

# The Lund Concept for treatment of a severe head trauma

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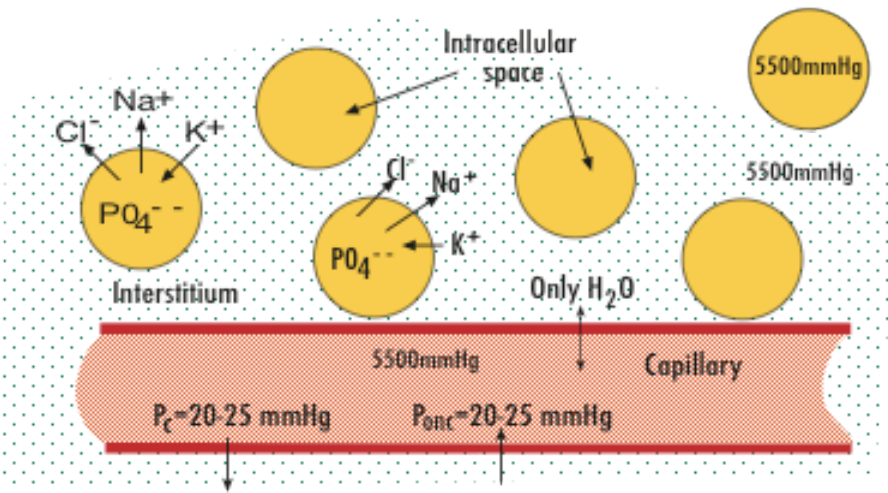
There is no randomized study supporting  
a special guideline of a severe head  
injury

In spite of improved intensive care  
there are no clear signs of improved  
overall outcome.

(Patel et al. Lancet 2005, 366, Hyam et al, Intensive Care Med, 2006, Bragge, Maas, Menon et al. J of Neurotrauma 2015).

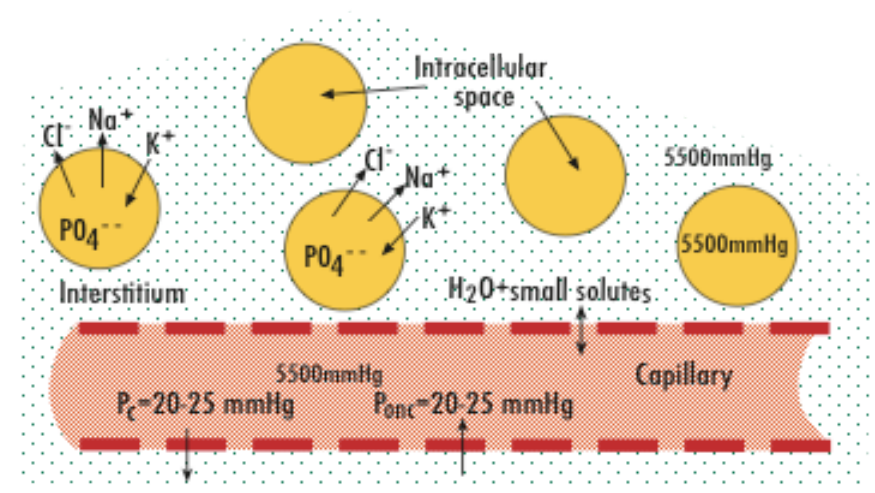
- 1) Antihypertensive treatment
- 2) Avoidance of vasopressors
- 3) The use of albumin

### a Volume regulation of the normal brain



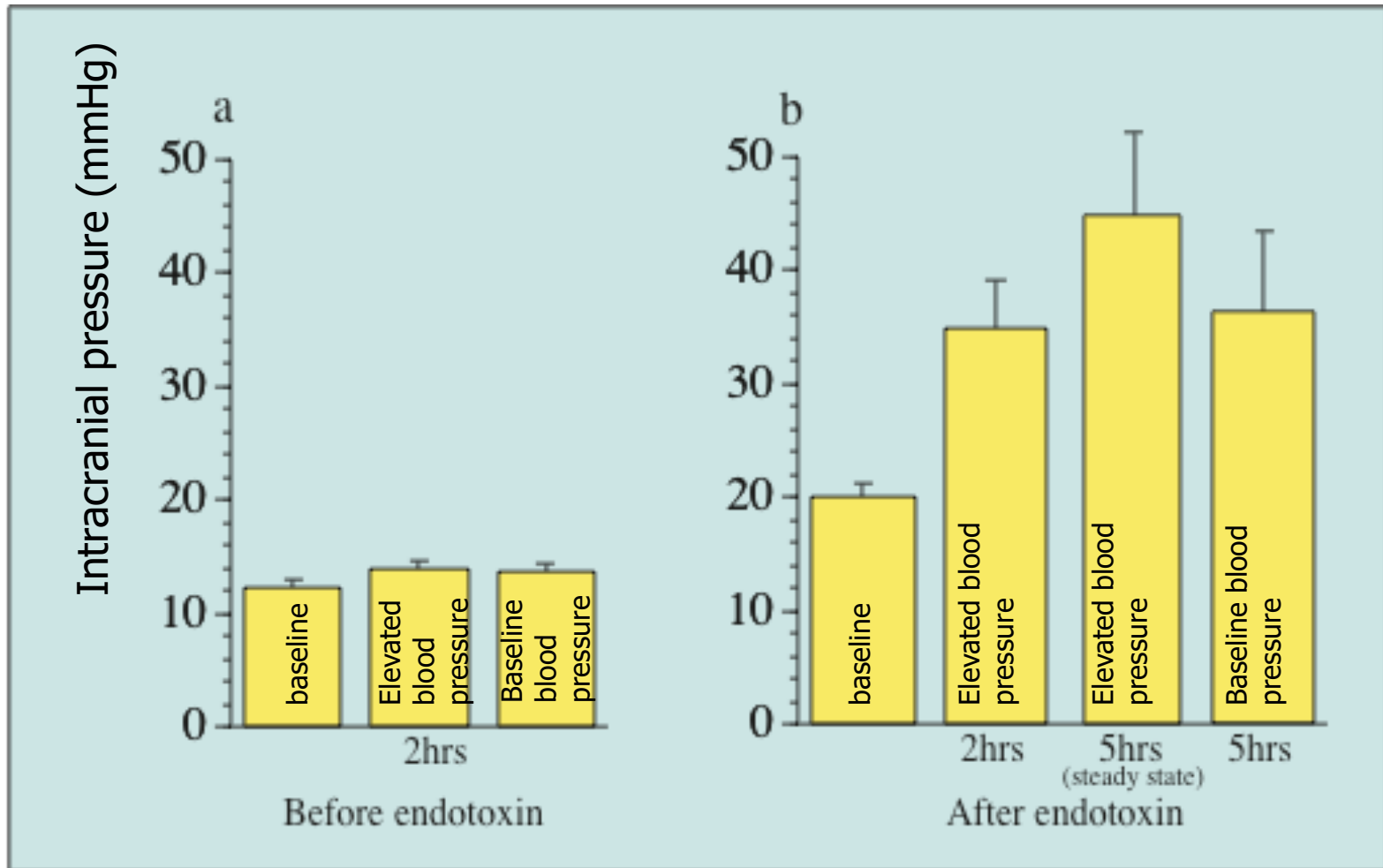
Capillary in the normal brain

### b Volume regulation of the injured brain

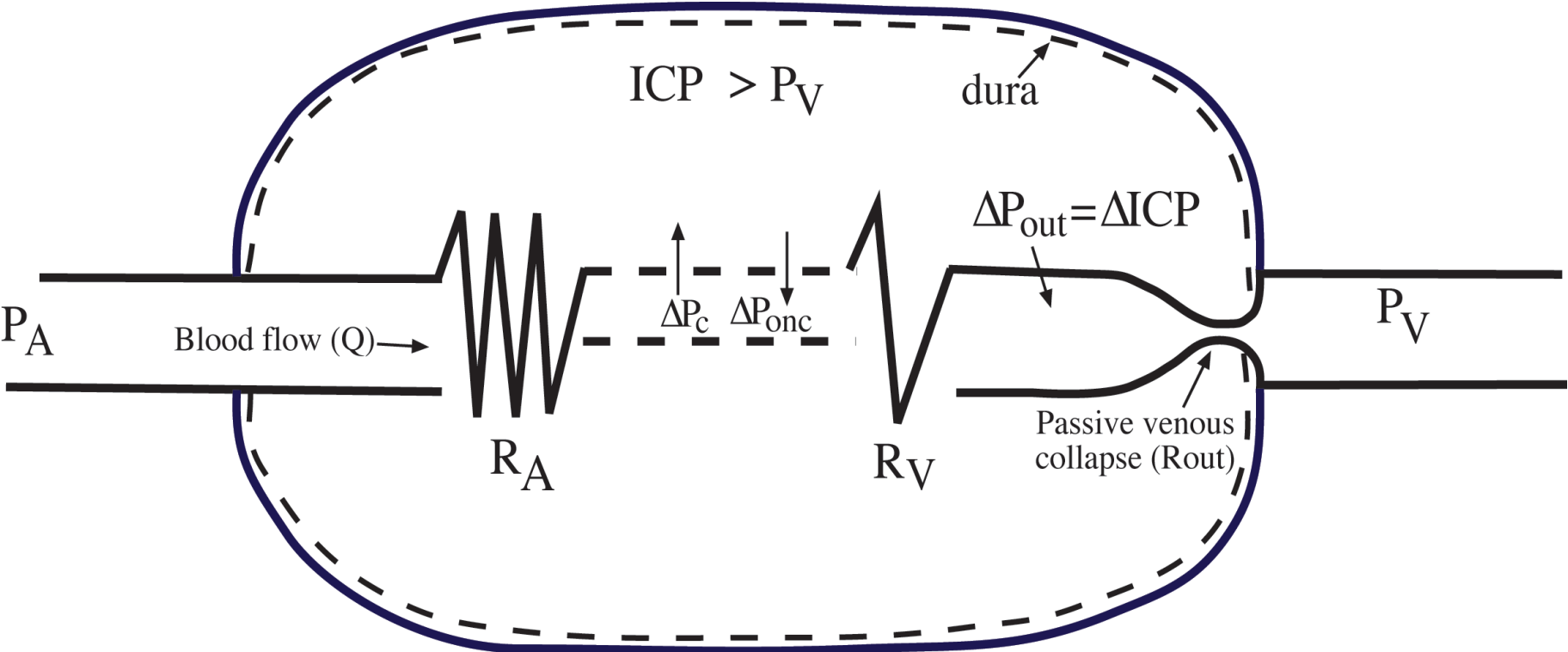


Capillary in the injured brain with disrupted BBB

# Effects of increase in blood pressure (30 mmHg) on ICP



Schematic illustration of the brain enclosed in the rigid dura/cranium



# Antihypertensive therapy in the LC

Beta-1 blockade

Alpha-2 agonist

If necessary, supplemented with moderate head elevation and angiotensin II antagonist

# Why beta blockade to head injured patients?

Cotton et al 2007, Inaba et al 2008 and Alali et al 2014 have shown significantly improved survival with beta-blockade in s-TBI patients.

Possible mechanism?

- 1) Reduces arterial blood pressure and brain oedema
- 2) Reduces adrenergic stress effects on the brain and the heart

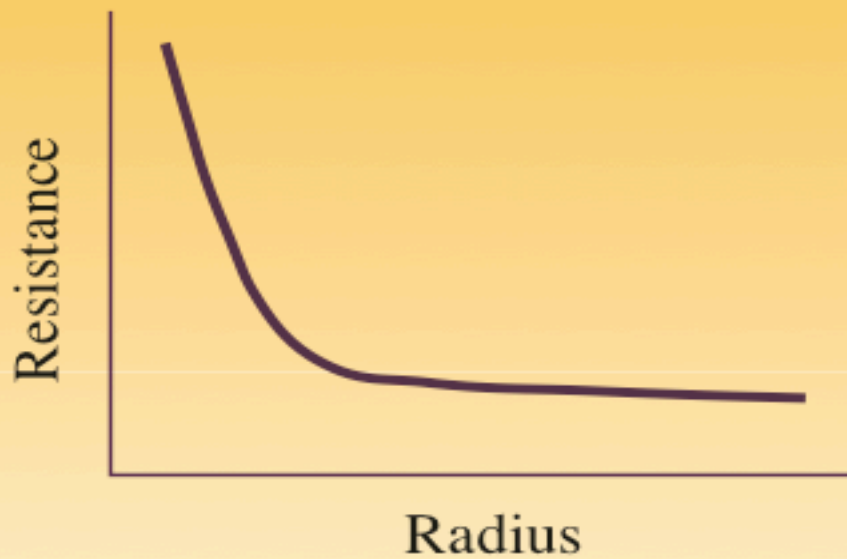
The Lund Concept is the only guideline suggesting beta-blockade to severe head trauma



2) Avoidance of vasopressors

# Poiseuille's law and vascular resistance

$$\text{Resistance} = \text{constant} \cdot \frac{1}{\text{radius}^4}$$



constricted vessel

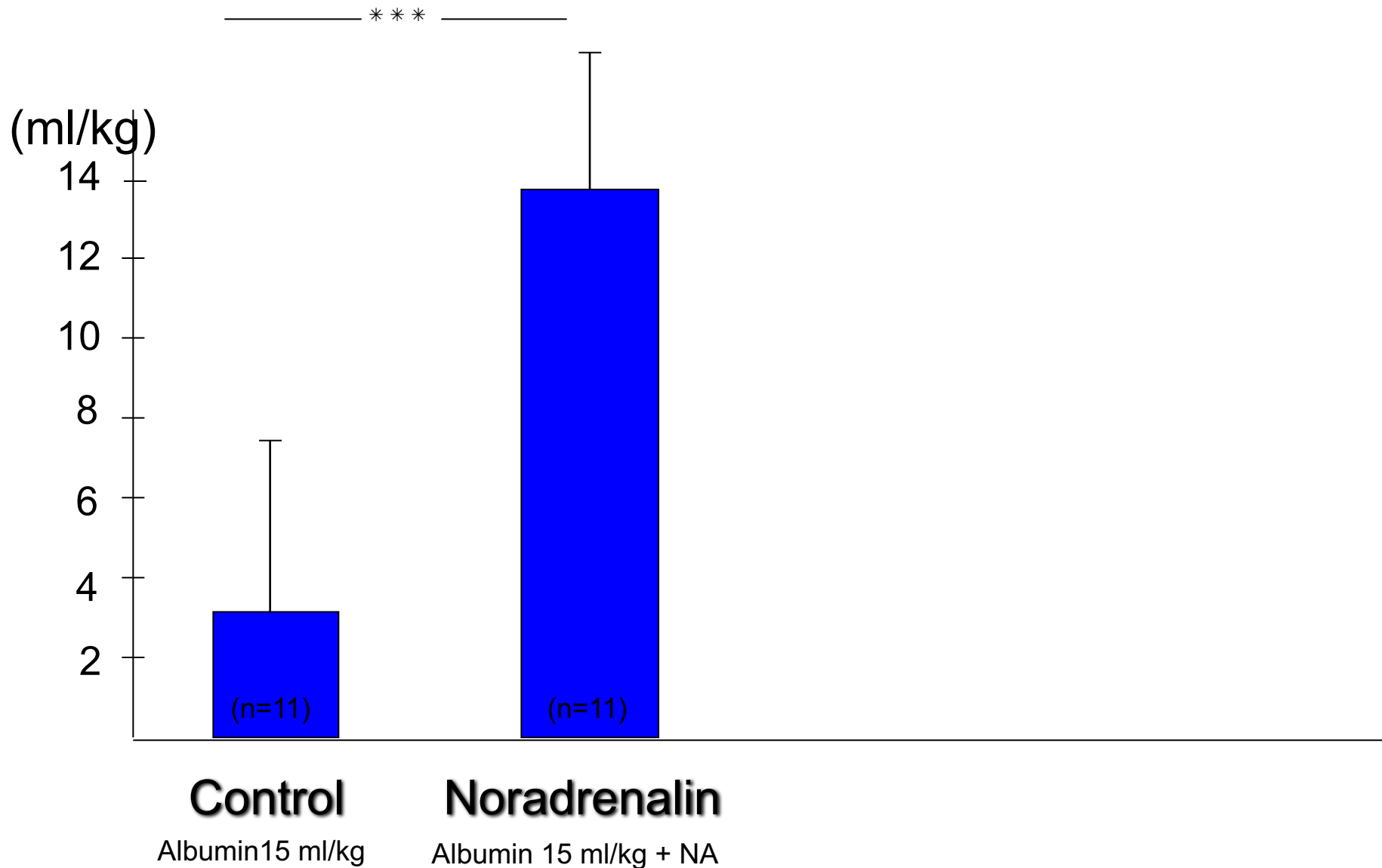


normal vessel



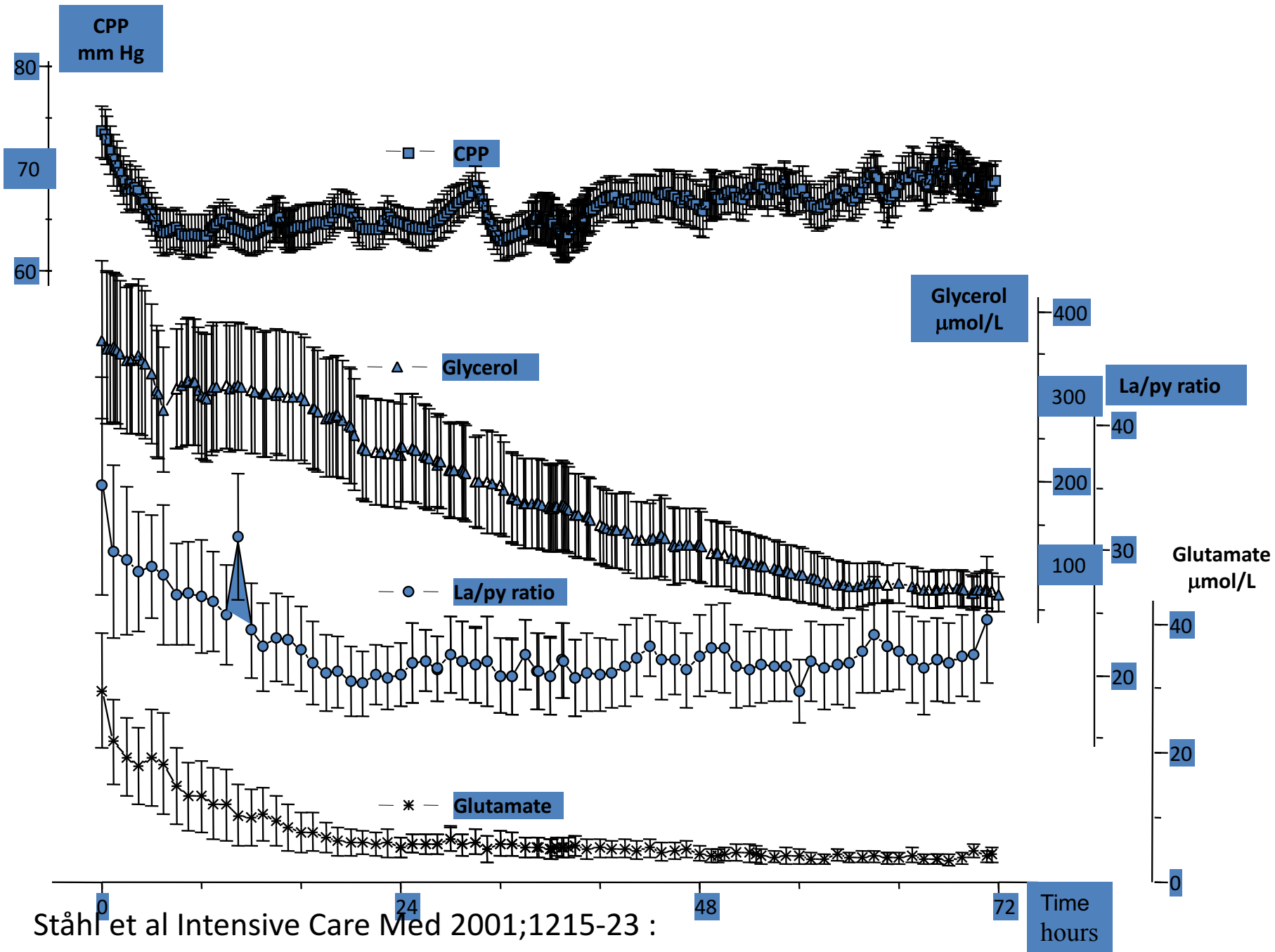
dilated vessel

# Plasma volume loss at 2 different levels of MAP (difference 12-15 mmHg) at increased permeability after 3 hrs



3) Albumin to s-TBI patients

van Aker: Albumin was not the deleterious factor in the SAFE-TBI study. The study just confirms that hypotonic solutions are deleterious in TBI patients



Ståhl N, Ungerstedt U, Nordström CH. Brain energy metabolism during controlled reduction of cerebral perfusion pressure in severe head injuries. *Intensive Care Med.* 2001 Jul;27:1215-23.

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Grände PO. The Lund Concept for treatment of severe head trauma-physiological principles and clinical application *Intensive Care Med* 2006:32:1475-84

Koskinen. LO, Olivecrona M, Grände PO. Severe traumatic brain injury management and clinical outcome using the Lund concept. *Neuroscience* 2014:283:245-55 (include the clinical outcome studies performed so far).

Grände PO. Critical evaluation of the Lund Concept for treatment of severe traumatic head injury, 25 years after its introduction. *Frontiers in Neurology* 2017: 8:315