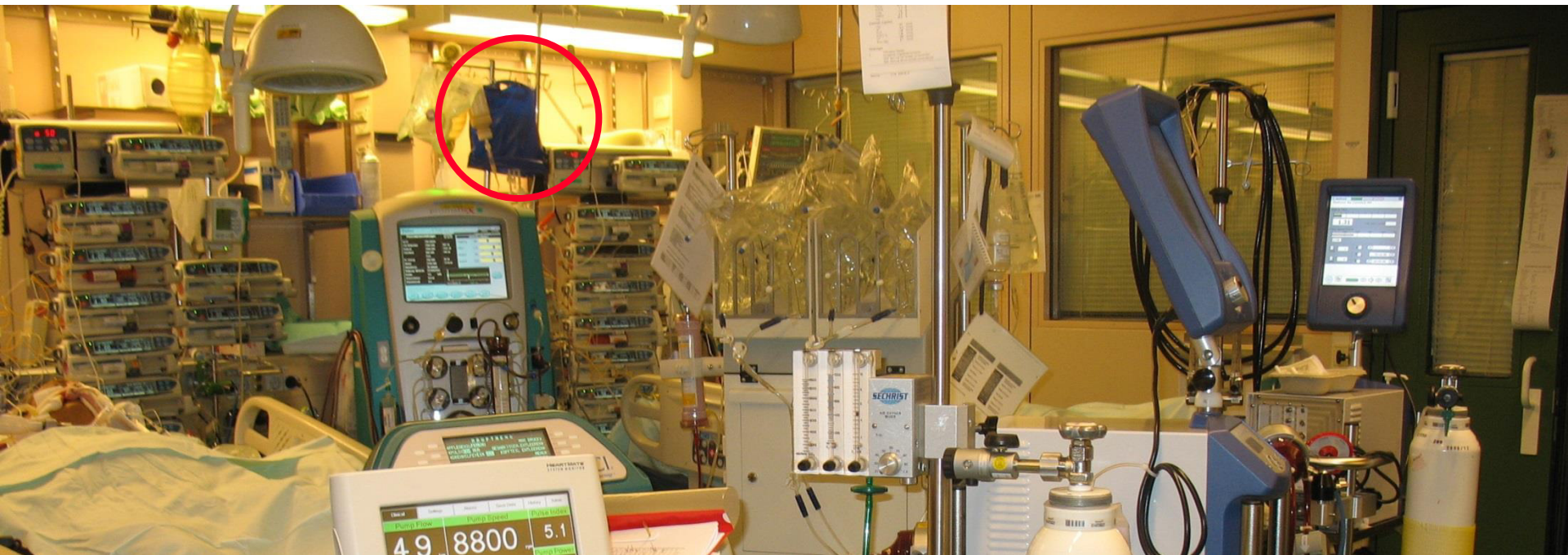


ICU patient case

Practical aspects of adequate feeding



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M. Hiesmayr & nutrition

Conflict of interest:

Honoraria

Baxter, Nestlé, Fresenius, BBraun,
Sino Sweed Pharmaceutical Company

Research & advisory board:

Fresenius, Novartis, NovoNordisk,
Nutricia, Nestlé

Clinical case (K.U.) presentation

A case with a **clinical** course that allows me to demonstrate how **information** may be **understood, interpreted** and permits to take safe and personalized nutrition care **action**

- History and evolution of the patient's status
 - ▶ Details
- Nutrition strategy and care

Case presentation: actual problem

- **74 a female, collapsed** at home **with loss of consciousness for a few minutes**
- Her husband (83 a) reported that she had complained about unusual back pain that did not resolve on anti-rheumatics
 - ▶ **no** hospitalization during the last 4 years
- Emergency department clinical presentation:
 - ▶ Somnolent, responding to simple questions
 - ▶ **Clinical signs of shock: low pressure, reduced peripheral perfusion**
 - ▶ BGA: acidosis, mild hypoxia
 - **Hemoglobin:** 11.5 g/ dL
 - **Lactate:** 4.4 mmol/ L

Case: more history & diagnostics

- Body weight:
 - ▶ ID (issued 8 years before): 172 cm, 75 kg
 - ▶ **Nurse evaluation: 80-85 kg**
- Fast ultrasound (FAST protocol): hypertrophic heart, normal systolic function, abdomen dilated gut
- CT Scan: **dissection of abdominal aortic aneurysm (AAA) with intra abdominal bleeding**
- Emergency surgery
 - ▶ 5.5 h
 - ▶ Large fluid volume (Ringer's lactate), blood, fibrinogen, FFP
 - ▶ **max lactate: 8 mmol/ L , min hemoglobin: 7.5 g/ dL**

postOP Day 1 on ICU

- **8 am**
 - ▶ Stable hemodynamics & ventilation
 - **Lactate:** 4 mmol/ L
 - **Glucose:** 140 mg/ dL
 - **K⁺ :** 3.4 mmol/ L
 - **PO₄⁻ :** 0.8 mmol/ L
 - ▶ **Norepinephrine (NE) ↓ 0.15 μg/ kg and min
Insulin ↑ 3 IU/ h**
 - ▶ **Fluid resuscitation with crystalloid & albumin**
 - ▶ Urinary output (UO): 800 ml (last 6 hours)
- Treatment plan: Awakening and weaning
 - ▶ no continuous fluid order, try decreasing Norepinephrine
give bolus Ringer's lactate if hemodynamics unstable
 - ▶ Nutrition: **start minimal enteral nutrition**

postOP nutrition plan for D1-D5

- **Metabolic evaluation**

- ▶ Unknown body weight, recent increase in weight with mobility restriction, BMI : 27-29
- ▶ Stress associated hyperglycemia, Insulin resistance
- ▶ Slight electrolyte deviation indicating higher needs
- ▶ Gut function unclear (surgery, fluid resuscitation, leakage)

- **Plan & strategy**

- ▶ Longer **ICU stay** to be expected
- ▶ Progressive nutrition with EN + PN
- ▶ **Target** by day 4-5 full nutrition based on **ideal BW**
calculation: $172 (\text{height}) - 100 \& (-\text{age } 1\% \text{ per year} > 65) = \mathbf{67}$
- ▶ Energy target: $\mathbf{67} \times 25 \text{ kcal}$ & protein target $\mathbf{67} \times 1.2 \text{ g}$
- ▶ **Prevent** refeeding syndrome: thiamin, phosphate

postOP Day 1...2 course

- Round D1, 8 pm (22 hours post surgery):
 - ▶ **Profound inflammatory response** (38.8 °C)
 - ▶ **Vasoplegia**
 - ▶ **NO** awakening, **NO** pain (?)CT scan (normal)
 - ▶ Increasing NE ↑ + Vasopressin 1 IU/h
- Next day D2
 - ▶ Large positive fluid balance
 - ▶ Inflammatory response ↓
 - ▶ Nutrition: **Residuals 350 ml at EN 10 ml/h**
- Maintain **minimal enteral nutrition**
- Start **parenteral nutrition** at 25-33% of target
- maintain glycaemia at 110-150 mg/dL (actual insulin 2 IU/h)

postOP Day 3

- Round 11 am
 - ▶ **Vasoplegia** ↓, norepinephrine ↓, vasopressin stop
 - ▶ **Edematous, some bowel sounds**
 - ▶ **Intermittent** awakening
 - ▶ + 3000 ml fluid balance, urine volume 2.1 liter.day⁻¹
- Lab values
 - **Lactate** 1.4 mmol/L
 - **Glucose** 140 mg/dL
 - **Creatinine** 1.30 mg/dL, **creaClearance: 25 ml/min**
 - **Urinary-N** 7.2 g (urinary urea x volume), **intestinal N?**
 - ▶ Nutrition: **Residuals 550 ml at EN 10 ml/h**

postOP Day 3 metabolic treatment

- Stop **minimal enteral nutrition**
 - ▶ **Evaluate intraabdominal pressure (IAP)**
 - ▶ Try again after 12 hours
- Increase **parenteral nutrition** to 66 % of target
- Sum of EN+PN = target (67 x 66% kcal/h)
= 44 ml/h (1150 kcal/ 24 hours)
- 2 commercial products with similar energy content
 - ▶ EN (100 ml): 100 Kcal (prot 3.8 g, gluc 13.8 g, lipid 3.4 g)
 - ▶ PN (100 ml): 110 Kcal (prot 5.0 g, gluc 12.5 g, lipid 3.8 g)

postOP Day 3/4 diagnostics & tx

- **D3: IAP: 17 mmHg (high intraabdominal pressure)**
 - ▶ Hemodynamics stable, no more tachycardia
 - Normal left systolic function, mildly reduced right heart function, tricuspid regurgitation grade II
 - Norepinephrine ↓ 0.08 µg/kg and mi
 - ▶ Insulin ↑ 2.5 IU/h (glucose 155 mg/dl)
- **Some right heart limitation / volume overload**
 - ▶ **Negative** fluid balance
(eventually continuous low dose diuretics)
 - ▶ Increase norepinephrine if needed
- **D4: IAP: 13 mmHg**
 - ▶ - 1000 ml fluid balance, urinary output: 2.5 liter/d
 - **Urinary-N** **8.4 g**
- Nutrition: **residuals 50 ml at EN 0 ml/h**

postOP Day 4 metabolic treatment

- Restart **EN**: Step 1 = 20 ml/h
 - ▶ **Monitor intraabdominal pressure (IAP)** & residuals
- Maintain **PN** at 66 % of target
- Sum of EN+PN = 44 + 20 ≈ **target** (67 kcal/h)
= 64 ml/h (1650 kcal/ 24 hours)
 - ▶ EN (100 ml): 100 Kcal (prot 3.8 g, gluc 13.8 g, lipid 3.4 g)
 - ▶ PN (100 ml): 110 Kcal (prot 5.0 g, gluc 12.5 g, lipid 3.8 g)
- Protein: 55 g (PN) + 19 g (EN) > 1g/kg IBW

postOP Day 8

- Round 9 am:
 - ▶ Since **D7 negative fluid balance**
 - ▶ **No diuresis** CVVHDF continued (since D5: bleeding shock)
 - ▶ Norepinephrine ↓ 0.05 µg/kg and min
 - ▶ Weaning (pressure support: 16/6 & FiO₂ 0.4)
 - ▶ Hemodynamic idem with further negative fluid balance
- **IAP: 13 mmHg**
- **Nutrition: residuals 50 ml at EN 40 ml/ h**
 - ▶ Insulin 3.2 IU/h (increasing dose since D2)
 - ▶ Organic phosphate 1 mmol/h , K⁺ 2 mmol/h

postOP Day 8 nutrition treatment

- Full **EN** to 100 % of target (67 ml/h)
- Stop **PN**
- Compensation for losses from **CVVHDF**
 - ▶ Double dose of **water soluble vitamins**
 - ▶ Electrolyte monitoring!
- **Protein:** 61 g (EN) < 1g/ kg IBW
 - Eventually consider increasing nutrition target or change to higher protein content if insulin dose stable and triglycerides < 350 mg/dl
 - Observe for 2 days metabolic tolerance

Final course & summary

- **Extubation day 10**
 - ▶ High flow oxygen for 2 days
 - ▶ Intermittent CPAP
 - ▶ Bronchoscopy for secretion retention
- **ICU acquired weakness:** training program from D 14
- **Swallowing** tested on day 16: negative
 - ▶ Logopedic training **(PN for 5 days)**
- **Diuresis** started day 19 (CVVH stopped D 22)
- **Discharge to ward** day 27

Summary

- **Nutrition adaptation needs multiple steps**
 - ▶ EN + PN Then again PN
 - ▶ Consider fluid dynamics, evolution and labs
 - ▶ Adaptation when CVVHDF
- **Weight unknown** ... estimate
- Obesity, untreated diabetes?
- Higher energy intake not tolerated
- **ICU acquired weakness** related to inflammation...
long ICU stay