous or caused)

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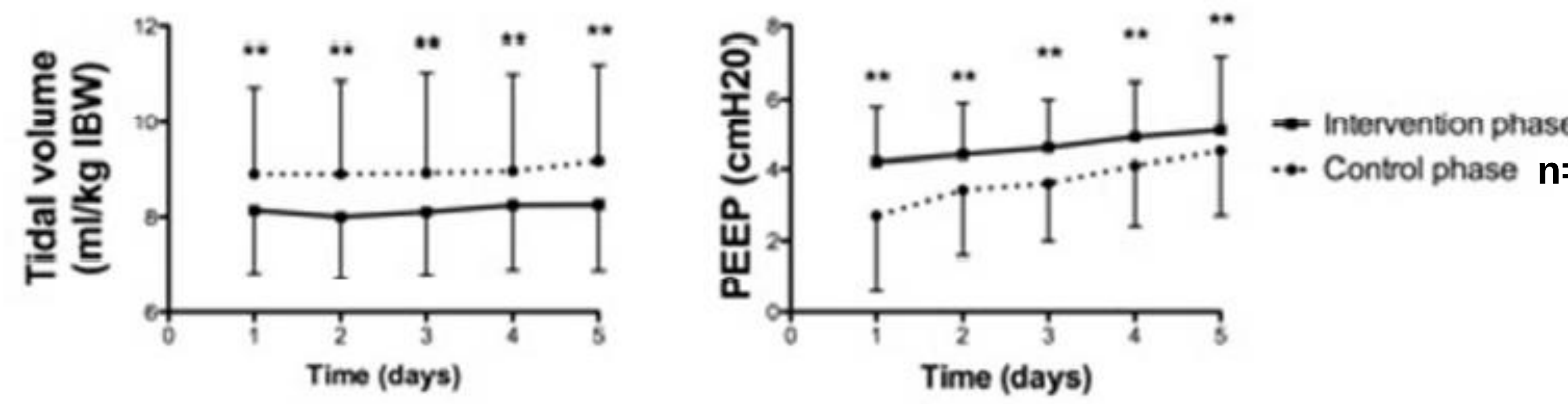

n=299

n=200

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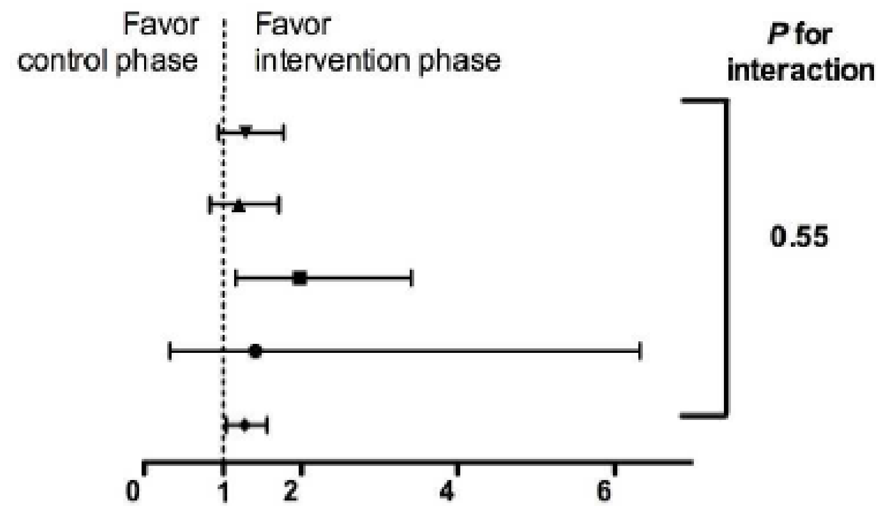
	No. patients	hazard ratio (95%CI)
Traumatic brain injury	225	1.29 (0.94; 1.77)
Subarachnoid hemorrhage	165	1.20 (0.84; 1.71)
Stroke	88	1.98 (1.16; 3.40)
Other	20	1.42 (0.32; 6.33)
Entire population	449	1.28 (1.04; 1.57)



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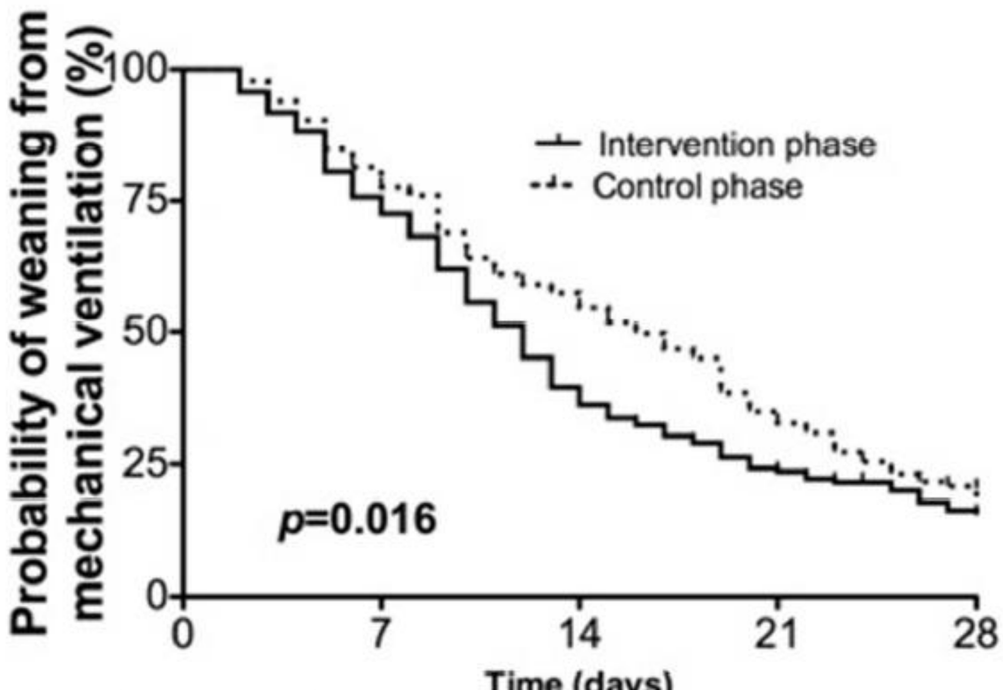
Duration of mechanical ventilation, days, *mean (SD)**	14.9 (11.7)	12.6 (10.3)
Duration of mechanical ventilation, days, *median (IQR)***	17 (9-25)	12 (8-19)



Number of patients at risk:

Control :	299	169	93	42	12	4	2
Intervention:	200	103	29	10	5	3	1

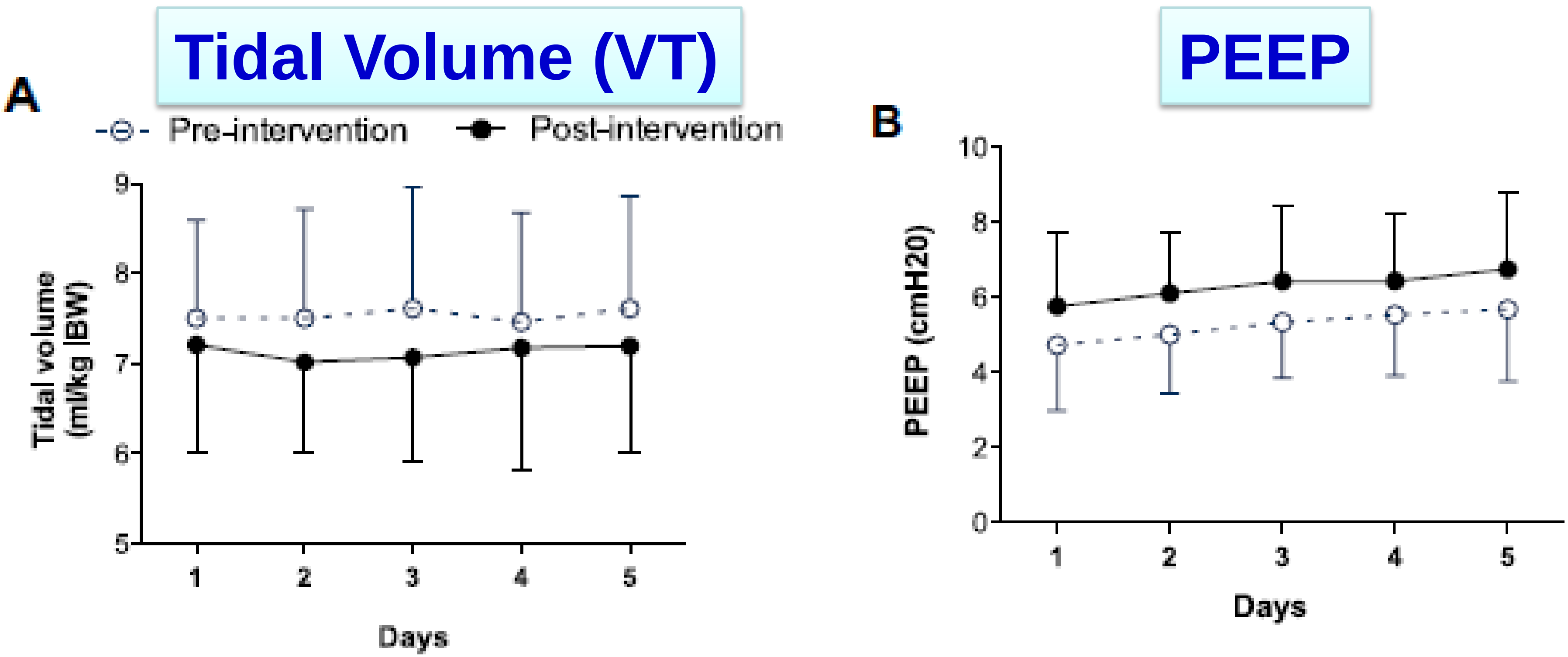
A multi-faceted strategy to reduce ventilation-associated mortality in brain-injured patients. The BI-VILI project: a nationwide quality improvement project

Intensive Care Med
DOI 10.1007/s00134-017-4764-6

2017

Karim Asehnoune[1,20*], Ségolène Mrozek[2], Pierre François Perrigault[3], Philippe Seguin[4], Claire Dahyot-Fizelier[5], Sigismond Lasocki[6], Anne Pujol[7], Mathieu Martin[8], Russel Chabanne[9], Laurent Muller[10], Jean Luc Hanouz[11], Emmanuelle Hammad[12], Bertrand Rozec[13], Thomas Kerforne[14], Carole Ichai[15], Raphael Cinotti[1], Thomas Geeraerts[2], Djillali Elaroussi[7], Paolo Pelosi[16], Samir Jaber[17], Marie Dalichampt[18], Fanny Feuillet[19], Véronique Sebille[18,19], Antoine Roquilly[1] and The BI-VILI study group

n=744 pts ; 20 ICU



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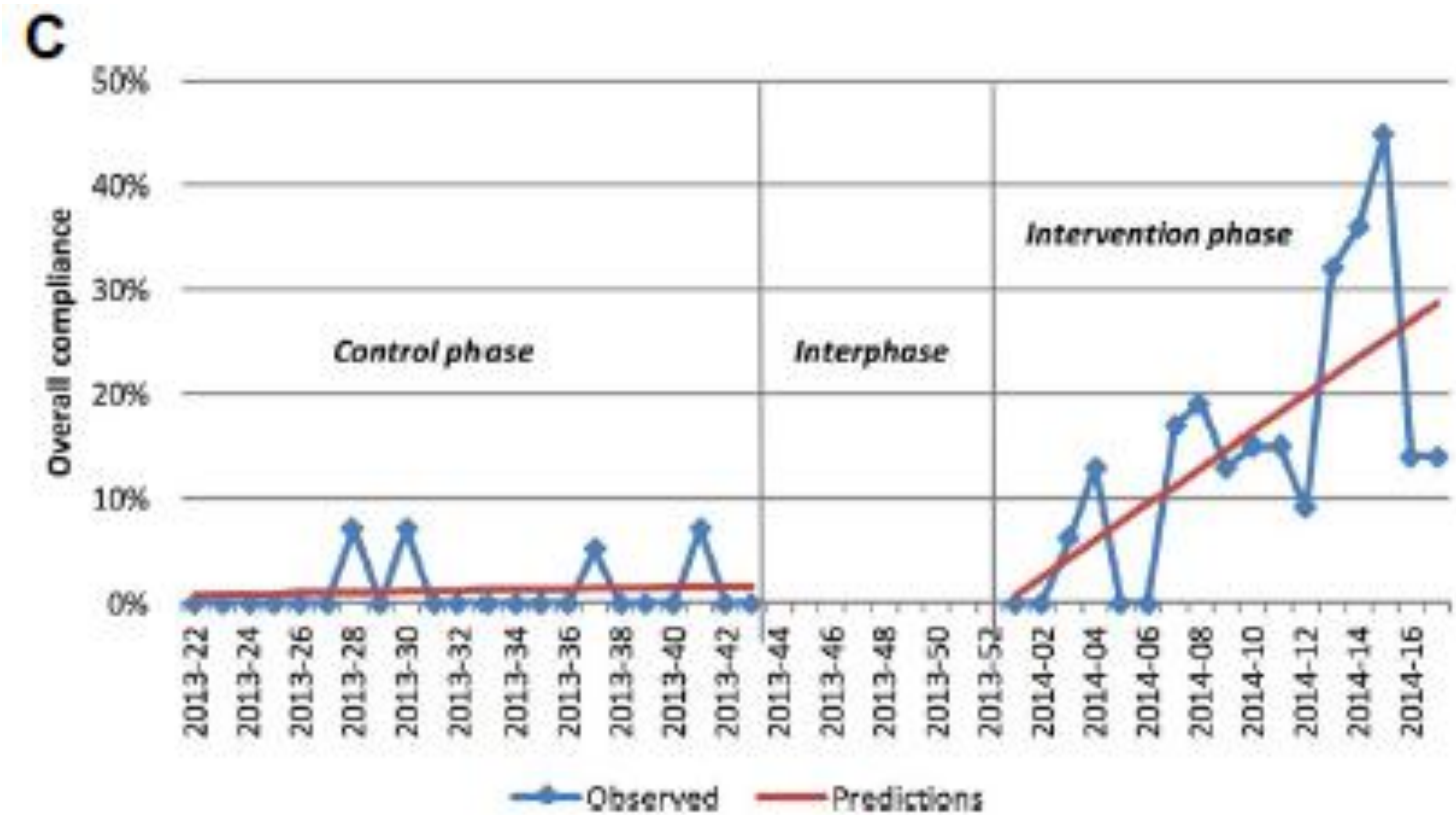

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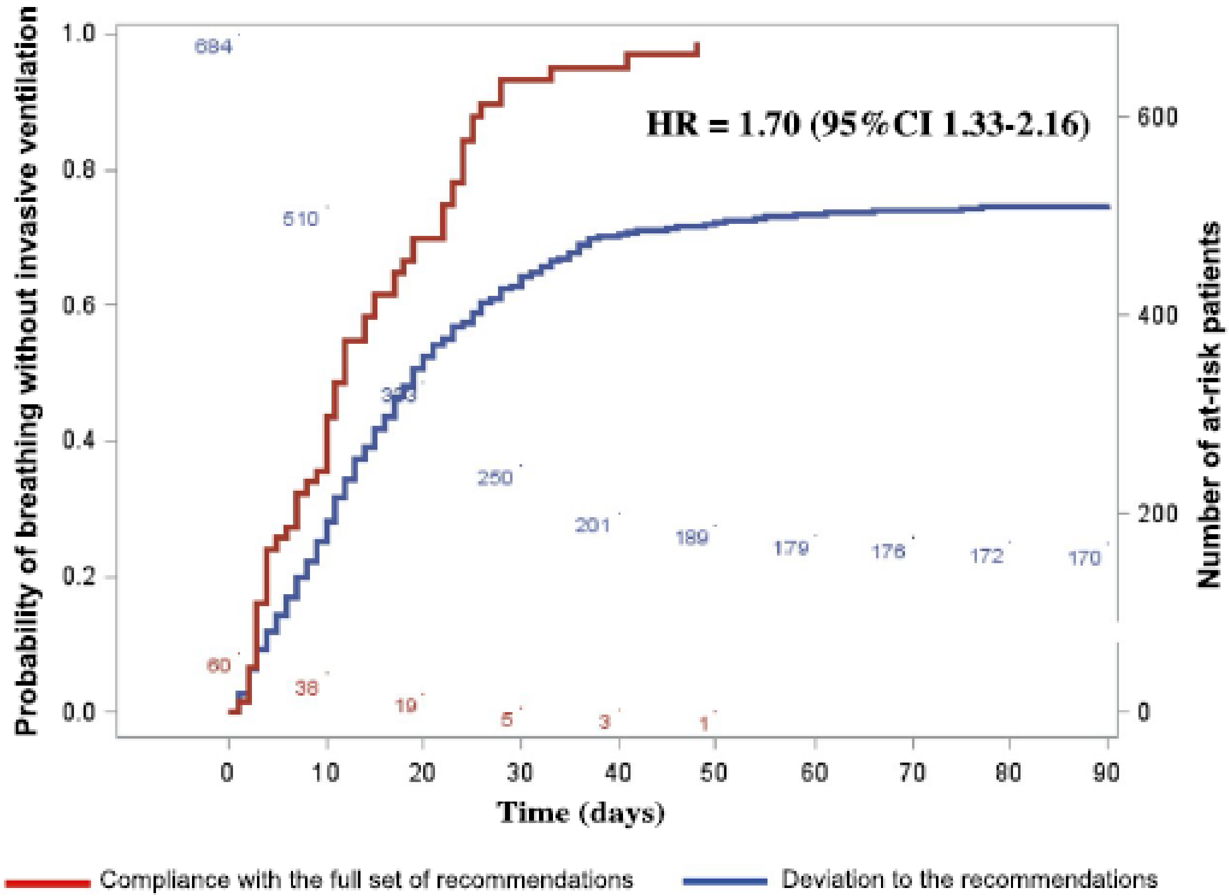
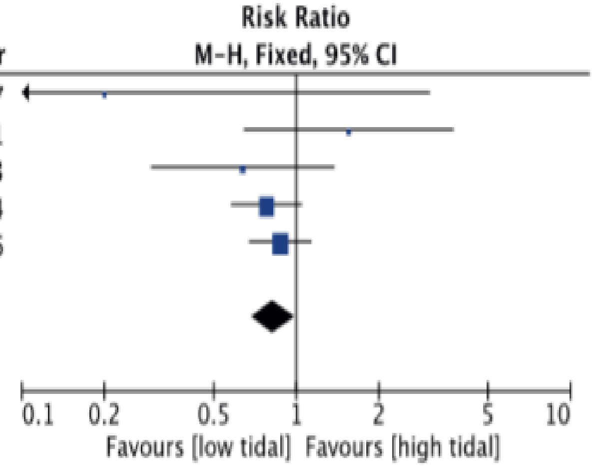


Volume courant < 8 ml/kg et poumons des cérébrolésés méta-analyse

A. Acute Respiratory Distress Syndrome

Study or Subgroup	Low tidal Events	Low tidal Total	High tidal Events	High tidal Total	Weight	Risk Ratio M-H, Fixed, 95% CI	Year
Mascia 2007	0	9	18	73	2.3%	0.20 [0.01, 3.07]	2007
Pelosi 2011	8	239	12	556	3.7%	1.55 [0.64, 3.75]	2011
Roquilly 2013	10	259	16	264	8.2%	0.64 [0.29, 1.38]	2013
Elmer 2014	42	185	149	511	40.7%	0.78 [0.58, 1.05]	2014
BI-VILI 2016	70	280	97	339	45.1%	0.87 [0.67, 1.14]	2016
Total (95% CI)		**972**		**1743**	**100.0%**	**0.83 [0.68, 1.00]**	
Total events	130		292				

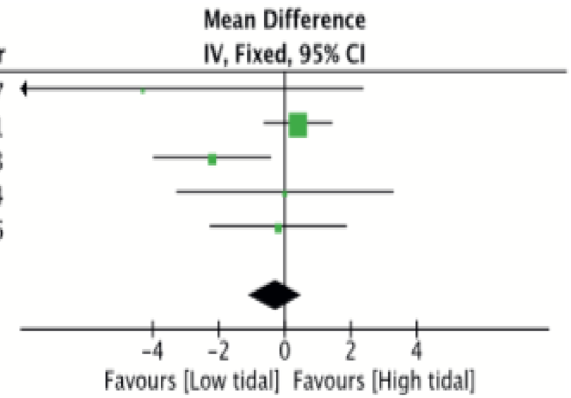
Heterogeneity: $Chi^2 = 3.76$, df = 4 (P = 0.44); $I^2 = 0\%$
Test for overall effect: Z = 2.01 (P = 0.04)



B. Duration of mechanical ventilation

Study or Subgroup	Low tidal Mean	Low tidal SD	Low tidal Total	High tidal Mean	High tidal SD	High tidal Total	Weight	Mean Difference IV, Fixed, 95% CI	Year
Mascia 2007	12.1	9.8	9	16.4	8.3	73	1.4%	-4.30 [-10.98, 2.38]	2007
Pelosi 2011	6.6	6.9	239	6.2	6.8	556	58.3%	0.40 [-0.64, 1.44]	2011
Roquilly 2013	12.2	10	171	14.4	9	328	19.8%	-2.20 [-3.99, -0.41]	2013
Asehnoune 2014	16.2	13.5	85	16.2	11.8	207	5.8%	0.00 [-3.29, 3.29]	2014
BI-VILI 2016	15.8	12.1	280	16	14.2	339	14.7%	-0.20 [-2.27, 1.87]	2016
Total (95% CI)			**784**			**1503**	**100.0%**	**-0.29 [-1.09, 0.50]**	

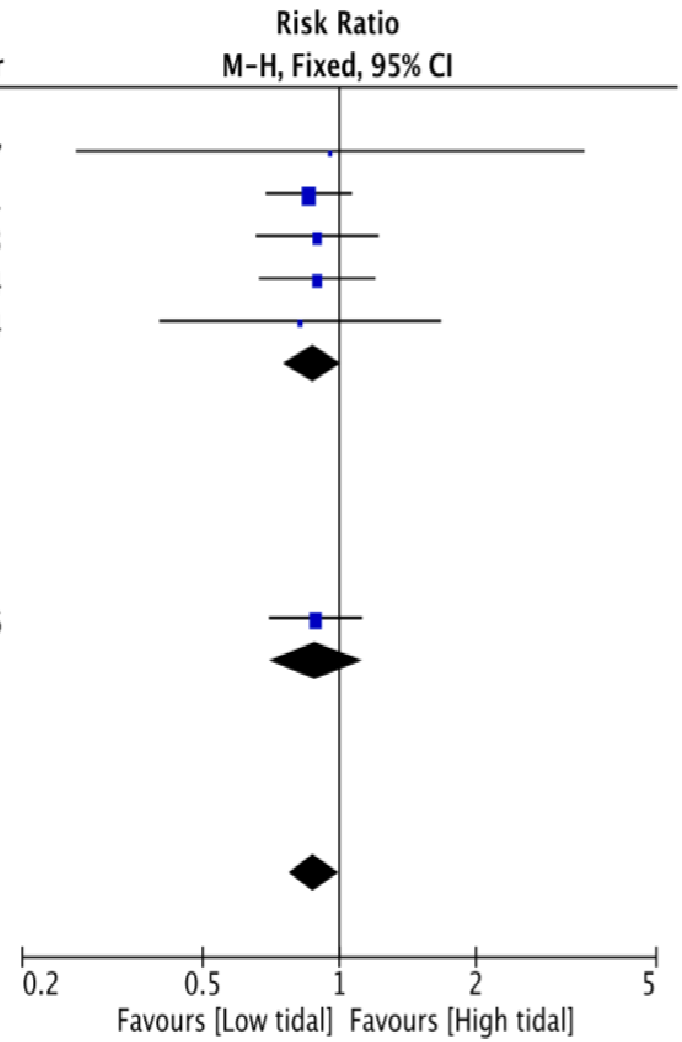
Heterogeneity: $Chi^2 = 7.49$, df = 4 (P = 0.11); $I^2 = 47\%$
Test for overall effect: Z = 0.72 (P = 0.47)



Courtesy Pr Asehnoune; data submitted 2017

Volume courant < 8 ml/kg et **mortalité** - méta-analyse

Study or Subgroup	Low tidal Events	Low tidal Total	High tidal Events	High tidal Total	Weight	Risk Ratio M-H, Fixed, 95% CI	Year
1.1.1 Subgroup							
Mascia 2007	2	9	17	73	1.0%	0.95 [0.26, 3.47]	2007
Pelosi 2011	74	239	201	556	32.0%	0.86 [0.69, 1.07]	2011
Roquilly 2013	57	259	65	264	17.0%	0.89 [0.65, 1.22]	2013
Elmer 2014	44	185	136	511	19.1%	0.89 [0.67, 1.20]	2014
Asehnoune 2014	9	87	26	206	4.1%	0.82 [0.40, 1.68]	2014
Subtotal (95% CI)		**779**		**1610**	**73.2%**	**0.87 [0.75, 1.01]**	
Total events	186		445				
Heterogeneity: $Chi^2 = 0.12$, df = 4 (P = 1.00); $I^2 = 0\%$							
Test for overall effect: Z = 1.77 (P = 0.08)							
1.1.2 Total							
BI-VILI 2016	82	280	112	339	26.8%	0.89 [0.70, 1.12]	2016
Subtotal (95% CI)		**280**		**339**	**26.8%**	**0.89 [0.70, 1.12]**	
Total events	82		112				
Heterogeneity: Not applicable							
Test for overall effect: Z = 1.00 (P = 0.32)							
Total (95% CI)		**1059**		**1949**	**100.0%**	**0.88 [0.77, 1.00]**	
Total events	268		557				
Heterogeneity: $Chi^2 = 0.13$, df = 5 (P = 1.00); $I^2 = 0\%$							
Test for overall effect: Z = 2.03 (P = 0.04)							
Test for subgroup differences: $Chi^2 = 0.01$, df = 1 (P = 0.92), $I^2 = 0\%$							



Courtesy Pr Asehnoune; data submitted 2017

Prevention for ARDS after Trauma

1. Limited over-load fuild
2. Limited transfusion
3. Non-Invasive Ventilation (NIV)
4. Lung protective ventilation
5. **Optimal Analgesia**

Regional anesthesia for the trauma patient: improving patient outcomes

Jeff Gadsden
Alicia Warlick
Department of Anesthesiology, Duke University, Durham, NC, USA

Local and Regional Anesthesia 2015:8

Table 1 Potential advantages of regional analgesia over systemic therapies

Decreased adverse effects compared to some conscious sedation techniques (eg, hypoxia, agitation, nausea/vomiting)[8,9]
Decreased need for sedatives, an improved neurologic assessment[10]
Reduction in opioid requirement and ORAEs[11,12]
Reduction in length of stay in emergency or critical care units[13,14]
Improved comfort and safety for transport[10,15]
Decreased need for staffing (secondary to decreased need for monitoring compared to procedural sedation)[14,16]
Reduction in the stress response to injury[17,18]
Decreased cost compared with conscious sedation (largely related to monitoring and staffing costs)[19]

Abbreviation: ORAEs, opioid-related adverse events.

Take Home Messages

A retenir

1. Overall
(non-selected)
ARDS

2. Trauma
(selected)
ARDS

1. **Overall** (non-selected) **ARDS**

Efficace

1.- Volume bas = 6 ml/kg/PIT
2.- 5 < PEP < 15 cmH2O
3.- Pression plateau < 30 cmH2O
+ Pression motrice (Pplat-PEP)<15 cmH2O
4.- Curares (précoce et durée <48h)
5.- Décubitus Ventral (D.V)

Non-efficace

1. Béta-2
2. H.F.O
3. Surfactant,
4. Omega 3
5. Statine…

Faut voir ?

1.- ECMO / ECCO2R
2.- Réglages aidées par P-esophagienne
3.- Corticoides (précoce et/ou tardive ?)
4.- N.O (sauvetage-rescue)
5.- Manoeuvres de recrutement
6.- Echographie

2. **Trauma** (selected) ARDS

1. Early detection and treatment pneumothorax, hemothorax…+++
2. Limited over-load fluid
3. Limited transfusion
4. Early Non-Invasive Ventilation (NIV)
5. Lung (ultra) protective ventilation
6. Optimal Analgesia (loco-regional++)
7. Early weaning and extubation

Many thanks