Postgraduate Certificate in Electrocardiography

Cardiac Anatomy and Physiology

Cardiac Anatomy and Physiology

Cardiac anatomy and physiology refer to the structure and function of the heart, including its chambers, valves, vessels, and electrical system. Understanding cardiac anatomy and physiology is crucial for interpreting electrocardiograms accurately and diagnosing various heart conditions. This glossary will cover key terms related to cardiac anatomy and physiology in the context of the Postgraduate Certificate in Electrocardiography.

Atria

The atria are the two upper chambers of the heart responsible for receiving blood from the body (right atrium) and the lungs (left atrium). They contract to push blood into the ventricles.

Ventricles

The ventricles are the two lower chambers of the heart that pump blood out to the body (left ventricle) and the lungs (right ventricle). They have thicker walls than the atria to generate enough force to propel blood through the circulatory system.

Septum

The septum is the wall of tissue that separates the right and left sides of the heart, preventing oxygen-rich and oxygen-poor blood from mixing. It plays a crucial role in maintaining the efficiency of the circulatory system.

Valves

Valves in the heart control the flow of blood between chambers and prevent backflow. The four main heart valves are the tricuspid valve, pulmonary valve, mitral valve, and aortic valve.

Tricuspid Valve

The tricuspid valve is located between the right atrium and right ventricle. It opens to allow blood to flow from the atrium to the ventricle and closes to prevent backflow.

Pulmonary Valve

The pulmonary valve is situated between the right ventricle and the pulmonary artery. It opens to allow blood to be pumped to the lungs for oxygenation and closes to prevent blood from flowing back into the heart.

Mitral Valve

The mitral valve, also known as the bicuspid valve, is found between the left atrium and left ventricle. It opens to permit blood to pass from the atrium to the ventricle and closes to prevent regurgitation.

Aortic Valve

The aortic valve is located between the left ventricle and the aorta, the body's main artery. It opens to allow oxygenated blood to be pumped out to the body and closes to prevent blood from re-entering the heart.

Coronary Arteries

The coronary arteries supply the heart muscle with oxygen-rich blood. They branch off from the aorta and encircle the heart, ensuring that the heart receives the nutrients it needs to function properly.

Cardiac Cycle

The cardiac cycle refers to the sequence of events that occur during one heartbeat. It includes atrial and ventricular contraction (systole) and relaxation (diastole), as well as the opening and closing of heart valves to facilitate blood flow.

Electrical Conduction System

The electrical conduction system of the heart controls the heartbeat by generating and transmitting electrical impulses that coordinate the contraction of cardiac muscle cells. It includes the sinoatrial (SA) node, atrioventricular (AV) node, bundle of His, bundle branches, and Purkinje fibers.

Sinoatrial (SA) Node

The SA node is the heart's natural pacemaker, located in the right atrium. It initiates each heartbeat by generating an electrical signal that causes the atria to contract.

Atrioventricular (AV) Node

The AV node is located between the atria and ventricles and serves as a relay station for electrical impulses. It delays the signal to allow the atria to contract before the ventricles, ensuring efficient blood flow.

Bundle of His

The bundle of His is a collection of specialized muscle fibers that transmit the electrical impulse from the AV node to the ventricles, coordinating their contraction.

Bundle Branches

The bundle branches are extensions of the bundle of His that deliver the electrical signal to the right and left ventricles, ensuring synchronized contraction.

Purkinje Fibers

Purkinje fibers are specialized conducting fibers that distribute the electrical impulse throughout the

ventricles, causing them to contract from the apex upward.

Electrocardiogram (ECG or EKG)

An electrocardiogram is a test that records the electrical activity of the heart using electrodes placed on the skin. It provides valuable information about the heart's rhythm, rate, and conduction system.

Normal Sinus Rhythm (NSR)

Normal sinus rhythm refers to the typical pattern of electrical activity in the heart, originating from the SA node. It is characterized by a regular heart rate (60-100 beats per minute) and a coordinated sequence of atrial and ventricular contractions.

Arrhythmia

An arrhythmia is an abnormal heart rhythm that can manifest as tachycardia (fast heart rate), bradycardia (slow heart rate), or irregular heartbeats. It may result from disturbances in the heart's electrical conduction system.

Atrial Fibrillation (AFib)

Atrial fibrillation is a common type of arrhythmia characterized by rapid and irregular electrical impulses in the atria. It can lead to inefficient blood pumping and an increased risk of stroke.

Ventricular Fibrillation (VFib)

Ventricular fibrillation is a life-threatening arrhythmia that causes the ventricles to quiver ineffectively, leading to cardiac arrest. Immediate treatment with defibrillation is necessary to restore normal heart rhythm.

Myocardial Infarction (MI)

Myocardial infarction, commonly known as a heart attack, occurs when a coronary artery becomes blocked, cutting off blood flow to part of the heart muscle. This can result in tissue damage or death if not promptly treated.

Ischemia

Ischemia refers to insufficient blood flow to a particular area of the heart, usually due to a blockage in a coronary artery. It can lead to chest pain (angina) and, if severe, myocardial infarction.

Cardiomyopathy

Cardiomyopathy is a disease of the heart muscle that can lead to heart failure. It may be caused by genetic factors, infections, toxins, or other underlying conditions.

Heart Failure

Heart failure occurs when the heart is unable to pump enough blood to meet the body's needs. It can result from various heart conditions, leading to symptoms such as fatigue, shortness of breath, and fluid retention.

Valvular Heart Disease

Valvular heart disease refers to conditions that affect the heart valves, such as stenosis (narrowing), regurgitation (leakage), or prolapse. These abnormalities can disrupt normal blood flow and cardiac function.

Hypertension

Hypertension, or high blood pressure, is a common condition that can strain the heart and blood vessels over time. It is a significant risk factor for cardiovascular disease, including heart attacks and strokes.

Heart Murmur

A heart murmur is an abnormal sound heard during auscultation of the heart, indicating turbulent blood flow through the valves. Murmurs can be innocent (benign) or signify underlying heart problems.

Cardiac Output

Cardiac output is the amount of blood the heart pumps out per minute, calculated by multiplying stroke volume (amount of blood pumped per heartbeat) by heart rate. It reflects the heart's efficiency in delivering oxygen and nutrients to the body.

Stroke Volume

Stroke volume is the volume of blood ejected from the left ventricle with each heartbeat. It is influenced by factors such as preload (volume of blood in the heart), afterload (resistance to blood flow), and contractility (heart muscle strength).

Preload

Preload refers to the amount of blood in the ventricles at the end of diastole, just before contraction. It determines the stretch of the heart muscle and influences stroke volume.

Afterload

Afterload is the resistance the heart must overcome to eject blood from the left ventricle into the aorta. High afterload can impair cardiac function and lead to increased workload on the heart.

Contractility

Contractility refers to the strength and efficiency of the heart muscle's contractions. It plays a crucial role in maintaining cardiac output and can be influenced by factors such as medications, hormones, and disease.

Frank-Starling Law

The Frank-Starling law of the heart states that the heart will pump more blood if it is filled with more blood before contraction. This relationship between preload and stroke volume helps the heart adapt to changing demands.

Cardiac Reserve

Cardiac reserve refers to the heart's ability to increase cardiac output above resting levels in response to stress or exercise. It reflects the heart's capacity to meet the body's increased oxygen demand.

Baroreceptors

Baroreceptors are specialized sensory receptors located in the walls of blood vessels and the heart that detect changes in blood pressure. They help regulate heart rate and blood vessel constriction to maintain blood pressure within a narrow range.

Autonomic Nervous System

The autonomic nervous system controls involuntary functions of the body, including heart rate, blood pressure, and digestion. It consists of the sympathetic (fight or flight) and parasympathetic (rest and digest) branches.

Sympathetic Nervous System

The sympathetic nervous system prepares the body for action by increasing heart rate, constricting blood vessels, and releasing stress hormones. It plays a crucial role in the body's response to stress and exercise.

Parasympathetic Nervous System

The parasympathetic nervous system helps the body rest and recover by slowing heart rate, relaxing blood vessels, and promoting digestion. It counterbalances the effects of the sympathetic nervous system.

Cardiac Stress Test

A cardiac stress test is a diagnostic test that measures how the heart responds to physical exertion. It may involve exercise on a treadmill or medication-induced stress to evaluate heart function and detect coronary artery disease.

Echocardiogram

An echocardiogram is a non-invasive imaging test that uses sound waves to create a detailed picture of the heart's structure and function. It can assess heart size, valve function, and blood flow patterns.

Cardiac Catheterization

Cardiac catheterization is a procedure that involves inserting a thin tube (catheter) into a blood vessel and threading it to the heart. It allows for the measurement of pressures, collection of blood samples, and visualization of the coronary arteries.

Heart Rate

Heart rate is the number of times the heart beats per minute, reflecting the body's demand for oxygen and nutrients. It can be influenced by factors such as age, fitness level, stress, and disease.

Heart Sounds

Heart sounds are the noises produced by the heart during the cardiac cycle, heard through auscultation with a stethoscope. The two main heart sounds are "lub-dub," representing the closure of heart valves during contraction and relaxation.

Pacemaker

A pacemaker is a small device implanted in the chest to regulate heart rhythm by sending electrical impulses to the heart muscle. It is used to treat bradycardia, tachycardia, and other arrhythmias.

Cardiac Rehabilitation

Cardiac rehabilitation is a structured program of exercise, education, and lifestyle modification designed to improve heart health and recovery after a heart attack, heart surgery, or other cardiac events.

Cardiovascular Disease (CVD)

Cardiovascular disease refers to conditions that affect the heart and blood vessels, such as coronary artery disease, heart failure, and stroke. It is a leading cause of death worldwide.

Electrophysiology

Electrophysiology is the study of the heart's electrical system and its disorders. It involves the mapping of electrical signals in the heart to diagnose and treat arrhythmias.

Heart Block

Heart block is a condition in which the electrical signals between the atria and ventricles are delayed or blocked, leading to abnormal heart rhythms. It can range from mild to severe, requiring treatment with medications or pacemakers.

Cardiac Arrest

Cardiac arrest is a sudden loss of heart function, causing the heart to stop beating. It is a medical emergency that requires immediate intervention with cardiopulmonary resuscitation (CPR) and defibrillation.

Cardiopulmonary Resuscitation (CPR)

Cardiopulmonary resuscitation is a lifesaving technique used to revive individuals experiencing cardiac arrest. It involves chest compressions and rescue breaths to maintain blood flow and oxygenation until advanced medical care is available.

Defibrillation

Defibrillation is a treatment for life-threatening arrhythmias, such as ventricular fibrillation, that involves delivering an electric shock to the heart to restore normal rhythm. Automated external defibrillators (AEDs) are used in public settings for rapid defibrillation.

Cardiac Enzymes

Cardiac enzymes are proteins released into the bloodstream following heart muscle damage, such as in a heart attack. They can be measured through blood tests to diagnose myocardial infarction and assess the extent of cardiac injury.

Cardiac Troponins

Cardiac troponins are specific proteins found in heart muscle cells that are released into the bloodstream during myocardial infarction. They are sensitive markers of heart injury and play a key role in diagnosing acute coronary syndromes.

Cardiac Biomarkers

Cardiac biomarkers are substances in the blood that indicate heart damage or stress. They include enzymes, proteins, and other molecules that can help diagnose heart conditions and monitor treatment response.

Cardiac Imaging

Cardiac imaging encompasses various techniques used to visualize the heart's structure and function, such as echocardiography, cardiac MRI, and nuclear imaging. These tests provide valuable information for diagnosing and managing heart disease.

Cardiac Output

Cardiac output is the volume of blood pumped by the heart per minute, calculated as the product of stroke volume and heart rate. It reflects the heart's ability to meet the body's metabolic demands.

Cardiac Pharmacology

Cardiac pharmacology is the study of drugs used to treat heart conditions, such as hypertension, heart failure, arrhythmias, and angina. It includes medications that regulate heart rate, blood pressure, and cardiac function.

Heart Valve Disease

Heart valve disease refers to conditions that affect the valves of the heart, such as stenosis, regurgitation, or prolapse. These abnormalities can impair blood flow and lead to symptoms such as chest pain, shortness of breath, and fatigue.

Cardiac Rehabilitation

Cardiac rehabilitation is a comprehensive program of exercise, education, and lifestyle modification aimed at improving heart health and recovery after a cardiac event. It helps patients regain strength, reduce risk factors, and enhance quality of life.

Cardiac Surgery

Cardiac surgery involves procedures to treat heart conditions, such as coronary artery bypass grafting, valve repair or replacement, and heart transplant. It is performed by cardiothoracic surgeons in specialized cardiac centers.

Cardiac Risk Factors

Cardiac risk factors are factors that increase the likelihood of developing heart disease, such as smoking, high blood pressure, high cholesterol, diabetes, obesity, and sedentary lifestyle. Identifying and managing these risk factors is essential for preventing cardiovascular events.

Cardiac Rehabilitation

Cardiac rehabilitation is a structured program of exercise, education, and support for individuals recovering from heart conditions or procedures. It aims to improve cardiovascular fitness, reduce risk factors, and enhance overall well-being.

Cardiac Monitoring

Cardiac monitoring involves the continuous or intermittent recording of the heart's electrical activity to detect arrhythmias, ischemia, or other abnormalities. It may include ambulatory monitoring devices, telemetry, or event recorders.

Cardiac Assessment

Cardiac assessment involves a comprehensive evaluation of the heart's structure, function, and electrical activity to diagnose heart conditions accurately. It may include physical examination, imaging tests, blood tests, and electrocardiography.

Cardiac Rehabilitation

Cardiac rehabilitation is a supervised program of exercise, education, and counseling for individuals recovering from heart conditions or procedures. It aims to improve cardiovascular fitness, reduce risk factors, and enhance quality of life.

Cardiac Arrhythmia

Cardiac arrhythmia refers to abnormal heart rhythms that disrupt the heart's electrical conduction system. It can manifest as tachycardia, bradycardia, or irregular heartbeats and may require treatment with medications, devices, or procedures.

Cardiac Assessment

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