SNS COLLEGE OF ALLIED HEALTH SCIENCES
SNS Kalvi Nagar, Coimbatore - 35
Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT OF CARDIOPULMONARY AND PERFUSION TECHNOLOGY

COURSE NAME : CPB & ITS COMPLICATIONS

3RD YEAR

TOPIC : COMPLICATIONS WHILE INITIATION OF CPB

DEFINITION

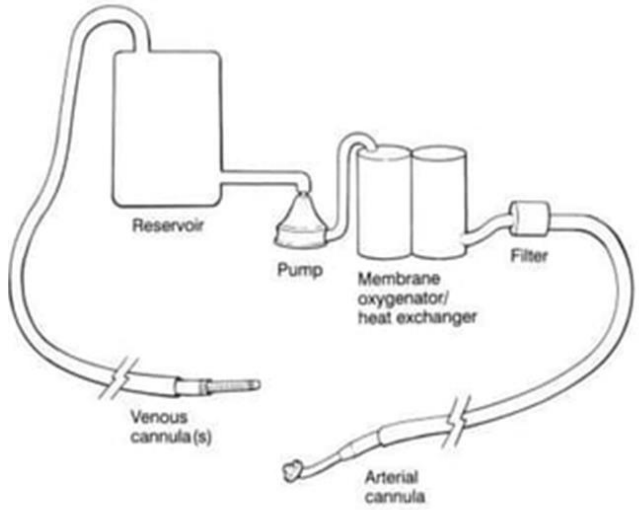
- CPB is a form of extracorporeal circulation
- It temporarily takes over the function of heart and lungs during surgery, circulation of blood and the oxygen content of the body

- To facilitate surgical intervention
- Provide a motionless field
- Provide a blood less field

CARDIOPULMONARY BYPASS

- Bypass basic system
  - Blood is drained from the venous system utilising gravity through:
    - Cannulas in SVC and IVC
    - Single cannula in right atrium

  Into the venous reservoir
  - It is pumped into the membrane oxygenator
  - Returned to the system via a cannula usually placed in distal ascending aorta

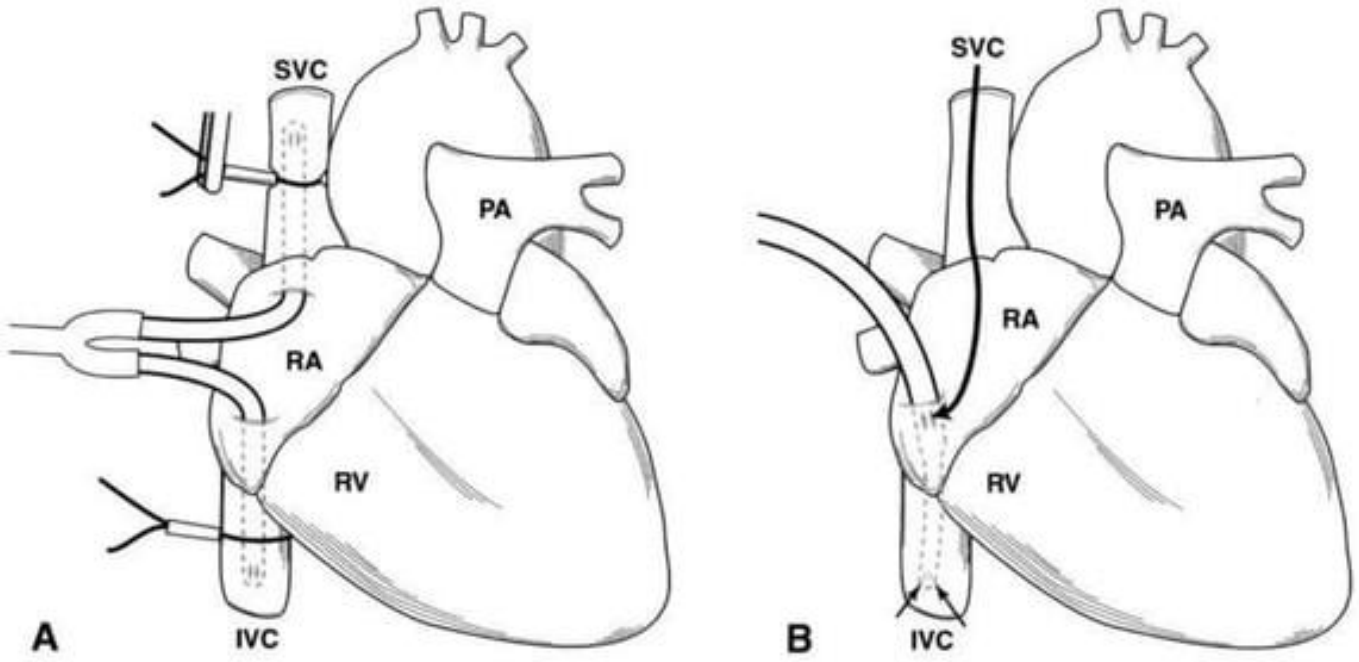


VENOUS DRAINAGE

- Venous blood enters the circuit by gravity or siphonage into a reservoir placed 40-70 cm below the level of heart.
- The amount of blood drained is determined by:
  - CVP
  - Δ H
  - Resistance in cannulas, tubing and connectors
  - Absence of air within in the system
  - Inadequate blood volume
  - Excessive siphon pressure

  Compliant venous or atrial walls collapse against cannular intake openings corrected by adding volume to the patient

VENOUS BLOOD FLOW



- Venous cannulation Techniques:
  - Bicaval
  - Single atrial
  - Cavo atrial

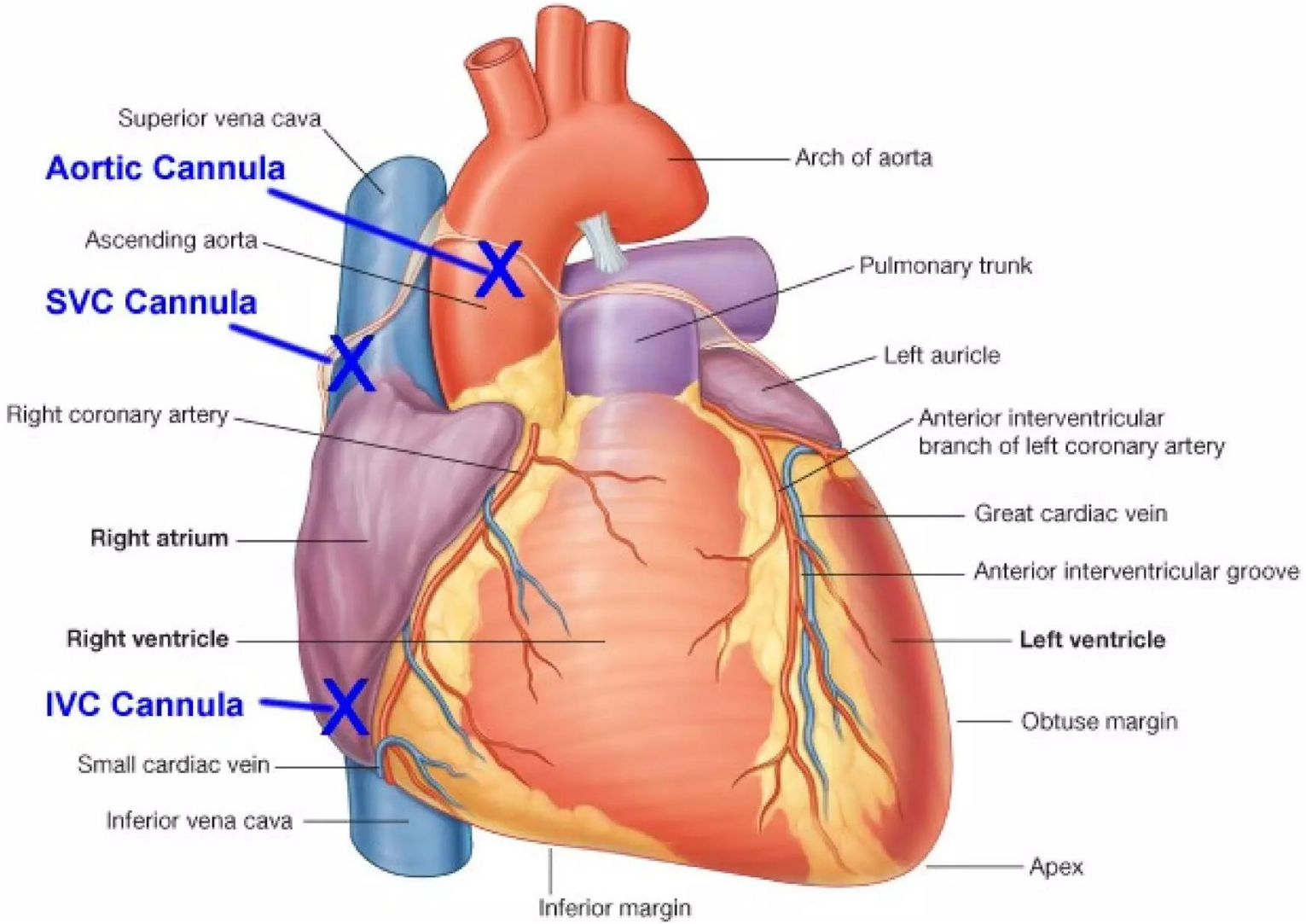
VENOUS CANNULATION DRAINAGE AND COMPLICATIONS

- Atrial arrythmias
- Atrial / caval tears and bleeding
- Air embolization
- Injury or obstruction due to catheter malposition
- Reversing arterial and venous lines
- Unexpected decannulation.
- Placing tapes around the cavae may lacerate
  - Branches
  - Nearby vessels
  - Cava itself
- Venous catheters may compromise venous return to the right atrium before or after the CPB
- Entrapment of the intra-cardiac catheter by a suture
- Improper purse suture placement obstructing the cava when tied

CAUSES OF LOW VENOUS RETURN

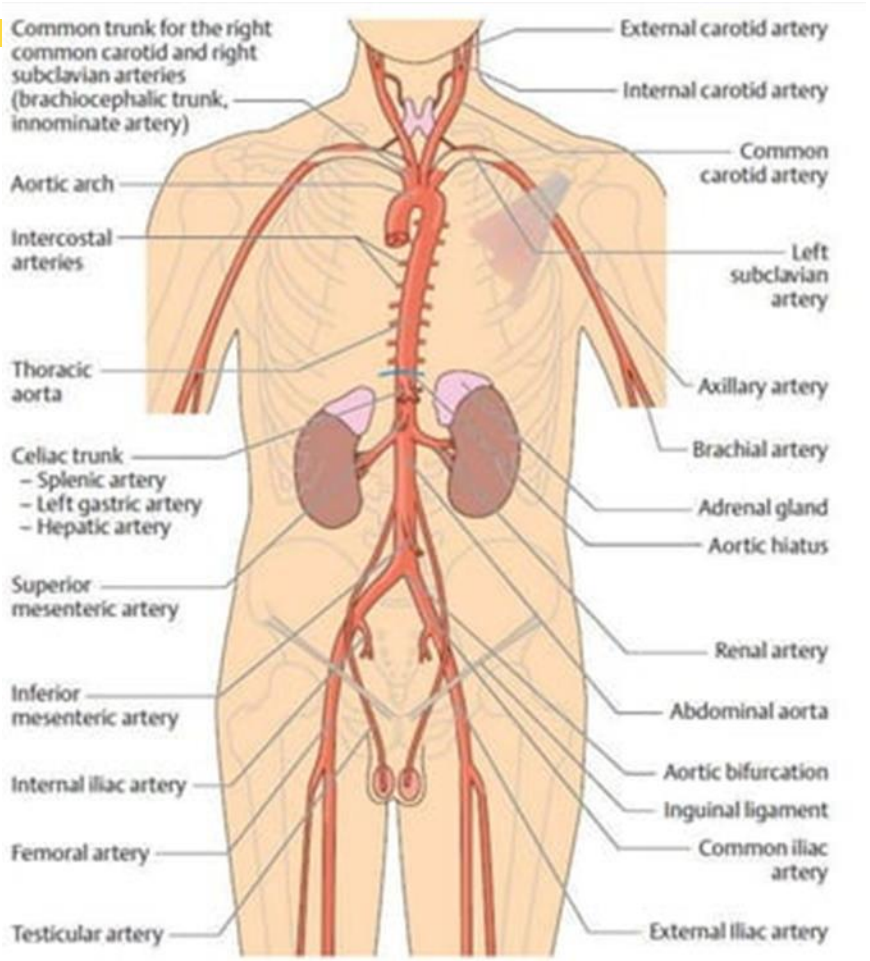
- Inadequate height
- Malposition of venous cannulas
- Obstruction or excess resistance
- Inadequate venous pressure(venodilation or hypovolemia)
- Kinks, airlocks or insertion of PA balloon catheter into a cannula.
- During rewarming tendency for kinking is more(softening of tubes)
- Surgical manuplation.

- Low venous pressure
- Hypovolemia
- Drug induced venous dilation
- Small cannula
- Excessive flow resistance
- Partial obstruction causes of venous return causes RV distension and contractility impairment


Superior vena cava
Aortic Cannula
Arch of aorta
Ascending aorta
Pulmonary trunk
SVC Cannula
Left auricle
Right coronary artery
Anterior interventricular branch of left coronary artery
Great cardiac vein
Right atrium
Anterior interventricular groove
Right ventricle
Left ventricle
IVC Cannula
Obtuse margin
Small cardiac vein
Inferior vena cava
Apex
Inferior margin

ARTERIAL CANNULATION

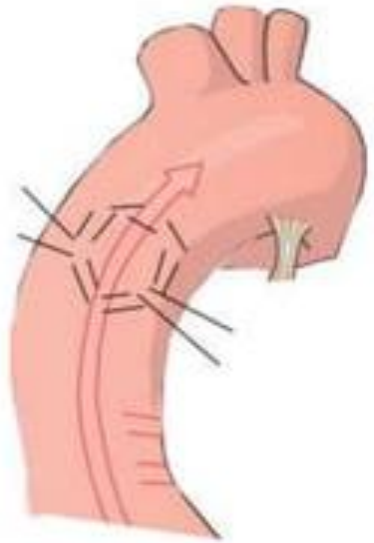
- SITES
  - ✓Proximal aorta
  - ✓Innominate artery
  - ✓Distal aortic arch
  - ✓Femoral
  - ✓External iliac
  - ✓Axillary
  - ✓Subclavian
- The choice is influenced by:
  - ✓The planned operation
  - ✓The distribution of atherosclerotic disease



ASCENDING AORTIC CANNULATION

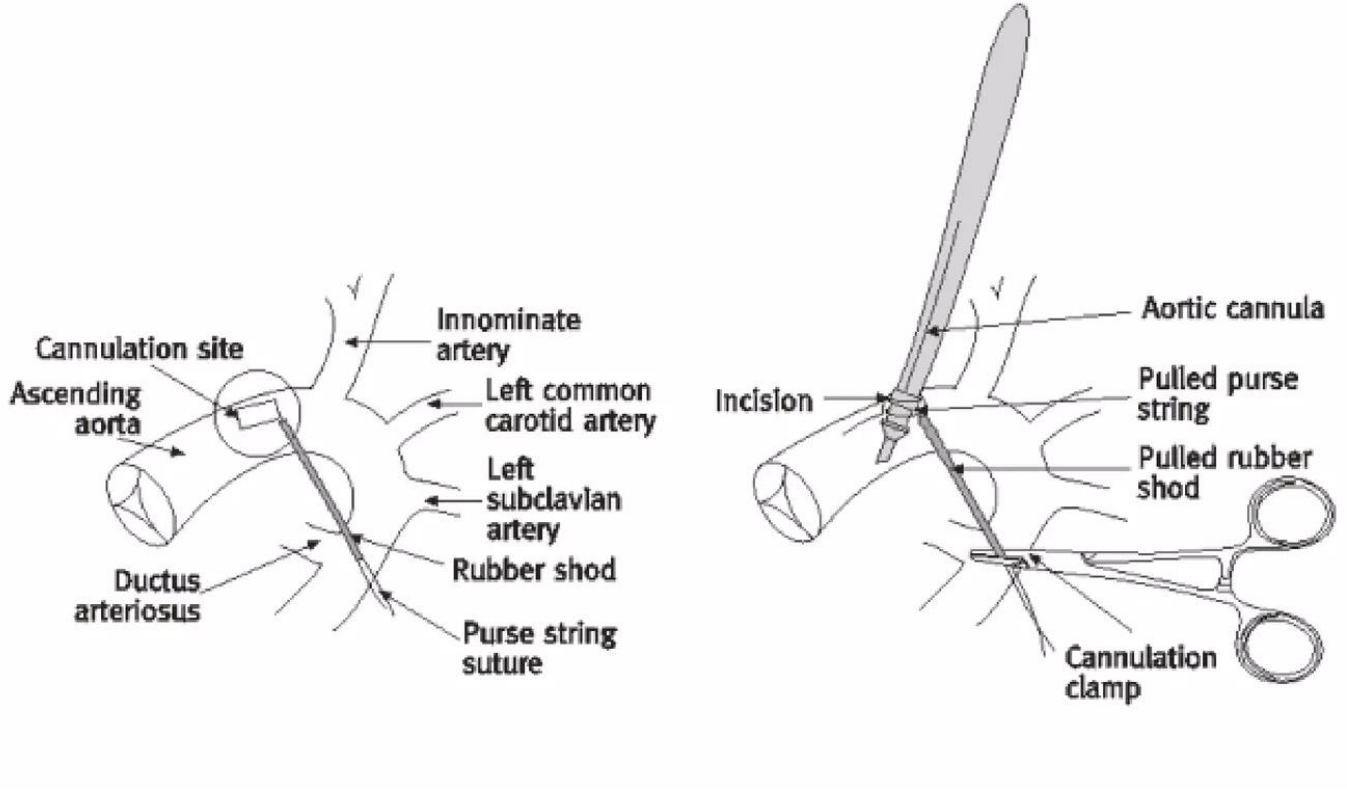
CANNULATION

- 2 purse strings (1.0 – 1.3cm diameter) partially through the aortic wall.
- MAP of 60 – 80 mm Hg
- 4 – 5mm full of thickness stab wound
- Insert the cannula under a finger
- Position the cannula to direct the flow to the mid transverse aorta
- Proper placement is confirmed by noting pulsatile pressure inn the aortic line monitor and equivalent pressure in the radial artery



ASCENDING AORTA

- ADVANTAGE – ease, safe and no additional incision
- If pressure too high – greater chance of tear and dissection
- If pressure too low – aorta tend to collapse, difficult to make incision and greater risk of tear.


Cannulation site
Ascending aorta
Innominate artery
Left common carotid artery
Left subclavian artery
Rubber shod
Ductus arteriosus
Purse string suture
Incision
Aortic cannula
Pulled purse string
Pulled rubber shod
Cannulation clamp

POTENTIAL COMPLICATIONS

- Atherosclerosis with or without calcification
- Atherosclerosis is a risk factor for perioperative and aortic dissection and post op renal dysfunction
- Inability to introduce cannula
- Intramural placement
- Air embolism from the cannula
- Persistent bleeding around the cannula
- Malposition of the tip
- Aortic dissection and high CPB line pressure

Complications summary

- Difficult insertion
- Bleeding
- Tear in the aortic wall
- Malposition of cannula tip
- Atheromatous emboli
- Failure to remove all air from arterial line
- Injury to aortic back wall
- Aortic dissection

THANK YOU