

Cardiac Surgery Patient Problems

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Stuck on Escalator

▶ <https://www.youtube.com/watch?v=Kq65aAYCHOW>



Put on your critical thinking hat!



CMC-CSC Test Blueprint

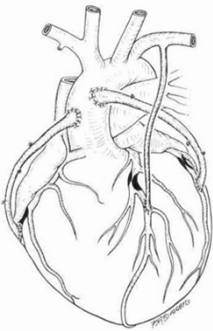
- ▶ Thoracic Aneurysm
- ▶ Abdominal Aneurysm

B. Surgical Treatment of: <ol style="list-style-type: none">1. Non-congenital heart defect repair in adults (e.g., ventricular septal defect (VSD), left ventricular aneurysm repair)2. Cardiac rhythm disorders (e.g., MAZE procedure/modified MAZE)3. Congenital heart defect repair in adults4. Coronary heart disease5. Hypertrophic obstructive cardiomyopathy (HOCM)6. Valvular disease<ol style="list-style-type: none">a. repairb. replacement	C. Other Cardiovascular Problems <ol style="list-style-type: none">1. Off-pump coronary artery bypass (OPCAB)2. Patients who have undergone cardiopulmonary bypass3. Thoracic aorta repair<ol style="list-style-type: none">a. open repairb. endograft
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CMC	CSC
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Coronary Artery Bypass Surgery

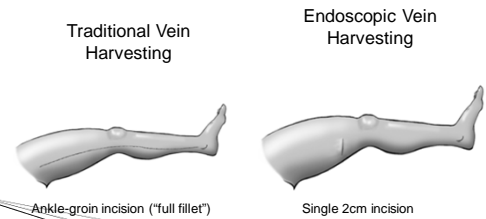
Coronary Artery Bypass Surgery



Venous Conduits or grafts

- ▶ Saphenous vein
 - With long leg incisions, graft vulnerable to platelet aggregation so need **antithrombotic** therapy to prevent graft closure
 - Persantine & ASA

What is endoscopic vein harvesting (EVH)?

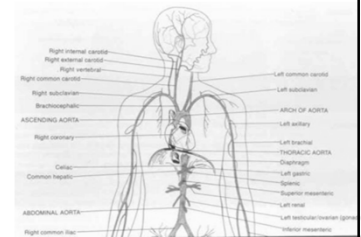


Arterial Grafts/conduits

- ▶ Longer patency than venous grafts
- ▶ LIMA/RIMA
- ▶ Radial artery
- ▶ Gastroepiploic Artery (stomach)

LIMA/RIMA

- ▶ LIMA - LAD
- ▶ RIMA - RCA
- ▶ Resistant to atherosclerosis
- ▶ Only one anastomosis



LIMA/RIMA Complications:

- Phrenic nerve devascularization - LIMA
 - Can cause inability or delayed vent weaning
- Spasm (ST segment changes)
 - Diltiazem or Nitroglycerin
- Steal syndrome
- Sternal ischemia
- Brachial plexus injury
 - Limp or paralyzed arm, lack of muscle control in upper extremity
- Pulmonary complications due to pleural dissection
 - Pleural effusion

Radial Artery conduit

Preop

- ▶ Assess ulnar function by doing Allen's test
- ▶ **Positive** Allen's test > 6 seconds = contraindication to radial artery use
- ▶ Doppler tests to assess for collateral circulation

- ▶ Manual labor using hands
- ▶ Stroke with upper extremity weakness
- ▶ Reynaud's disease

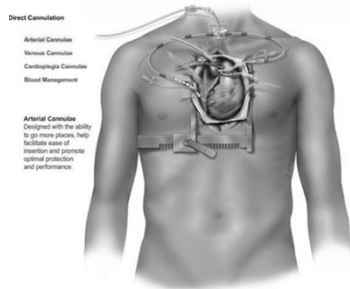
Contraindications

Radial Artery conduit Post op

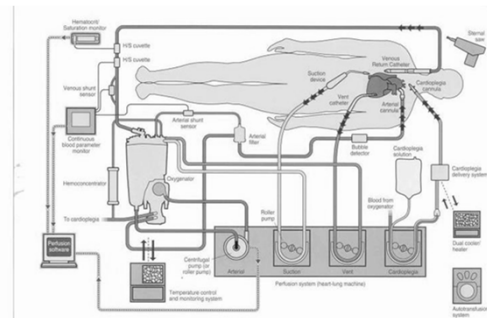
- ▶ May have drain
- ▶ Assess the 6 "Ps" for arterial blood flow
 - Pain
 - Pulselessness
 - Pallor
 - Paresthesia
 - Paralysis
 - Polar (cold)
- ▶ May experience loss of motor strength and numbness (6 months)
 - Encourage hand/fist exercises
- ▶ Spasms
 - Diltiazem

Cardiopulmonary Bypass (CPB) vs OPCAB

Cardiopulmonary Bypass



Cardiopulmonary Bypass (CPB)



Cardiopulmonary Bypass (CPB)

- ▶ Utilize cardioplegic to stop heart
 - High in potassium, bicarb
 - May need to pace until cardioplegia wears off
 - Mannitol to decrease brain edema
 - Mannitol causes diuresis post op



Cardiopulmonary Bypass (CPB) Complications

- ▶ Systemic inflammatory response syndrome (SIRS)
 - Vasoactive substances generated
 - Fluid retention and fluid shifts
 - Organ dysfunction
 - Coagulation disruption
- ▶ Utilize hypothermia to ↓ myocardial O₂ demand
 - Rewarming contributes to vasodilatation and can worsen effects of SIRS
- ▶ Nonpulsatile
 - Neurologic dysfunction
 - Bleeding due to effect on RBCs and platelets and decreasing coagulation factors
 - Renal failure
- ▶ Heparin complications
 - Bleeding or HIT

Cardiopulmonary Bypass (CPB) Complications

- ▶ Fluid retention/fluid shifts
 - Hypovolemia from diuresis as rewarming occurs
 - Pulmonary complications
- ▶ Electrolyte imbalances
 - Low potassium with diuresis
 - Hyperglycemia due to altered hormone regulation
- ▶ Aortic dissections/embolization (air/plaque/thrombosis) due to aortic cannulation
- ▶ Myocardial stunning/edema
 - Inability to wean: may need IABP, Inotropes, VAD

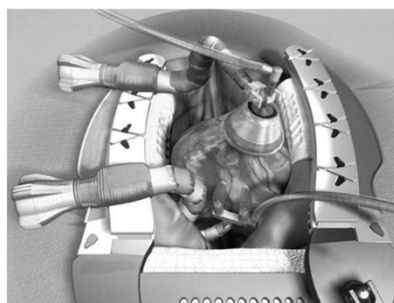
Off Pump Coronary Artery Bypass: OPCAB (beating heart surgery)

- ▶ No Cardioplegia – heart is still beating
- ▶ May be utilized for
 - Medial sternotomy
 - Able to do four or five vessel revascularization
 - MIDCAB
 - Only able to do one or two vessel revascularization
 - Robotic (ROBOCAB)
- ▶ Mild hypothermia so less bleeding from hypothermia

OPCAB Advantages

- ▶ Less cerebral hypoperfusion
- ▶ Less embolization
- ▶ Less SIRS from CPB
- ▶ Less bleeding
 - Use about 1/3 to 1/2 less heparin than onpump CABG

Off Pump CABG



MICS (Minimally Invasive Cardiac Surgery)

Types:

- ▶ Mini-thoracotomy incision without use of CPB (MIDCAB)
- ▶ Endoscopic approach with CPB utilizing femoral cannulation
- ▶ Robotic

Disadvantage:

- ▶ Unable to access posterior heart for revascularization

Contraindication:

- ▶ Difficulty locating the LAD

MIDCAB

(Minimally Invasive Direct Coronary Artery Bypass)

- ▶ Mini-thoracotomy incision without use of CPB
 - 3- 4 inch incision made between the ribs
 - Heart is beating
- ▶ Utilized for LAD and RCA
- ▶ Only able to revascularize one or two vessels
- ▶ Unable to access posterior heart for revascularization

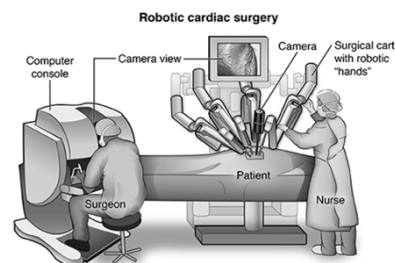


MIDCAB Advantages

- Less pain
- Earlier mobilization
- Shorter ICU LOS and hospital LOS
- Decreased sternal wound infections
- Lower mortality and morbidity

Robotic Heart Surgery

- MV Repair
- MVR
- AVR
- Myxoma
- VSD
- TV repair
- CABG



Robotics Cannulation

- Right femoral artery
- Right femoral vein and right jujular
- Monitor during OR for tissue perfusion
- If high risk, put in a catheter to perfuse the right leg
- May be occlusive & ischemia to the right leg
- DO NOT put warming blanket over right leg -- let warm naturally

Robotics Intubation

- Intubate with double lumen ET tube so can drop the right lung
- The right lung becomes atelectic with no blood flow
- When reinflate may get "reperfusion syndrome" or bleeding

Robotics

- Pain is from spreading the ribs and the chest tubes
- Exercise/Activity to patient discomfort
- Most bleed very little

MICS Preop Teaching

- ▶ Decreased amount of post op pain
- ▶ Aggressive pulmonary toilet
- ▶ Early ambulation
- ▶ Earlier discharge

MICS Nursing Care – Post op First 15 minutes

- ▶ Mostly same as those with sternotomy
- ▶ In depth report
- ▶ Assessment of vital signs, PA pressures, labs, U/O, CT output
- ▶ Hemodynamic stability
- ▶ Level lines – connect CT to suction
- ▶ Warm patient *if had CPB* (Hypothermia)

MICS Nursing Care – Post op The Next 15 minutes

- ▶ Preliminary assessment for clinical issues
 - Bleeding, hyper/hypotension, agitation, arrhythmias
- ▶ Head to toe assessment
- ▶ Rewarming

MICS Specific Complications

- ▶ Typically related to the more technically challenging nature of these procedures and the procedure related stress on the heart.
 - Dysrhythmias – A Fib, VT
 - Hypotension
 - MI
 - Bleeding
 - Brain Injury

MICS Ventilatory Support

- ▶ May extubate in OR
- ▶ Extubate 3– 6 hours
- ▶ Extubation criteria
 - ABGs within parameters
 - Hemodynamically stable
 - Normal CXR
 - Normothermia
 - CT output < 100 ml/hour prior to extubate
 - UO > 1 ml/kg prior to extubate

Cardiac Surgery Recovery

	ICU LOS	Hospital LOS	Return to normal activity
MIDCAB	1 day	3 days	2 weeks
OPCAB	1 day	5 – 7 days	2 – 3 months
Traditional CABG	1 – 3 days	5 – 10 days	2 – 3 months

Source: Hardin, Kaplow: Cardiac Surgery Essentials for CC Nursing

Rewarming --- all cardiac surgery patients

- ▶ Causes vasodilation → ↓ BP and filling pressures
- ▶ Use volume and pressors
- ▶ May get postop cognitive impairment due to cerebral hyperthermia if warmed too fast

Hypothermia

More common with CPB

- ▶ Bleeding, platelet dysfunction and impairment of the coagulation cascade
- ▶ May stimulate the SNS leading to:
 - Hemodynamic instability
 - Dysrhythmias
 - Vasoconstriction, hypertension, and increased SVR
- ▶ Shivering
 - Increased oxygen consumption (↓ SVO₂) and CO₂ production
 - Adrenergic stimulation
 - Use Demerol to treat

Bleeding risk factors

- ▶ Greater risk if CPB - more heparin
- ▶ Hemodilution
- ▶ Fibrinolysis
- ▶ Hypothermia
- ▶ If off pump patient is bleeding, it is usually surgical in nature
- ▶ Dark blood = venous or older blood
- ▶ Bright red (warm) blood = arterial or fresh blood

Valvular Surgery

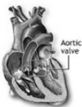
All Valve Surgeries Postoperative Considerations

- ▶ Prosthetic heart valve malfunction:
 - Acute prosthetic valve failure:
 - Sudden onset of dyspnea, syncope, or precordial pain
 - Sudden death
 - Hyperdynamic precordium
 - Pronounced JVD
 - Subacute valve failure:
 - Gradually worsening congestive heart failure
 - Unstable angina
 - Hemolytic anemia
 - Asymptomatic

Postoperative Valve Considerations

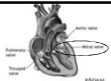
- ▶ Embolic complications
 - Stroke
 - TIA
- ▶ Anticoagulant-related hemorrhage
 - Hemorrhage site - brain, abdomen, etc.
- ▶ Dysrhythmia
 - AV Block
 - Atrial dysrhythmias

Valvular Surgery Pearls Aortic Valve



	Aortic Stenosis	Aortic Regurgitation
Preop	LV hypertrophy ↑ SVR s/s heart failure	LV hypertrophy
Post op	LV may not anticipate ↓ in SVR and continue to pump hard Avoid hypertension and stress on suture line	IV vasodilators to ↓ SVR Inotropic support to promote emptying LV: Milrinone/Dobutamine IABP

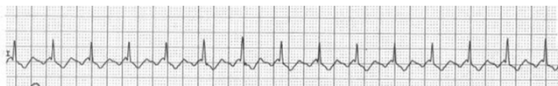
Valvular Surgery Pearls Mitral Valve



	Mitral Stenosis	Mitral Regurgitation
Preop	Nx LV function Pulmonary Hypertension RV failure High atrial & pulmonary pressures Pulmonary congestion	Enlarged left atrium Both common to have atrial fibrillation
Post op	Assess pulmonary hypertension (PVR) Dobutamine or Milrinone + Norepinephrine to ↑ contractility of RV & ↓ PVR Fluids ↑ CVP may indicate RV decompression Treat atrial fibrillation	Immediate ↑ SVR due to no backflow of blood in LA Pulmonary hypertension & myocardial hibernation take time to reverse Inotropes (Milrinone, Dobutamine) + epinephrine IABP Monitor for RV failure Treat atrial fibrillation

Case Study

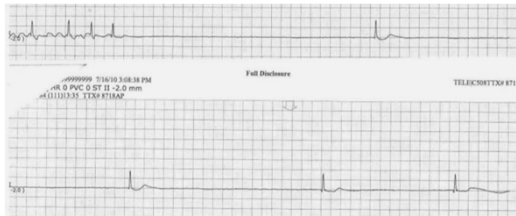
► Ms Leaky, a 47 y/o. had a MVR. Today on POD #4, she is being transferred to the progressive care unit.



► What is the rhythm?

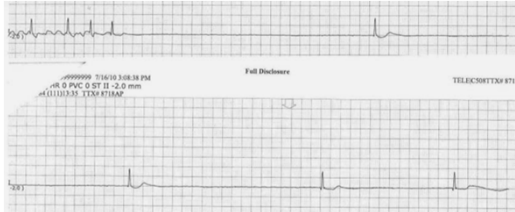
1. Sinus Tachycardia
2. Atrial Flutter
3. Sinus Rhythm
4. SVT

At 1508 Ms Leaky's rhythm changes to this.



What are your actions?

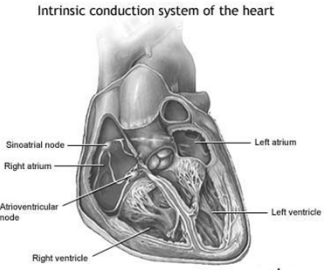
1. Atropine
2. Connect Pacemaker



You have both atrial and ventricular epicardial pacemaker wires.
Which wires would you connect FIRST?

1. Atrial
2. Ventricular

Damage to His bundle may result in BBB or CHB



Intrinsic conduction system of the heart

Labels: Sinoatrial node, Right atrium, Atrioventricular node, Right ventricle, Left atrium, Left ventricle

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