Cardiovascular Physiology Conference

November 19, 2005

You are working at the Queen Lane Hospital emergency room, when a 53 year old female, named Sally Lovemore, is brought in via ambulance. She is suffering from chest tightness, has shortness of breath, feels nauseous, and is in obvious discomfort in her bed. Her blood pressure is 170/70, heart rate is 96, and respiratory rate is 22. Her skin is cool and clammy and she has no signs of peripheral edema. You perform an EKG and believe that she is suffering from a myocardial infarction. You give 2 sublingual nitroglycerin tablets at five minute intervals, but there is no change in her EKG. You decide to give intravenous nitroglycerin.

1. What change in the EKG would lead you to think that she is having a myocardial infarction?

2. Draw a normal set of cardiovascular function curves and also a set of CV function curves that may occur during an acute myocardial infarction.

3. Draw a normal pressure-volume loop and also the PV loop that may occur during an acute myocardial infarction.
4. What happens to cardiac output following myocardial infarction? Stroke volume? Heart rate? Myocardial work?

5. What is the purpose of nitroglycerine?

*Today*
Sally Lovemore comes to the clinic with a history of fatigue for the past 6 months and dyspnea which has gotten worse in the last week. In fact, she says “I have been unable to sleep lying down and prefer to sleep upright in my chair.” Her blood pressure is 100/85, heart rate is 120, and respiration rate is 28 per minute. You order labs and also cardiac tests (EKG, echocardiography, pulmonary artery catheterization)

**Physical exam:**
- Mucous Membrane and Skin: mucous membranes are pale and grayish-blue; skin is cool and clammy to touch
- Lungs: Inspiratory crackles half way up to apices
- Heart: jugular venous distention; auscultation reveals a murmur of mitral regurgitation; S3 is audible
- Abdomen: distended and mildly tender liver
- Extremities: pitting edema to knees

**Lab Results:**
- Na+ = 125 mg/dl (Normal 135-145)
- Slightly elevated BNP

6. Explain the following symptoms: inspiratory crackles, jugular venous distention, tender liver, pitting edema.

7. Why do you think that she may be hyponatremic?
Test results:

EKG: sinus tachycardia, evidence of old myocardial infarct

Echocardiography: dilated left atrium, left ventricle, and right atrium; severe left ventricular global hypokinesis; ejection fraction is 30%. This suggests heart failure.

Pulmonary Artery Catheter:

<table>
<thead>
<tr>
<th>Location</th>
<th>Pressure (mmHg)</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Atrium</td>
<td>25</td>
<td>2-10</td>
</tr>
<tr>
<td>Right ventricle</td>
<td>70/28</td>
<td>25-40/10</td>
</tr>
<tr>
<td><strong>Pulmonary Artery</strong></td>
<td>70/40</td>
<td>25-40/15-20</td>
</tr>
<tr>
<td><strong>Pulmonary capillary wedge</strong></td>
<td>35</td>
<td>8-15</td>
</tr>
<tr>
<td><strong>Radial artery</strong></td>
<td>100/70</td>
<td></td>
</tr>
</tbody>
</table>

Heart Rate = 144/min
Cardiac output = 2.1 L/min
Systemic vascular resistance = 2600 RU (Normal: 800-1200 RU)

8. Draw a normal set of CV function curves and also a set from the patient today.

9. Draw a normal PV loop and also from the patient today.

10. Based upon what you have learned in the CV physiology section, what parameters can you change as a physician to treat this patient?