

Persistent Intraoperative Hypoxemia: A Case Report

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Abstract

Cardiology is a branch of medicine that deals with disorders of the heart and the cardiovascular system. The field includes medical diagnosis and treatment of congenital heart defects, coronary artery disease, heart failure, valvular heart disease and electrophysiology. Physicians who specialize in this field of medicine are called cardiologists, a specialty of internal medicine. Pediatric cardiologists are pediatricians who specialize in cardiology. Physicians who specialize in cardiac surgery are called cardiothoracic surgeons or cardiac surgeons, a specialty of general surgery.

Keywords: Cardiology • Osteopathic • Surgeons • Pediatrics • Internal medicine

Introduction

Specializations

All cardiologists study the disorders of the heart, but the study of adult and child heart disorders each require different training pathways. Therefore, an adult cardiologist (often simply called "cardiologist") is inadequately trained to take care of children, and pediatric cardiologists are not trained to treat adult heart disease. Surgical aspects are not included in cardiology and are in the domain of cardiothoracic surgery. For example, Coronary Artery Bypass Surgery (CABG), cardiopulmonary bypass and valve replacement are surgical procedures performed by surgeons, not cardiologists. However, some minimally invasive procedures such as cardiac catheterization and pacemaker implantation are performed by cardiologists who have additional training in non-surgical interventions (interventional cardiology and electrophysiology respectively) [1-3].

Adult cardiology

Cardiology is a specialty of internal medicine. To be a cardiologist in the United States, a three-years residency in internal medicine is followed by a three-years fellowship in cardiology. It is possible to specialize further in a sub-specialty. Recognized sub-specialties in the U.S. by the accreditation council for graduate medical education are cardiac electrophysiology, echocardiography, interventional cardiology, and nuclear cardiology. Recognized subspecialties in the U.S. by the American osteopathic association bureau of osteopathic specialists include clinical cardiac electrophysiology and interventional cardiology [4]. In India, a three-year residency in

general medicine or pediatrics after M.B.B.S and then three years of residency in cardiology are needed to be a D.M/Diplomate of National Board (DNB in cardiology).

Cardiac electrophysiology

Cardiac electrophysiology is the science of elucidating, diagnosing, and treating the electrical activities of the heart. The term is usually used to describe studies of such phenomena by invasive (intracardiac) catheter recording of spontaneous activity as well as of cardiac responses to Programmed Electrical Stimulation (PES) [5]. These studies are performed to assess complex arrhythmias, elucidate symptoms, evaluate abnormal electrocardiograms, assess risk of developing arrhythmias in the future, and design treatment. These procedures increasingly include therapeutic methods (typically radiofrequency ablation, or cryoablation) in addition to diagnostic and prognostic procedures. Other therapeutic modalities employed in this field include antiarrhythmic drug therapy and implantation of pacemakers and Automatic Implantable Cardioverter-Defibrillators (AICD) [6].

The cardiac electrophysiology study typically measures the response of the injured or cardiomyopathic myocardium to PES on specific pharmacological regimens in order to assess the likelihood that the regimen will successfully prevent potentially fatal sustained Ventricular Tachycardia (VT) or Ventricular Fibrillation (VF) in the future. Sometimes a series of electrophysiology study drug trials must be conducted to enable the cardiologist to select the one regimen for long term treatment that best prevents or slows the development of VT or VF following PES. Such studies may also be conducted in the presence of a newly implanted or newly replaced cardiac pacemaker or AICD.

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Case Presentation

Clinical cardiac electrophysiology

Clinical cardiac electrophysiology is a branch of the medical specialty of cardiology and is concerned with the study and treatment of rhythm disorders of the heart. Cardiologists with expertise in this area are usually referred to as electrophysiologists. Electrophysiologists are trained in the mechanism, function, and performance of the electrical activities of the heart. Electrophysiologists work closely with other cardiologists and cardiac surgeons to assist or guide therapy for heart rhythm disturbances (arrhythmias). They are trained to perform interventional and surgical procedures to treat cardiac arrhythmia.

The training required to become an electrophysiologist is long and requires 8 years after medical school (within the U.S.). Three years of internal medicine residency, three years of cardiology fellowship, and two years of clinical cardiac electrophysiology.

Cardio geriatrics

Cardio geriatrics, or geriatric cardiology, is the branch of cardiology and geriatric medicine that deals with the cardiovascular disorders in elderly people.

Cardiac disorders such as coronary heart disease, including myocardial infarction, heart failure, cardiomyopathy, and arrhythmias such as atrial fibrillation, are common and are a major cause of mortality in elderly people. Vascular disorders such as atherosclerosis and peripheral arterial disease cause significant morbidity and mortality in aged people.

Imaging

Echocardiography, cardiac magnetic resonance imaging, and computed tomography of the heart. Cardiac imaging includes echocardiography (echo), Cardiac Magnetic Resonance Imaging (CMR), and computed tomography of the heart. Those who specialize in cardiac imaging may undergo more training in all imaging modes or focus on a single imaging modality. echocardiography (or "echo") uses standard two-dimensional, three-dimensional, and doppler ultrasound to create images of the heart. Those who specialize in echo may spend a significant amount of their clinical time reading echos and performing transesophageal echo, in particular using the latter during procedures such as insertion of a left atrial appendage occlusion device. Cardiac MRI utilizes special protocols to image heart structure and function with specific sequences for certain diseases such as hemochromatosis and amyloidosis. Cardiac CT utilizes special protocols to image heart structure and function with particular emphasis on coronary arteries.

Interventional cardiology

Interventional cardiology is a branch of cardiology that deals specifically with the catheter based treatment of structural heart diseases. A large number of procedures can be performed on the heart by catheterization, including angiogram, angioplasty, atherectomy, and stent implantation. These procedures all involve insertion of a sheath into the femoral artery or radial artery (but, in practice, any large peripheral artery or vein) and cannulating the heart under X-ray visualization (most commonly fluoroscopy). This

cannulation allows indirect access to the heart, bypassing the trauma caused by surgical opening of the chest (Figure 1).



Figure 1. Anesthesia management in neonatal congenital bronchobiliary fistula.

Results and Discussion

The main advantages of using the interventional cardiology or radiology approach are the avoidance of the scars and pain, and long post-operative recovery. Additionally, interventional cardiology procedure of primary angioplasty is now the gold standard of care for an acute myocardial infarction. This procedure can also be done proactively, when areas of the vascular system become occluded from atherosclerosis. The Cardiologist will thread this sheath through the vascular system to access the heart. This sheath has a balloon and a tiny wire mesh tube wrapped around it, and if the cardiologist finds a blockage or stenosis, they can inflate the balloon at the occlusion site in the vascular system to flatten or compress the plaque against the vascular wall. Once that is complete a stent is placed as a type of scaffold to hold the vasculature open permanently.

Cardiomyopathy/heart failure

Specialization of general cardiology to just that of the cardiomyopathies leads to also specializing in heart transplant and pulmonary hypertension. Cardiomyopathy is a heart disease of the heart muscle, where the heart muscle becomes inflamed and thick.

Cardiooncology

A recent specialization of cardiology is that of cardio-oncology. This area specializes in the cardiac management in those with cancer and, in particular, those with plans for chemotherapy or whom have experienced cardiac complications of chemotherapy.

Preventive cardiology and cardiac rehabilitation

In recent times, the focus is gradually shifting to preventive cardiology due to increased cardiovascular disease burden at an

early age. According to the WHO, 37% of all premature deaths are due to cardiovascular diseases and out of this, 82% are in low and middle income countries. Clinical cardiology is the sub specialty of cardiology which looks after preventive cardiology and cardiac rehabilitation. Preventive cardiology also deals with routine preventive checkup through noninvasive tests, specifically electrocardiography; fasegraphy, stress tests, lipid profile and general physical examination to detect any cardiovascular diseases at an early age, while cardiac rehabilitation is the upcoming branch of cardiology which helps a person regain their overall strength and live a normal life after a cardiovascular event. A subspecialty of preventive cardiology is sports cardiology.

Pediatric cardiology

Tetralogy of Fallot: Helen B. Taussig is known as the founder of pediatric cardiology. She became famous through her work with Tetralogy of Fallot, a congenital heart defect in which oxygenated and deoxygenated blood enters the circulatory system resulting from a Ventricular Septal Defect (VSD) right beneath the aorta. This condition causes newborns to have a bluish-tint, cyanosis, and have a deficiency of oxygen to their tissues, hypoxemia. She worked with Alfred Blalock and Vivien Thomas at the Johns Hopkins hospital where they experimented with dogs to look at how they would attempt to surgically cure these "blue babies." They eventually figured out how to do just that by the anastomosis of the systemic artery to the pulmonary artery and called this the Blalock-Taussig shunt.

Tetralogy of Fallot, pulmonary atresia, double outlet right ventricle, transposition of the great arteries, persistent truncus arteriosus, and Ebstein's anomaly are various congenital cyanotic heart diseases, in which the blood of the newborn is not oxygenated efficiently, due to the heart defect.

Adult congenital heart disease

As more children with congenital heart disease are surviving into adulthood, a hybrid of adult and pediatric cardiology has emerged called Adult Congenital Heart Disease (ACHD).

Conclusion

This field can be entered as either adult or pediatric cardiology. ACHD specializes in congenital diseases in the setting of adult diseases (e.g., coronary artery disease, COPD, diabetes) that is, otherwise, atypical for adult or pediatric cardiology. Pediatric cardiologists are pediatricians who specialize in cardiology. Physicians who specialize in cardiac surgery are called cardiothoracic surgeons or cardiac surgeons, a specialty of general surgery.

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