



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



DEPARTMENT OF CARDIOPULMONARY PERFUSION CARE
TECHNOLOGY

COURSE NAME: CPB & Perfusion Technology

TOPIC : Effects of Lung on Bypass

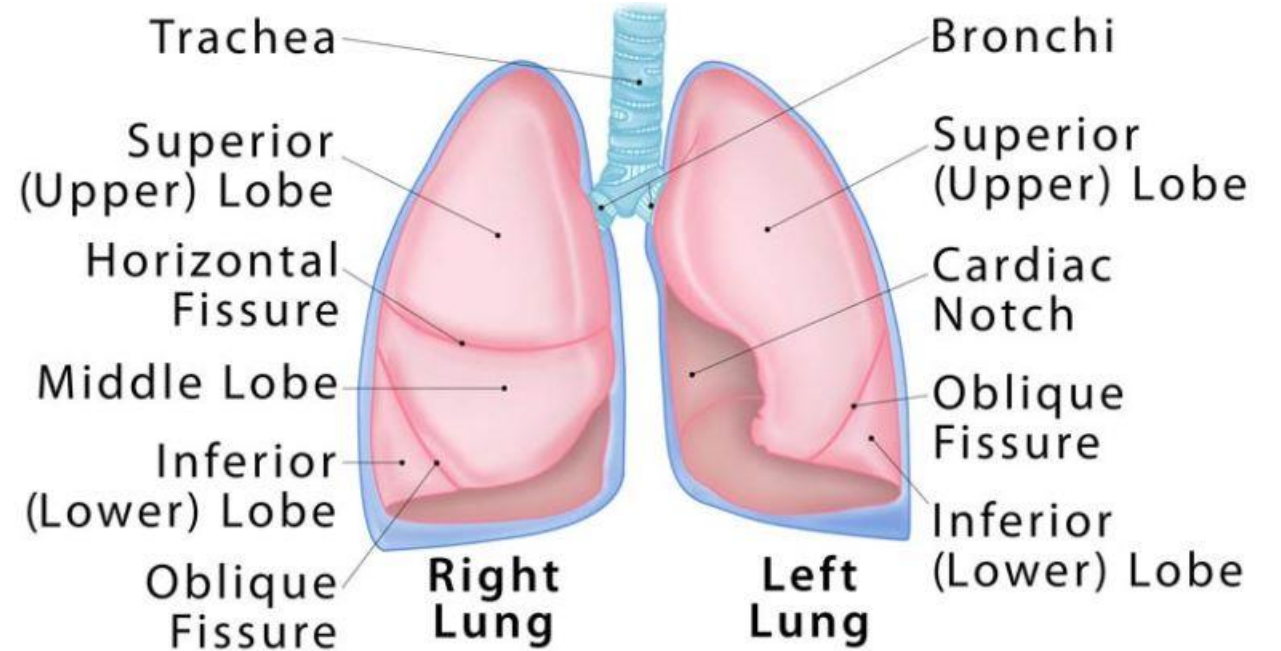
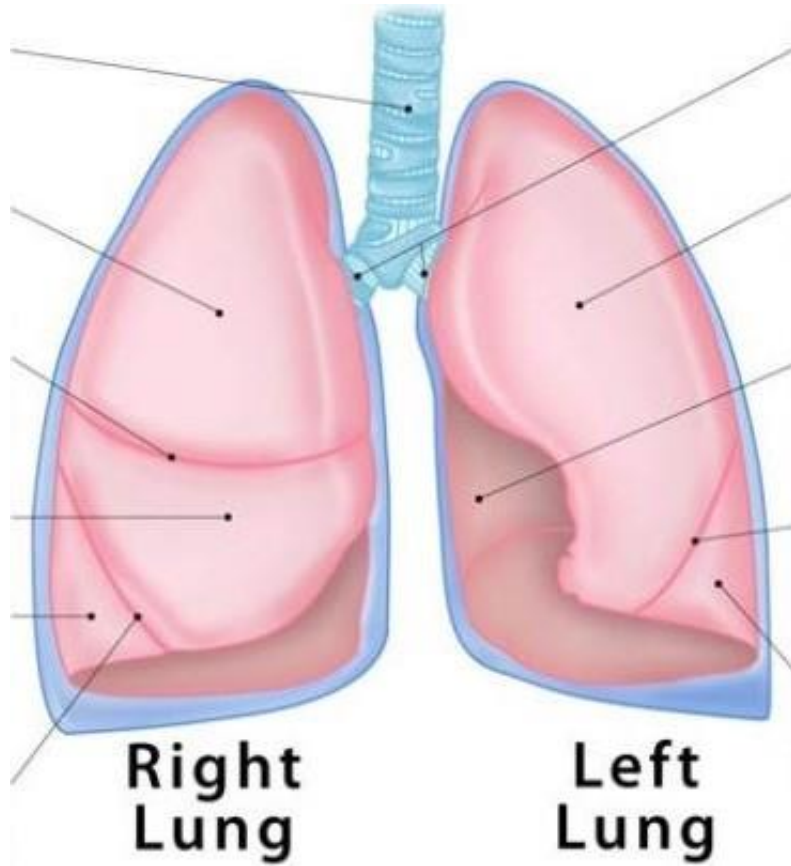


INTRODUCTION

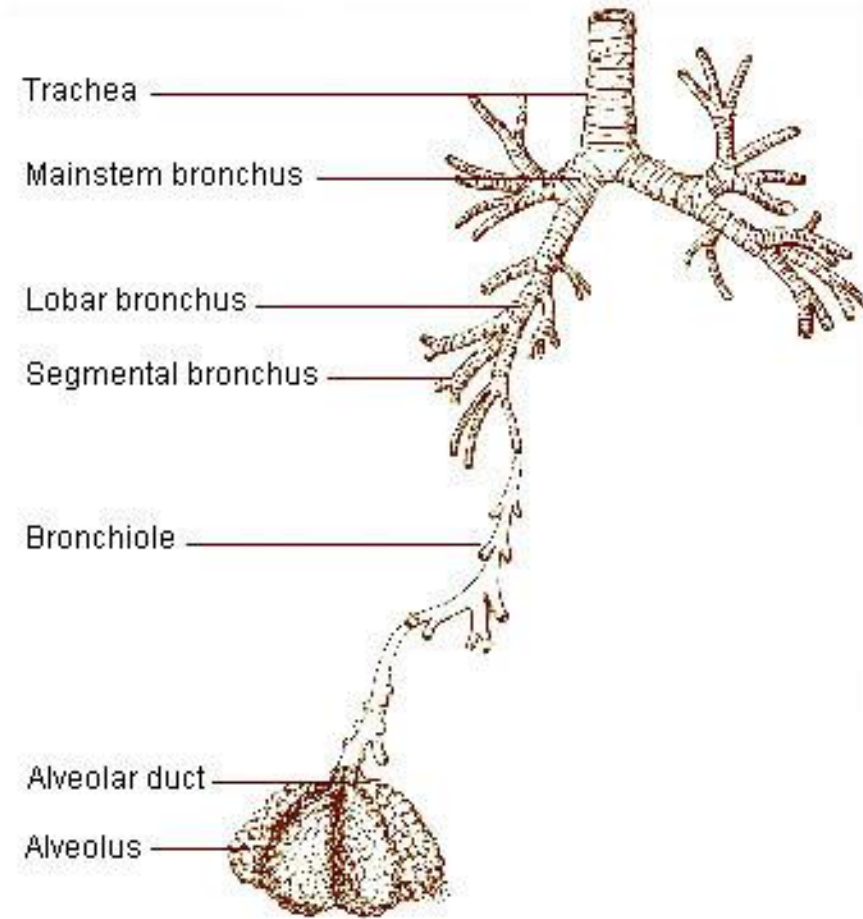
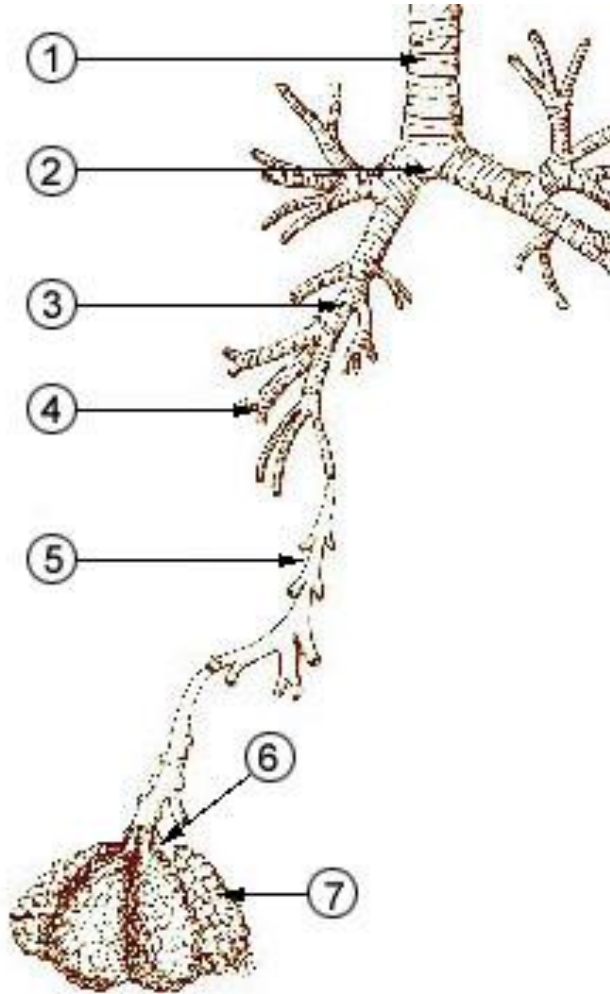


- Injury to some degree or another occur in all patients who undergo CPB
- **Injury is directly proportional to duration of CPB**
- **Membrane oxygenator , arterial filter, bubble deflectors -- have decreased incidence of serious injury.**
- It is important to understand the injuries that do occur in order to decrease factors that may worsen the effect of CPB.
- **The goal of Perfusionist is to maintain a normal physiological status during CPB.**

Pre test



Pre test

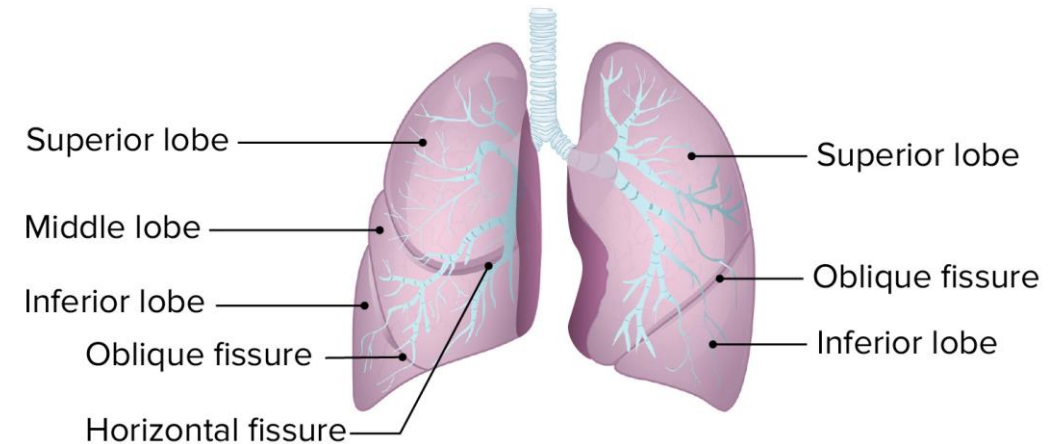




LUNGS



- Lungs receive blood from Pulmonary Artery and Bronchial Arteries
- The blood from the heart return to the lungs through Pulmonary Veins
- Each lung is cone shaped and has a peak, base and three borders and two surfaces
- The base of the lung is supported by diaphragm
- The peak of the lung is about 4cm above the first ribs into the root of the neck
- The thickness of the respiratory membrane is only 6 microns.

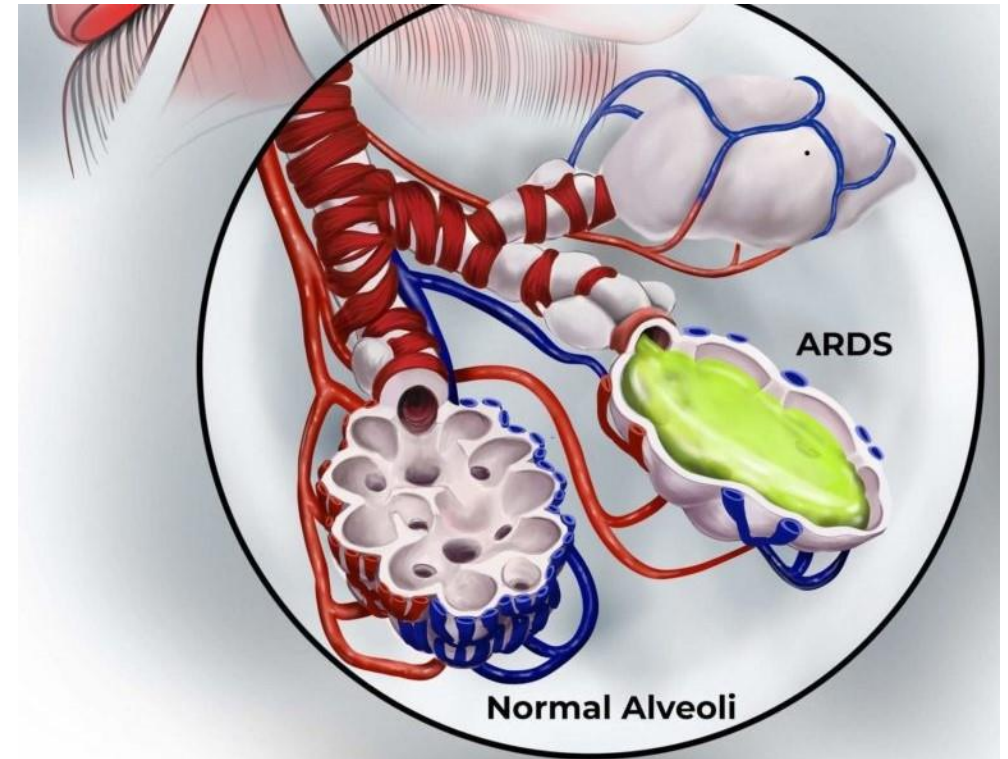




EFFECTS ON PULMONARY SYSTEM



- Pulmonary complications remain the leading cause of post-cardiac surgery morbidity with an incidence of 7.5% and a mortality rate of 21%, resulting in prolonged hospital stay and increase in cost.
- The spectrum of pulmonary complications ranges from atelectasis to acute respiratory distress syndrome (ARDS).





CAUSES OF POSTOPERATIVE RESPIRATORY FAILURE



- Atelectasis
- Increase in lung water content as a result of increased capillary permeability caused by **SIRS**
- Impaired hemodynamics in the immediate postoperative period
- Additional **fluid load** during CPB
- Transfusion-related acute lung injury (**TRALI**)
- Pneumothorax or haemothorax

**Submit your
Intraoperative
causes**



CAUSES OF POSTOPERATIVE RESPIRATORY FAILURE



- Altered chest wall mechanics resulting from sternotomy (Median sternotomy results in more than 50% reduction in vital capacity (VC))
- The use of the internal **thoracic artery for grafts**
- Alteration in the production of surfactant
- Phrenic nerve injury impairing diaphragmatic function
- SIRS causing decreased static and dynamic lung compliance



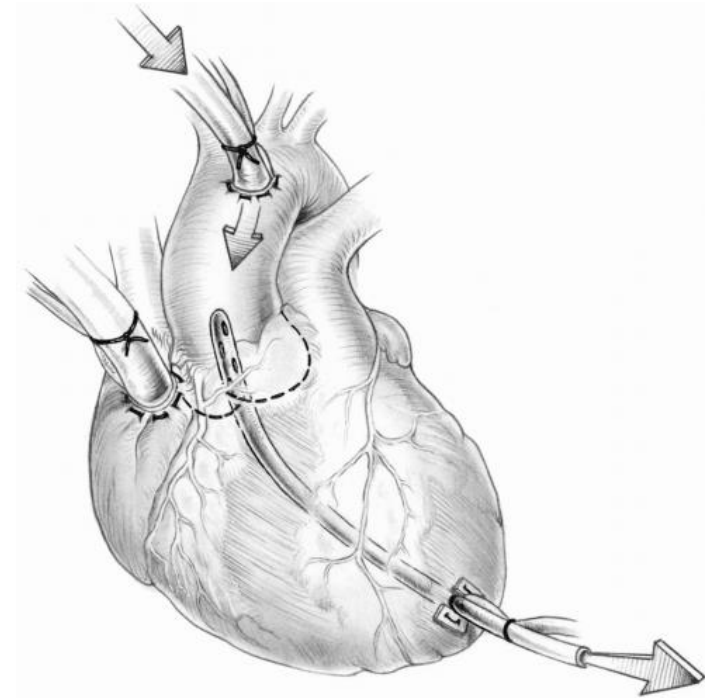
MAJOR EFFECT ON LUNGS BECAUSE OF



- **Left heart venting**
- **Bypassing the lungs** leads itself cause injury. (Longer bypass time)
- **SIR** - Complement activation of C3a and C5a leads to activation of leukocytes which causes leuko-embolization.



- Release of oxygen free radicals and proteolytic enzymes from neutrophils will damage the lung parenchyma





PUMP LUNG



- **Congested lung with intra alveolar edema.**
- Form of acute respiratory failure
- Capillary leaking in the lungs is a result of complement activation , neutrophil effect
- Decrease in COP leads to interstitial pulmonary edema.
- Overfilling the pulmonary vasculature may cause increased hydrostatic pressure leads to fluid accumulation.





PREDISPOSING FACTORS THAT LEADS TO ATELECTASIS



- History if smoking
- Chronic bronchitis
- COPD
- Obesity
- Pulmonary edema
- Pre op lung function.



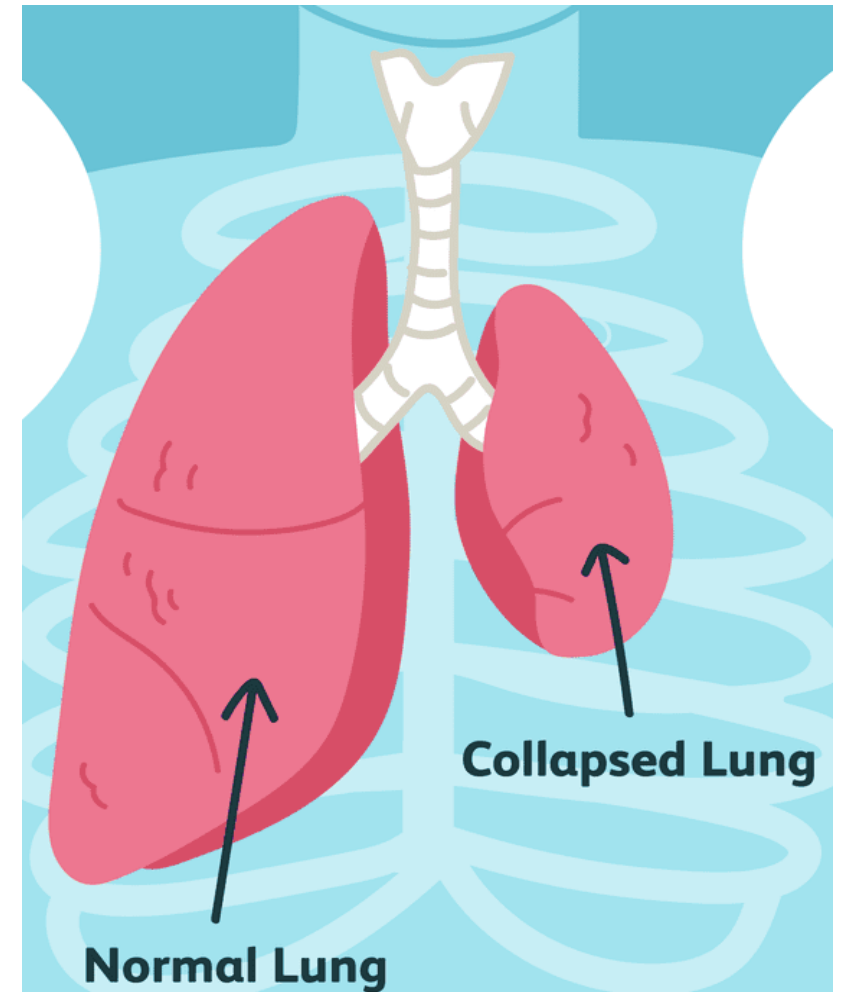


ATELECTASIS DURING CPB



ATELECTASIS – Partial or incomplete inflation of the lung

- **Bypassing the lung** itself may cause atelectasis
- **Altered lung state** (deflation, static inflation or intermittent inflation) will lead to atelectasis.

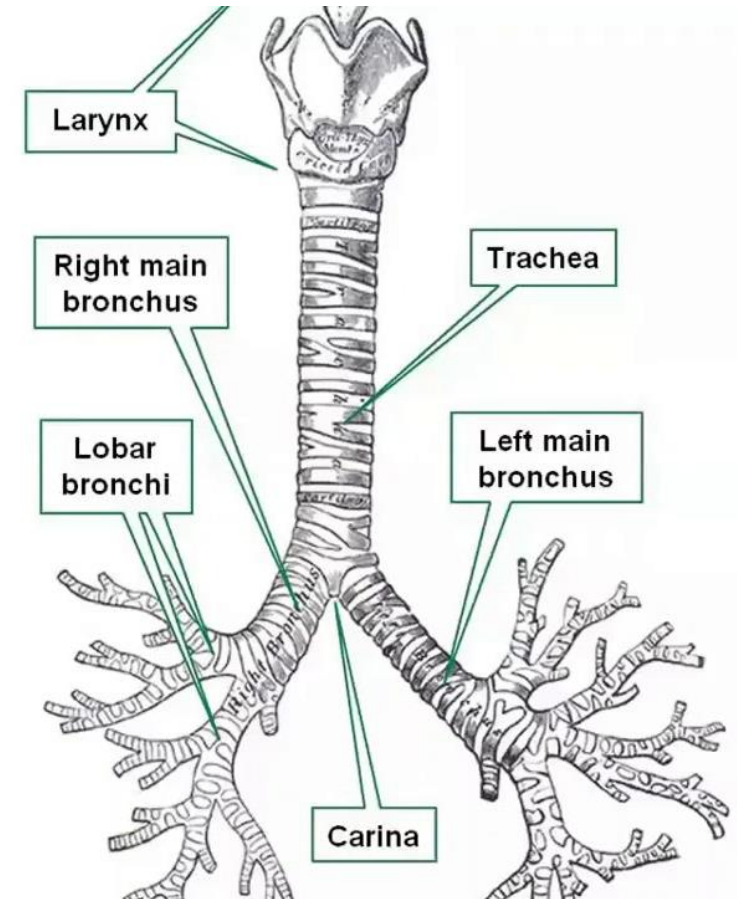


Which part of lung is mostly affected?

- The left lower lobe of the lung is mostly affected because of the normal right deviation of the tracheobronchial junction



- Lack of drainage of the left lung during suctioning





HOW TO AVOID ATELECTASIS?

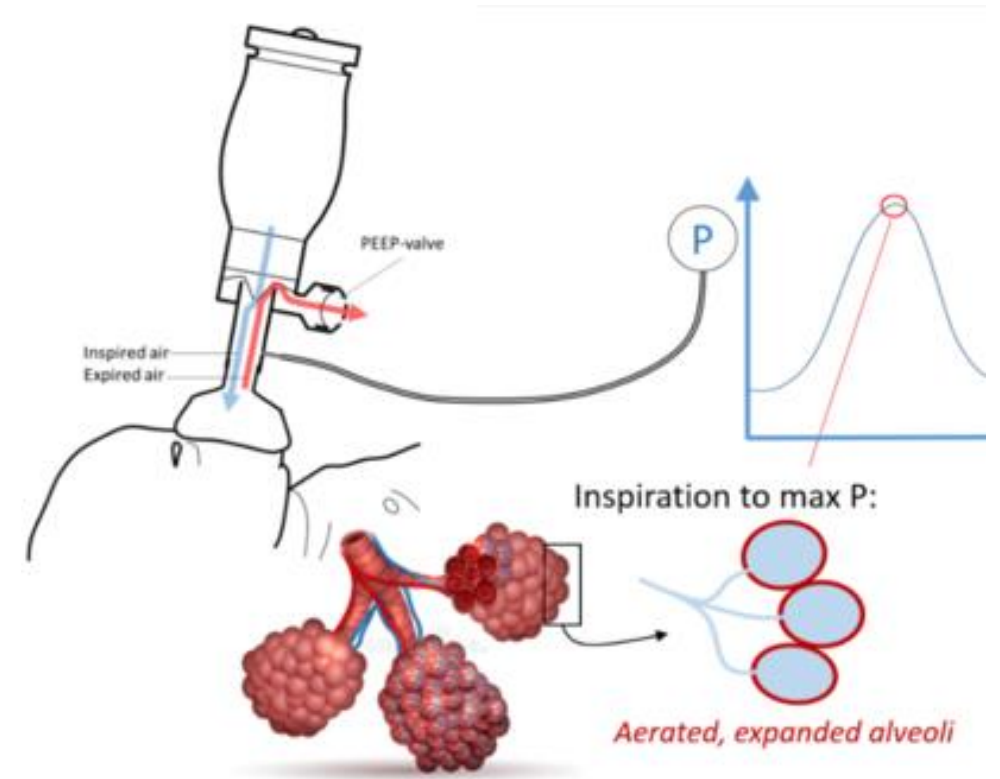


Match the following

- | | | |
|-----------------------------|---|---|
| 1. Arterial filter | → | Avoid distention of pulmonary vasculature |
| 2. Leukocyte depleting AF | → | Remove platelet aggregates and debris |
| 3. Colloid Osmotic Pressure | → | Reduce lung water |
| 4. Albumin coating | → | Decrease platelet adhesion |
| 5. least possible duration | → | Removes leukocyte clumps & platelet aggregation |
| 6. Left Heart Venting | → | Decrease morbidity rate |

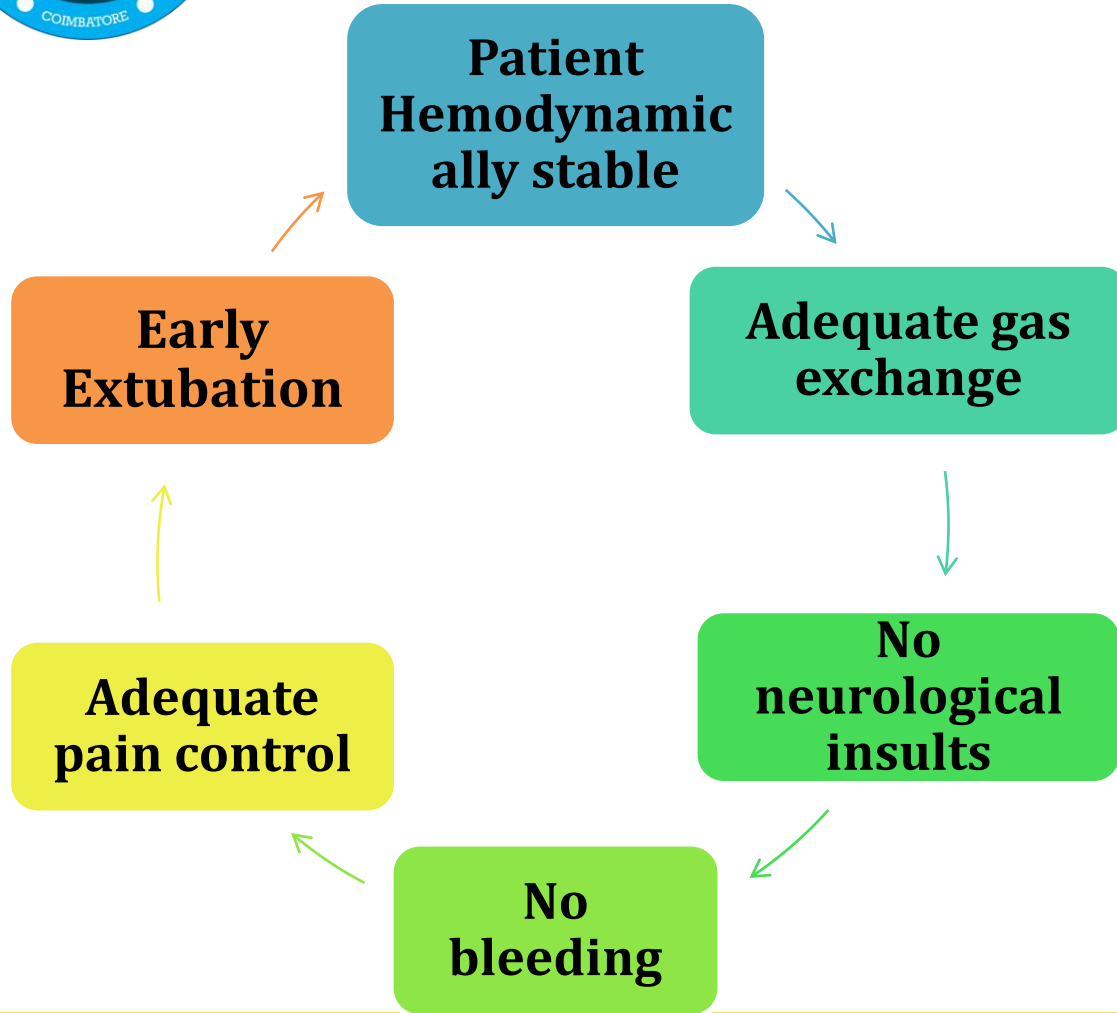
Post-op Care

- Effects of lungs causes **intrapulmonary shunts** that leads to mismatch between ventilation and perfusion.
- This mismatch is corrected by maintaining **higher inspired oxygen concentration**
- Application of **PEEP** during mechanical ventilation or continuous positive airway pressure (**CPAP**)
- **Tidal volume** should not be more that 10ml/kg to avoid organ failure
- **Diuretic support** for managing interstitial lung water





Post-op Care



- Early ambulation
- Ability to cough
- Clear pulmonary secretions



Reduced pulmonary complications



Assessment



- What is atelectasis?
- What perfusion measure you will take to avoid atelectasis on bypass?
- What post op care the patient needs particularly for lung?



Thank you



References:

The manual of Clinical Perfusion second edition – Bryan
Cardiopulmonary Bypass and Principles – Sunit Ghosh