Projector Center

Let's Have a Hand for the Cardiac Cycle

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Guest Author

A cycle is a circle. There's no way out of it. Most human anatomy and physiology books that I've reviewed, though, use left-to-right linear formats for the cardiac cycle. Typically, texts provide illustrations such as pressure-volume plots or electrocardiogram tracings, often in complex multifactorial figures (e.g. Marieb 1989; Seeley, Stephens & Tate 1992; Solomon, Schmidt & Adragna 1990). There is much valuable information in these diagrams, but their linearity isn't intuitive. They are thus difficult for students to grasp at first. So, why not present the cardiac cycle with a circle? Better yet, why not have some fun doing it?

A "Handy" Activity

A good way to introduce students to the cardiac cycle is illustrated by the three sets of hands on the transparency (Surmacz 1990). Using one hand held above the other to represent atria and ventricles, a clenched fist for systole, and an open palm for diastole, the basic cycle of "atrial systole/ventricular diastole, atrial diastole/ventricular systole, both in diastole" can be quickly demonstrated. The outer and inner circles on the diagram correspond to these general phases. Get the students involved! Try it at 72 cycles per minute!

A Walk Through the Presentation

The following is approximately how I present the mid-portion of the diagram in class. The approximate times for various events are those given by McClintic (1985).

During atrial systole, the atria contract, packing additional blood into the ventricles and thus raising intraventricular pressure.

At the beginning of ventricular systole, the cuspid valves close. This is the first heart sound, "lub." A constant volume of blood is now trapped in the ventricles, and as the ventricles continue to contract, pressure inside them rises dramatically. This stage is known as isovolumetric contraction. When intraventricular pressure becomes high enough to force the semilunar valves open, ejection occurs.

During ejection, blood is pumped into the pulmonary trunk from the right heart and the aorta on the left. When the ventricles start to relax, intraventricular pressure drops below that in the big vessels, so blood flows back toward the ventricles, and the semilunar valves close. This is the second heart sound, "dub."

Isovolumetric relaxation begins. Again, all valves are closed, but this time the ventricles are emptied and in a smaller, contracted configuration. The atria contain blood that returned to them during atrial diastole. As ventricular diastole begins, intraventricular pressure drops below that in the atria, and the cuspid valves open. Blood rushes from the atria into the ventricles (rapid ventricular filling). As more blood enters the ventricles, the pressure differential between atria and ventricles diminishes, and reduced ventricular filling results.

Then, the atria contract, packing additional blood into the ventricles and thus raising intraventricular pressure . . .

A few full reiterations, perhaps a good-natured spoof of students' requests for verbatim repetition, followed by a closer look at those textbook graphs and the "hand jive" again, concludes what has become a perennial favorite lecture for me and my students.

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Acknowledgments

I thank Judith Sparlin (Clarion University of Pennsylvania) for providing ideas that substantially improved this manuscript and Cynthia Surmacz (Bloomsburg University, Bloomsburg, Pennsylvania) who introduced me to the "hand signal" approach to the cardiac cycle.

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