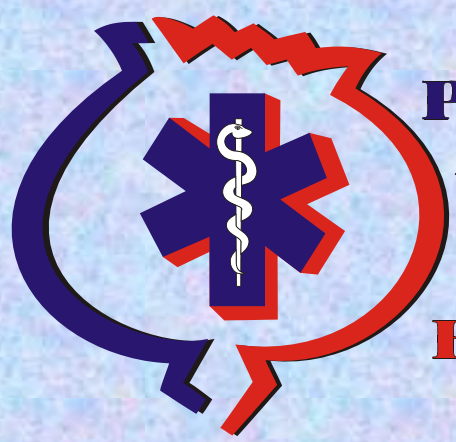
Juliusz Jakubaszko

Acute Respiratory Distress Syndrome
- challange to Intensive Care



Polskie Towarzystwo Medycyny Ratunkowej

Polish Society for Emergency Medicine

COI Disclosure

I have no relevant relationship or financial/ material support to disclose.

PRESENTER: DR. JULIUSZ JAKUBASZKO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Wroclaw University

from its history:

- **prof. Jan Mikulicz-Radecki** (1850-1905), great surgeon
  pioneer of modern surgery and *antiseptics*
- **prof. Albert Neisser** (1855-1916), dermatologist/bacteriologist
  discovered *gonococcus (Neisseria Gonorrhoeae)*
- **prof. Alois Alzheimer** (1864-1915), psychiatrist/neurologist
  described *neurodegenerative dementia*
- **prof. Ludwik Hirszfeld** (1884-1954) bakteriologist/immunologist
  discovered *human blood groups*
- **prof. Max Born** (1882-1970) physicist/mathematician
  Nobel Prizer in Physics for research on Quantum Mechanics


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Acute Respiratory Distress Syndrome

Definition

(after Berlin Classification Consensus 2012)

1. Timing within 1 week of clinical insult
2. Bilateral chest infiltration
3. Origin of pulmonary edema
4. Hypoxemia
   - *a) Mild* PaO_2/FiO_2 *200 - 300 mmHg*
   - *b) Moderate* PaO_2/FiO_2 *100 - 200 mmHg*
   - *c) Severe* $PaO_2/FiO_2 < 100$ *mmHg*

Acute Respiratory Distress Syndrome

Etiology

- **Direct lung injury:**

  gastric aspiration, pulmonary contusion, pneumonia, toxic inhalation, …

- **Indirect lung injury:**

  sepsis, trauma, burns, pancreatitis, transfusion related blood products, …

Acute Respiratory Distress Syndrome

Etiology

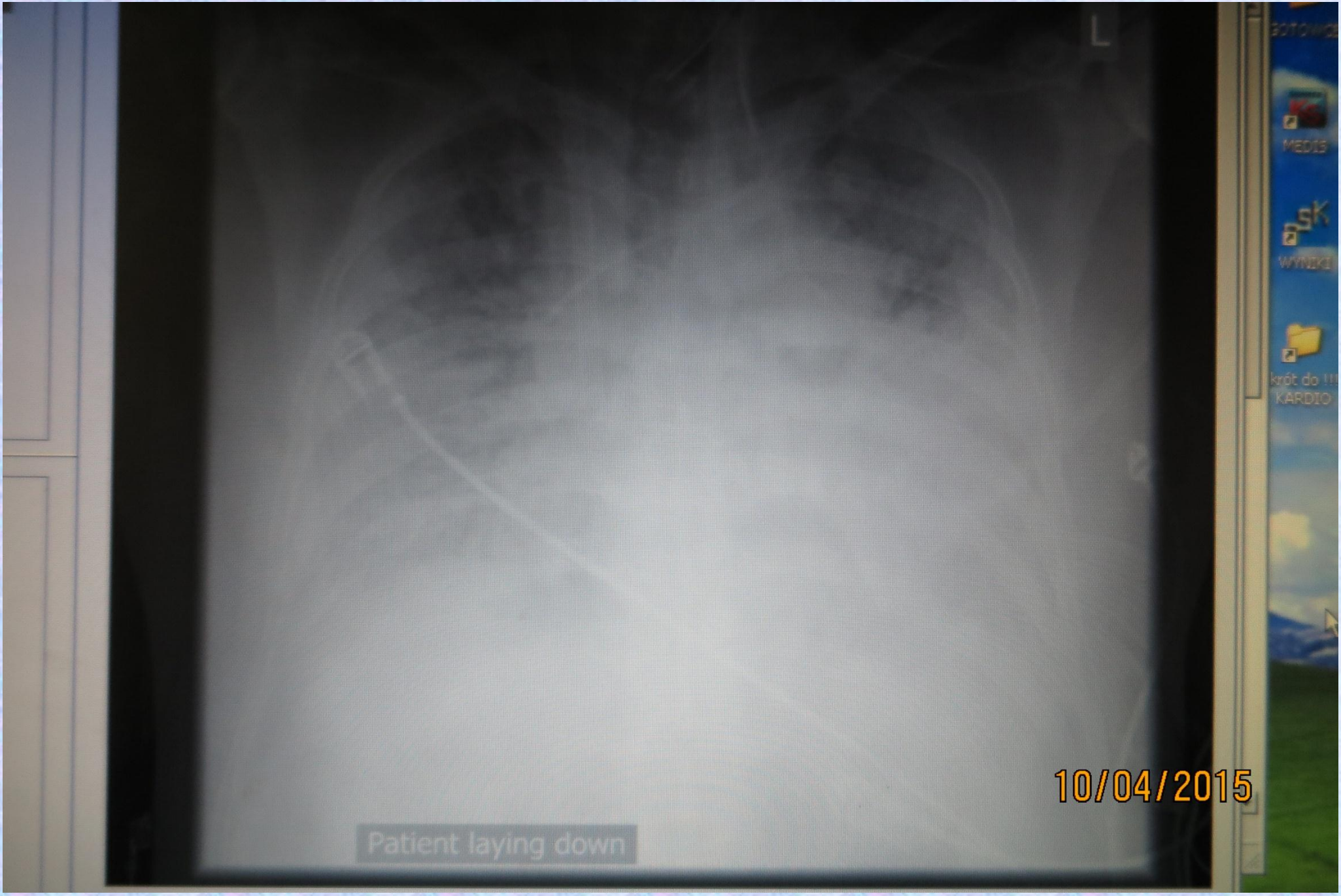
Acute lung injury with:

- ***Diffuse alveolar damage (DAD)***
- ***Increased capillary permeability***
- ***Pulmonary interstitial edema and fibrosis***
- ***Ventilation/perfusion mismatch***
- ***Refractory hypoxemia***

Acute Respiratory Distress Syndrome

Patophysiology

- *DAD with interstitial and alveolar edema and fibrin, hyaline membrane deposition*
- *Extensive right-to-left shunt (25% - 50% cardiac output)*
- *Reduction of lung compliance*
- *Increase of work of breathing (25% - 50% of total oxygen consumption)*
- *No characteristic hemodynamic pattern*


L
10/04/2015
Patient laying down


10/04/2015


10/04/2015

Acute Respiratory Distress Syndrome

General management

- **No specific treatment**
- **Removing the cause**
  - *infection source, antibiotics, fixation of long bone fracture,….*
- **Supportive treatment**
  - *respiratory management*
  - *haemodynamic manipulation*

Acute Respiratory Distress Syndrome
Supportive treatment

Respiratory management

Increased alveolar-capillary permeability:

- ***Inactivation of lung surfactant***
- ***Decrease lung compliance***
- ***Decreased functional lung size***
- ***Impared O_2 intake and CO_2 elimination***

Life threatening hypoxemia

Acute Respiratory Distress Syndrome

Supportive treatment

Respiratory management

- *Initially - noninvasive positive pressure ventilation*
- *Lung protection strategy*
- *Adequate sedation*
- *Ventilatory management*
  - *Low tidal volume (V_T)*
  - *Minimizing inspiratory pressure (< 30 cm H_2O)*
  - *Higher level of PEEP (up to 20 cm H_2O)*
  - *Higher level of FiO_2 (0,6 - 1,0)*
- *Patient positioning (prone position)*
- *Extracorporeal membrane oxygenation (ECMO)*

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

Driving Pressure and Survival in the Acute Respiratory Distress Syndrome

Marcelo B.P. Amato, M.D., Maureen O. Meade, M.D., Arthur S. Slutsky, M.D., Laurent Brochard, M.D., Eduardo L.V. Costa, M.D., David A. Schoenfeld, Ph.D., Thomas E. Stewart, M.D., Matthias Briel, M.D., Daniel Talmor, M.D., M.P.H., Alain Mercat, M.D., Jean-Christophe M. Richard, M.D., Carlos R.R. Carvalho, M.D., and Roy G. Brower, M.D.

Derceased lung compliance ***Decreased functional lung size***

Driving pressure $\Delta P = V_T / C_{RS}$

… Decrease in ΔP owing to changes in ventilator settings were strongly associated with increased survival… ***(NEJM, February, 2015)***

The NEW ENGLAND JOURNAL of MEDICINE

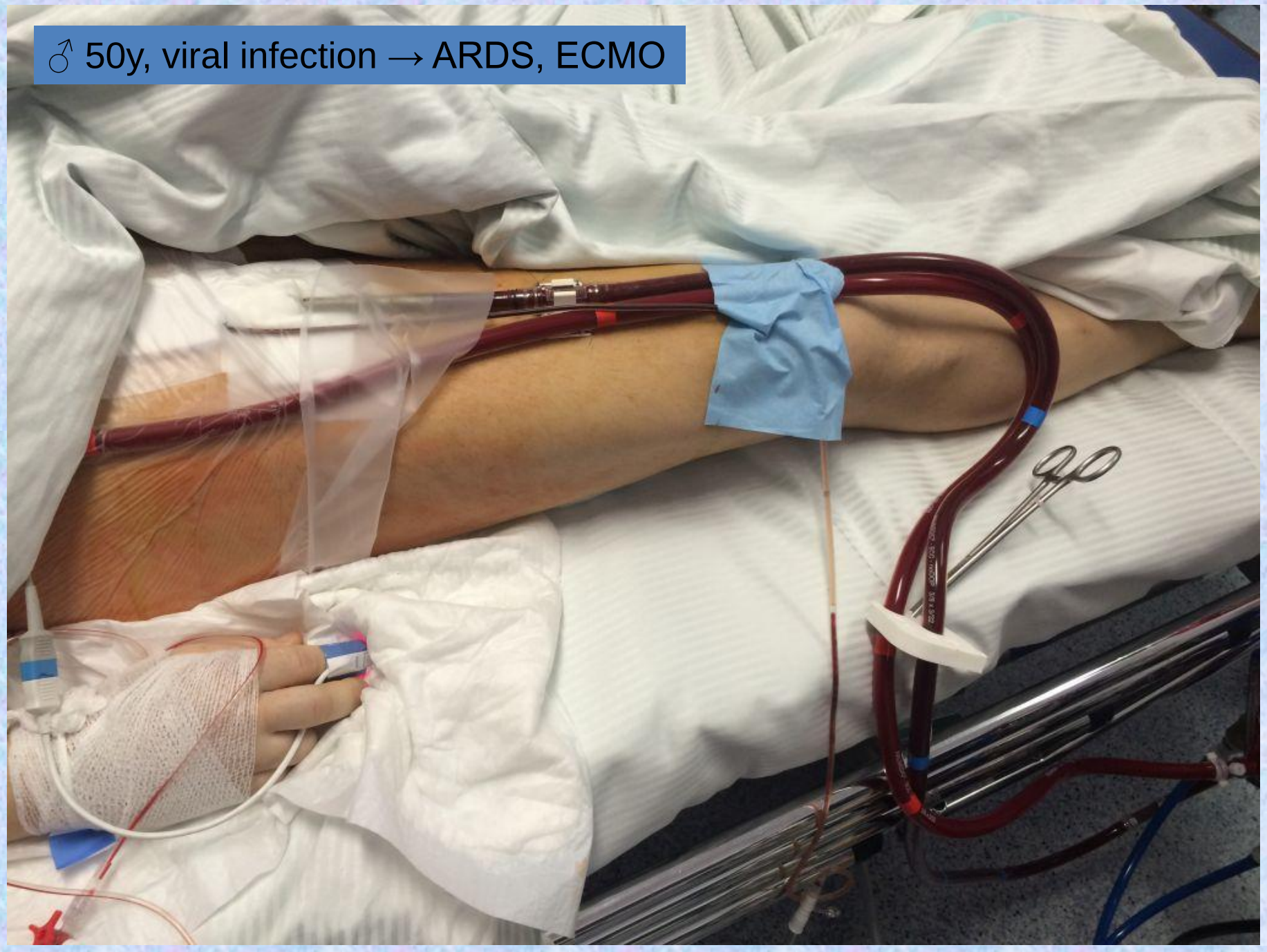
ESTABLISHED IN 1812 JUNE 6, 2013 VOL. 368 NO. 23

Prone Positioning in Severe Acute Respiratory Distress Syndrome

Claude Guérin, M.D., Ph.D., Jean Reignier, M.D., Ph.D., Jean-Christophe Richard, M.D., Ph.D., Pascal Beuret, M.D., Arnaud Gacouin, M.D., Thierry Boulain, M.D., Emmanuelle Mercier, M.D., Michel Badet, M.D., Alain Mercat, M.D., Ph.D., Olivier Baudin, M.D., Marc Clavel, M.D., Delphine Chatellier, M.D., Samir Jaber, M.D., Ph.D., Sylvène Rosselli, M.D., Jordi Mancebo, M.D., Ph.D., Michel Sirodot, M.D., Gilles Hilbert, M.D., Ph.D., Christian Bengler, M.D., Jack Richecoeur, M.D., Marc Gainnier, M.D., Ph.D., Frédérique Bayle, M.D., Gael Bourdin, M.D., Véronique Leray, M.D., Raphaele Girard, M.D., Loredana Baboi, Ph.D., and Louis Ayzac, M.D., for the PROSEVA Study Group*

… In patients with severe ARDS, early application of prolonged prone - positiong sessions , significantly decreased 28-day and 90-day mortality…


♂ 50y, viral infection → ARDS, ECMO


♂ 50y, viral infection → ARDS, ECMO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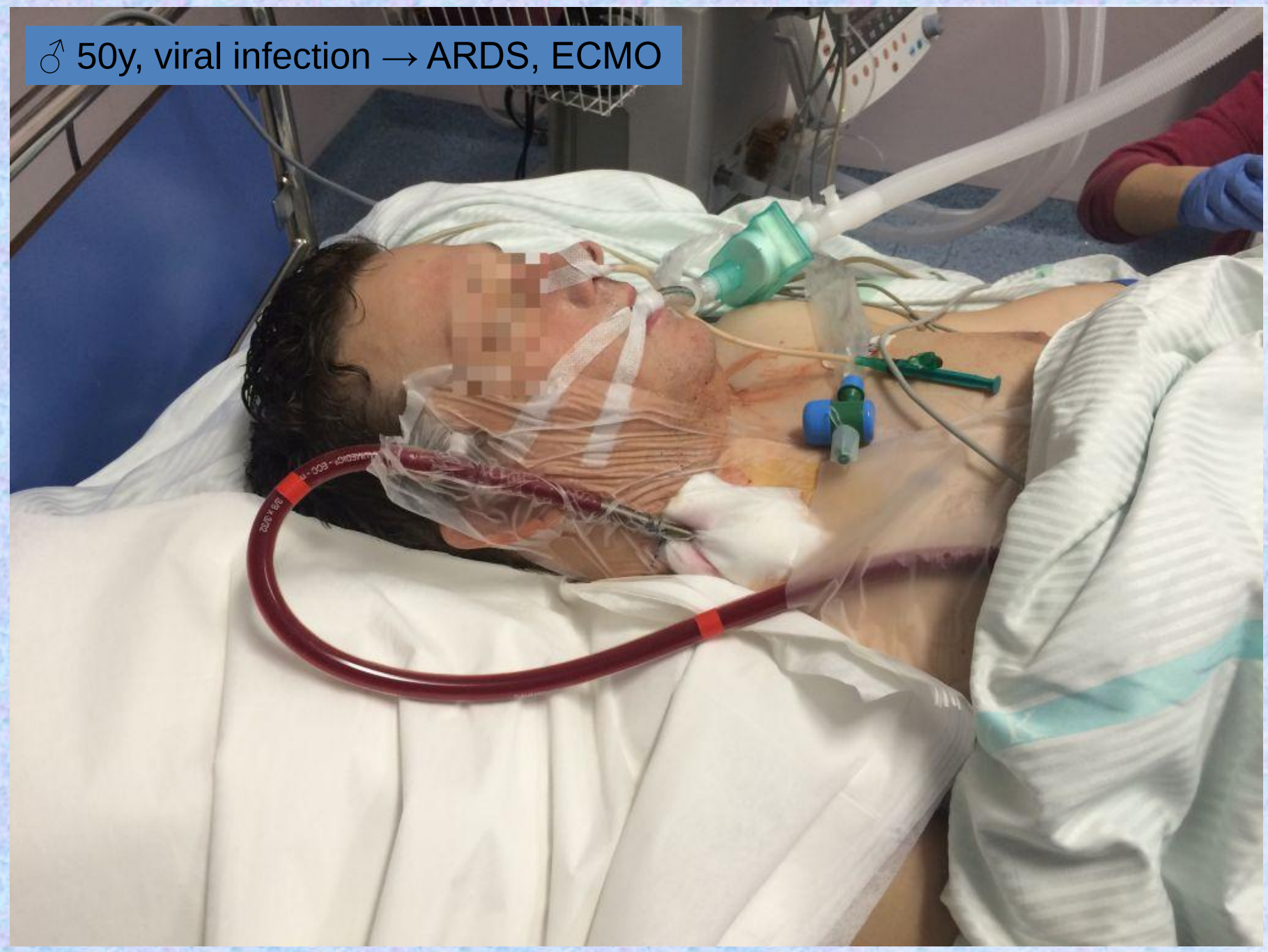
♂ 50y, viral infection → ARDS, ECMO

Acute Respiratory Distress Syndrome
Supportive treatment

Pharmacologic therapies ?

No specific medications have been shown effective in ARDS (corticosteroids, iNO,…)

Haemodynamic manipulations

inotrops, vasoconstrictors, dilators, diuretics, fluids,…

may improve cardiac output and oxygenation

Acute Respiratory Distress Syndrome
Supportive treatment

Fluid treatment

ARDS facts :

- *increased alveolar-capillary permeability*
- *extravasation of protein-enriched fluid into alveoli*
- *pulmonary exudate in alveoli*
- *reduced intravascular volume*

Acute Respiratory Distress Syndrome
Supportive treatment

Fluid treatment

Colloids controversies:

- reduce alveolar-capillary permeability, histological damage, inflamatory cell infiltration

- faster hemodynamic stabilization

- might increase tissue edema due to extravasation of colloid molecules

- synthetic colloids (HAES, gelatins) are associated with higher risk of AKI and death

Consensus on colloid treatment in ARDS has not been achieved

Albumin Versus Crystalloid Solutions in Patients With the Acute Respiratory Distress Syndrome

A Systematic Review and Meta-analysis

Christopher Uhlig, Pedro L Silva, Stefanie Deckert, Jochen Schmitt, Marcelo Gama de Abreu

Crit Care. 2014;18(R10)

… superiority of combined albumine and furosemid versus furosemid alone…

… albumin solutions improve the early oxygenation without affecting mortality…

… there is a need for large RCTs addressing the potential benefits of albumin or synthetic colloids as volume expanders in ARDS…

CEEM 2015

Central European Emergency Medicine 2015

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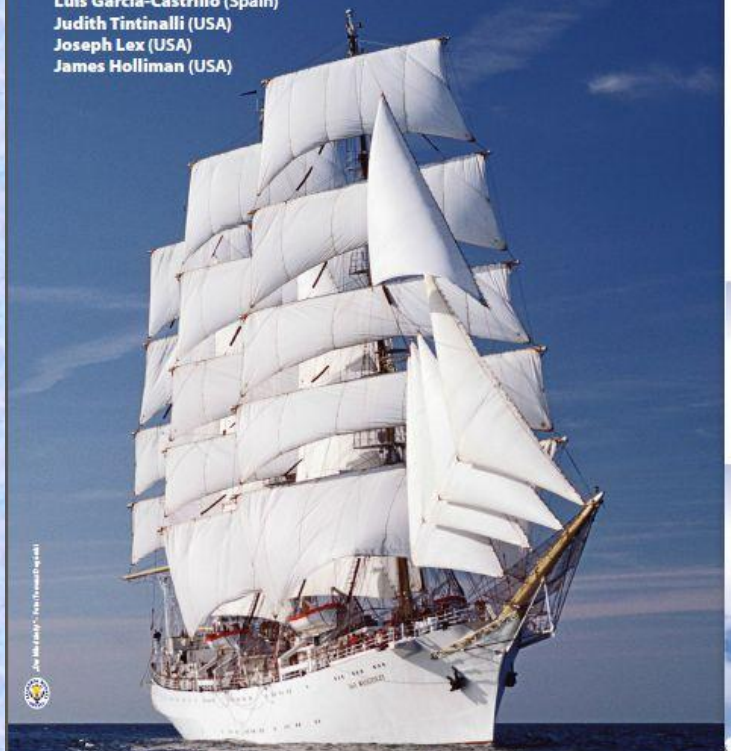

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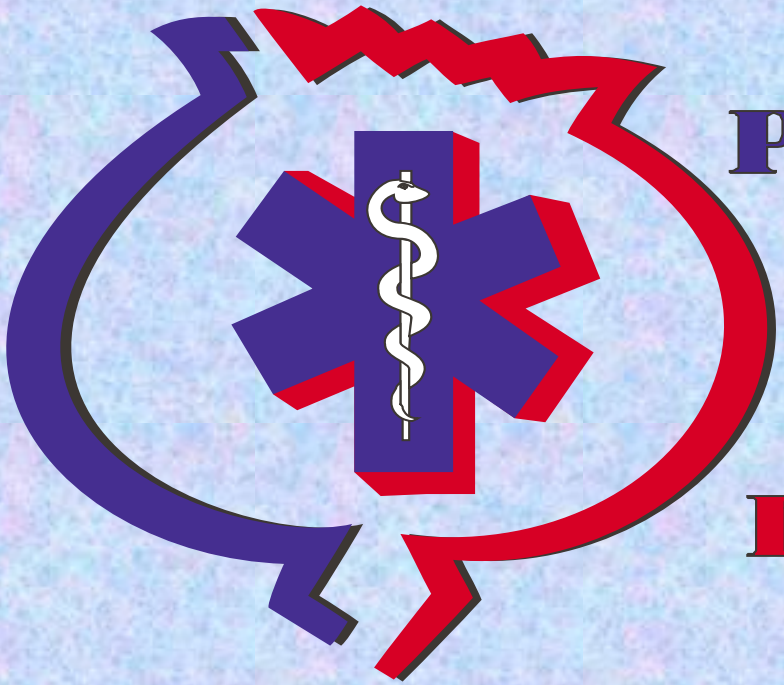

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