

Traumatisme thoracique



Dr Hadrien Rozé

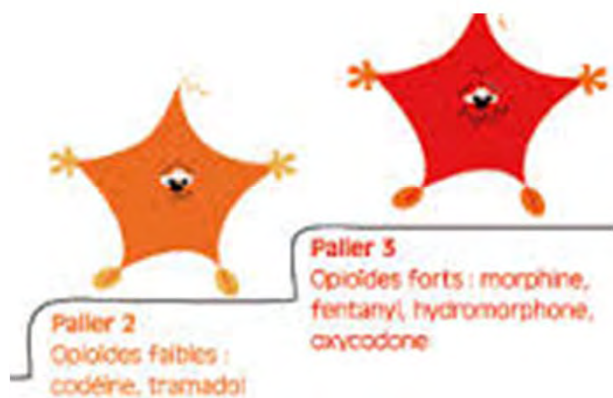
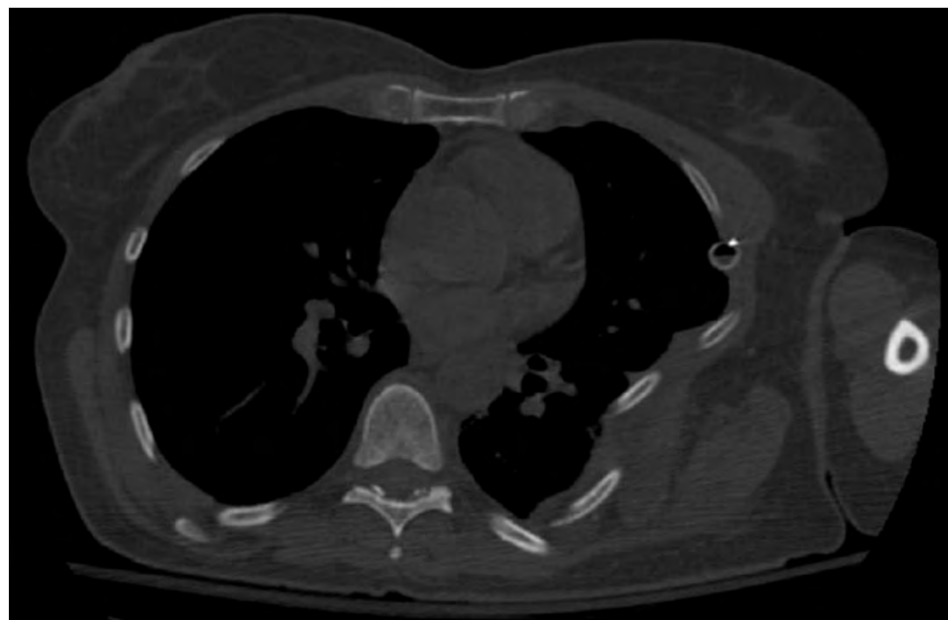
SAR2

Anesthésie Réanimation Thoracique

Pas de conflit d'intérêt

Bilan lésionnel

- Thoracique
 - Lésions pariétales
 - Lésions pleurales
 - Hemothorax
 - Pneumothorax
 - Hémopneumotorax
 - Lésions pulmonaires
 - Lésions trachéo bronchiques
 - Lésions œsophage
 - Lésions cardio vasculaires
 - Lésions diaphragmatiques
 - Canal thoracique
- Extra thoracique



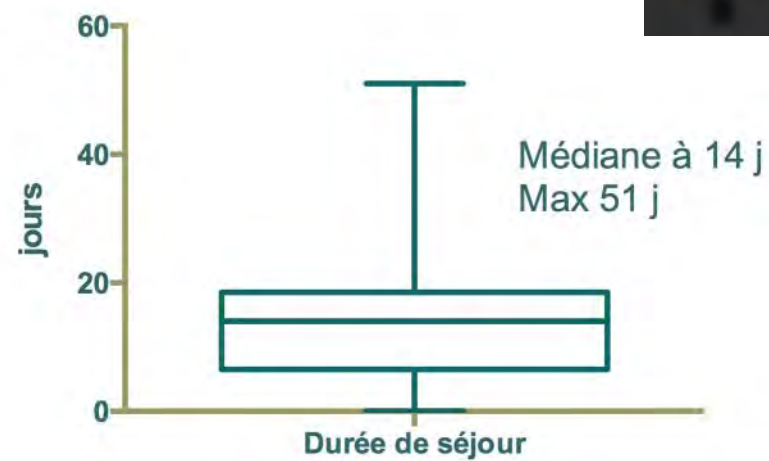
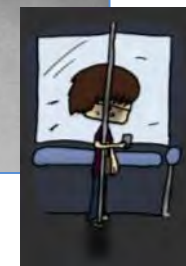
CURRENT CONCEPTS REVIEW

Operative Treatment of Chest Wall Injuries: Indications, Technique, and Outcomes

By Paul M. Lafferty, MD, Jack Anavian, MD, Ryan E. Will, MD, and Peter A. Cole, MD

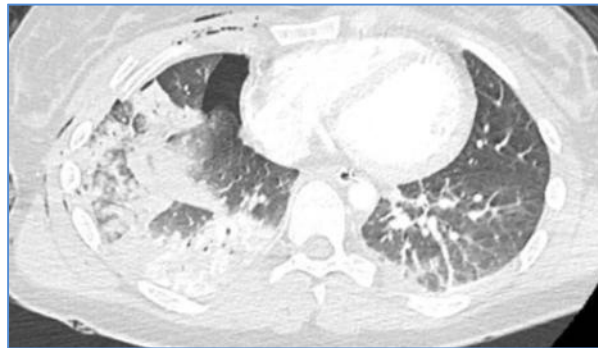
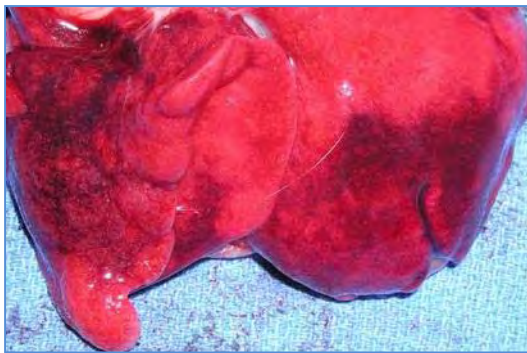


Dans le service



Sévérité

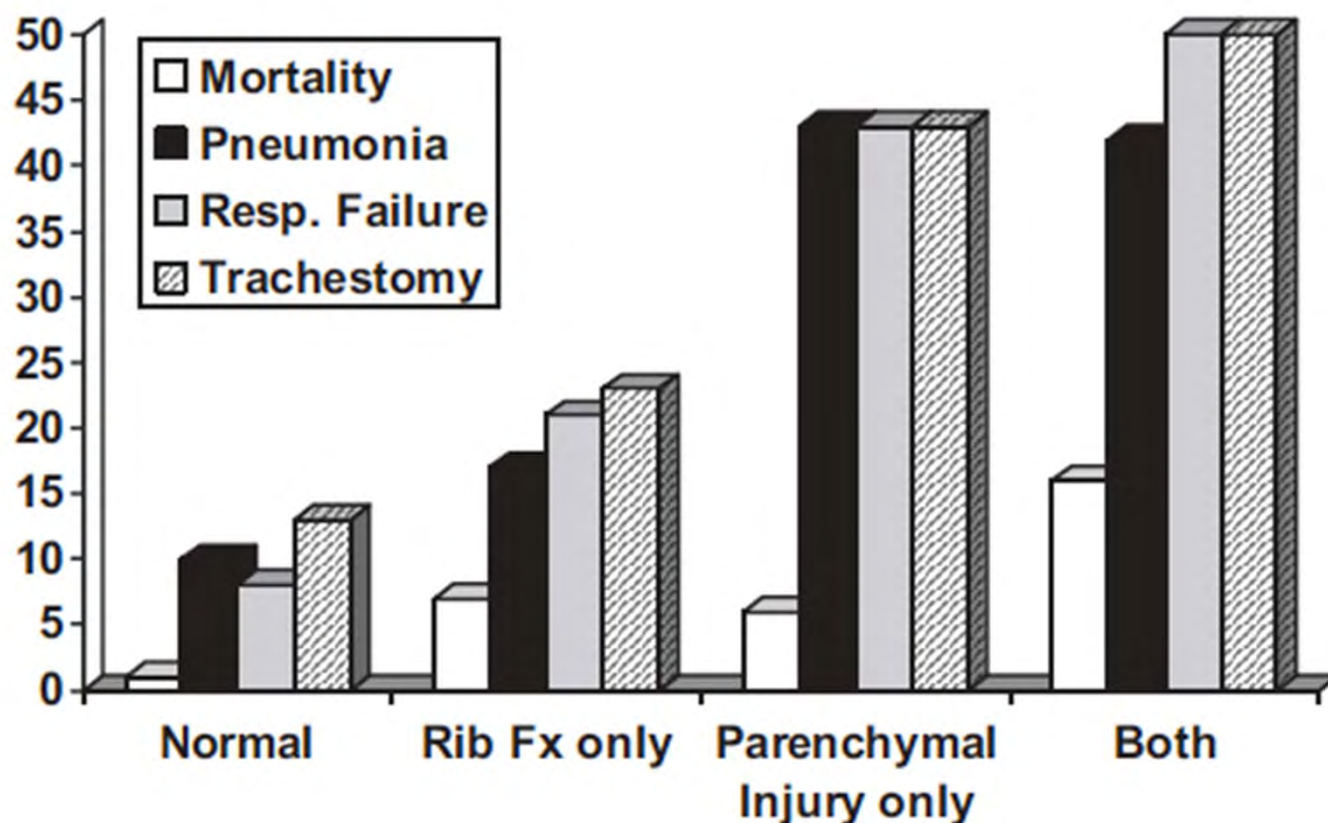
Grade	PaO ₂ /FiO ₂	Rib fracture	Contusion	Pleural involvement	Age	Points
0	>400	0	None	None	<30	0
I	300–400	1–3	1 lobe, unilateral	PT	30–41	1
II	200–300	3–6	1 lobe bilateral or 2 lobes unilateral	HT/HPT unilateral	42–54	2
III	150–200	>3 bilateral	<2 lobes bilateral	HT/HPT bilateral	55–70	3
IV	<150	Flail chest	<2 lobes bilateral	TPT	>70	5



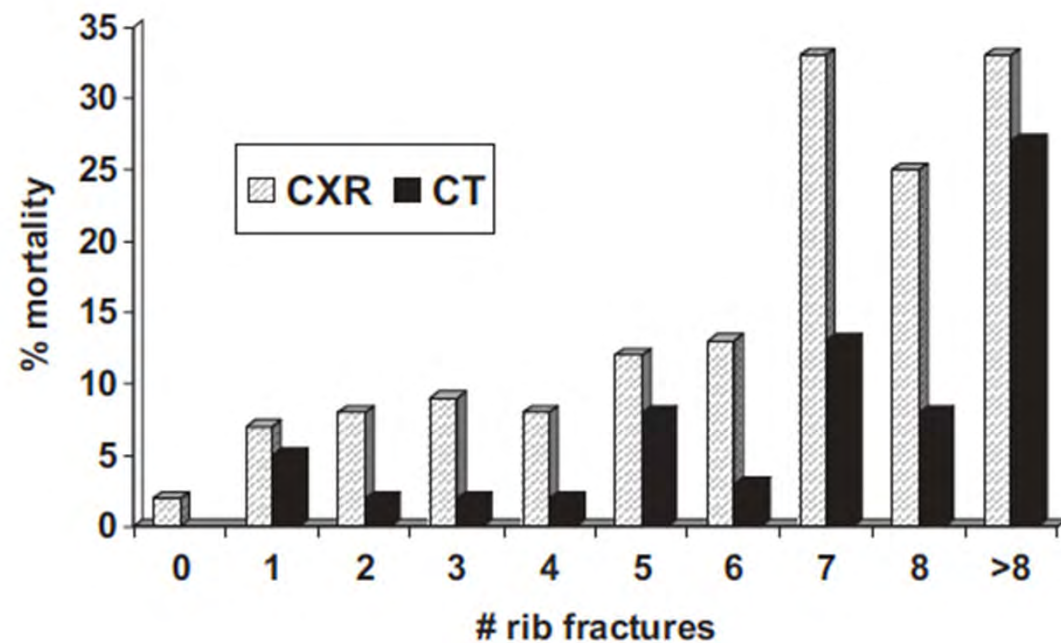
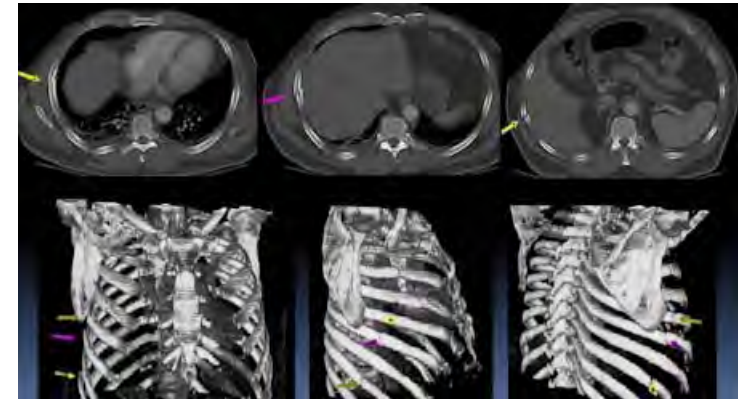
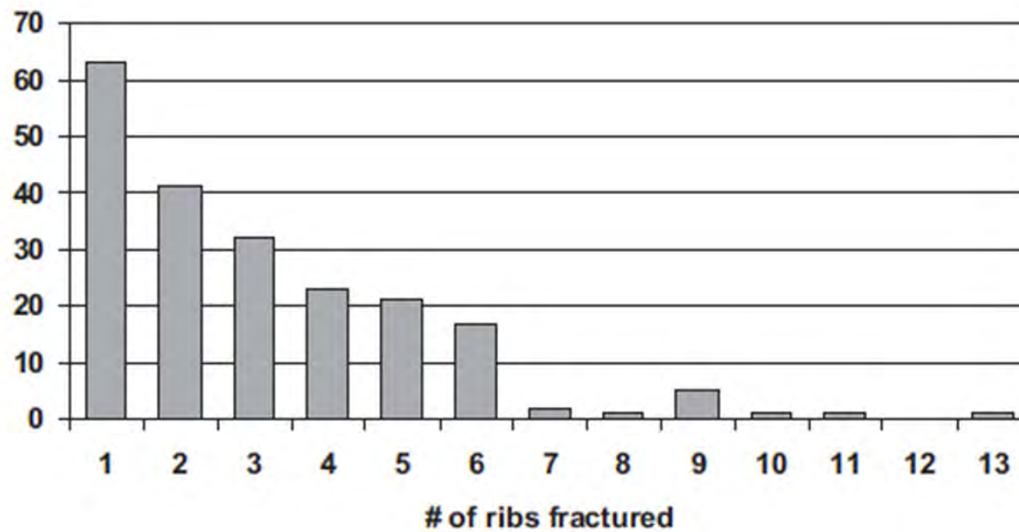
CT Diagnosis of Rib Fractures and the Prediction of Acute Respiratory Failure

David H. Livingston, MD, FACS, Benjamin Shogan, BS, Preeti John, MD,
and Robert F. Lavery, MA, MICP

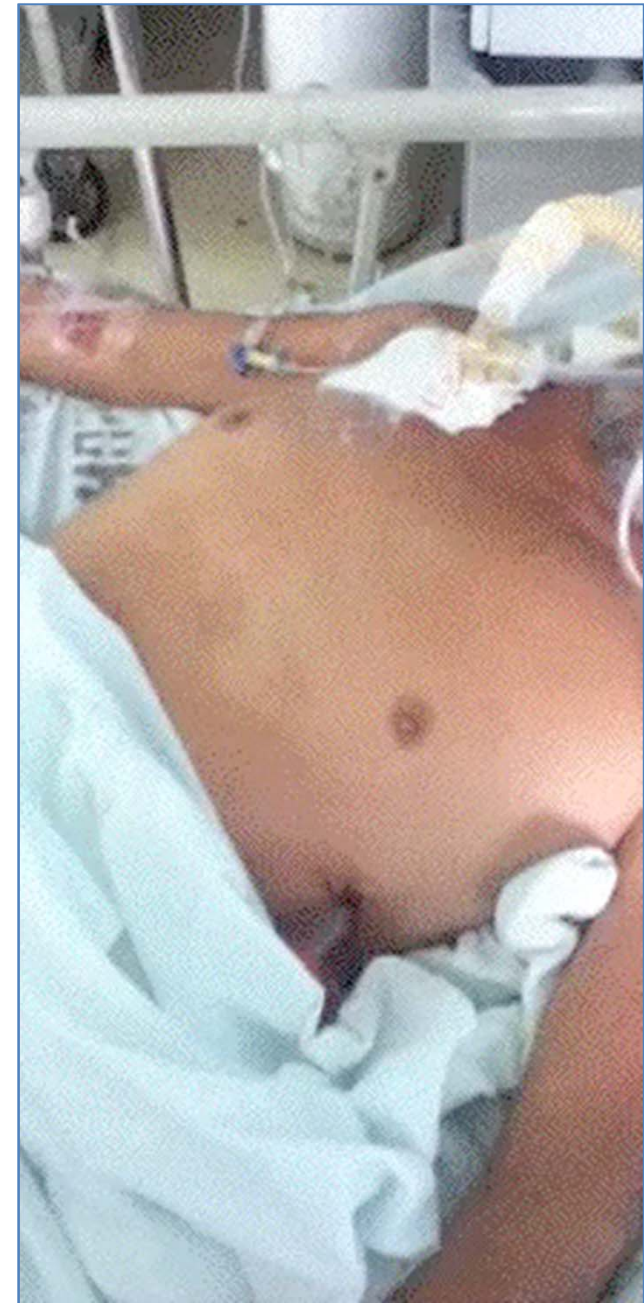
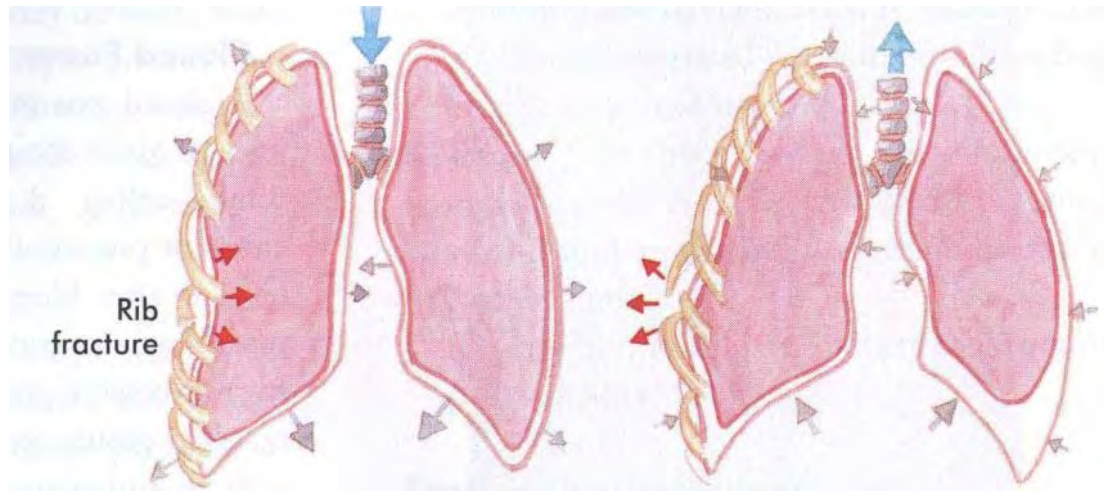
J Trauma. 2008;64:905–911.



205 radios de thorax lues et relues comme normales:
nb moyen de fractures au scanner= 3,1

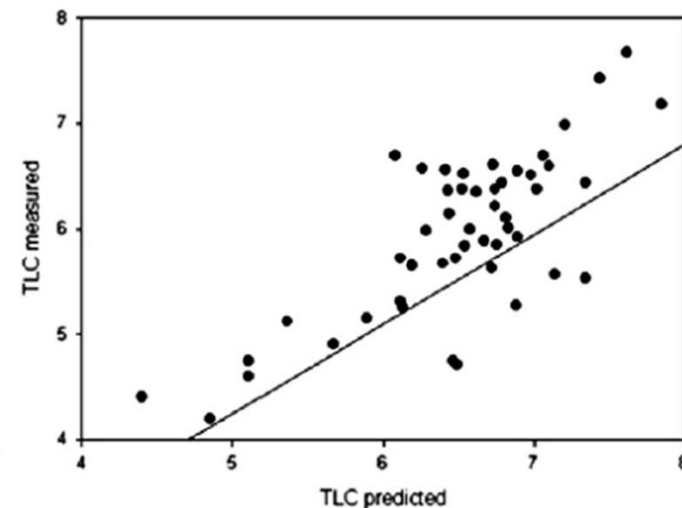
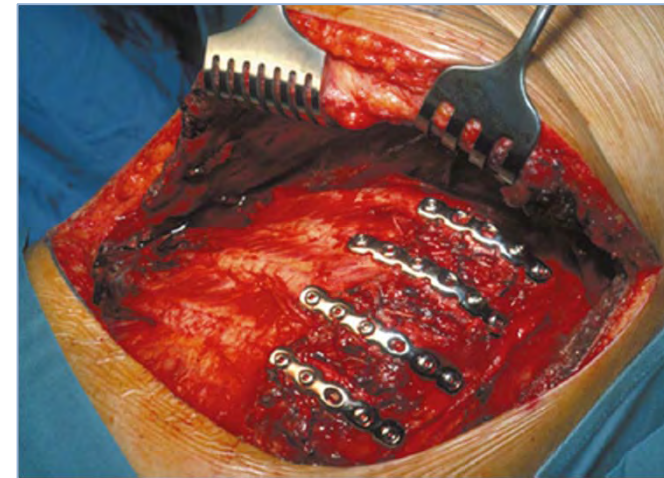
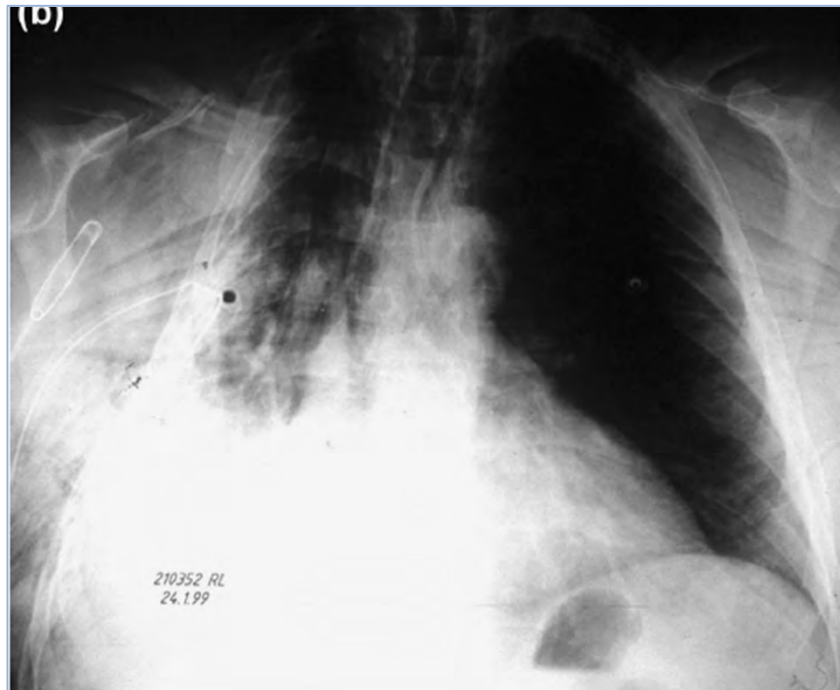


Volet thoracique



Pulmonary function testing after operative stabilisation of the chest wall for flail chest[☆]

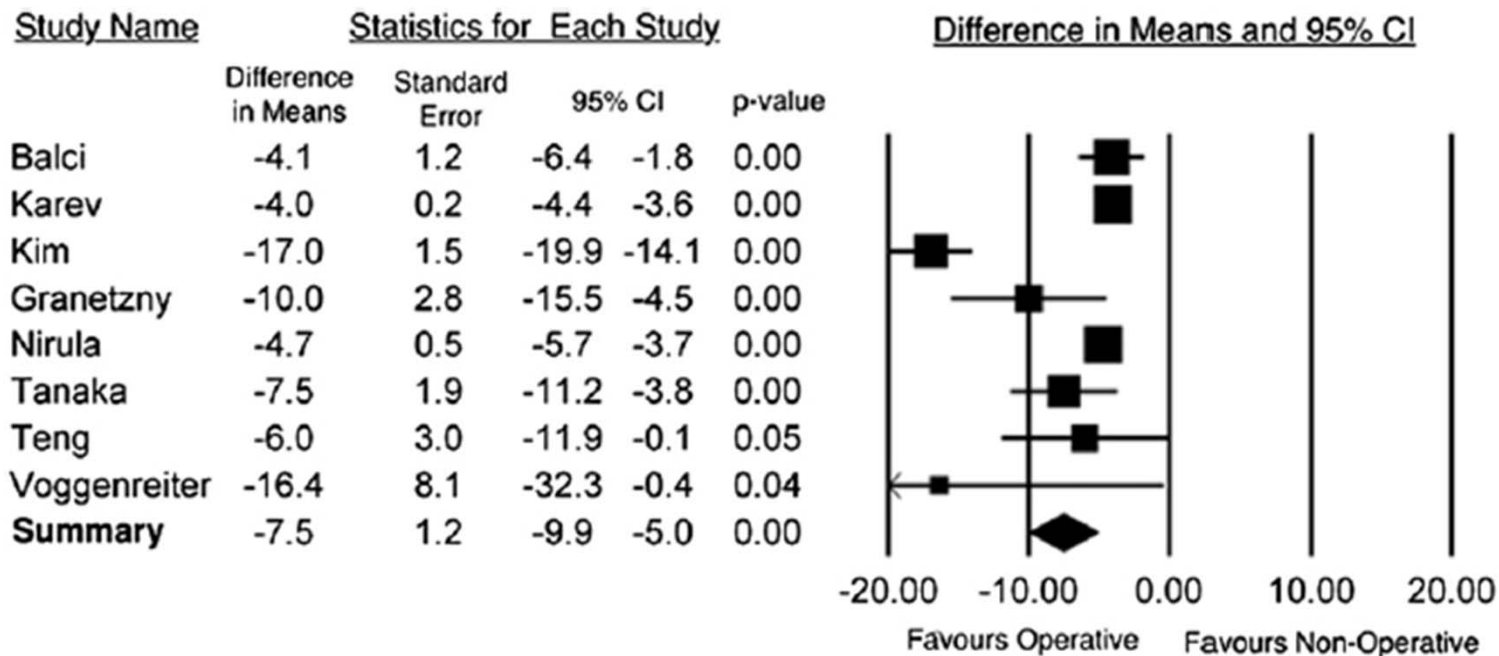
D. Lardinois^a, T. Krueger^b, M. Dusmet^b, N. Ghisletta^a, M. Gugger^c, H.-B. Ris^{b,*}

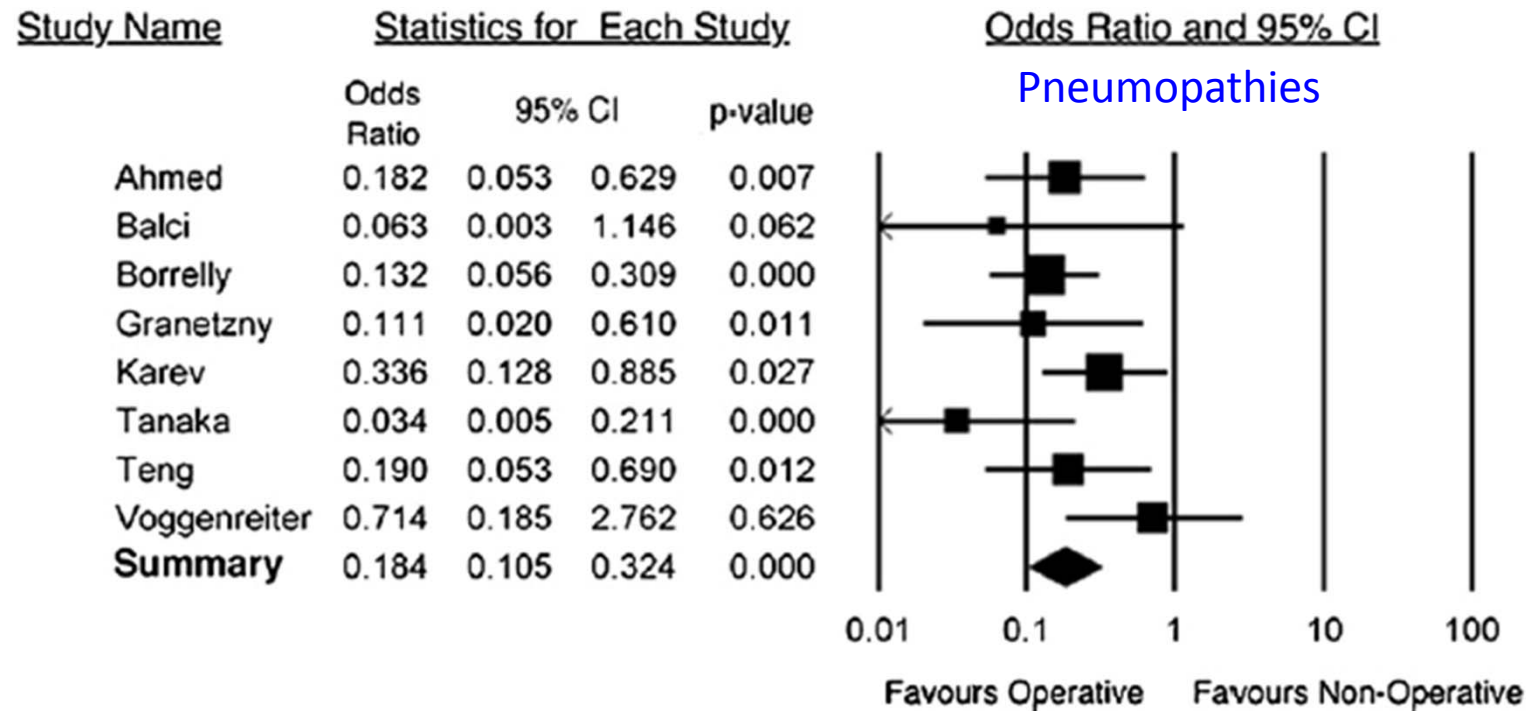


Surgical Fixation vs Nonoperative Management of Flail Chest: A Meta-Analysis

Gerard P Slobogean, MD, MPH, FRCSC, Cailan Alexander MacPherson, MD, MHSc, Terri Sun, BSc, Marie-Eve Pelletier, MD, S Morad Hameed, MD, MPH, FRCSC, FACS

Durée de ventilation en jours





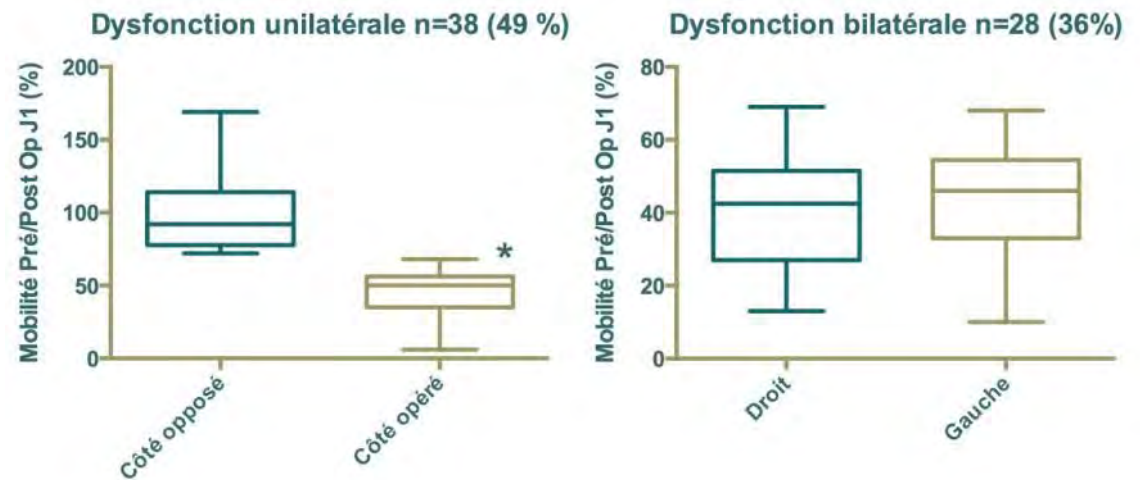
Etudes randomisées prospectives (77 patients)

Table 3. Summary of Pooled Results from Prospective Randomized Controlled Trials Only (n = 77)^{15,20}

Outcomes	Treatment favored	I ² Statistic, %	Mean decrease (95% CI)	Odds ratio (95% CI)	Risk difference (95% CI)	NNT
Ventilator days	Operative	0	8.3 (5.2–11.4)	—	—	—
ICU days	Operative	0	6.6 (1.8–11.5)	—	—	—
Pneumonia	Operative	0	—	0.06 (0.02–0.22)	0.54 (0.27–0.81)	2

NNT, number needed to treat (1/risk difference).

Dysfonction diaphragmatique

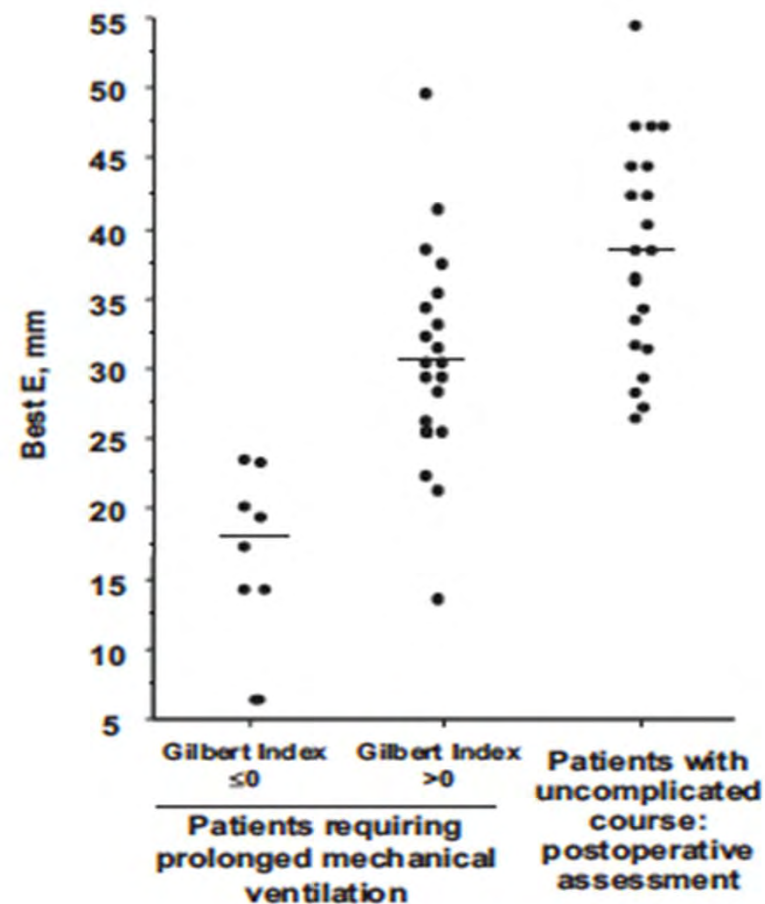
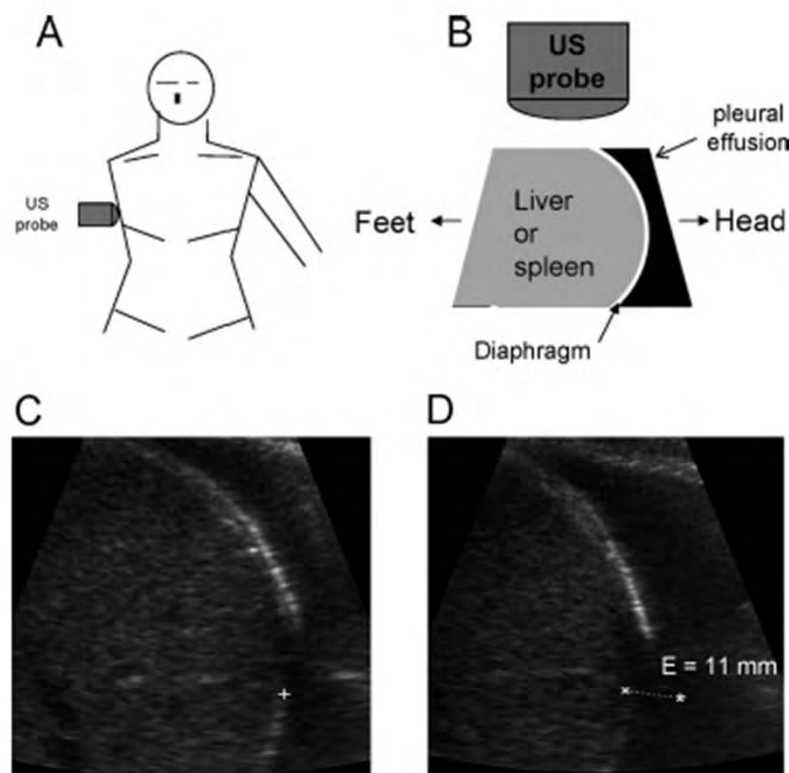




Ultrasonographic Diagnostic Criterion for Severe Diaphragmatic Dysfunction After Cardiac Surgery*

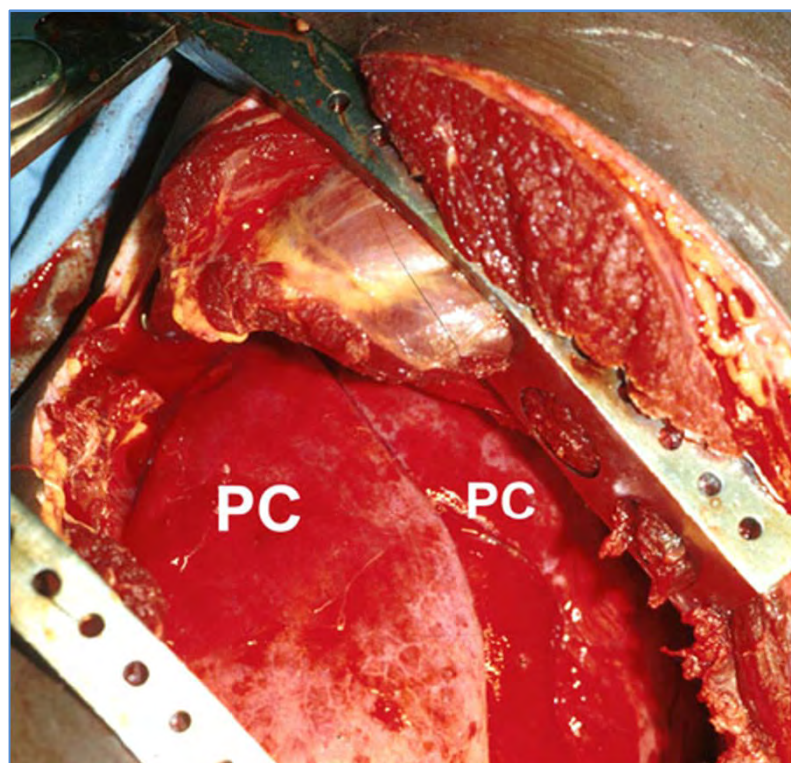
Nicolas Lerolle, MD; Emmanuel Guérot, MD; Saoussen Dimassi, MD; Rachid Zegdi, MD, PhD; Christophe Faisy, MD, PhD; Jean-Yves Fagon, MD, PhD; and Jean-Luc Diehl, MD

CHEST / 135 / 2 / FEBRUARY, 2009



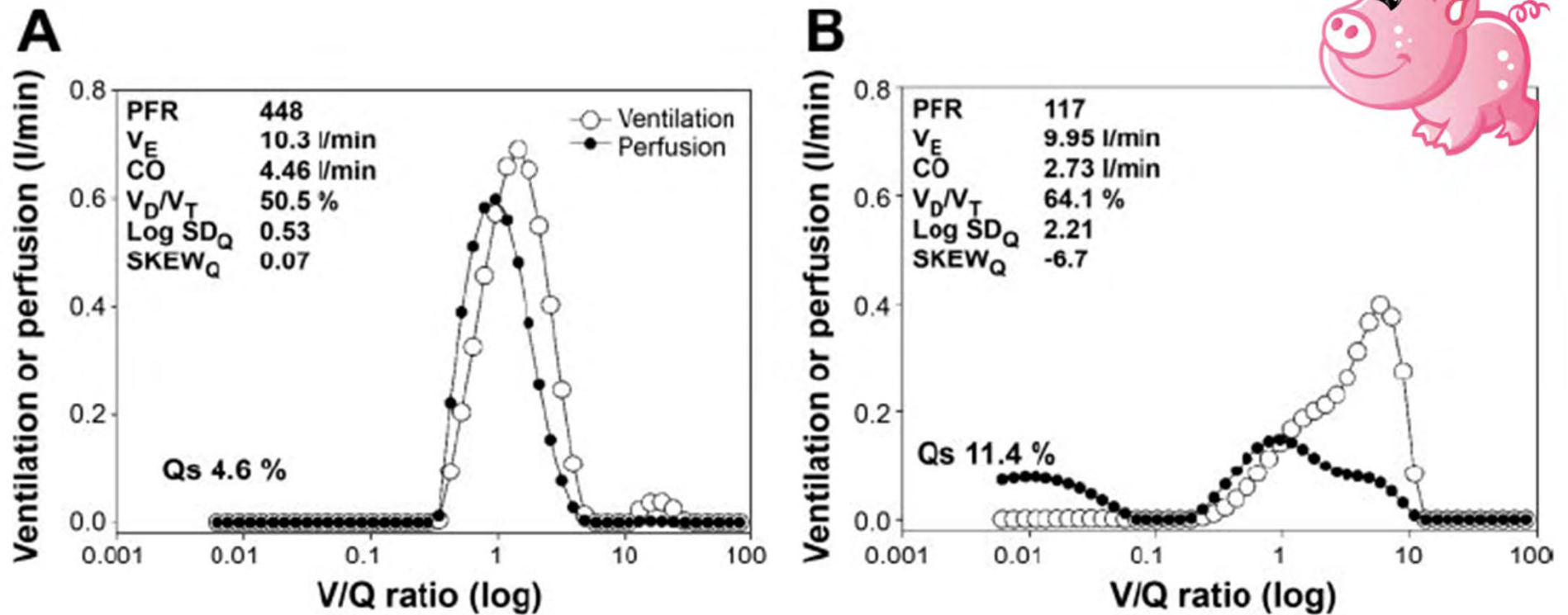
Pulmonary Contusion: An Update on Recent Advances in Clinical Management

Stephen M. Cohn • Joseph J. DuBose



Ventilation-perfusion relationships following experimental pulmonary contusion

Andriy I. Batchinsky,¹ William B. Weiss,² Bryan S. Jordan,¹ Edward J. Dick Jr.,³ David A. Cancelada,⁴ and Leopoldo C. Cancio¹



Rib fractures: Relationship with pneumonia and mortality*

Karen J. Brasel, MD, MPH; Clare E. Guse, MS; Peter Layde, MD, MS; John A. Weigelt, MD



N=4982 (29%)

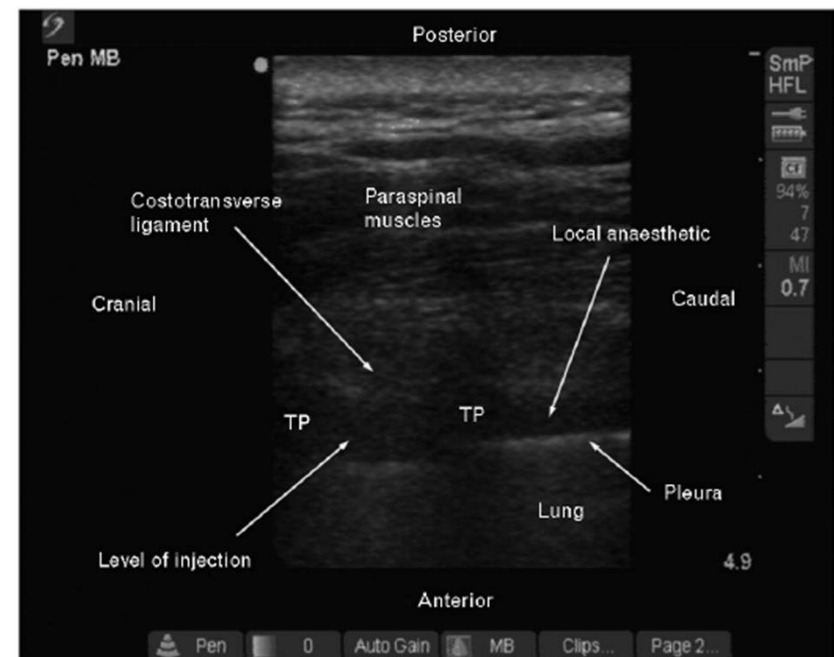
Risk Factor	Multiply Injured Adjusted Odds Ratio (95% CI) ^a	Isolated Thoracic Trauma Adjusted Odds Ratio (95% CI) ^a
Age		
0-4	2.5 (0.7-9.4)	9.0 (1.3-61.6)
5-44	Referent group	Referent group
45-54	1.2 (0.9-1.6)	0.4 (0.1-1.6)
55-64	2.1 (1.4-2.9)	2.0 (0.7-5.7)
65-74	2.1 (1.5-3.0)	2.7 (1.1-7.1)
75-84	5.8 (4.3-7.7)	5.2 (2.1-13.1)
≥85	8.4 (6.0-11.7)	7.0 (2.8-17.3)
Comorbidity score ^b	0.9 (0.8-1.0)	1.2 (1.1-1.3)
ISS		
<9	Referent group	Referent group
9-15	3.7 (2.3-6.1)	1.6 (1.0-2.5)
16-25	8.1 (4.8-13.5)	2.9 (1.5-5.5)
>25	53.3 (32.1-88.6)	18.0 (2.0-162.2)
Pneumonia	0.9 (0.6-1.3)	
Female gender	0.5 (0.4-0.7)	0.5 (0.3-0.7)
1-2 ribs	Referent group	Referent group
Multiple ribs	1.3 (1.1-1.6)	1.8 (1.1-3.0)
Unspecified no. of ribs	2.3 (1.5-3.5)	3.9 (1.9-8.2)

Acute pain management of patients with multiple fractured ribs: a focus on regional techniques

Anthony M.-H. Ho, Manoj K. Karmakar and Lester A.H. Critchley

Curr Opin Crit Care 17:323–327

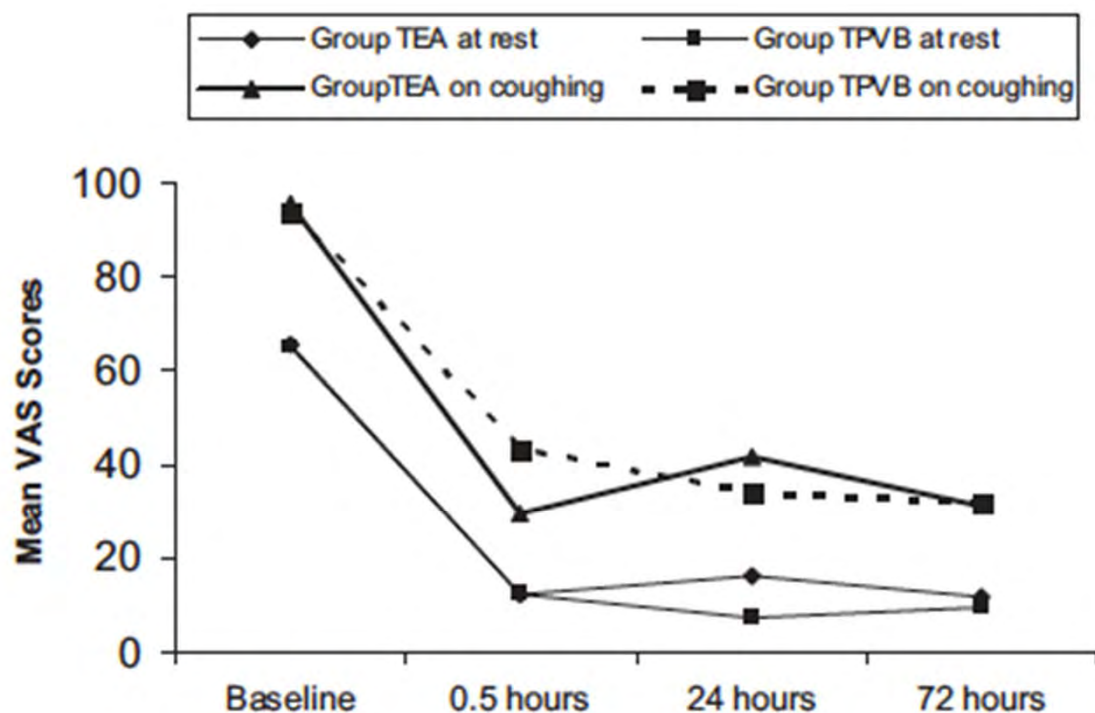
- Fractures > 2 ribs
- Personnes âgées +++
- Péridurale thoracique, bloc paravertébrale, bloc intercostale
- Echographie



Prospective, Randomized Comparison of Continuous Thoracic Epidural and Thoracic Paravertebral Infusion in Patients With Unilateral Multiple Fractured Ribs—A Pilot Study

Medha Mohta, MD, MAMS, Priyanka Verma, MBBS, Ashok Kr. Saxena, MD, DA, FAMS,
Ashok K. Sethi, MD, DA, Asha Tyagi, MD, DNB, MNAMS, and Gautam Girotra, MD

J Trauma. 2009;66:1096–1101.



Parameters	Group TEA (n = 15)	Group TPVB (n = 15)	p
Morphine requirement (mg)	9.2 ± 5.1	11.2 ± 9.5	0.477
Length of ICU stay (d)	6.3 ± 1.6	6.8 ± 4.2	0.650
Length of hospital stay (d)	10.1 ± 3.5	11.7 ± 5.5	0.350

ORIGINAL ARTICLE

A comparative study of continuous positive airway pressure (CPAP) and intermittent positive pressure ventilation (IPPV) in patients with flail chest

M Gunduz, H Unlugenc, M Ozalevli, K Inanoglu, H Akman

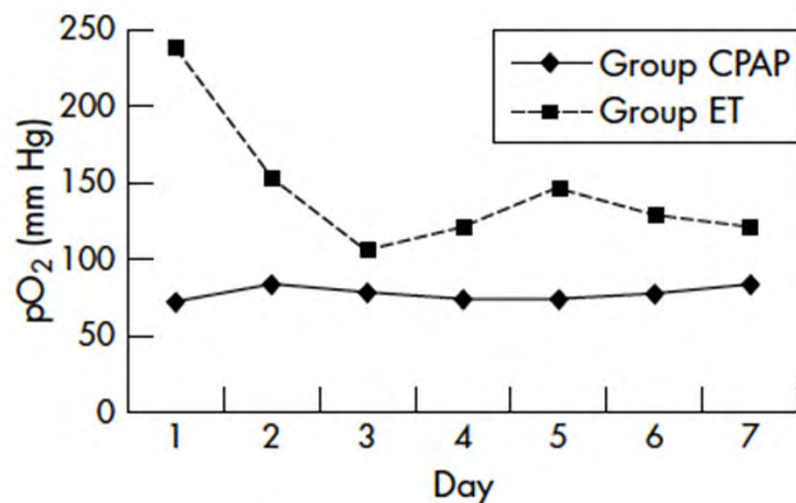


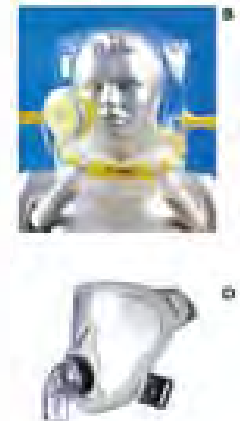
Table 4 Complications related to death

Complication	ET group (n = 21) (n) (%)	CPAP group (n = 22) (n) (%)
Pneumonia	10 (47.6%)	2 (9.1%)
Urinary infection	0 (0%)	2 (9.1%)
Sepsis	5 (23.8%)	2 (9.1%)
Renal failure	4 (19.1%)	1 (4.5%)
MOF	1 (4.8%)	0 (0%)
ARDS	1 (4.8%)	0 (0%)

MOF, multiple organ failure; ARDS, acute respiratory distress syndrome.

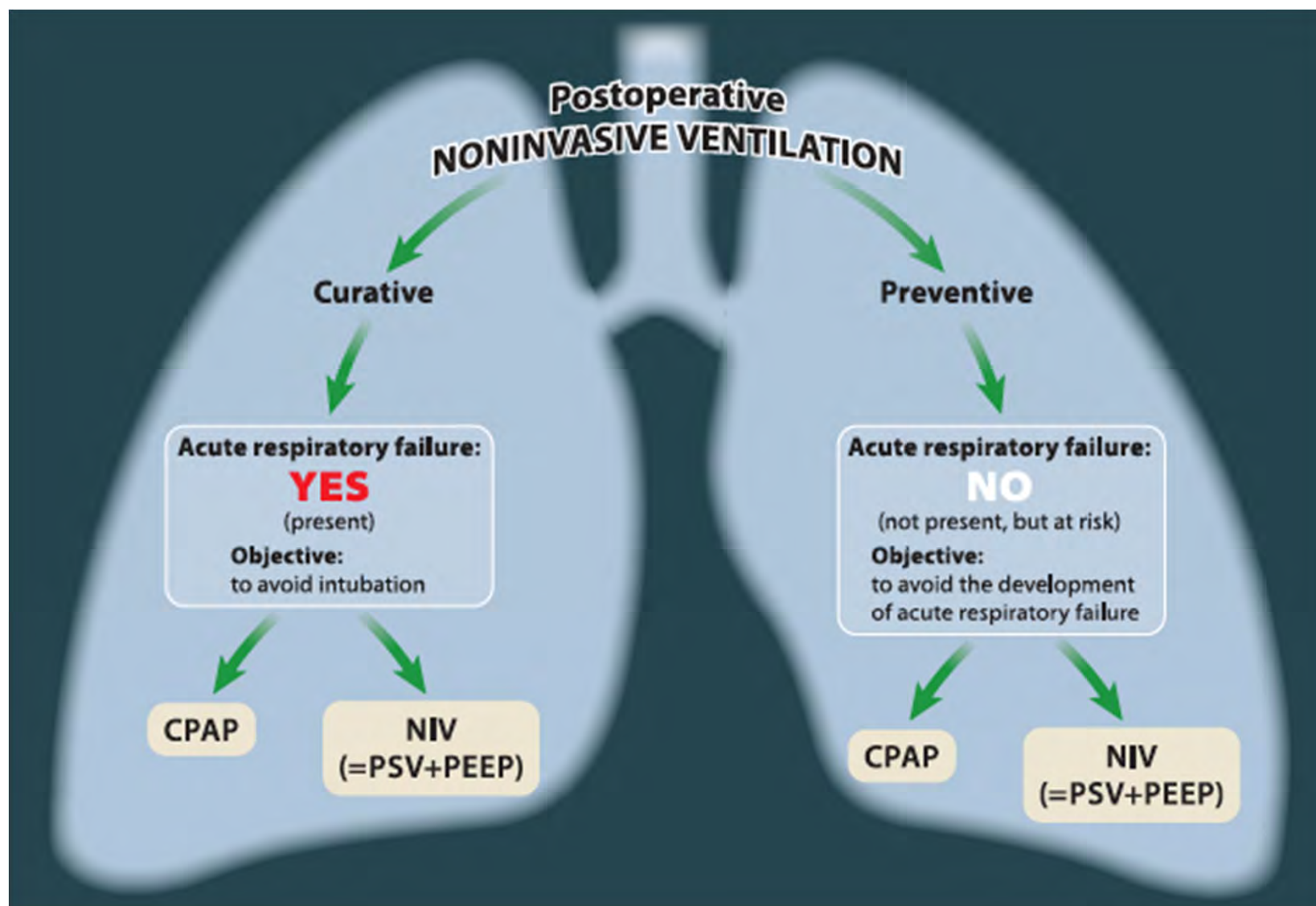
Eviter d'intuber le patient

VNI



Preventif

Curatif



CASE REPORTS

Non-invasive positive pressure ventilation for severe thoracic trauma

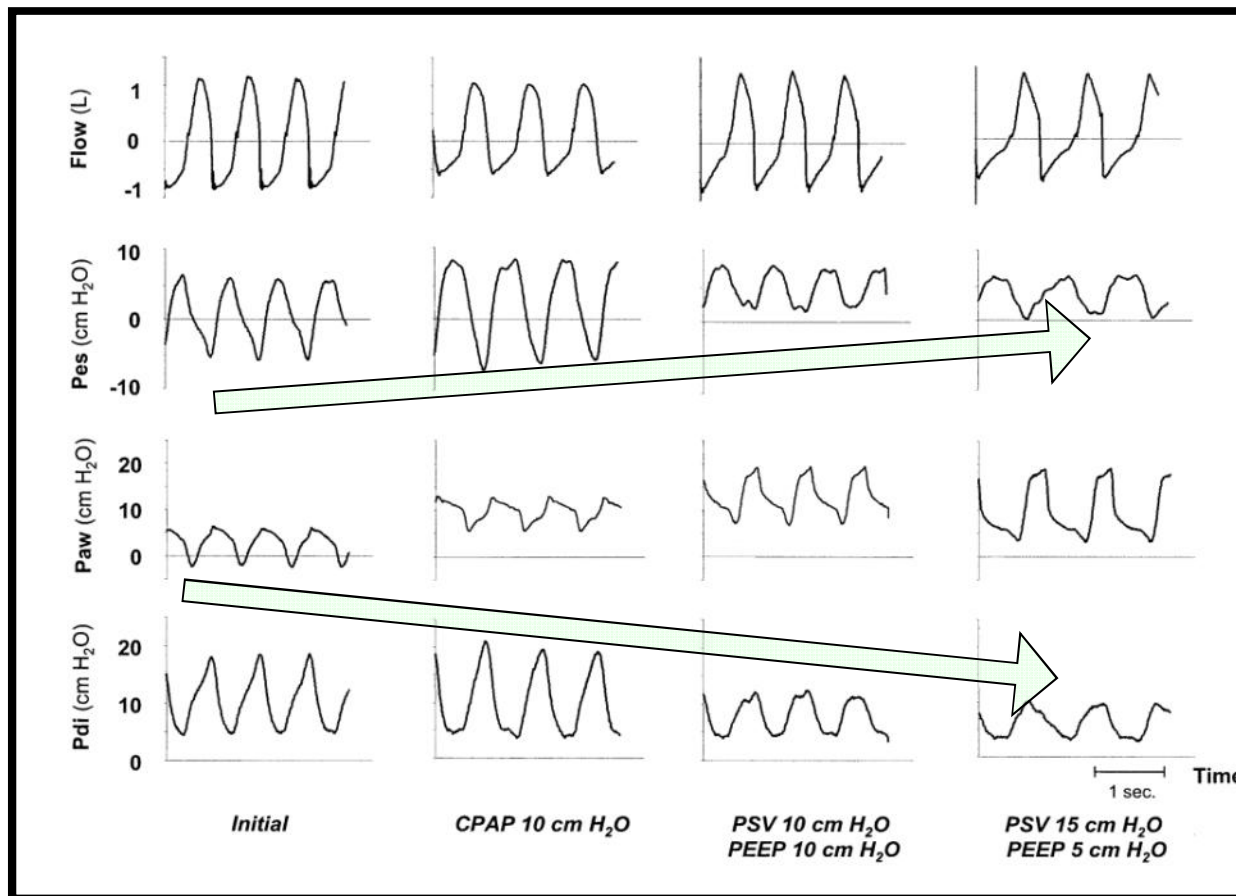
M. J. Garfield^{1*} and R. M. Howard-Griffin

- Oxygénation
- Eviter l'intubation et l'apnée
- Acidose respiratoire
- Fuites pleurales
- Intermittente, Optiflow en relais

Physiologic Effects of Noninvasive Ventilation during Acute Lung Injury

Erwan L'Her, Nicolas Deye, François Lellouche, Solenne Taille, Alexandre Demoule, Amanda Fraticelli, Jordi Mancebo, and Laurent Brochard

Am J Respir Crit Care Med Vol 172. pp 1112–1118, 2005



Noninvasive Ventilation Reduces Mortality in Acute Respiratory Failure following Lung Resection

IGOR AURIANT, ANNE JALLOT, PHILIPPE HERVÉ, JACQUES CERRINA, FRANCOIS LE ROY LADURIE, JEAN LAMET FOURNIER, BERNARD LESCOT, and FRANCOIS PARQUIN

Am J Respir Crit Care Med Vol 164. pp 1231–1235, 2001



VNI diminue la mortalité

	No-NPPV (n = 24) Mean ± SD	NPPV (n = 24) Mean ± SD	p Value*
ETMV, n (%)	12 (50%)	5 (20.8%)	0.035
In-hospital deaths, n (%)	9 (37.5%)	3 (12.5%)	0.045
Length of ICU stay, d	14 ± 11.1	16.65 ± 23.6	0.52
Length of hospital stay, d	22.8 ± 10.7	27.1 ± 19.5	0.61
120 - d mortality, n (%)	9 (37.5%)	3 (12.5%)	0.045

	No NPPV (n = 24) Mean ± SD	NPPV (n = 24) Mean ± SD	p Value*
Age, yr	63 ± 9	58.9 ± 10	0.09
SAPS II at ICU admission	16.8 ± 4.4	16.9 ± 5.4	0.74
Pulmonary function testing			
FVC, % pred	93.2 ± 17.8	101.5 ± 20.0	0.36
FEV ₁ , % pred	80 ± 19.7	78.5 ± 18.6	0.71
TLC, % pred	100.3 ± 18.1	97.7 ± 16.1	0.42
FRC, % pred	117.1 ± 33.5	113.1 ± 30.7	0.80
Predicted postoperative FEV ₁ (%)	61.6 ± 15.9	61.7 ± 13.5	0.90
Arterial blood gases	N = 19	N = 15	
pH	7.41 ± 0.03	7.42 ± 0.02	0.19
PaO ₂ , mmHg	78.7 ± 8.9	67.5 ± 26.8	0.19
Paco ₂ , mmHg	39.4 ± 4.6	34.2 ± 13.3	0.44
Type of ICU admission			
Emergency admission	7	8	0.54
Days in ICU before inclusion	1.7 ± 1.5	2.1 ± 1.9	0.57
Extent of resection			
Lobectomy	14	16	0.53
Bilobectomy	2	0	0.14
Pneumonectomy	7	7	

Noninvasive Positive-Pressure Ventilation vs Conventional Oxygen Supplementation in Hypoxemic Patients Undergoing Diagnostic Bronchoscopy*

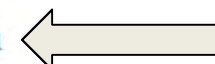
Massimo Antonelli, MD; Giorgio Conti, MD; Monica Rocco, MD; Andrea Arcangeli, MD; Franco Cavaliere, MD; Rodolfo Proietti, MD; and Gianfranco Umberto Meduri, MD

CHEST 2002; 121:1149–1154,

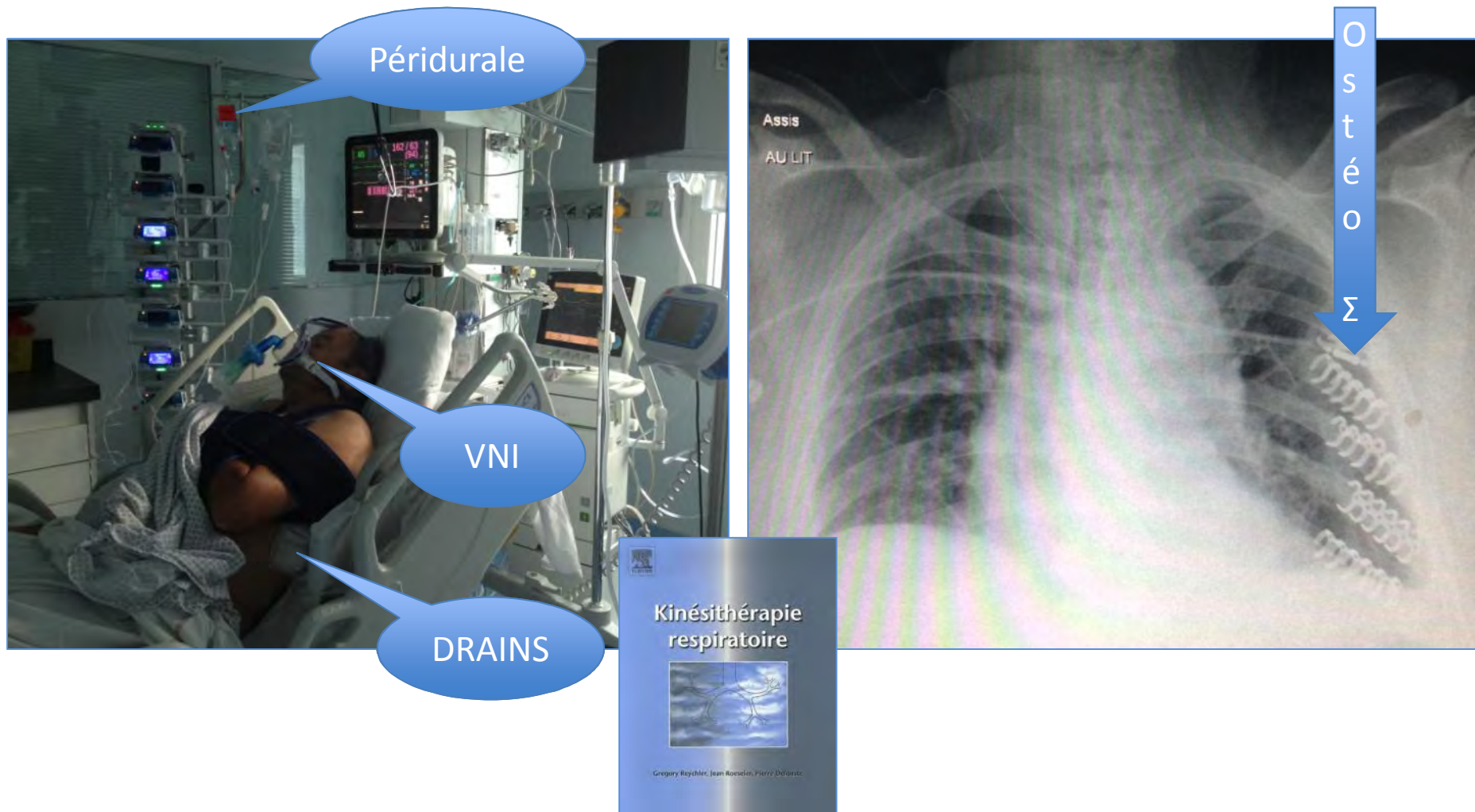


VNI au masque facial
Aide 15 à 17 cmH₂O
PEP 5 cmH₂O

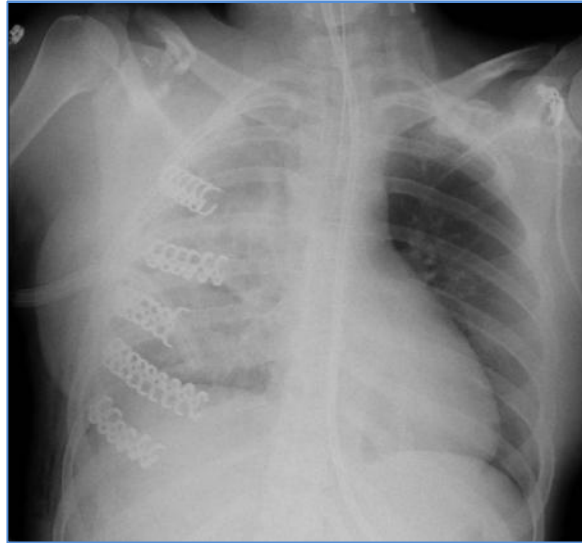
Variable	NPPV Group (n = 13)	Standard Treatment Group (n = 13)	p Value
Baseline			
Respiratory rate, breaths/min	35 ± 4	36 ± 4	0.18
PaO ₂ /FIO ₂ ratio	143 ± 32	155 ± 24	0.30
PaCO ₂ , mm Hg	50 ± 22	40 ± 8	0.15
pH	7.4 ± 0.07	7.4 ± 0.07	0.18
Heart rate, beats/min	94 ± 27	103 ± 20	0.35
MAP, mm Hg	88 ± 10	96 ± 13	0.08
During bronchoscopy			
Respiratory rate, breaths/min	31 ± 4	33 ± 4	0.12
PaO ₂ /FIO ₂ ratio	261 ± 100	139 ± 38	< 0.001
PaCO ₂ , mm Hg	48 ± 17	39 ± 8	0.13
pH	7.41 ± 0.06	7.44 ± 0.08	0.26
Heart rate, beats/min	98 ± 22	104 ± 10	0.37
MAP, mm Hg	87 ± 7	81 ± 13	0.12
1 h after bronchoscopy			
Respiratory rate, breaths/min	29 ± 4	32 ± 4	0.20
PaO ₂ /FIO ₂ ratio	176 ± 62	140 ± 38	0.09
PaCO ₂ , mm Hg	47 ± 15	39 ± 9	0.13
pH	7.41 ± 0.04	7.44 ± 0.08	0.31
Heart rate, beats/min	91 ± 18	108 ± 15	0.02
MAP, mm Hg	89 ± 7	78 ± 18	0.08
Outcome			
Patients requiring endotracheal intubation within 10 h of FOB	1 (7)	2 (15)	0.50
Mortality	4 (30)	7 (54)	0.16



Traitement actif

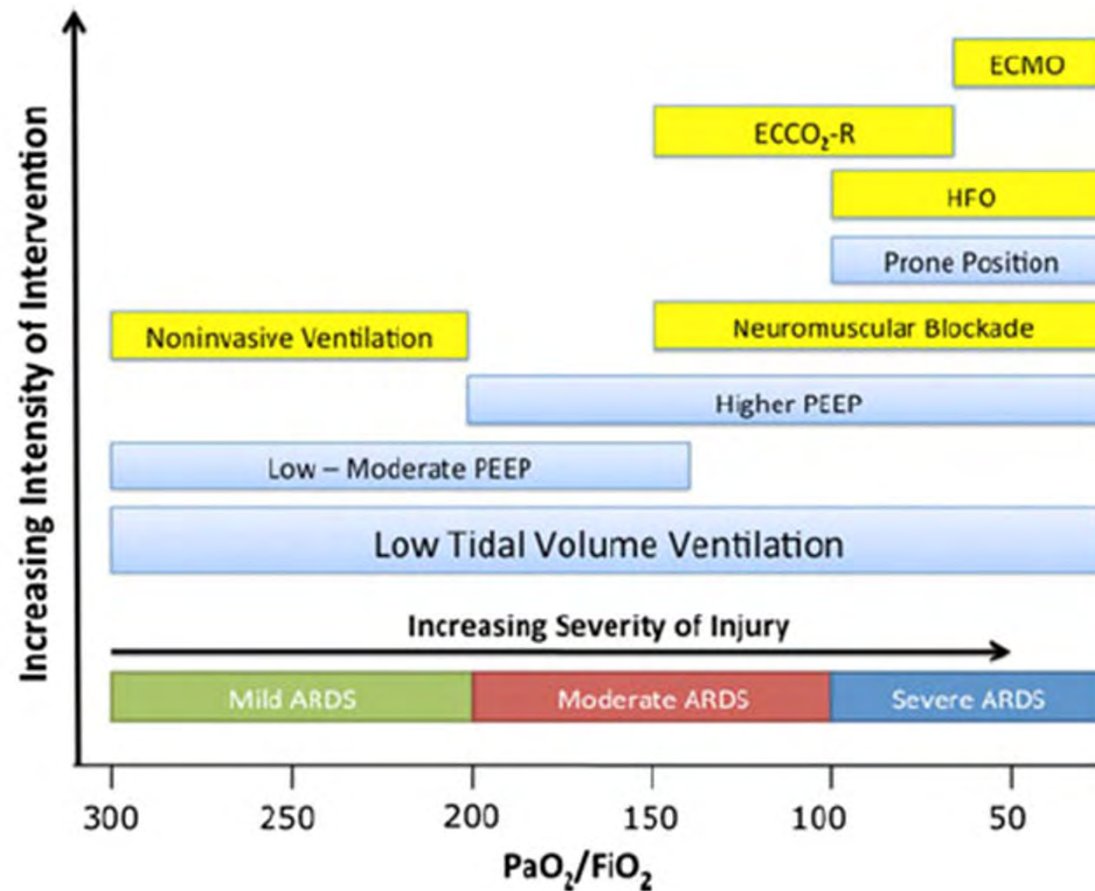


Ventilation invasive



- Retour à la ventilation spontanée si possible
- Ventilation protectrice
- PEEP oxygénation vs fuites pleurales
- Hypercapnie permissive, en l'absence d'HTIC

Traitement et Sévérité



Ventilation spontanée

Spontaneously regulated vs. controlled ventilation of acute lung injury/acute respiratory distress syndrome

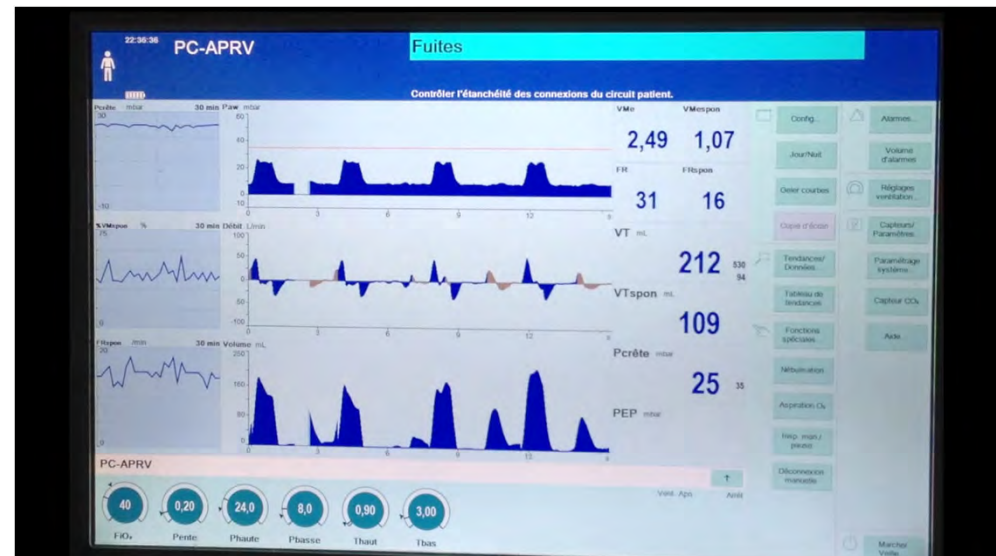
John J. Marini

Current Opinion in Critical Care 2011,
17:24–29

*Maintenir une activité
musculaire diaphragmatique
≈50% de VS*

Diminuer la sédation

Améliorer l'hémodynamique



Fuites pleurales



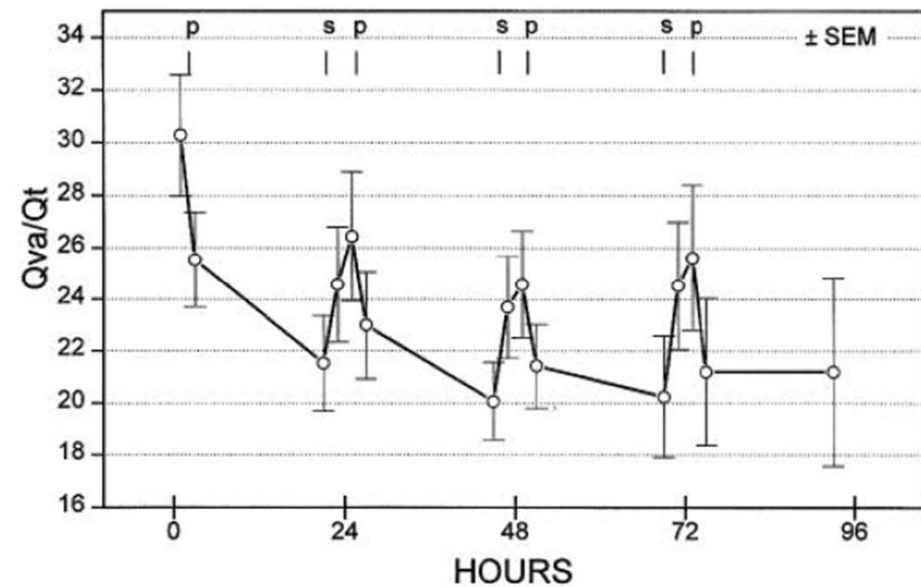
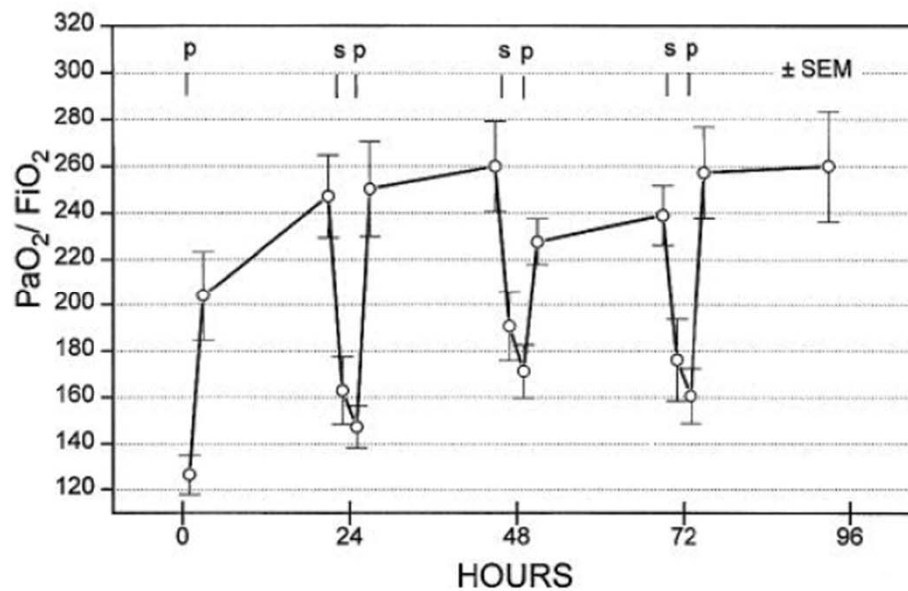
Ventilation en fuite avec un cyclage électrique utilisant le mode NAVA

Décubitus ventral

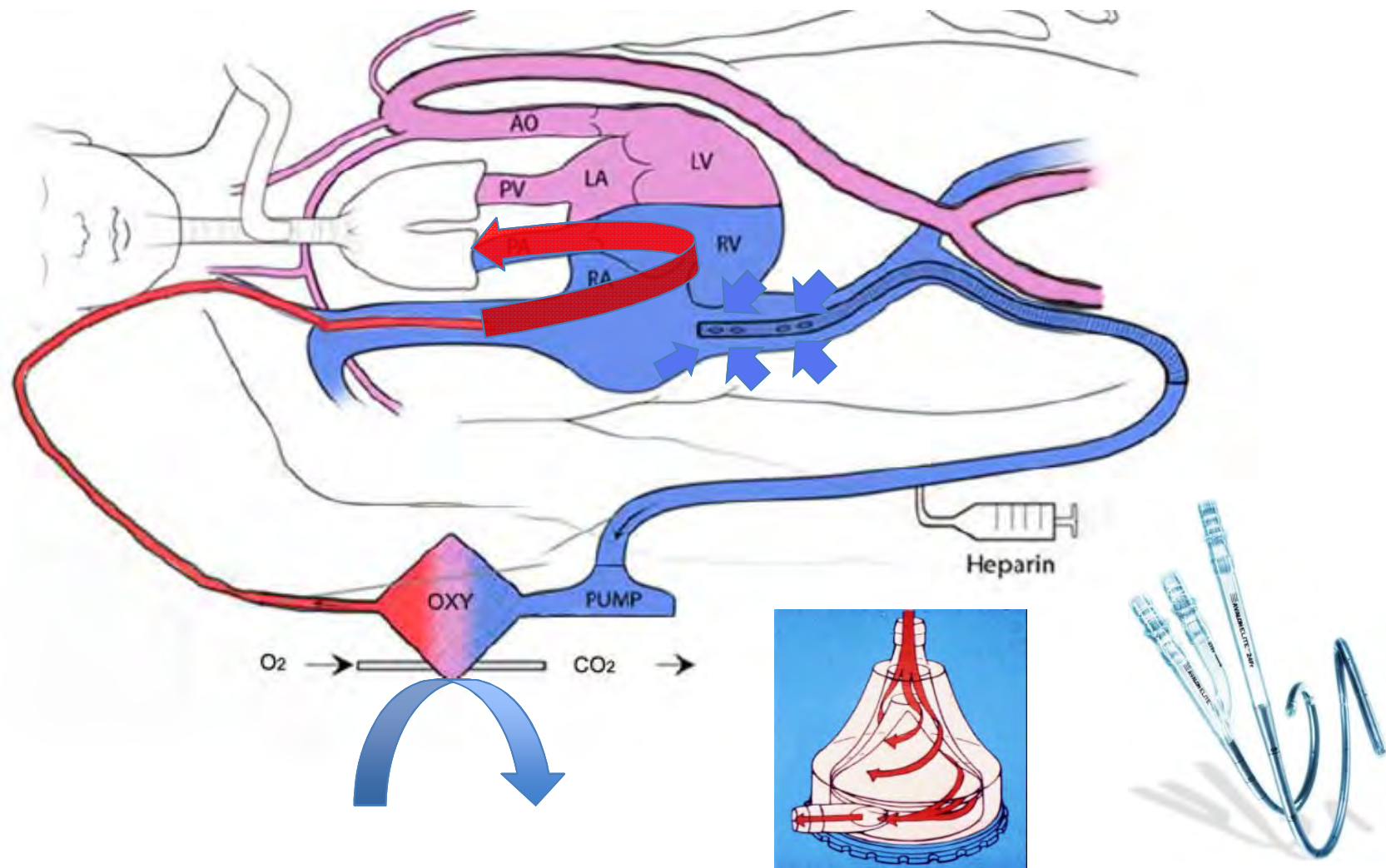
The Effects of Long-Term Prone Positioning in Patients with Trauma-Induced Adult Respiratory Distress Syndrome

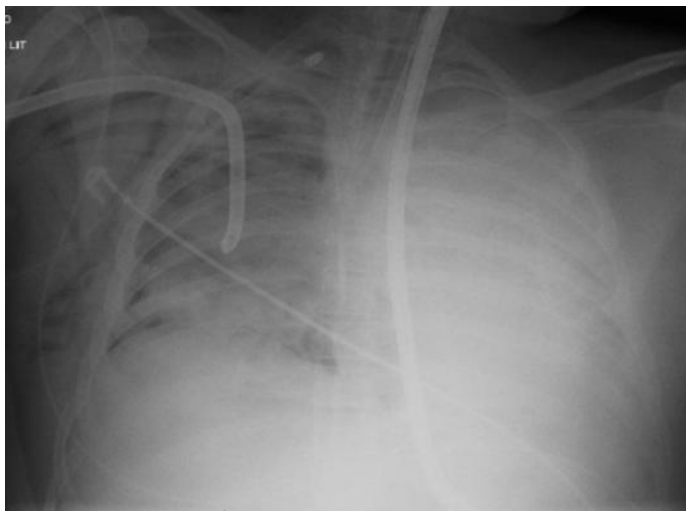
Peter Fridrich, MD*, Peter Krafft, MD*, Hannes Hochleuthner, RN+, and Walter Mauritz, MD†

Anesth Analg 1996;83:1206-11



ECMO et traumatisme thoracique





Leloup et al. BJA. 2011

Extracorporeal membrane oxygenation in severe trauma patients with bleeding shock☆

Matthias Arlt*, Alois Philipp, Sabine Voelkel, Leopold Rupperecht, Thomas Mueller, Michael Hilker, Bernhard M. Graf, Christof Schmid

Patient/ gender/age	ECMO type	Trauma	Diagnosis	Scores ISS/SOFA	paO ₂ /FiO ₂ pre-ECMO	PaCO ₂ [mm Hg] pre-ECMO	Norepinephrine [mg/h] pre-ECMO	Treatment on ECMO	Blood transfusion units on ECMO	Days on ECMO	Outcome
H.R./m/22 years	v-v	Car crash	Polytrauma Bleeding shock ARDS	66/13	41	50	5.0	Damage control surgery CT-scan	PRBC: 33 FFP: 54 PLTC: 6 PRBC: 2	4	Survived without handicap
K.M./m/30 years	v-v	Car crash	Polytrauma Bleeding shock ARDS	75/14	39	80	1.0	Damage control surgery CT-scan	PRBC: 10 FFP: 22 PLTC: 3	6	Survived without handicap
D.V./m/56 years	v-v	Car crash	Aspiration Polytrauma ICB Bleeding shock ARDS	75/12	58	59	1.1	Kinetic therapy Damage control surgery CT-scan	PRBC: 12 FFP: 19 PLTC: 2	5	Survived without handicap
B.S./m/27 y	v-v	Car crash	Polytrauma Bleeding shock ARDS	75/14	64	36	1.4	CT-scan Kinetic therapy	PRBC: 54 FFP: 102 PLTC: 11	2	Died 20 days post-ECMO in septic multiple organ failure
W.T./m/21 years	v-v	Car crash	Polytrauma Bleeding shock ARDS	75/10	36	84	2.0	Damage control surgery CT-scan Kinetic therapy	PRBC: 10 FFP: 27 PLTC: 2	3	Died on ECMO in septic multiple organ failure
K.P./m/17 years	v-v	Motorcycle crash	Polytrauma Open chest Bleeding shock ARDS	75/12	48	67	13.5	CT-scan Kinetic therapy	PRBC: 7	5	Died on ECMO in septic multiple organ failure
K.N./f/24 years	v-v	Car crash	Polytrauma Bleeding shock ARDS	66/12	69	38	1.0	Laparotomy Trauma surgery	PRBC: 12 FFP: 24 PLTC: 2 PRBC: 25 FFP: 12	7	Survived without handicap
T.P./m/39 years	v-a	Truck crash	Polytrauma Bleeding shock ARDS	75/10	46	53	5.6	Trauma surgery Kinetic therapy CT-scan	PRBC: 12 FFP: 3	7	Survived without handicap
P.S./f/23 years	v-a	Suicid fall	Polytrauma ICB Bleeding shock ARDS	75/10	40	85	5.0	Damage control surgery	PRBC: 12 FFP: 3	0.5	Died on ECMO intractable retroperitoneal bleeding
A.S./m/62 years	v-a	Open chest trauma	CPR open heart Bleeding shock	29/11	105	89 g	4.0	Damage control chest surgery		11	Survived without handicap

The contribution of rib fractures to chronic pain and disability



Stephanie Gordy, M.D., Loic Fabricant, M.D., Bruce Ham, M.D., Richard Mullins, M.D., John Mayberry, M.D.*

26% de douleurs chroniques

Consultation douleur chronique

Table 2 Mean RAND-36 Health Survey scores at follow-up (isolated rib fracture patients)

	Days post-op		
	60	120	180
Role physical	20.4	47.0	55.6
Pain	46.6	63.1	67.4
Physical function	60.3	72.7	76.7
General health	60.3	62.2	64.4
Vitality	43.4	53.8	55.6
Social function	63.2	76.2	78.9
Role emotional	59.9	75.7	73.8
Mental health	67.6	73.2	73.7

Conclusion

Antalgie, ALR

Ostéosynthèse en chirurgie thoracique

O₂, Ventilation Non Invasive

Ventilation Invasive

Rien

ECMO

Curatif ou préventif

