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 : PRINCIPLES OF PERFUSION TECHNOLOGY I

II nd YEAR

TOPIC : ELEMENTS OF ECC&ITS HAZARDS

Hemolysis by roller

Three basic materials currently used for tubing:

- silicone rubber
- latex rubber and
- polyvinyl chloride (PVC)- most widely used (durability and acceptable hemolysis rates)

Hemolysis Latex rubber > PVC > silicone rubber

- PVC tubing stiffens during hypothermic CPB and tends to induce spallation,. Silicone rubber > PVC

Management

- Refers to the occlusion as the roller presses the tubing against the raceway
- Occlusion is set by holding the tubing line vertically so the top of the fluid is about 30 cm above the pump and then gradually decreasing occlusiveness until the fluid level falls at a rate less than 1 cm/minute
- Occlusion should be set each roller separately.
- This compression appears to be more critical ,

  Excessive compression – hemolysis and tubing wear

  Very little compression –forward output impaired , rarely hemolysis

Occlusion setup

1. Load the unprimed tubing in the roller pump raceway
2. Introduce the appropriate amount of priming solution in the oxygenator
3. Close the sampling ports and recirculating lines.
4. Hold the distal arterial line vertically.
5. Advance a column of priming approximately 30cm above the level of the pump.
6. Deocclusion of the rollers by moving the rollers away from the backing plate to ensure there are no excessive occlusion.
7. Adjusting roller occlusion against the backing plate to allow slight drop of fluid at a rate less than 1cm/m.
8. The occlusion should be set to each roller separately (one by one),if one of the rollers in the pump head does not yield the same rate of fluiddrop(under occlusion),the occlusion should be set to the roller that is tightest.

Airembolism

- Massive air embolismCritical complication due to residual neurologic damage and high mortality

Causes

- sudden reduction in venous reservoir level(ex. large AP collateral)
- Inverson of left sided vent
- Reversal of pump head
- Air from cardiac chambers
- Runaway pump head

Management

- Stop CPB immediately
- Clamping venous line
- Steep Trendelenberg position
- Remove aortic cannulae
- Remove arterial filter
- Deair arterial cannulae & pump line
- Retrograde hypothermic SVC perfusion
- Resume antegrade CPB

- Finish cardiac procedure
- Rewarming; up to 34°C,
- no overheating
- Induce hypertension

- Retrograde cerebral perfusion – Direct connect arterial line to SVC
- Use Arterio venous shunt
- Line flow – 1-2 L/min(adult)
- Duration – 1-4min , Pressure upto 40mmHg
- Carotid compression confirm no air on aortic cannulation site
- Medication – Methyprednisilone 30mg/kg, Thiopental 20mg/kg, Mannitol 1gm/kg, Mannitol 0.5gm/kg,8hrs phenytoin 25mg, 12hrs temperature control

Electric Failure

- Usually failure of backup system (OR & CPBconsole)
- PreventionBe familiar with operating facilities and devices in case of emergency backup
- Check flashlight and hand crank
- Need battery operated emergency lightsource, portable monitor, infusion pump,suction
- Source of light – Flash light,laryngoscope
- Venous line clamping to avoid exanguination
- Manual systemic perfusion with hand crank – High speed (60-100rpm/min)
- Extra manpower ,Manual ventilation, Battery operated monitor, Infusion pump, Suction device cpb console battery
- Limited duration of support 30min for arterial pump,sucker,vent, light 50 min for only arterial pump

Inadequate systemic pressure

- Inadequate systemic pressures have been incriminated as the cause of multisystem organ dysfunction, including neurocognitive changes, renal failure, and splanchnic hypoperfusion.
- Whether low-flow or high-flow CPB is optimal for organ system protection is controversial, but a minimum pressure of 50–60mm Hg should be maintained unless it is desired to intentionally maintain a higher pressure (e.g., the patient with significant uncorrected carotid disease or the hypertensive, diabetic patient with preexisting renal dysfunction).

Management

- Phenylephrine or norepinephrine is commonly used on pump to maintain systemic pressures, accepting the transient dips that occur with cardioplegia infusion or reinfusion of shed blood aspirated through the cardiotomy suckers.
- However, adequate flow rates must be maintained, because a- agents will shunt blood away from the muscles and splanchnic circulation
- Occasionally, in the patient on numerous antihypertensive medications, including ACE inhibitors, ARBs, amiodarone, and/or calcium channel blockers, a state of refractory hypotension exists. This state of autonomic dysfunction or “vasoplegia” may require the infusion of vasopressin to maintain blood pressure.
- On rare occasions, methylene blue 1–2 mg/kg may be used to maintain blood pressure.

High arterial line pressure

- High arterial line pressure measured by the perfusionist is a potentially alarming situation.
- With pressurized roller pumps, this could result in a catastrophic line disconnection.
- With centrifugal pumps, which are afterload-sensitive, unsafe high line pressures should not occur because the pump head automatically reduces flow.
- In adults, the venous outflow limb of the CPB circuit is a larger diameter tubing than the arterial inflow tubing, precisely to eliminate reversed cannulation.
- This is why reversed cannulation is rare in adults, but it has happened.
- In pediatric cases, the arterial inflow and venous outflow limbs of the CPB circuit are close or equal in size

CAUSES

- A high line pressure caused by a high flow rate through a small cannula should not occur if the appropriately sized cannula is selected.
- Malposition of the tip of the aortic cannula, kinking or clamping of the line, or an aortic dissection can also account for a high line pressure.
- When a dissection occurs, the high line pressure is accompanied by very low systemic pressures, and mandates immediate cessation of pump flow and relocation of the arterial inflow cannula.