Acute heart failure with hypotension and renal dysfunction

Alexandre Mebazaa
Hôpital Lariboisière,
University Paris 7, U942 Inserm
Paris, France
AHF with Systolic Dysfunction

Oxygen, CPAP
Furosemide ± Vasodilator
Clinical evaluation (leading to mechanistic therapy)

SBP > 100 mmHg
- Vasodilator (NTG, SNP, BNP)
- Good response
  - Oral therapy
  - Furosemide, ACEi

SBP 85 -100 mmHg
- Vasodilator and/or inotropic (dobutamine, PDEi, levosimendan)
- No response
  - Reconsider mechanistic therapy
  - Inotropic agents

SBP < 85 mmHg
- Volume loading?
- Inotrope?
  - and/or DA >5 μg/kg/min
- Norepinephrine?
  - Good response
    - Oral therapy
    - Furosemide, ACEi
  - No response
    - Reconsider mechanistic therapy
    - Inotropic agents

Acute Heart Failure ESC Guidelines, Eur Heart J 2005; 26:384
Medical history

- 77 yo male
- Weight 56 Kgs
- Ischemic cardiomyopathy diagnosed in 1997
- Three previous hospitalisations for decompensated CHF; the last one in April 2002
- NYHA class IV
- Standard medication for advanced CHF: ACE inhibitor, β-blocker, nitrate, furosemide, spironolactone
Physical examination when admitted in our hospital

- Extreme anxiety, dyspnoea
- Cool extremities
- Jugular veins not so much dilated in sitting position
- BP – 91/65 mmHg
- HR – 85 bpm
- RR – 26 /min
- Pulmonary auscultation – no rales, a bit of wheeze
- No urine output
Biological variables

- Arterial $pO_2$ 69.7 mmHg ($O_2$sat 96%) at room air
- Arterial $pCO_2$ 34 mmHg
- Lactate 3.5 mmol/L (NR < 2 mmol/L)
- Creatinine 350 µmol/L (NR < 120 µmol/L)
- AST and ALT 3 x upper level
- Phosphatase alkaline 3 x upper level
- Prothrombin time 45% (INR 2.0)
- Proteins 40 g/L
- BNP 2,398 pg/mL
What would be your first line therapy in this AHF patient with hypotension?

1. IV diuretics
2. IV nitrates
3. Volume loading
4. Hemodialysis
5. Non-invasive ventilation
Temp 35.8 °C

250 ml colloids in 15 min

HR

BP

SpO2

UO 10 ml/h 10 ml/h
1. Volume loading 250 ml
2. Volume loading 250 ml
3. Echocardiography showing LVEF 35%, dilated RV and IVC
4. Swan Ganz was introduced
What change in Swan Ganz parameters is unlikely?

1. increased wedged pressure
2. low cardiac index
3. low right atrial pressure
4. Dilated left ventricle
Swan Ganz in place

- SBP
- DPB
- Pcwp
- RAP

<table>
<thead>
<tr>
<th>Time</th>
<th>CI l/min/m²</th>
<th>UO ml/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>H0</td>
<td>1.3</td>
<td>20</td>
</tr>
<tr>
<td>H12</td>
<td>1.7</td>
<td>20</td>
</tr>
</tbody>
</table>

Dobutamine

7.5 µg/kg/min
What would be your first line therapy in this AHF patient with persistent hypotension?

1. IV diuretics
2. IV nitrates
3. Volume loading
4. Vasopressors
5. Non-invasive ventilation
Swan Ganz in place

CI l/min/m²
1.3
1.7
2.5

UO ml/h
20
20
110

Dobutamine
7.5 µg/kg/min

Norepinephrine 0.25 mg/h
Mechanism(s) of Low BP in AHF Patient?

- SBP < 85mmHg
- Oliguria (<0.5ml/Kg/hour)
- Clinical signs of tissue hypoperfusion

Heart rate

- Volemia
- Myocardial function
- Vessel tone
Hemodynamic Management of Shock:

First Steps

Impact of Heart rate and/or Volemia
SBP < 85mmHg
Oliguria (<0.5ml/Kg/hour)
Clinical signs of tissue hypoperfusion

Heart rate Normal / high
Give fluid challenge of 250 ml over 5 min
Improvement?
Yes, repeat if needed

Heart rate < 40 bpm
Isoprenaline or pacemaker as necessary

No
Myocardial and/or vascular dysfunction
When duration of shock is prolonged, this leads to a combination of mechanisms.
AHF with Systolic Dysfunction

Oxygen, CPAP
Furosemide ± Vasodilator
Clinical evaluation (leading to mechanistic therapy)

SBP > 100 mmHg
- Vasodilator (NTG, SNP, BNP) or
- Good response
  - Oral therapy
    - Furosemide, ACEI

SBP 85 - 100 mmHg
- Vasodilator and/or inotropic (dobutamine, PDEi, levosimendan)

SBP < 85 mmHg
- Volume loading?
- Inotrope?
  - and/or DA > 5 μg/kg/min
  - Norepinephrine?

No response
- Reconsider mechanistic therapy
  - Inotropic agents

Acute Heart Failure ESC Guidelines, Eur Heart J 2005; 26:384