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# HIGH-DOSE ASCORBIC ACID AND FLUID RESUSCITATION REQUIREMENTS IN MASSIVE BURN INJURY – A REAL IMPACT?

P. Stoecklin, Y.A. Que, P. Voirol, H. Engel, M.M. Berger

Service de Médecine Intensive Adulte et Centre des Brûlés
CHUV - Lausanne

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# HIGH-DOSE ASCORBIC ACID AND FLUID RESUSCITATION REQUIREMENTS IN MASSIVE BURN INJURY – A REAL IMPACT

## Background

- Some studies suggest that early administration of high-dose ascorbic acid (AA: 66 mg/kg/h in 24hrs) may decrease fluid requirements during resuscitation in major burns via an antioxidant mechanism, reducing capillary leak and resultant tissue edema, with better oxygenation.(Reference: Tanaka H, et al « Reduction of resuscitation fluid volumes in severely burned patients using ascorbic acid administration: a randomized, prospective study » Arch Surg. 2000 ; 135(3): 326-331 )

- Despite promising preliminary results no large study is yet available.

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## Methods

Design: Retrospective quality control study of the impact of Ascorbic Acid (AA) vs. none (NO) during the first 48h of 16 patients with massive burns. Unicentric.

Data: Prospective collected data (MetaVision ®) in the reference burn center ICU (CHUV; Lausanne, Switzerland). Ventilation, oxygenation data and lactate at 12, 24, 36 and 48 hrs

Patients: Inclusion criteria: admission within 6 hrs, survival $\geq$ 48h.

- 8 massive burns resuscitated guided by the new protocol with AA
- 8 patients paired historical control matched for TBSA, inhalation, age

Ventilator settings were by ICU protocol.

Statistics: Wilcoxon tests, 2-way ANOVA

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## Methods

Fluid resuscitation

until 2010:

Parkland guided (4ml/kg/TBSA%) in all burns

2011: recommendation to use the “lower” Parkland range for all patients (2ml/kg/TBSA%) with the addition of AA 66 mg/kg/h in patients with burns >50% TBSA.

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## **Results** (Data as medians)

| Variable | Ascorbic Acid | NO |
|---|---|---|
| N | 8 | 8 |
| Age (years) | 37.5 | 30.5 (ns) |
| Sex ratio (M/F) | 7/1 | 6/2 |
| Weight (Kg) | 78.5 | 73.6 |
| TBSA (%) | 71 | 70 |
| Surgical TBSA (%) | 65 | 62.5 |
| Inhalation injury (n) | 6 | 6 |
| SAPS II | 44 | 35 |
| Length mech vent (d) | 26 | 27 |
| Length ICU (days) | 50 | 78 |
| Outcome (Live/D) | 5 / 3 | 6 / 2 (p=0.12) |

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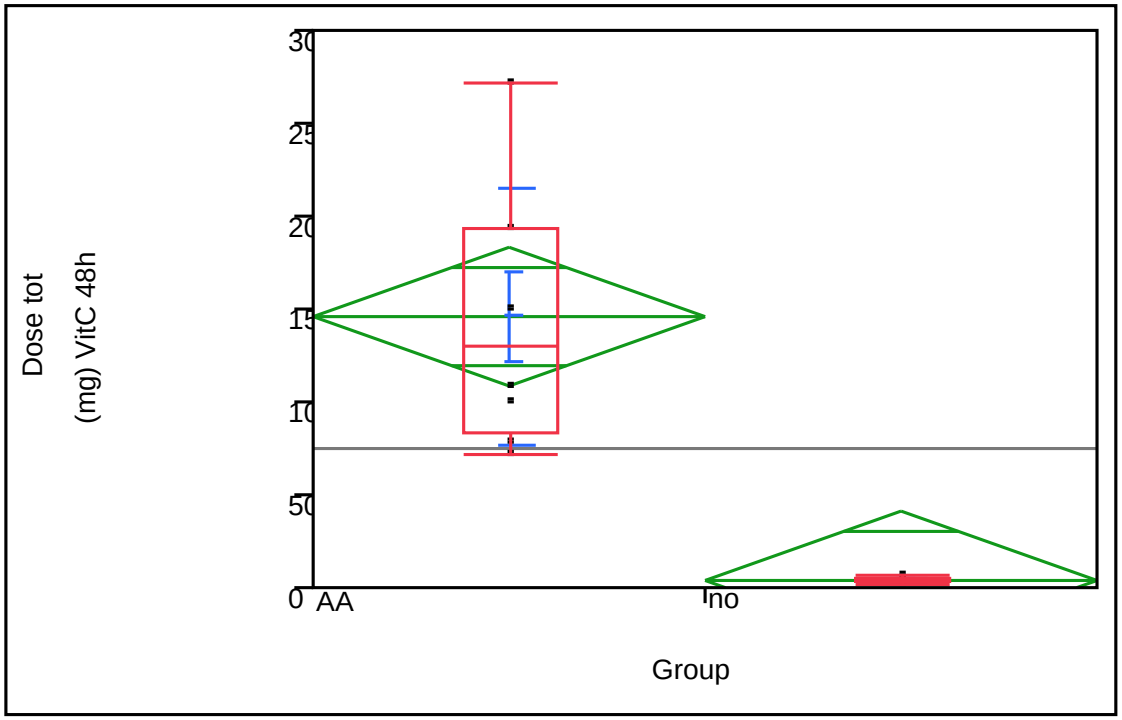
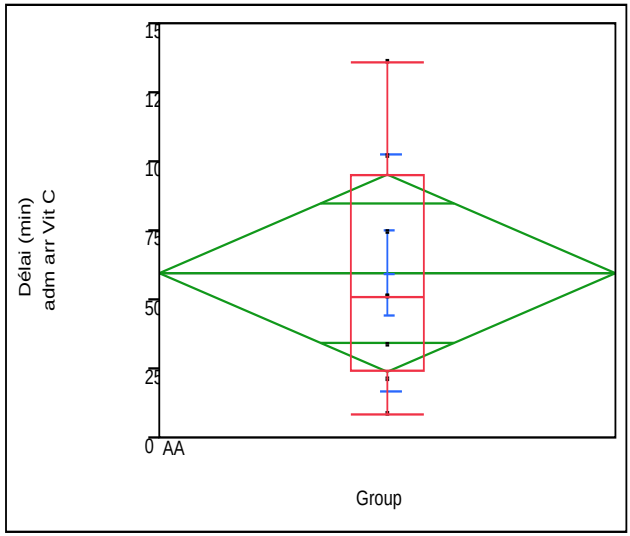
# HIGH-DOSE ASCORBIC ACID AND FLUID RESUSCITATION REQUIREMENTS IN MASSIVE BURN INJURY – A REAL IMPACT?

## Result

### Total dosis (mg) of Vit C administrated the first 48hrs'




### Delai time to high dose AA




**(median 509min)**

1 orange = 51 mg AA … 150 g → ≈2800 oranges

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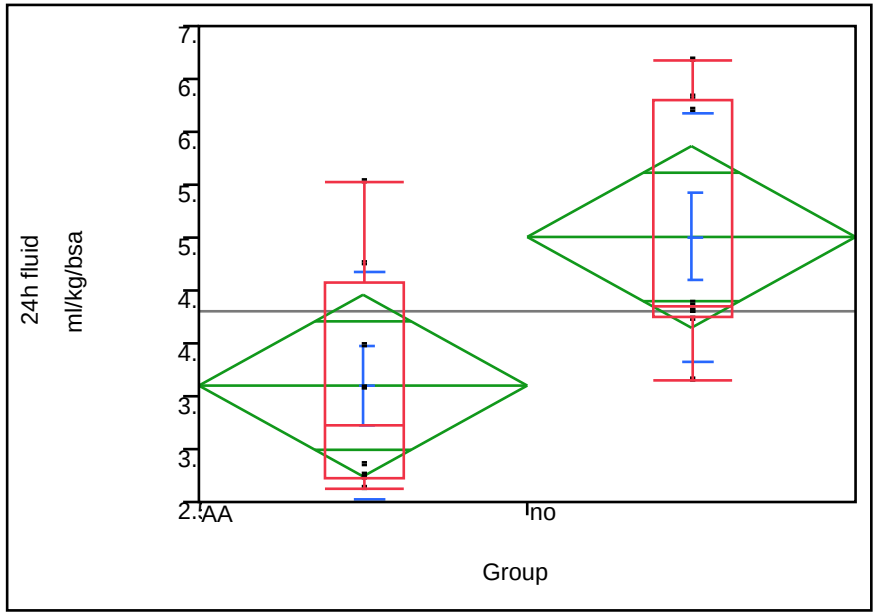
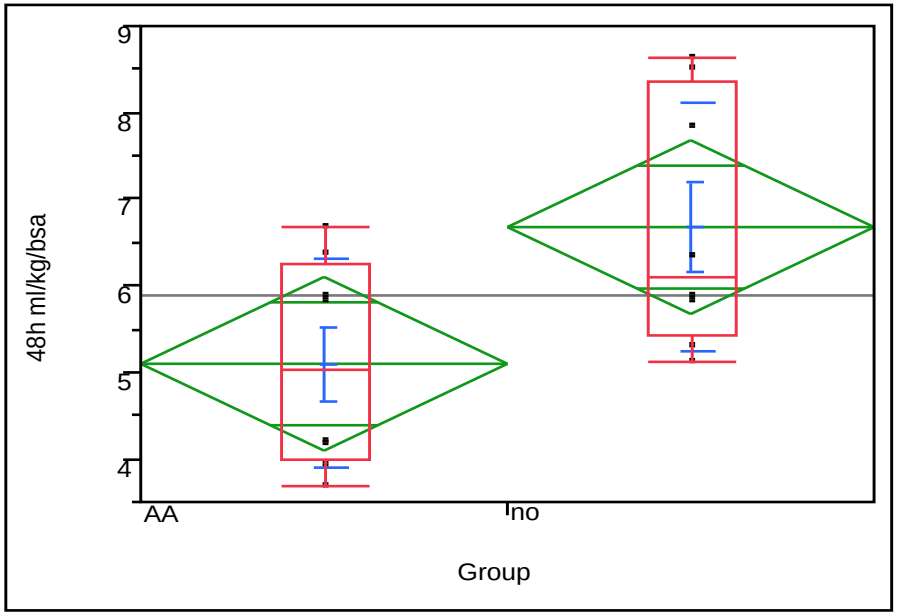
**Result**

## Fluid resuscitation volume




| | | |
|---|---|---|
| **Fluid input 0-24h (L)** | **19** | **21.8** |
| 24h fluid ml/kg/bsa | **3.2** | **4.3** |

p= 0.0264

| | | |
|---|---|---|
| 48h fluid input ml/kg/bsa | **5.0** | **6.1** |

p= 0.0318

## HIGH-DOSE ASCORBIC ACID AND FLUID RESUSCITATION REQUIREMENTS IN MASSIVE BURN INJURY – A REAL IMPACT?

**Results** (Data as medians)

| Variable | Ascorbic Acid | NO |
|---|---|---|
| Urine output (ml/kg/h) | 1.0 | 1.9 (p=0.062) |
| Norephinephrine (mg) tot 48h | 73.6 | 13.9 |
| Lactate (mmol/l) | 3.7 | 2.3 |

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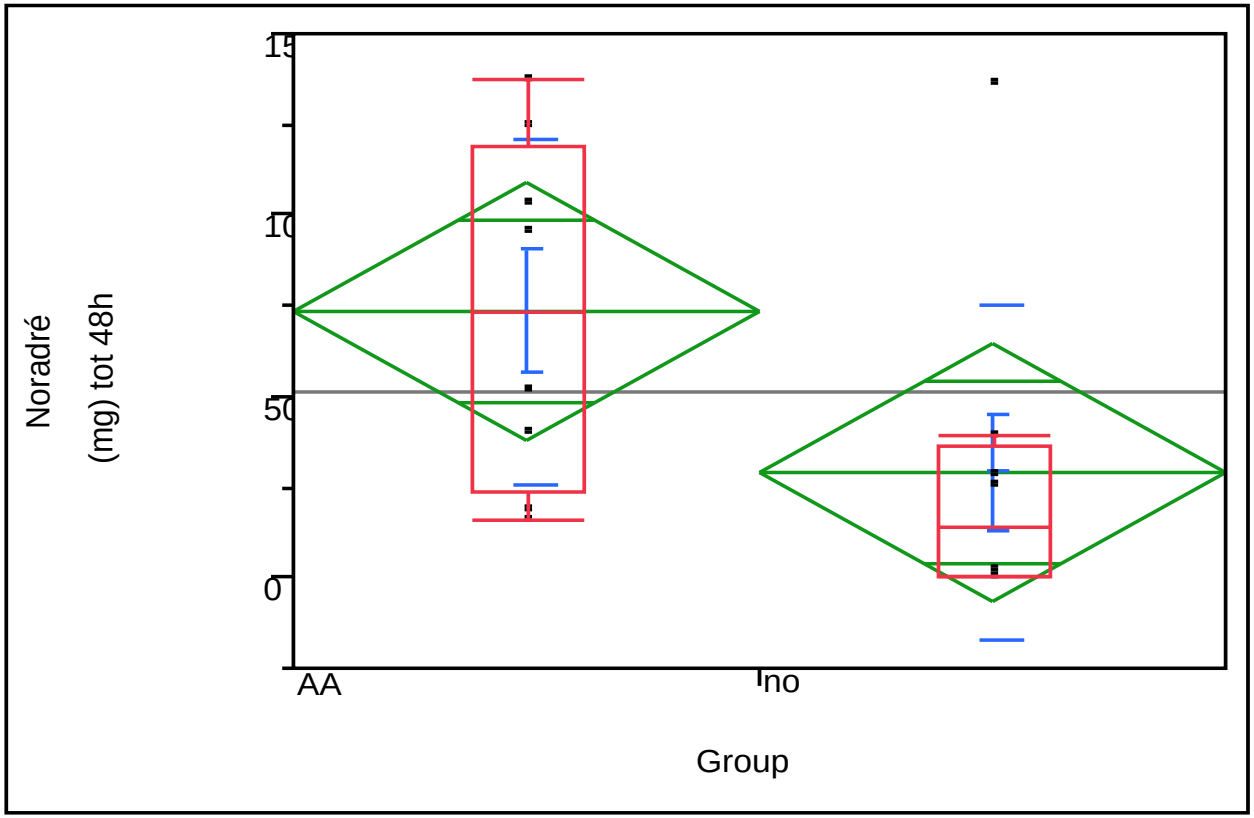
# HIGH-DOSE ASCORBIC ACID AND FLUID RESUSCITATION REQUIREMENTS IN MASSIVE BURN INJURY – A REAL IMPACT?

## Result

**Norephinephrine cumulated doses over first 48 hrs** (Trend: p= 0.0792)



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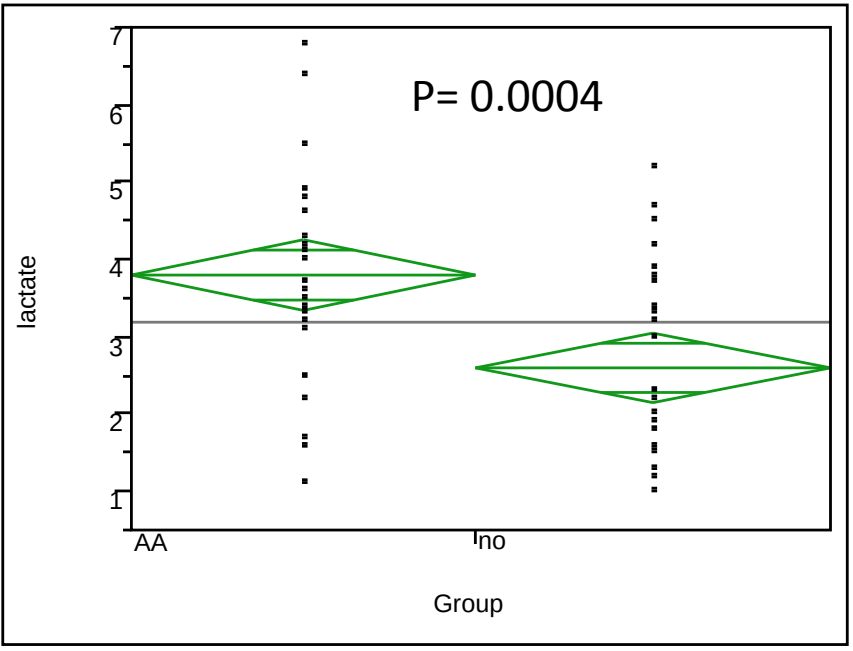
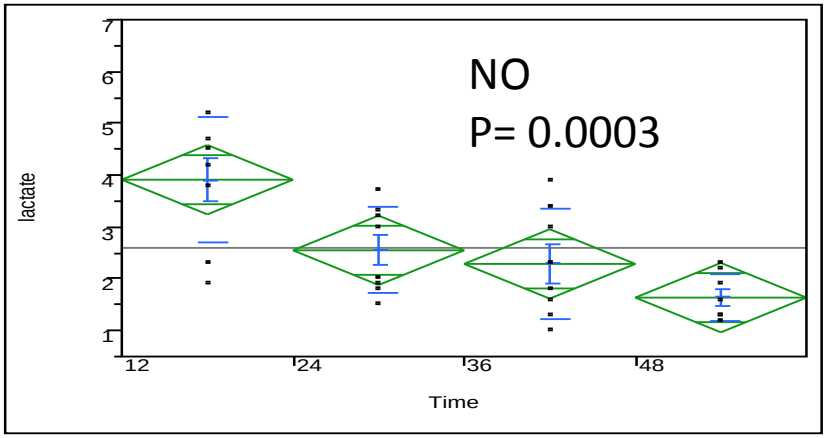
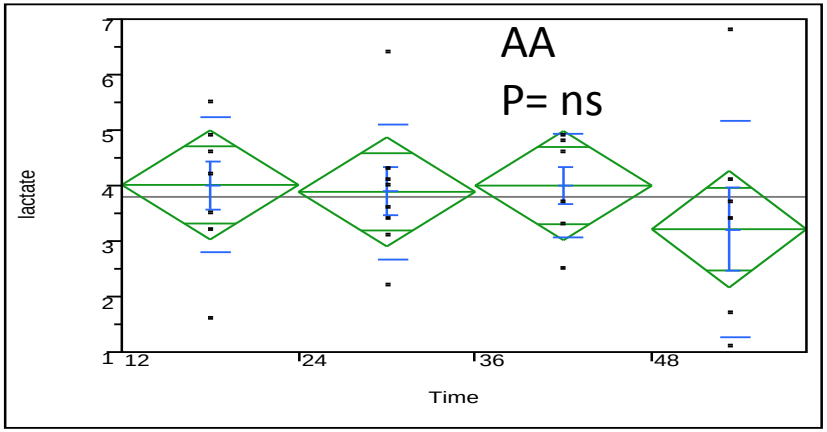
## Result

### Oxygenation: First 48hrs' $PaO_2/FiO_2$ ratios –n.s impact



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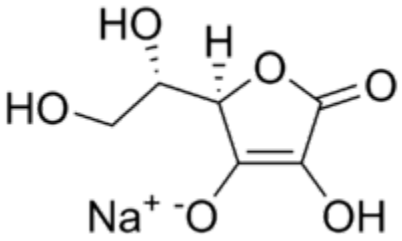
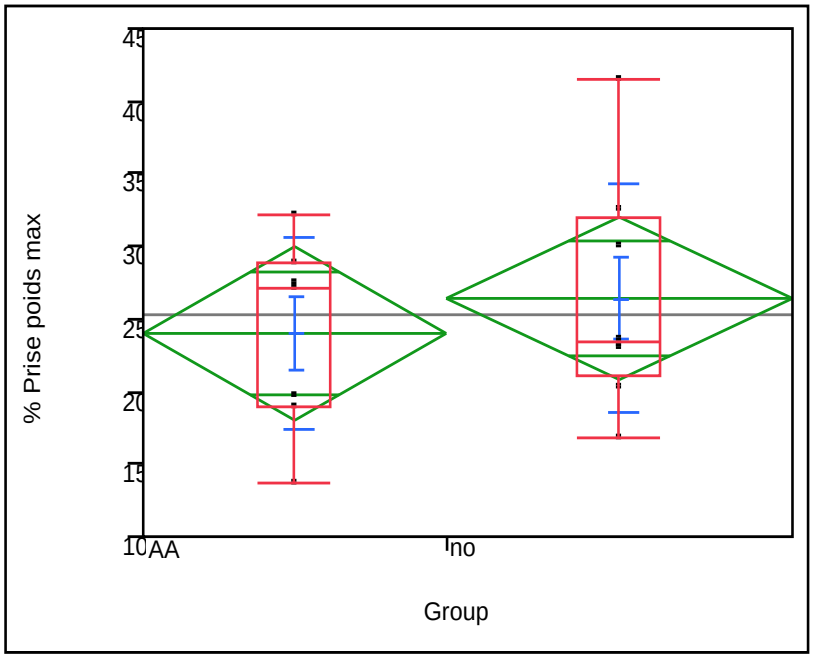
## Results




Weight change - % from admission

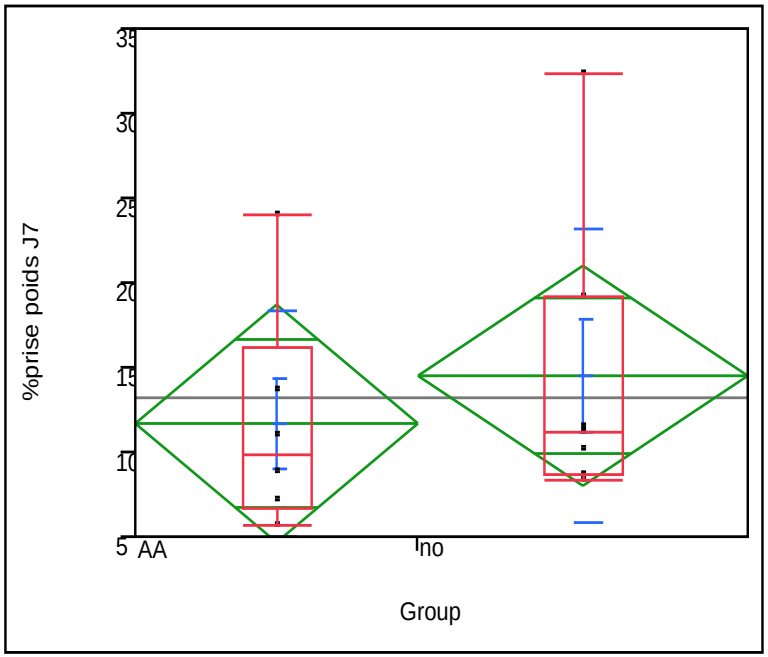
**Maximum (day 2)**

NS : +27% AA vs +23% NO




**Day 7**

Ns: + 11.7% AA vs + 14.5% NO




Sodium ascorbate provides 131 mg of sodium per 1 g of ascorbic acid

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## CONCLUSIONS:

- High dose AA was associated with a significant reduction of fluid requirements.
- There was no significant impact on weight gain
- AA was not associated with major organ failure
- Higher lactate levels are a concern though: cause uncertain.
- Indeed 2 major changes in resuscitation protocol were introduced simultaneously – the fluid restriction may also have been the cause
- Larger studies are warranted to determine the efficiency of the treatment.

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## **Results** (Data as medians)

| Variable | Ascorbic Acid | NO |
|---|---|---|
| Delay administration AA (min) | 509 | - |
| Total of Vit.C at 48h (mg) | 129’228 | 3’572 |
| Fluid input 0-24h (L) | 19 | 21.8 |
| Fluid input 25-48h (L) | 8.2 | 15.9 |
| 24h fluid input ml/kg/bsa | 3.2 | 4.3 |
| 48h fluid input ml/kg/bsa | 5.0 | 6.1 |
| Norephinephrine (mg) tot 48h | 73.6 | 13.9 |
| Urinary output (ml/kg/h) | 1.0 | 1.9 (p=0.062) |
| Lactate (mmol/l) | 3.7 | 2.3 |