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Perspective

A General Perspective on the Cardiac Cycle

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DESCRIPTION

The cardiac cycle describes the performance of the human heart from the start of one heartbeat to the start of the next. It is divided into two parts: diastole, when the heart muscle relaxes and refills with blood, and systole, when the heart muscle contracts and pumps blood. After emptying, the heart immediately relaxes and expands to receive another influx of blood returning from the lungs and other body systems before contracting again to pump blood to the lungs and other body systems. A normally functioning heart must be fully expanded before it can pump efficiently again. Each cardiac cycle, or heartbeat, takes about 0.8 seconds to complete, assuming a healthy heart and a typical rate of 70 to 75 beats per minute. The heart has two atrial and two ventricle chambers; they are paired as the left and right hearts, that is, the left atrium with the left ventricle and the right atrium with the right ventricle, and they work together to continuously repeat the cardiac cycle.

The heart relaxes and expands at the start of the cycle, during ventricular diastole early, while receiving blood into both ventricles through both atria; then, near the end of ventricular diastole late, the two atria contract, and each atria pumps blood into the ventricle below it. During ventricular systole, the ventricles contract and pulsate two separate blood supplies from the heart, one to the lungs and one to the rest of the body's organs and systems, while the atria relax. This precise coordination ensures that blood is collected and circulated efficiently throughout the body. The mitral and tricuspid valves, also known as the atrioventricular or AV, valves open to allow filling during ventricular diastole. The atria begin to contract late in the filling period, forcing a final crop of blood into the ventricles under pressure. The ventricles then contract in response to electrical signals from the sinoatrial node, and as back-pressure against them increases, the AV valves are forced to close, preventing blood volumes in the ventricles from flowing in or out; this is known as the isovolumic contraction stage.

Due to systolic contractions, pressures in the ventricles rapidly rise, exceeding pressures in the trunks of the aorta and pulmonary arteries and causing the necessary valves to open, resulting in separated blood volumes ejected from the two ventricles. The ejection stage of the cardiac cycle is depicted as the first phase of ventricular systole, followed by the second phase of ventricular systole. When ventricular pressures fall below their peak and below those in the trunks of the aorta and pulmonary arteries, the aortic and pulmonary valves close again. This is the isovolumic relaxation, during which pressure within the ventricles begins to fall significantly and the atria begin to refill as blood returns to flow into the right and left atriums. The mitral and tricuspid valves reopen as the ventricles relax, and the completed cycle returns to ventricular diastole and a new "start" of the cardiac cycle. Blood pressure rises and falls throughout the cardiac cycle. A series of electrical impulses produced by specialized pacemaker cells found in the sinoatrial node and the atrioventricular node coordinate the movements of cardiac muscle. Cardiac muscle is made up of myositis that initiate internal contractions without using external nerves, with the exception of changes in heart rate caused by metabolic demand.

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