Groups 13-24: Cardiac Case and Cardiac Exam Workshop

OR: http://medicine.ucsd.edu/clinicalmed/heart.htm

Prepare by:
- Having at least one student bring physiology lecture notes and a physiology textbook
- Bringing your stethoscope
- Dressing for the cardiac exam workshop (2-piece outfit, sports bra, tank top, gown)
- Mentors bring physical exam supplies, including mats and gowns

Brief Outline:

Section 1: Touch Base (20 minutes)

Section 2: Case with Chest Pain and Fever (1 hour)

Section 3: Cardiac Exam Workshop (1 ½ hour)/ Female SP chest exam

Section 4: Evaluate Session (10 minutes)

Preparation for next session:

Readings:

OR: http://medicine.ucsd.edu/clinicalmed/heart.htm


Schmidt SA. When You Come Into My Room. JAMA 276(7): 512, 8/21/96

Bring: The results of your research into the learning objectives from this week’s case.
Section 1: Touch Base  (30 minutes)

Section 2: Case discussion - A Young Man with Fever and Shortness of Breath

Goal:
1. To use principles reviewed in cardiac physiology to understand the physiology of the condition described in the case.

Objectives:
1. Describe the physiology underlying abnormal physical findings found in this patient.
2. Describe the alterations in normal physiology caused by the disease process illustrated in the case.

Case – Part 1

You are seeing a 27-year-old-male with a history of anxiety disorder who was admitted to the hospital because of fever and shortness of breath. The patient had been in his usual state of good health until four days ago, when he developed flu like illness with fever, myalgias (muscle aches), and a non-productive cough. Yesterday he developed shortness of breath. The shortness of breath began suddenly and has steadily worsened overnight. He came into the ER because of increasing difficulty catching his breath. He feels short of breath at rest, and the shortness of breath is worsened if he moves about or lies down. He has started coughing up some frothy pink sputum, and he is complaining of feeling “clammy.” He has a sense of “fullness” in his chest that he relates to the shortness of breath. No sharp pain or pressure type pain.

Past Medical History:
History of mitral valve prolapse. Was told that he would need to take antibiotics before dental procedures. Thinks he might have been told that he had a “slight heart murmur.” No other significant medical illnesses
No past surgeries. Did have a “boil” that he recently had for several weeks. It drained several days ago. He did not seek medical care because he does not have insurance.

Social History
He uses no drugs, does not smoke or drink. He is in a monogamous sexual relationship with his girlfriend of 4 years. She has been his only lifetime partner. He worked at Technicolor, but has been laid off with company’s closure. He was offered COBRA\(^1\) coverage, but could not afford it. Is very concerned about hospital bills.

Case – Part 2

Vital signs: T 101.6, resp 32, P 120, pulses present but weak, BP 100/50.
The patient’s chest is resonant to percussion, with crackles heard over the lower 2/3 of both lung fields. The PMI (point of maximal impulse) is difficult to feel; you are unsure whether

\(^1\) COBRA is a federal law mandating that employers offer departing employees the option to purchase health insurance through the company’s health insurer.
you can feel it, and the heart sounds are difficult to hear because of the crackles. You hear an S₂, but no S₁. There is a loud, 3/6 holosystolic murmur heard best at the apex; it radiates towards the axilla. The patient's neck veins are distended, even when he is sitting upright. He is very uncomfortable in the supine position and cannot lie down long enough for you to complete your cardiac exam. The patient has no edema, but does have what appear to be small red "splinters" under several of his fingernails, near the nail cuticle. He has one painful, red nodule on the plantar aspect of his left foot.

What are the abnormal physical findings noted above?

What physiologic processes could explain these findings?

Patient's X-ray:
Normal Chest x-ray for comparison:

What differences do you notice between the patient’s chest x-ray and the normal x-ray?
How do the x-ray findings you noticed correlate with the physical examination findings?
What are possible causes for the patient’s current illness?
Case – Part 3: Learning objective/ research

Learning Objectives: Please select ONE to answer from the list below:

1. What are possible causes of the patient’s shortness of breath?
2. What is mitral valve prolapse? How is it diagnosed and treated?
3. Why are antibiotics given to people with some heart conditions?
4. What are possible causes of the patient’s heart murmur?
   How might these (causes of heart murmur) lead to patient’s symptoms?
5. How could the boil that the patient had be related to his current condition?
6. What is congestive heart failure? How is it diagnosed and treated?
7. What is pulmonary edema? How is it diagnosed and treated?

Please search for the answer to your chosen learning objective in EACH search tool below:

- MD Consult
- UPtoDATE
- GOOGLE

1. Please state your learning objective.
2. What was your search strategy or technique in using each tool? For example: I searched GOOGLE using “term”, found 150,000 hits, selected 2 web sites to look at based on the reputation of their authoring institution and currency.
3. What was the specific source of information for your answer (e.g. textbook, practice guideline, journal article, patient handout, university web site, etc.)?
4. Please indicate what your answer is to this learning objective.
5. Please compare and contrast the strengths and weaknesses of each search tool for answering your particular learning objective. For example, which search tool took the least amount of time? Which tool provided the best answer?
6. Did you find the same answer using each tool? If not, why?
7. How do you know if the answer you found is correct?

Please be prepared to present your findings next week.
Section 2: Cardiac Examination Workshop (1 1/2 hours)

Objectives: By the end of this session, you will be able to:
- Identify a normal S1 in each of the 4 heart listening areas
- Identify S2 and hear physiologic S2 splitting in at least one person
- Hear the differences in sound transmitted through the stethoscope’s bell and diaphragm
- Recognize the components of a normal jugular venous pulse
- Identify carotid and other peripheral pulses
- Examine a woman’s heart, including draping

Logistics:

Part A: Standardized patient examination
A woman standardized patient will join your group for part of this exercise. With her help, your mentor will demonstrate appropriate draping and examination of a woman’s heart. A few hints:

1. Base (upper part) of the heart can usually be examined from above (neckline).
2. To examine left lower sternal border (LLSB) and apex, examiner can move center of covering sheet or gown up toward the sternal angle, forming an open triangle that exposes both listening areas while covering most of the breasts.
3. If a woman’s left breast covers her apex, ask her to move her breast up so you can examine under it.
4. After demonstration, group can move to another room to begin Part B (practicing on each other), while one member at a time comes to practice auscultation of the four listening areas on the SP. A mentor will stay with the SP as an escort and to help the student, while the other mentor accompanies the other students in the group as they practice.

Part B: practice on each other
Exercise 1: the four heart listening areas
On yourself, while sitting up, find:

- The angle of Louis (sternal angle). Trace the second rib on either side of this angle and find the space underneath the rib on each side of the sternum:
- The right sternal border (aortic area): second right intercostal space
- The left upper sternal border (pulmonic area): second left intercostal space
- The left lower sternal border (tricuspid area): fourth and fifth left intercostal spaces just left of the sternum; count ribs down from the second
- The apex (mitral area): fifth intercostal space at the left midclavicular line

For all other exercises, break into pairs. One student lies down while the other examines; then switch.
Exercise 2: find S1
With a slow heart rate, S1 is the first sound – the “lub” of “lub-dub.” When heart rate is rapid, telling one from another is not so easy. To find S1:

1. Locate and palpate the carotid pulse in your supine “patient.” Keep one hand on the carotid pulse with just enough pressure to palpate it reliably.
2. With your other hand, place the diaphragm of your stethoscope on the second left intercostal space and listen for the heart sounds. S1 immediately precedes or coincides with the carotid upstroke.
3. Listen for long enough that you are certain that you can tell S1 from S2 in this location.
4. Now, listen with the diaphragm of your stethoscope in each of the four heart listening areas. Where is S1 loudest? Why? Is either sound louder at the left upper sternal border? If so, which one?

Note: in some people, S1 can seem to be a slightly wider sound, while in others it is a narrow click. Either is normal, so we don’t comment on it.

Exercise 3: hear S2 and listen for physiologic S2 splitting

S2 is a composite of two valve closure sounds: P2, the closing of the pulmonic valve, and A2, the closing of the aortic valve. The aortic valve closes with four to six times the force of the pulmonic valve, so it is the loudest sound in all-normal hearts. Because the aortic is so much louder than the pulmonic valve, we listen for valve splitting in the pulmonic area – the left upper sternal border.

Because of increased blood flow to the right ventricle during inspiration, the pulmonic valve closes later during inspiration – so P2 comes after A2. This causes a split S2 during inspiration, which closes during expiration.

1. Listen with the diaphragm at the left upper sternal border. Use the carotid upstroke to identify S1. Now identify and pay attention to S2 with normal breathing.
2. Ask your “patient” to breathe in slowly, to a count of one-one thousand-two-one thousand-three-one thousand, etc, to a count of six. Hold the breath for three counts, then breathe out in the same way to a count of six and hold it for two or three counts. Listen to S2 closely during these maneuvers. Can you hear a split during inspiration? Which part of the sound is louder?
3. S2 splitting is easier to hear in some people than in others. If one of you has an especially clear S2 split, let others listen to it.
4. While you are listening during respiration, pay attention to the heart rate. In normal young people, it may be more rapid during inspiration and slower during expiration. This is called sinus arrhythmia.

Note on abnormal S2 splitting: either a non-split S2 or one that closes during expiration is normal. An S2 that stays split throughout respiration is called a fixed split S2 and is abnormal. In paradoxical splitting, S2 is closed with inspiration and splits with expiration. This is abnormal, too.
**Exercise 4: sound transmission by bell and diaphragm of stethoscope**

1. Place the diaphragm of your stethoscope at the apex (point of maximal impulse) and listen to S1 and S2. Pay attention to their pitch and intensity.
2. Now, switch to the bell and listen to the same sounds, touching the bell lightly to the chest. Switch back and forth and listen to the pitch of the sounds with each.
3. Listen with the bell with light pressure, then press down hard on the chest wall to “convert” the bell to a diaphragm. Listen to how the sound changes.

Note on gallop rhythms: both S4 (just before S1) and S3 (just after S2) are very low-pitched sounds audible with the bell of the diaphragm at the apex. They are vibrations – almost easier to feel than to hear. Occasionally, you can hear one of these in a slender normal person at the end of expiration. See if you can find one in your “patient.”

**Exercise 5: jugular venous pulse**

In a supine person, the jugular venous pulse (JVP) is easily visible – both external (visible vein in the neck) and internal (pulsation under the sternocleidomastoid muscle). The JVP is an estimate of right atrial pressure (which is normally around 10 cm of water). (The right atrium is near the level of the anterior fourth intercostal space, i.e. about 5 cm below the angle of Louis.) In an upright patient, the clavicles are 13 cm or more above the right atrium – so visible JVP is abnormal.

In your supine “patient,” you can see the contours of a normal JVP. To help you time the JVP, feel the carotid pulse on one side as you look at the other side.

Shining a light across the lateral neck will make the JVP easier to see. Look closely for:

- The three-beat rhythm of the JVP
- The first (A) wave as the atria contract
- The (shortly afterward) C wave as the tricuspid valves close (onset of systole)
- The (separate) V wave as right atrial volume increases late in systole, increasing right atrial pressure
- The carotid pulsation (single pulse, coincides with V wave and with palpable carotid pulse.)
Exercise 5: Palpate pulses
Palpate the following pulses, using pads of fingers:
- Carotid
- Brachial
- Radial
- Popliteal
- Dorsalis pedis
- Posterior tibial

Section 4 (10 minutes): Evaluate session.
# Physical Examination

**Objective Structured Clinical Examination (OSCE)**

**Heart & Blood Vessels**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Comments</th>
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<tbody>
<tr>
<td>1. JUGULAR VENOUS PULSE INSPECTION: Pt should recline to 30 to 45 degrees from horizontal while Ex shines his/her pen light over right side of the Pt’s neck. (Will only be assessed if exam table inclines)</td>
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<td>2. PRECORDIAL INSPECTION: Ex inspects precordium (looks at area and states: “I am checking the precordium for visible pulsations” or similar statement).</td>
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<td>3. PRECORDIAL PALPATION: Ex should use the palmar surface of his/her fingers to gently palpate the left sternal border and the base while lying.</td>
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<td>4. APICAL IMPULSE PALPATION: Ex should ask Pt to “exhale and hold it” while, Ex locates the pulse. Ex may need to roll pt midway to the left while lying.</td>
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<td>5-8. HEART: Ex should listen to the heart in each of the following FOUR AREAS while Pt is lying down:</td>
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<td>5. Aortic area</td>
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<td>6. pulmonic area</td>
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<td>7. tricuspid area</td>
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<td>8. mitral area</td>
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<td>In select situations, it may be best to listen to the patient sitting upright and in a left lateral decubitus position. This is a special maneuver and is not required.</td>
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<td>9. AUSCULTATION TECHNIQUE: Ex should listen to Pt’s heart using the diaphragm AND bell of the stethoscope. When using the diaphragm, it should be pressed firmly onto chest. When using the bell, it should be applied lightly to produce an air seal with its rim against chest.</td>
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<td>10 – 14. PULSES: Ex should locate and palpate the following pulses bilaterally:</td>
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<td>10. brachial</td>
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<td>11. radial</td>
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<td>12. popliteal</td>
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<tr>
<td>13. dorsalis pedis</td>
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<td>14. posterior tibial</td>
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<td>15. CAROTID PULSE: Ex should exert gentle pressure with the pads of fingers on pt’s carotid artery just below the corner of the jaw. This procedure should be repeated on the opposite side and should not be done simultaneously. Ex should use stethoscope to listen to the carotid artery. Pt should be asked to hold breath while Ex listens.</td>
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