



Cardiac Surgery

Additional Surgical Techniques



Lesson Objectives:

1. Identify key anatomical features of the heart and great vessels
2. Describe diagnostic procedures commonly used in cardiac medicine
3. Describe specific elements of case planning for cardiac surgery
4. Discuss cardiac pathology
5. Define the primary surgical goals for common cardiac procedures
6. Discuss what instrument sets may be used for common cardiac procedures

Cardiac Surgery

- **Cardiac Surgery Overview:**

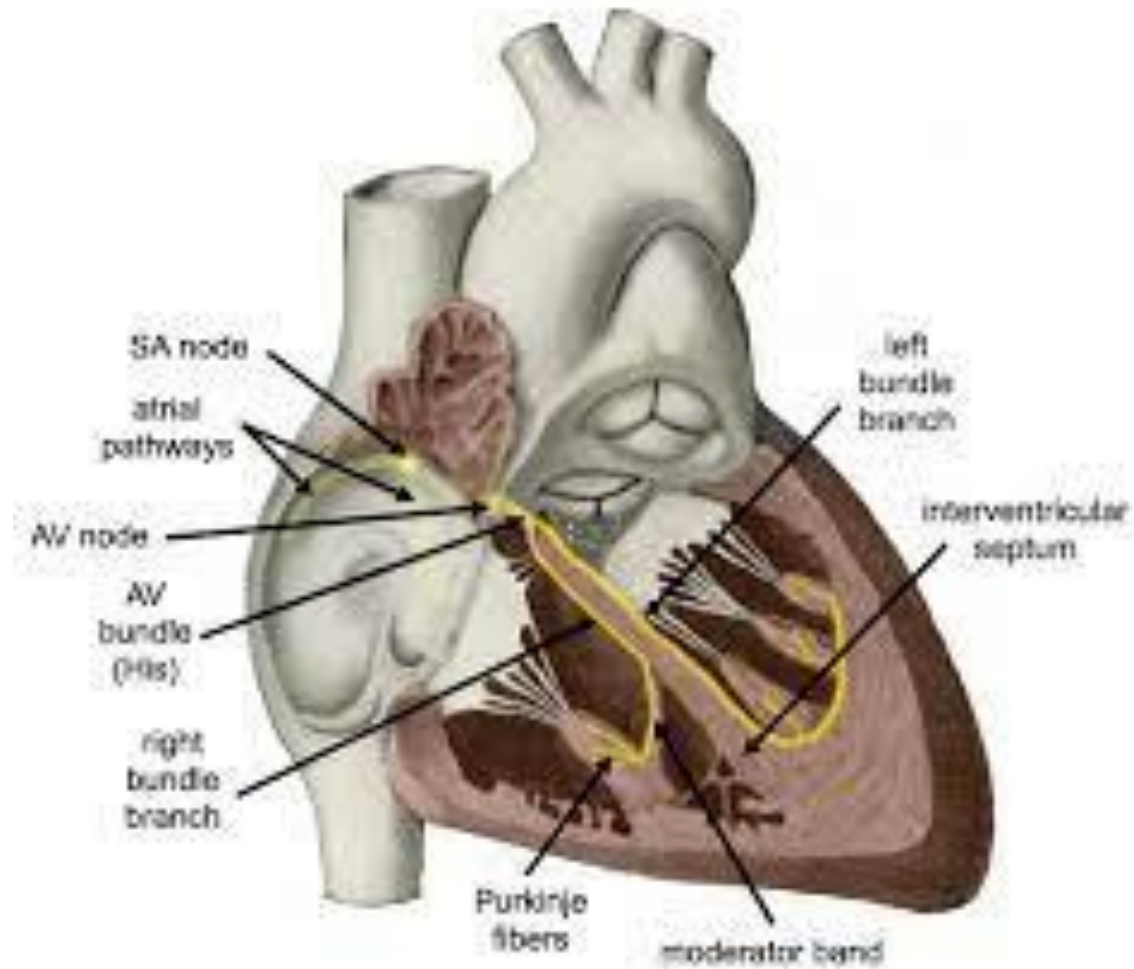
- Treats heart and associated great vessels diseases.
- Involves open and minimally invasive techniques.
- Builds on thoracic, general, and vascular procedures.

- **Surgical Technologist in Cardiac Surgery:**

- Can specialize after training in various surgeries.
- Requires understanding of cardiothoracic anatomy.
- Works in complex surgical environments with advanced technologies.

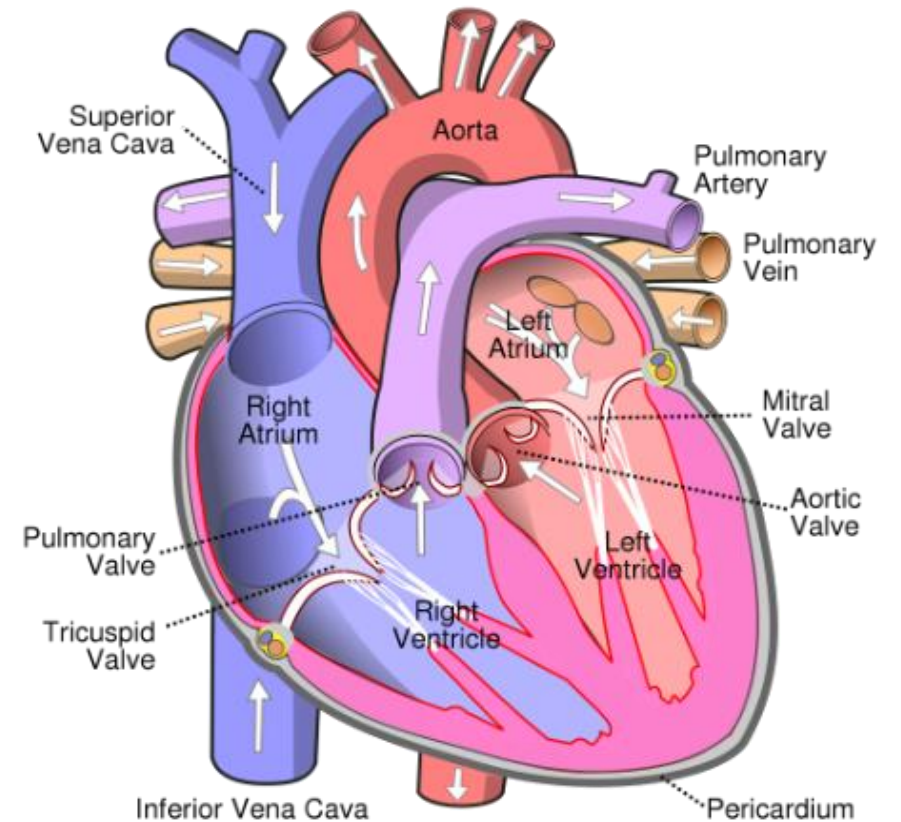
Surgical Anatomy

- Heart
- Heart valves
- Cardiac cycle
- Conduction system



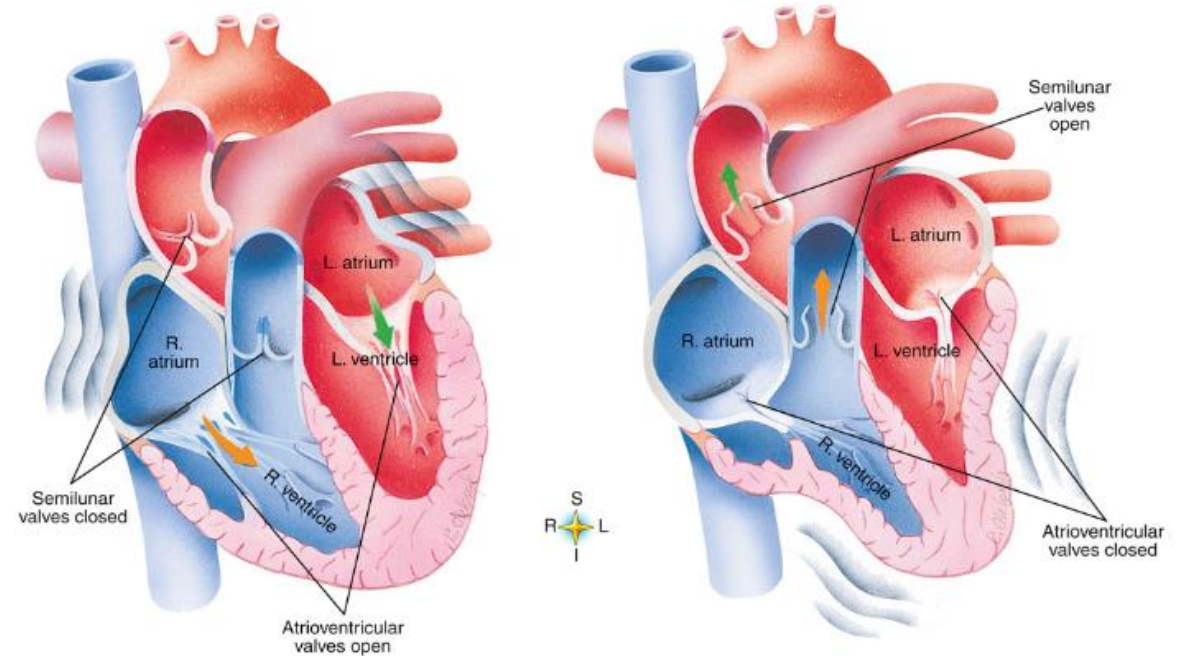
Heart

- Four chambers: right atrium, left atrium, right ventricle, left ventricle.
- Location: within mediastinum, posterior to sternum, predominantly left of midline.
- Enclosed by pericardium; heart wall layers: epicardium, myocardium, endocardium.



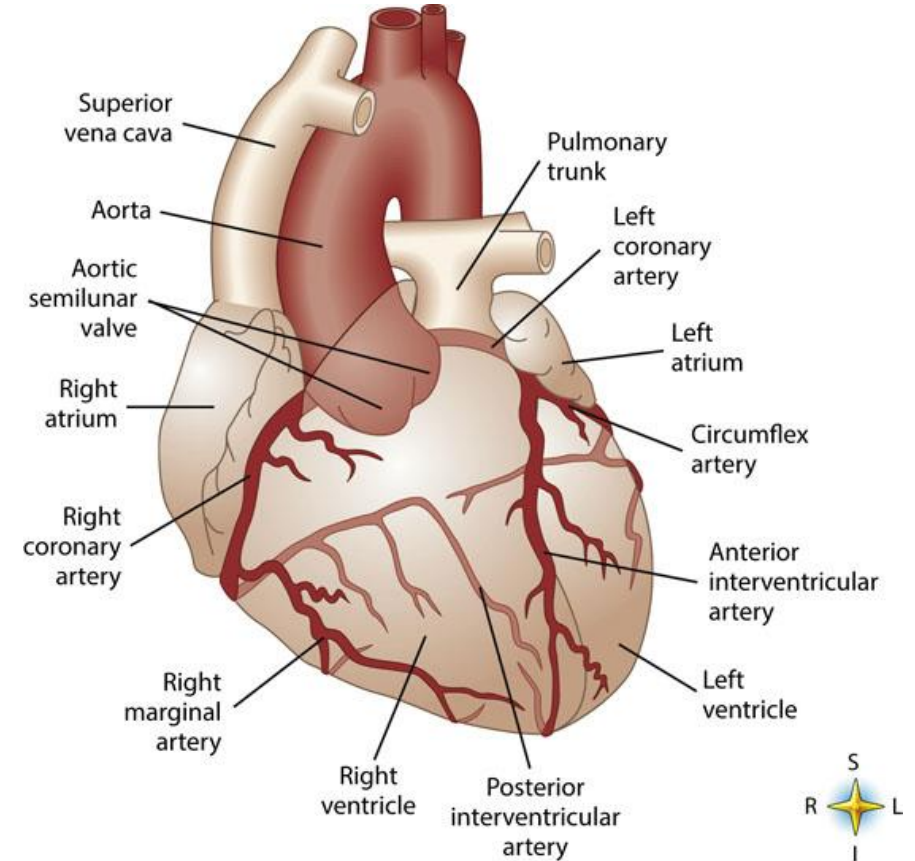
Heart Valves

- Maintain unidirectional blood flow.
- AV valves: tricuspid (right), bicuspid (mitral, left).
- Semilunar valves in large vessels: pulmonary (right ventricle to pulmonary artery), aortic (left ventricle to aorta).



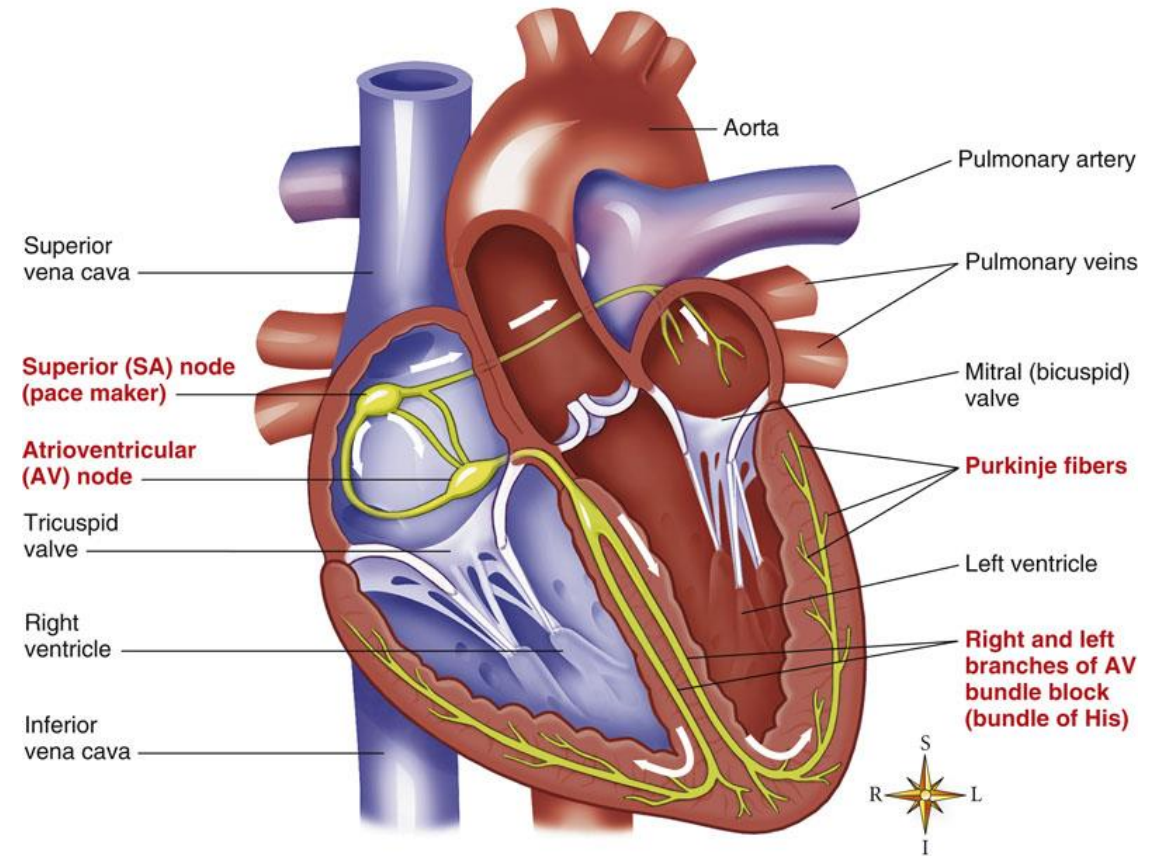
Cardiac Cycle

- Two phases: systole (contraction), diastole (relaxation/filling).
- Deoxygenated blood enters right atrium via vena cava, flows through tricuspid valve to right ventricle, then to lungs.
- Oxygenated blood enters left atrium from lungs via pulmonary veins, flows through mitral valve to left ventricle, then to body via aorta.
- Coronary artery circulation supplies heart's own blood.

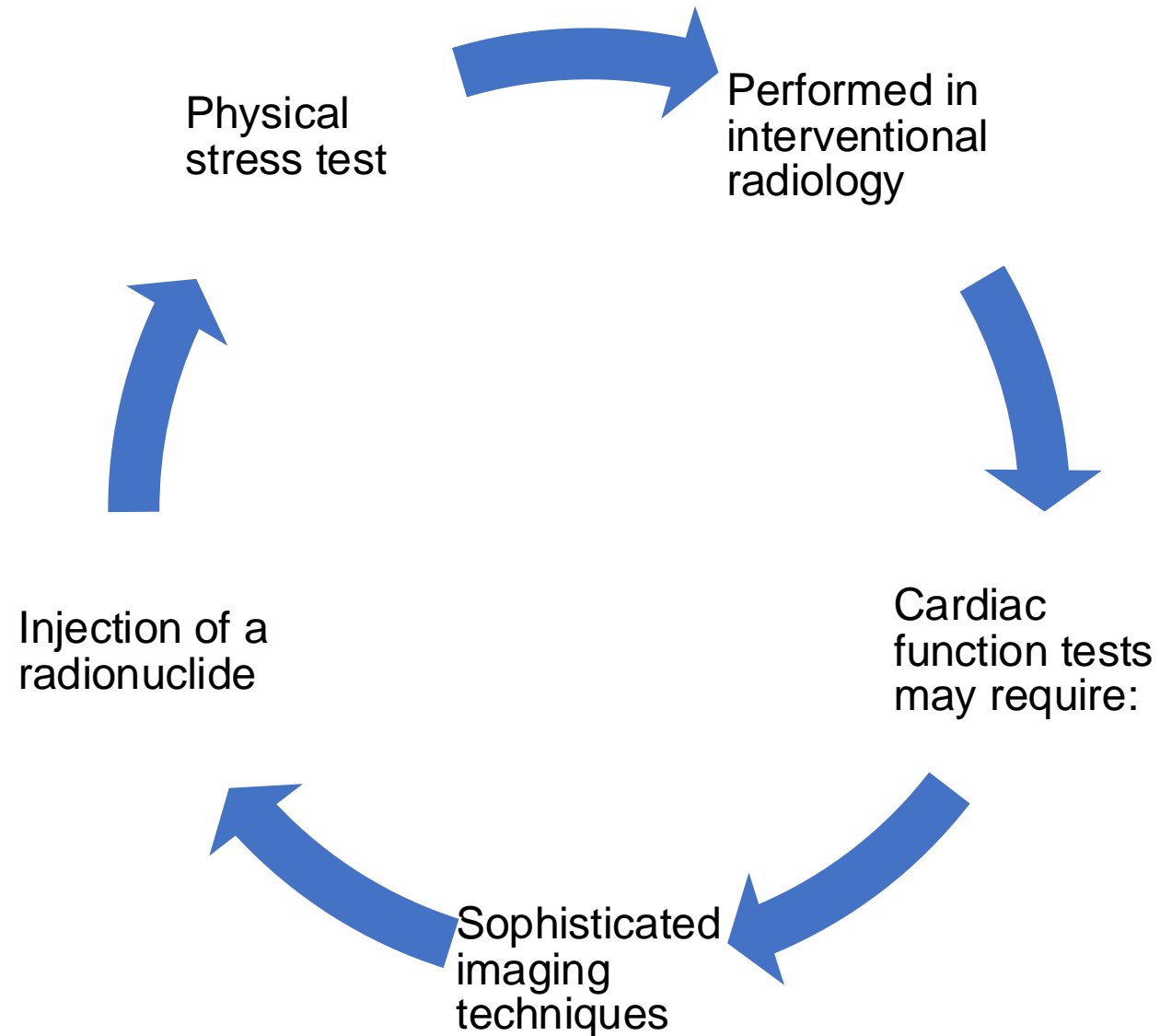


Conduction System

- Network of specialized cells generating electrical activity.
- Nodes: SA node (pacemaker), AV node, bundle of His, bundle branches, Purkinje fibers.
- Coordination of electrical signals ensures effective contractions.
- Dysfunction leads to irregular electrical activity.



Diagnostic Procedures (Slide 1 of 4)



Diagnostic Procedures (Slide 2 of 4)

- **Routine Laboratory Tests:**

- Identify abnormalities in blood, urine, cardiac enzymes, and waste products.
- Tests include blood and urine analysis, cardiac enzyme assays.

- **Cardiac Imaging:**

- Includes standard angiography and digital subtraction angiography.
- Used for aortic imaging, ventricular angiography, and assessing ejection fraction.

Diagnostic Procedures

(Slide 3 of 4)

- **Intravascular Ultrasound:**
 - Utilizes end catheter transducer to determine blood flow rate.
- **Oxygen Saturation Measurement:**
 - Detects abnormal blood shunting routes.
- **Cardiac Output Measurement:**
 - Calculates blood ejection per minute.
- **Cardiac Muscle Biopsy:**
 - Detects tissue rejection post-heart transplantation.

Diagnostic Procedures (Slide 4 of 4)

- **Cardiac Catheterization:**

- Involves inserting a cardiac catheter into heart chambers and large vessels.
- Tests include intravascular ultrasonography, angiography, and endocardial biopsy.

- **Left Heart Catheterization:**

- Assesses coronary arteries, vascular resistance, valve function, and left ventricular pressure.
- Access via femoral, radial, or brachial artery.

- **Right Heart Catheterization:**

- Assesses right atrium, ventricle, pulmonary artery, and valve function.
- Access via femoral, subclavian, or internal jugular vein.

**Watch "Cardiac Catheterization: What You Can Expect"
video to get detailed overview of the procedure**

Cardiac Catheterization Video



Cardiac Catheterization Video

- **Summary of the Video**

- **Purpose:** Cardiac catheterization recommended by your doctor for heart-related issues.
- **Procedure Overview:** X-ray angiogram reveals heart artery narrowings and blockages, evaluates heart valve function and overall heart muscle performance.
- **Appointment Preparation:** Arrive fasting, discuss medication intake with doctor, nurse prepares area, mild sedative may be offered.
- **During Procedure:** Local anesthetic numbs site, sheath inserted for catheter placement, patient awake, relaxed, and relatively pain-free.
- **Recovery and Follow-up:** Recovery involves lying flat for hours, encouraged to drink fluids, arrange for transportation, expect one to two days off from work.

Case Planning

(Slide 1 of 1)

Case Planning

- Ensure thorough pre-operative assessment and consultation.
- Develop a comprehensive plan tailored to the patient's specific cardiac condition.

Positioning and Incisions

- Patient positioned supine or lateral with affected side up.
- Common incisions: median sternotomy, anterolateral, posterolateral, mini-thoracotomy.

Patient Prep

- Extensive skin prep beyond incisional area often necessary.
- Access to peripheral veins and arteries may be required.
- Proper leg suspension or bilateral leg rests for femoral artery access.

Case Planning

(Slide 2 of 4)

- **Instruments and Equipment**

- Augmented general surgery set for cardiac procedures.
- Specialized instruments for coronary artery, valve, aneurysm, chest wall, and lung surgery.
- Rumel tourniquet for vessel occlusion or isolation.

- **Instrument and Equipment Management**

- Organized setup of instrument and equipment tables.
- Standardized setup for surgical technologist.
- Conserved space for surgical instruments amidst crowded operating room.



Case Planning

(Slide 3 of 4)

- **Vessel and Patch Grafts**

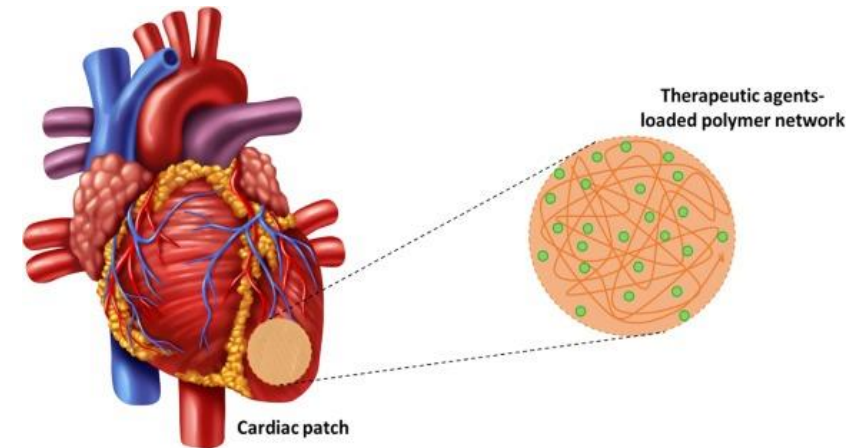
- Types: knitted and woven grafts; Teflon, Dacron, or PTFE materials.
- Graft selection based on procedure requirements.
- Proper recording of graft details on patient's operative record.

- **Prosthetic Valves**

- Full set required for valve replacement.
- Mechanical and biological types available.
- Valves stored in glutaraldehyde solution, rinsed before use.

- **Pacemaker**

- Produces electrical impulses to stimulate heart muscle.
- Temporary and permanent electrodes used.
- Endocardial and epicardial electrode insertion methods.



Case Planning

(Slide 4 of 4)

- **Defibrillator**

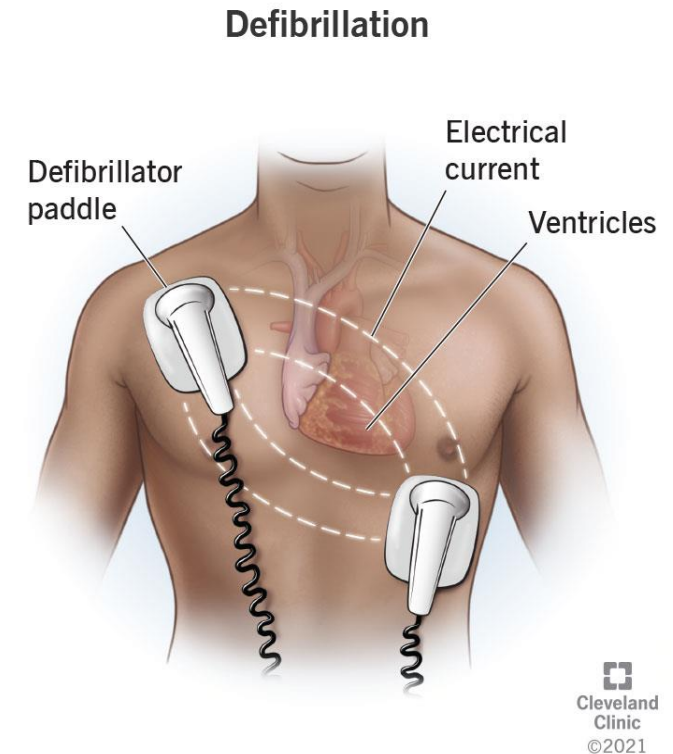
- Paddles used to convert fibrillation to normal rhythm.
- Internal paddles readily available on sterile field.
- Safety precautions during defibrillation.

- **Cardiopulmonary Bypass Machine and Cannulas**

- Replaces heart and lungs during surgery.
- Understanding pump operation and cannulation order.
- Types of cannulas and their functions.

- **Cardioplegic Solution**

- Contains potassium chloride for intentional heart muscle interruption.
- Administered via antegrade or retrograde infusion methods.

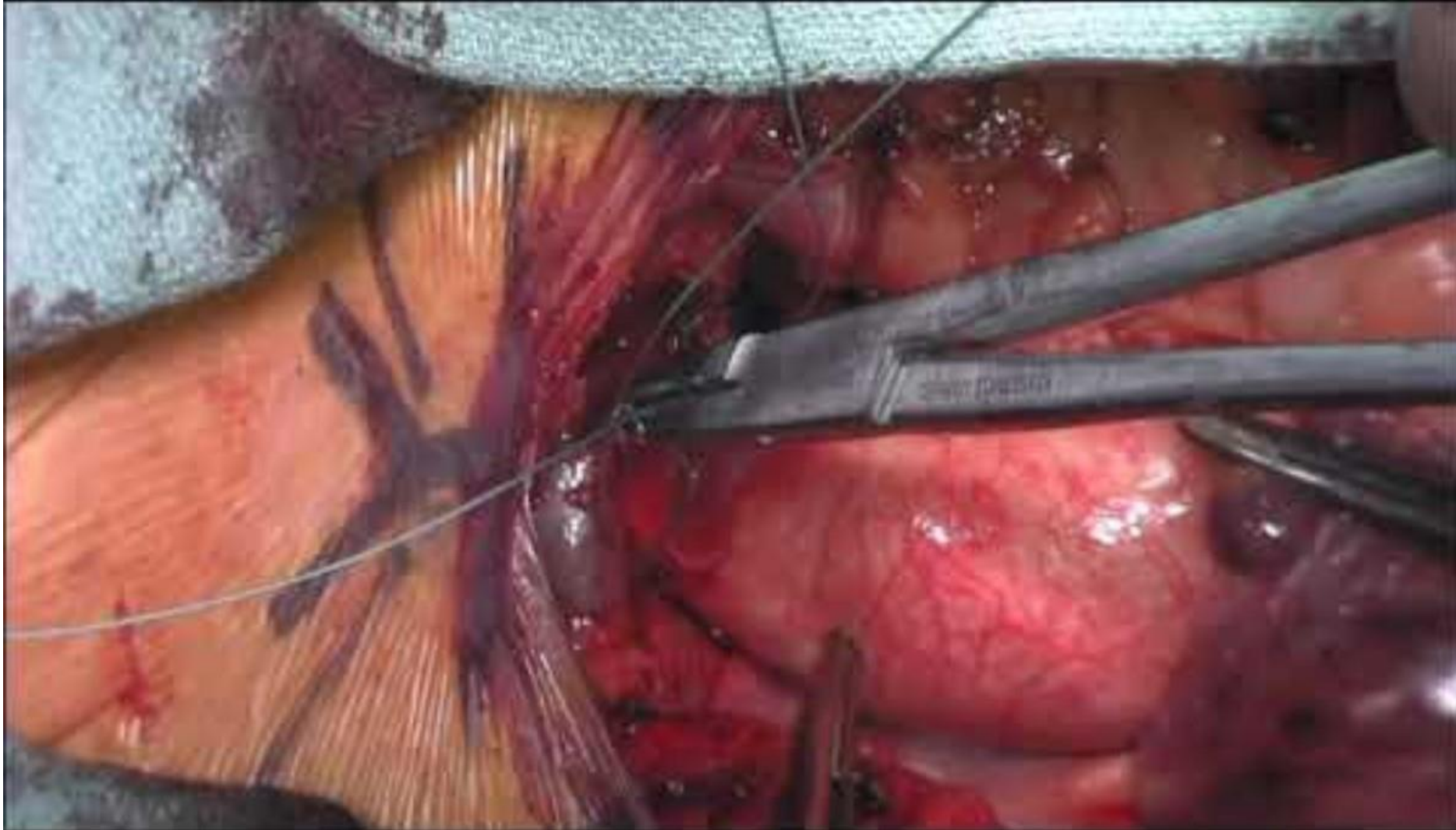


Surgical Procedures

- Median Sternotomy
- Cardiopulmonary Bypass
- Infusion of a Cardioplegic Solution
- Coronary Arty Bypass Grafting (Cabg)
- Saphenous Vein Graft
- Minimally Invasive Direct Cornoary Artery Bypass (Midcab)
- Resection of a Left Ventricular Aneurysm
- Aortic Valve Replacement
- Mitral Valve Repair and Replacement
- Resection of an Aneurysm of the Ascending Aorta
- Resection of an aneurysm of the aortic arch
- Resection of an aneurysm of the descending thoracic aorta
- Endovascular repair of a thoracic aneurysm
- Insertion of an artificial cardiac pacemaker
- Insertion of an intra-aortic balloon pump (IABP)
- Implantation of a left ventricular assist device
- Heart transplantation

Watch the "Cardiopulmonary Bypass" Video

Cardiopulmonary Bypass Video



Cardiopulmonary Bypass Video

- **Summary of Video:**
 - Dissection to Heart
 - Pericardium Tacked back
 - Purse-string suture placed (rumel tourniquets)
 - Cannulation
 - Arterial (Ascending Aorta)
 - Venous (Right Atrium – Dualstage)

Pediatric Cardiac Procedures

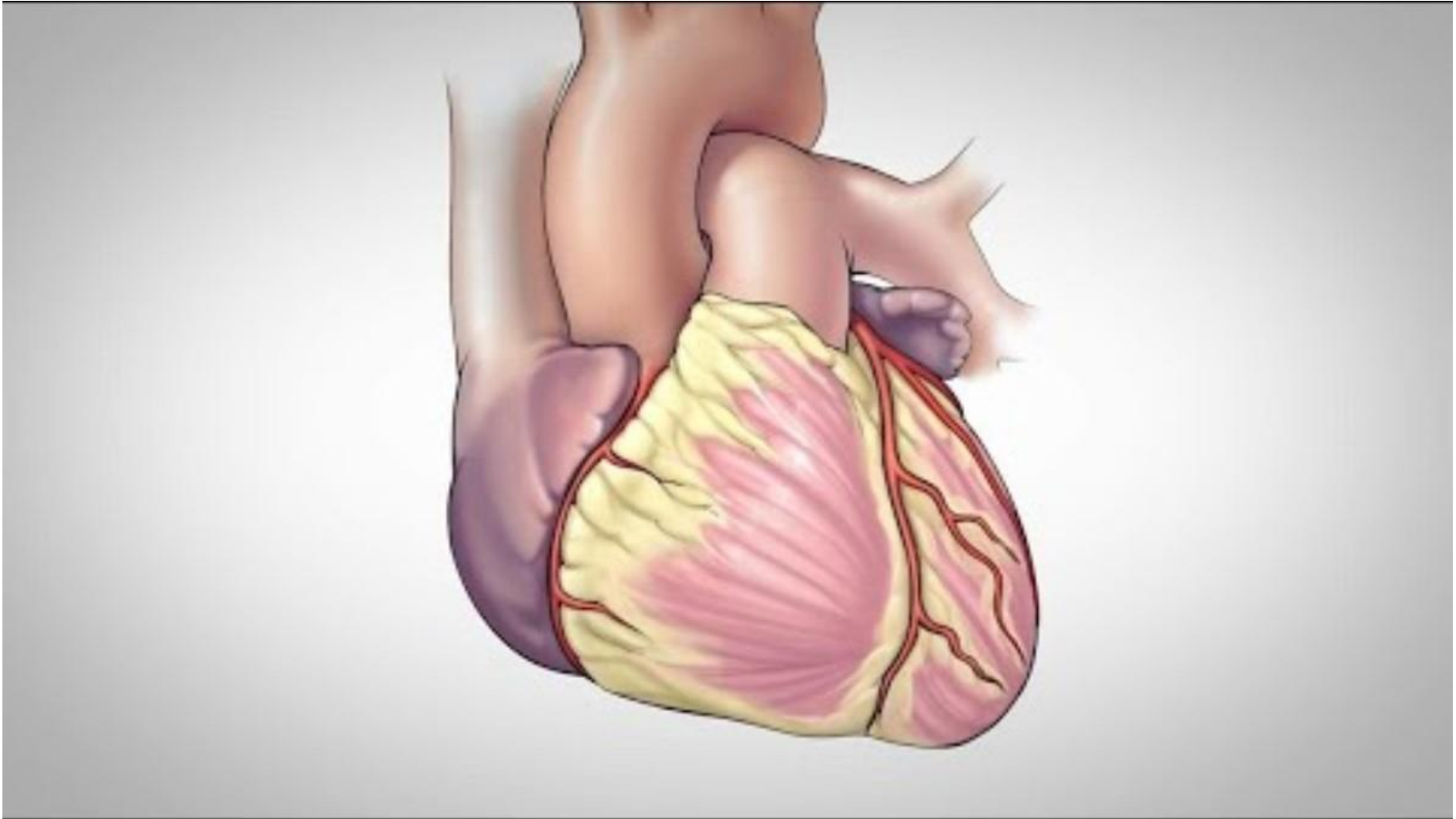
- Congenital Heart Defects: Some defects may not present symptoms and carry on into adulthood.

Includes:

- Closure of a patent ductus arteriosus
- Correction of a coarctation of the thoracic aorta
- Total correction of Tetralogy of Fallot
- Correction of pulmonary valve stenosis
- Closure of an atrial septal defect
- Closure of a ventricular septal defect

Watch the "CABG" Video

CABG Video



CABG Video

Summary of Video:

- CABG done for patients with CAD – blockages in coronary arteries
- Vein or Artery used to bring blood flow past the blockage
- While many Cardiac procedures are done on a heart lung machine, CABG can be done "off-pump"

Preoperative Preparation

- Pediatric cardiac instruments are smaller and more delicate
- Pediatric patients are at greater risk of hypothermia, therefore, OR temperature is generally raised
- Blood loss should be closely monitored by the surgical team because of the pediatric patient's low blood volume
- Most pediatric cases are done to repair congenital defects

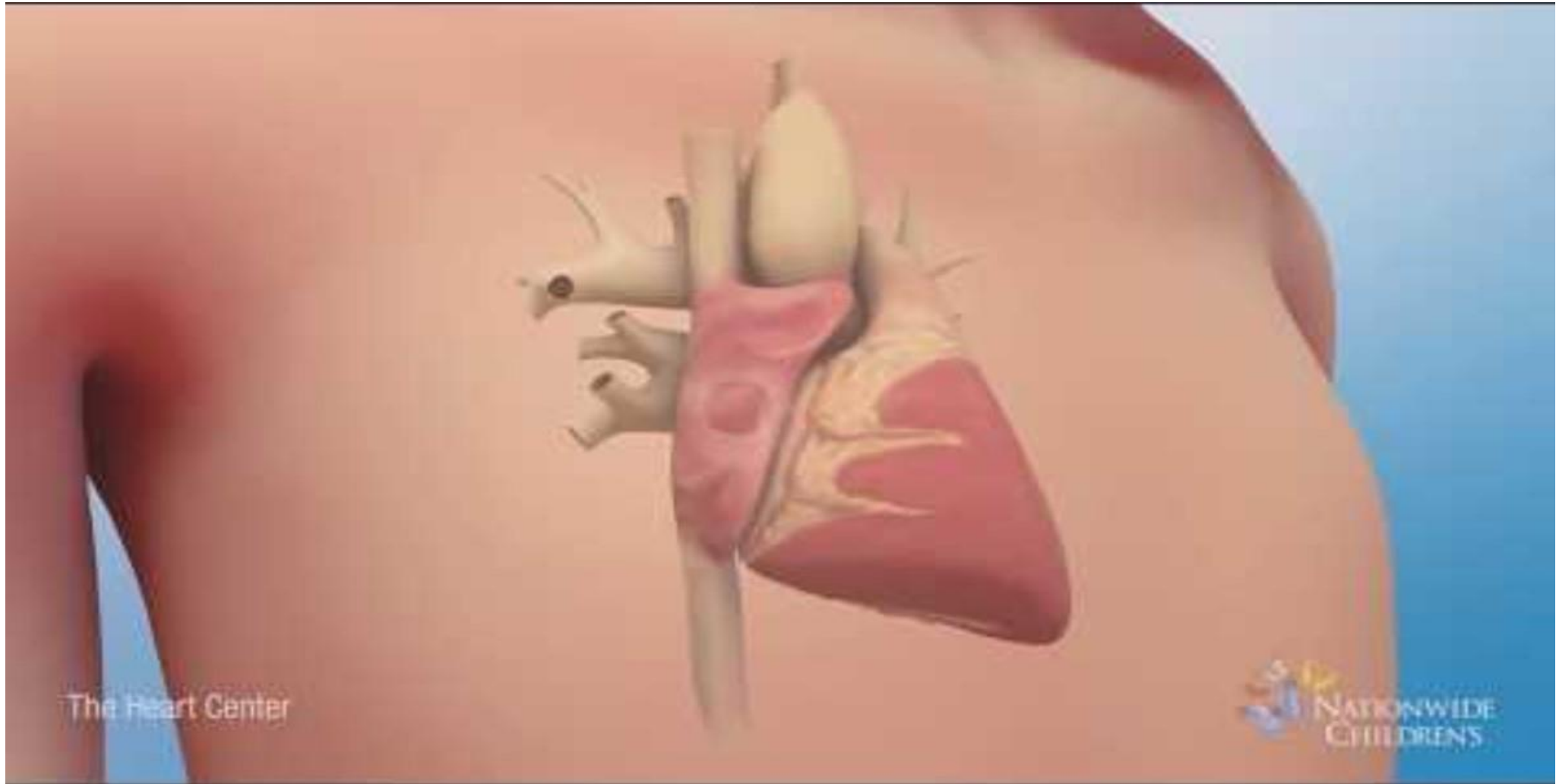


Pediatric Cardiac Procedures

- Some of the Procedures include:
- Repair of ASD
- Closure of Patent Ductus Arteriosus (PDA)
- Repair of Coarctation of the Aorta

Watch the video "Understanding the ASD" to gain insights into what Atrial Septal Defect is!

Atrial Septal Defect Video



Atrial Septal Defect Video

- **Summary of the video:**

- The Heart Center at Nationwide Children's specializes in treating atrial septal defects (ASD), which involve a hole in the wall between the heart's upper chambers.
- Most common type is secundum ASD, where the normal closure of an opening (patent foramen ovale) between chambers doesn't occur, leading to abnormal blood flow.
- Treatment options include medications, cardiac catheterization, or open-heart surgery depending on the size and persistence of the defect; the center provides comprehensive support for patients and families.

Read Chapter 32 from the E-book

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Get ready for your quiz and rest of the activities now. Best of luck!



Congratulations!

Lesson 32 is complete.