SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT OF CARDIO PULMONARY PERFUSION CARE TECHNOLOGY

COURSE NAME : CPB AND ITS COPMPLICATIONS

3RD YEAR

TOPIC : ACCIDENTS DURING CPB

COMMON PERFUSION PROBLEMS

- Electrical failure
- Oxygenator failure
- Blood coagulation within ECC
- Gross contamination
- Line separation
- Air embolism
- Hypoperfusion
- Transfusion errors
- Drug error
- Protamine reaction

Safety Measures

- In CPB morbidity and mortality is too high, as CPB is not a straight forward, predictable procedure continuing to be a high risk procedure
- It’s the responsibility of the perfusionist to ensure patient’s safety while on CPB
- Safety methods need to be taken accordingly to the occurrence of incidents on CPB

ELECTRICAL FAILURE

PREPARATION TO PREVENT THIS EVENT;

- Inspect cords and plugs before every pump run
- Utilize plugs that lock in
- Check flashlight before every pump run, put in accessible place
- Have hand cranks immediately accessible
- Have battery operated emergency light in OT
- Clamp the venous line to avoid exsanguination
- Have assistant shine light on reservoir
- Shut off pump
- Hand crank to previous blood level and/ or resistance
- Have surgeon bath heart with saline slush to avoid rewarming, if hypothermic

ELECTRICAL FAILURE

- Make sure the power failure alarm and backup battery unit are fully functional
- Operating rooms have an uninterruptible power supply (UPS)
- A series of batteries linked to the hospital generator that powers the CPB machine, anesthetic machine, intravenous infusion pumps and other vital equipments
- It must be ensured that the CPB machine is connected to a UPS.
- Battery backup (UPS) is charged
- The perfusionist should check that the relevant hand-crank mechanism is available in case of power failure

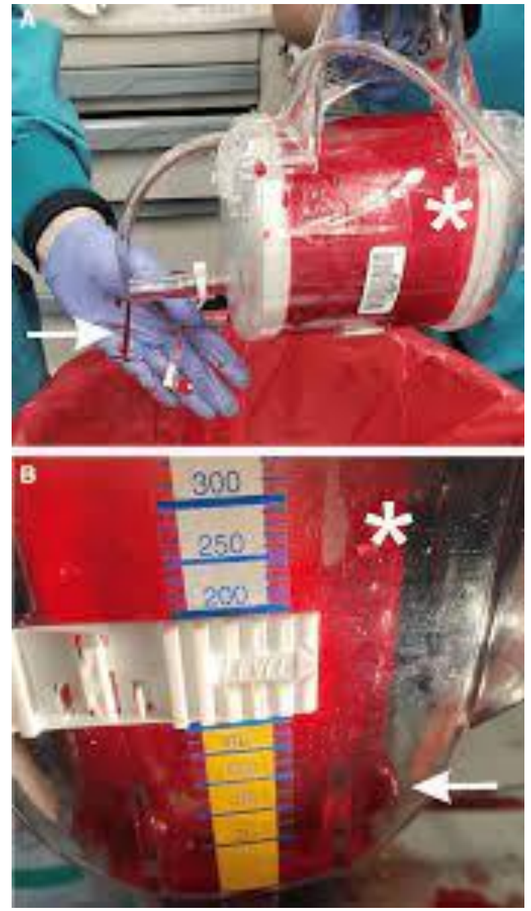
Oxygenator failure

Signs of failure

- Falling arterial PO_2 or falling venous saturation in the presence of 100% FiO2
- Flows at a normal to high cardiac index and adequate anaesthesia

- ACTION

1. Ensure that oxygen lines are connected through the entire circuit
2. Check the O_2 analyzer to ensure the blender is delivering the proper FIO_2. If analyzer is not in gas circuit connect 100% O_2 from a portable tank
3. In the presence of a slow failure and time permitting evaluate the oxygenator
4. Change out oxygenator



Oxygenator failure (cont)

- Check all gas connections to oxygenator – correct gas sources, kink free gas line, liquid free gas lines
- Use largest oxygenator possible for patient without compromising priming volume
- Use flowmeter with FiO2 blender calibrate flowmeter and blender regularly
- Perform oxygenator change out drills
- Be able to adequately diagnose oxygenator change out failure
- Open recirculation line if possible and increase flow
- Change out oxygenator
- Pre-primed oxygenator technique
- Use 2 perfusionist

Blood coagulation within ECC

PREPARATION TO PREVENT THIS EVENT;

- Add heparin to prime
- Monitor activated clotting times closely
- Prior to CPB have adequate ACT
- During CPB, ACT should be above 480 sec
- Keep circulating heparin at › 300 unit/kg during CPB
- Use heparin coated circuit within filters
- Shut off pump suction before protamine administration
- Use auto transfusion unit when heparin is not circulating for blood salvage
- Careful history taking
- Use of prostacyclin to avoid platelet aggregation

Management

- Add heparin as needed to increase ACT
- In evident blood clotting, discontinue CPB
- Change out circuit

GROSS CONTAMINATION

PREPARATION TO PREVENT:

- Limit traffic around pump
- Educate staff to sterile technique
- Do not remove sterile lines from table
- Be certain of sterile package integrity
- Gown & gloves during circuit preparation
- Do not allow set up ‘wet’ pump to sit for long period

MANAGEMENT

- Use of applicable antibiotics to patient

LINE SEPARATION

PREPARATIONS TO PREVENT ;

- Check all circuit connections
- Secure all connections with tie wrap
- Special attention should be paid to plastic tubing connections, tie wrap these prior to priming
- Monitor line pressure closely
- Shut off pump head if line pressure “peaks”
- Use of line resistance alarms/shut off systems
- Visually check arterial line
- Perform emergency drills

MANAGEMENT

- Shut off pump, clamp venous and arterial lines
- Make necessary connections, fill lines with fluid
- Aspirate air from arterial line

AIR EMBOLISM

PREPARATIONS TO PREVENT THIS EVENTS ;

- Careful priming techniques
- Flush system with CO2
- Level sensor
- Bubble detector
- Arterial filter/ bubble trap
- Look for emboli post CPB in arterial cannula before re-transfusing
- Check monitoring lines for air before flushing
- Check roller head direction
- Check whether all connections secured with tie wrap

AIR EMBOLISM (CONT)

- Cardiotomy reservoir vent should be open
- 100% occlusion of LV vent pump head
- Use vacuum system on membrane oxygenator
- Limit traffic around pump
- 1 way purge line off any arterial site
- 1 way LV vent pressure relief valve, check under fluid

MANAGEMENT

- Use of “battle plan” for automatic arterial pump head shut down
- Retrograde perfusion

HYPOPERFUSION

PREPARATIONS TO PREVENT THIS EVENT:

- Add crystalloid or colloid if needed, blood if HCT is low
- Watch line pressure at initiation to ensure proper cannulation
- Scan venous line for air
- Set occlusion before every case
- Monitor venous oxygen saturation closely

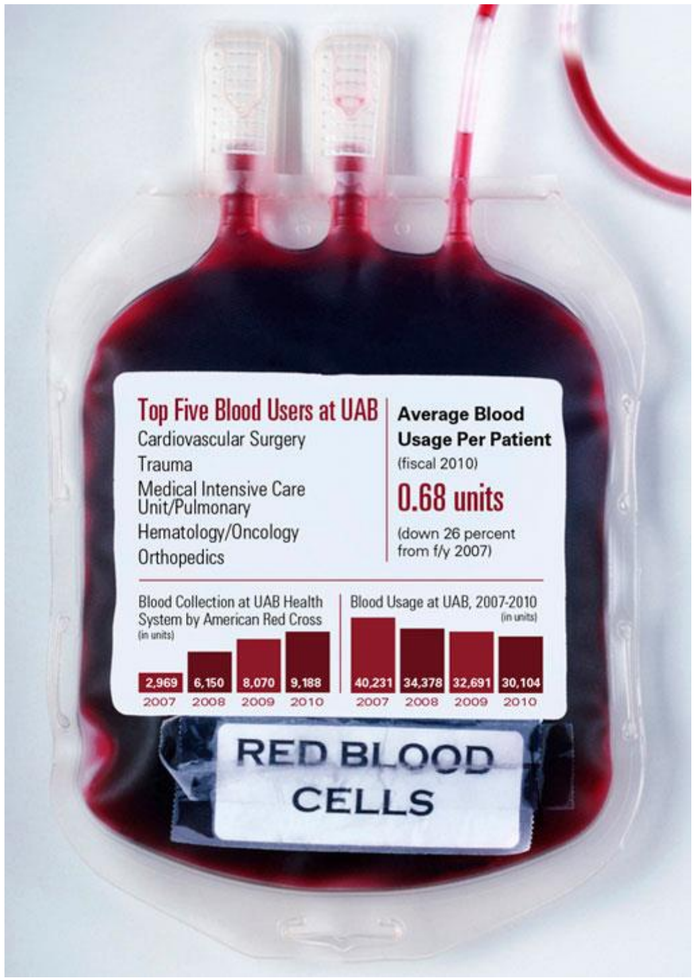
MANAGEMENT

- Increase flow and, add fluid

TRANSFUSION ERRORS

PREPARATION TO PREVENT :

- Document's identification no: and blood type on pump record prior to CPB
- Patient identification;
  - identify patient
  - patient hospital number
  - verify blood type & rh factor
- Check expiry date on blood bag
- Always double check before administration
- Be aware of sign of transfusion reactions
  - hematuria
  - anaphylaxis
- Remove all blood products after pt leave OT



MANAGEMENT

- Stop transfusion immediately
- Notify appropriate personnel
- Re- check all labels and forms
- Obtain urine specimen

DRUG ERRORS

PREPARATIONS TO PREVENT THIS EVENT ;

- Label all syringes
- Have back up watch as drugs are drawn
- Tap bottle to syringe
- Use colour coding of syringes
- Document all drugs and dosages administered
- Communicate with anaesthesiologist or surgeon regarding the use of non- protocol drugs

MANAGEMENT

- Consult anaesthetist or surgeon

PROTAMINE REACTION

PREPARATIONS TO PREVENT THIS EVENT ;

- Use slow injection
- Give peripherally
- Give 5-10mg test dose
- Careful history taking in;

i. Pt with poor LV function

ii. Vasectomised patient [have protamine reaction in males]

iii. Patient with prior protamine exposure

iv. Diabetic patients using NPH [neutral protamine hegitron] insulin

v. Patient allergic to fish

MANAGEMENT

- Administrate fluid for hypotensive reactions
- Give oxygen, steroid, epinephrine, antihistamines
- Alpha vasopressors and dopamine for myocardial depression
- Administrate heparin
- Reinstitute CPB if necessary

THANK YOU