A patient with acute heart failure and renal impairment

ACCA Masterclass 2017

Dr Sofie Gevaert
Mister P. J.M., 67-years-old

- **Cardiac risk factors:** Ex-smoker, AHT, Type 2 diabetes, BMI 43, Hyperlipidaemia
- **Medical history:**
  - 2009: Hospitalisation for heart failure: HFpEF
  - 2009: Sick sinus syndrome: DDD pacemaker
  - 1/2016 NSTEMI: PCI D1
  - 2014: Paroxismal atrial fibrillation
  - COPD GOLD II
  - 11/2011
    - NSTEMI, PCI LAD: 1 month triple R/: VKA-ASA-Clopidogrel
    - Gastro-intestinal bleed with need for transfusion: stop aspirin
    - CKD stage 3B: Serum creatinin 2.09mg/dl, eGFR 30.3mL/min/1.73m²
  - Echocardiography 11/2016:
    - Concentric LVH, EDD 52mm, nl systolic LVF
    - Pseudonormal relaxation pattern, E/E’ 16
    - Mild TR: 41mmHg, VCI>17mm, resp variation
    - TAPSE 11mm

*ACCA Masterclass 2017*
12/2016: hospitalization for AHF

- **Complaints:**
  Dyspnoea NYHA III, progressive over 6 days after resp infection treated with AB
  Peripheral edema
  Weight + 5kg
- **Medication:**
  - Allopurinol 100mg OD
  - Atorvastatin 80mg, OD
  - Bisoprolol 2.5 mg daily
  - Bumetanide 1mg OD
  - Clopidogrel 75mg
  - Pantoprazole 40mg
  - Ramipril 5mg OD
  - Warfarine ≈ INR
  - Salmeterol/fluticasone inhaler
12/2016: hospitalization for AHF

- **Clinical exam**
  - BP 116/60 mmHG, HR 63 BPM, SaO₂ 92%, RR 18
  - Jugular distension ++
  - Normal heart sounds
  - Decreased breathing, rales
  - Peripheral edema ++
Clinical Profile?

CONGESTION

- +

HYPOPERFUSION

- +

WARM-DRY

WARM-WET

COLD-DRY

COLD-WET

ESC guidelines AHF 2015
SHOCK

Yes → Ventilation support – Echocardiogram – ICU/CCU

High risk ACS

Yes → Cardiac catheterisation laboratory

No → SEVERITY SCORE

Respiratory distress
RR > 25/min,
SpO₂ < 90% on O₂,
or increased work of breathing

Haemodynamic instability
Low or high blood pressure,
Severy arrhythmia,
HR < 40 or > 130/min

Yes → RESUSCITATION AREA/CCU/ICU

To stabilize vital signs (echo if needed) and/or immediate non-invasive ventilation
(see chapter 3.1 page 43)

No → IV THERAPY

(see chapter 3.1 page 45)

DIAGNOSTIC TESTS
- ECG
- Laboratory tests (see chapter 3.1 page 44)
- Echo (lung, heart)
- Chest X-ray

ACCA toolkit 2015
Chest X-ray-ECG
• **Lab results**
  
  • Hct 36.3% (39-49)
  • K⁺ 5.5 mmol/L
  • Serum Creatinin **2.85 mg/dL** (0.72-1.17), eGFR: 22 mL/min/1.73 m²
  • proBNP: 2,400 pg/mL (≤125)
  • PH 7.37, pO₂ 55, pCO₂ 33.4
Timing echocardiography?

- Immediately
- <48 hours of admission
- Before discharge
- Not necessary, recent echo

Immediate echocardiography is mandatory only in patients with haemodynamic instability (particularly in cardiogenic shock) and in patients suspected of acute life-threatening structural or functional cardiac abnormalities (mechanical complications, acute valvular regurgitation, aortic dissection). Early echocardiography should be considered in all patients with de novo AHF and in those with unknown cardiac function; however, the optimal timing is unknown (preferably within 48 h from admission, if the expertise is available). Pocket-size echocardiography may be used as an extension of the clinical examination in the first instance where available. Repeated echocardiography is usually not needed unless there is relevant deterioration in clinical status.
Echocardiography

- Moderate views
- Restrictive relaxation pattern, E/E’ med 26
- TR grade 2+: 54mmHg, VCI>17mm no resp. variation
- TAPSE 11mm

→ ADHF triggered by respiratory infection
Initial treatment?

- IV diuretics
- IV diuretics and vasodilators
- Ultrafiltration
# Diuretics-Ultrafiltration

## Diuretics

Intravenous loop diuretics are recommended for all patients with AHF admitted with signs/symptoms of fluid overload to improve symptoms. It is recommended to regularly monitor symptoms, urine output, renal function and electrolytes during use of i.v. diuretics.

In patients with new-onset AHF or those with chronic, decompensated HF not receiving oral diuretics the initial recommended dose should be 20–40 mg i.v. furosemide (or equivalent); for those on chronic diuretic therapy, initial i.v. dose should be at least equivalent to oral dose.

It is recommended to give diuretics either as intermittent boluses or as a continuous infusion, and the dose and duration should be adjusted according to patients’ symptoms and clinical status.

Combination of loop diuretic with either thiazide-type diuretic or spironolactone may be considered in patients with resistant oedema or insufficient symptomatic response.

## Ultrafiltration

Ultrafiltration may be considered for patients with refractory congestion, who failed to respond to diuretic-based strategies.

Renal replacement therapy should be considered in patients with refractory volume overload and acute kidney injury.

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ESC guidelines AHF 2015
Referral CCU: IV diuretics and vasodilators

- Continuous infusion bumetanide 0.5mg/h for 24h
- Continuous infusion isosorbide dinitrate 2mg/h
- Negative fluid balance -3L 1st 24h → oral diuretics at increased dose

→

- Improvement kidney function: **2.0 mg/dl (eGFR 34mL/min)** at discharge
- Discharge after 72h:
  - Weight -5 kg
  - Oral dose Bumetanide increased to 2mg
  - Daily weight, salt restriction
  - Follow-up 4 weeks
Readmission 1 week later

• **Complaints:**
  Dyspnoea NYHA III, progressive 3 days, peripheral edema, weight +4 kilo

• **Medication:**
  - Allopurinol 100mg OD
  - Atorvastatine 80mg, OD
  - Bisoprolol 2.5 mg daily
  - **Bumetanide 2mg OD**
  - Clopidogrel 75mg
  - Pantoprazole 40mg
  - Ramipril 5mg OD
  - Warfarine ≈ INR
• **Clinical exam**
  - BP 128/55 mmHG, HR 56 BPM, SaO₂ 94%
  - Jugular distension
  - Normal heart sounds
  - Rales basal
  - Moderate peripheral edema

• **Lab results**
  - Serum creatinin: 2.3 mg/dL (+0.3mg/dL, GFR 28mL/min)
Could UF have prevented rehospitalization?

ADHF

Adjustable UF (up to 500mL/h) vs. diuretic R/ at discretion physician

UNLOAD trial, Costanzo et al, JACC 2007
Compliance problem? Diuretic resistance? Decongestion treatment?

- IV diuretics
- Increase oral dose
- Add thiazide or other
- Ultrafiltration
Referral to ward for IV diuretics

<table>
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<td>6</td>
<td>-</td>
<td>1.150</td>
<td>3.4</td>
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<tr>
<td>7</td>
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<td>8</td>
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<td>1.450</td>
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<tr>
<td>9</td>
<td>1mg PO</td>
<td>1.500</td>
<td>1.83</td>
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Too rapid decongestion $\rightarrow$ AKI

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<th>KDIGO definition of AKI</th>
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<tr>
<td>Increase in Scr level of $\geq$ 0.3 mg/dL (26.5 $\mu$mol/L)</td>
<td>$&lt;48h$</td>
</tr>
<tr>
<td>Increase in Scr level of $\geq$ 1.5 times baseline</td>
<td>$&lt;7$ d</td>
</tr>
<tr>
<td>Urine output $&lt;0.5$ mL/Kg/h</td>
<td>$&gt;6$ h</td>
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KDIGO: Kidney Disease Improving Global Outcomes
## KDIGO staging of AKI

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<th>Stage</th>
<th>Scr increase</th>
<th>Urine output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≥1.5-1.9 times baseline or ≥ 0.3mg/dL</td>
<td>&lt;0.5mL/kg/h for 6-12h</td>
</tr>
<tr>
<td>2</td>
<td>≥3times baseline or ≥ 4mg/dL or RRT</td>
<td>&lt;0.3mL/kg/h for ≥ 24h or Anuria for ≥12h</td>
</tr>
<tr>
<td>3</td>
<td>CRS type 1: acute cardiorenal</td>
<td></td>
</tr>
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</table>

www.escardio.org/ACCA  
ACCA Masterclass 2017
Could UF have prevented AKI?

ADHF+WRF:
Fixed UF rate (200mL/h) vs. defined stepped pharmacological R/

Figure 1. Changes in Serum Creatinine and Weight at 96 Hours (Bivariate Response).

CARESS trial,
Bart et al, NEJM 2012
OBJECTIVES The AVOID-HF (Aquapheresis versus Intravenous Diuretics and Hospitalization for Heart Failure) trial tested the hypothesis that patients hospitalized for HF treated with AUF have a lower risk of first HF event within 90 days after hospital discharge than those treated with ALD.

BACKGROUND Congestion in hospitalized heart failure (HF) patients is a major cause of hospital readmission and mortality. The AVOID-HF trial aimed to determine whether AUF could reduce the risk of HF readmission compared to ALD.

METHODS The AVOID-HF trial, designed as a multicenter, randomized, double-blind, placebo-controlled trial, was terminated unilaterally and prematurely by the sponsor (Baxter Healthcare) due to a worsening in the health status of patients (27.5%). Aquadex FlexFlow System (Baxter Healthcare) was used in the treatment group. The primary endpoint was hospitalization for HF within 90 days of discharge. The trial was adjudicated whether 90-day mortality was similar.

RESULTS A total of 110 patients were randomized to AUF (n=55) or ALD (n=55). The median time to first HF event for the AUF and ALD group was 69 and 61 days, respectively. Compared with the ALD group, the AUF group had fewer HF and cardiovascular events. More patients in the ALD group experienced an adverse effect of special interest. The 90-day mortality was similar in both groups.

CONCLUSIONS Compared with the ALD group, the AUF group had fewer HF and cardiovascular events. More patients in the ALD group experienced an adverse effect of special interest. Due to the trial's untimely termination, the findings should be interpreted with caution.

No difference in changes kidney function

AVOID trial, Costanzo, Bart et al, JACC HF 2016
3 weeks later, third admission

**Complaints:**
Dyspnoea NYHA IV, progressive since discharge, peripheral edema, weight +4 kg

**Medication:**
- Allopurinol 100mg OD
- Amlodipine 5 mg OD
- Atorvastatine 80mg, OD
- Bisoprolol 2.5 mg daily
- **Bumetanide 2-3mg OD, depending on weight**
- Clopidogrel 75mg
- Pantoprazole 40mg
- Ramipril 5mg OD
- Warfarine ≈ INR
• **Clinical exam**
  - BP 116/60 mmHG, HR 63 BPM, SaO$_2$ 88%
  - Jugular distension
  - New systolic murmur?
  - Decreased breathing, rales
  - Peripheral edema

• **Lab results**
  - Serum creatinin 2.2mg/dL
Immediate phase (initial 60–120 minutes)

Identification of acute aetiology:
- C acute Coronary syndrome
- H Hypertension emergency
- A Arrhythmia
- M acute Mechanical cause
- P Pulmonary embolism

No → Immediate stabilisation and transfer to ICU/CCU
Yes → Immediate initiation of specific treatment

Follow detailed recommendations in the specific ESC Guidelines

Diagnostic work-up to confirm AHF
Clinical evaluation to select optimal management
RUPTURED CHORDA of ant. LEAFLET MV

- Cardiac surgery
- Repair not successful → bioprosthesis CE Magna Ease
- Postoperative:

AKI, anuria → Dialysis
Thank you
How to avoid too rapid/much decongestion?

Decongestion goal
CLOSE monitoring of?

- BP
- weight
- Δ renal function/urine output
- Monitoring of intravascular volume
  - Hct as surrogate marker?
- Monitoring of CO?
  - CVO₂ as surrogate marker of CO?
  - ...

Vazir et al, Int J card 2016