Hypertensive Crisis

Treatment

Hypertensive Urgency:
- Reduce BP slowly over 24-48 hours
- IV Hydralazine/Labetalol OR PO Isradipine/Clonidine

Hypertensive Emergency:
- Reduce BP by 10-20% over first hour, reduce by no more than 25% in first 8 hours
- IV Hydralazine or Labetalol bolus, followed by Nicardipine or Labetalol infusion

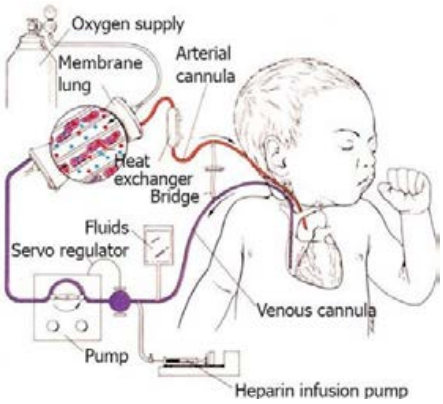
Medication	Dosage	Indications	Notes
Hydralazine	Start 0.1-0.2 mg/kg/ dose [max 20mg], max 0.5 mg/kg Q4H – onset in 10 min, duration 4-6 hrs	Short-term control of symptomatic hypertension	Not for use in LV dysfunction. Potential exists for prolonged hypotension
Labetalol	0.25-1 mg/kg/dose (max 40 mg) as frequently as q5-10 min, or continuous 0.25-1 mg/kg/hr	• Short-term control of symptomatic hypertension • For pheochromocytoma use after initiation of an alpha blocker so as to not precipitate hypertensive crisis.	Not for use in myocardial dysfunction
Nicardipine	Loading dose 5-10 mcg/kg then 0.5-3.5 mcg/kg/min. Peak effect at 30 min, lasting up to 4 hours	Consider use w/ renal dysfunction.	Not for acute heart failure or coronary ischemia. Caution in infants w/ calcium-dependent myocardium

ECMO

Definition

An extracorporeal circuit designed to provide prolonged pulmonary (VV ECMO) or cardiopulmonary (VA ECMO) support by removing blood from the native vascular system, performing gas and heat exchange and reinfusing the oxygenated blood into the body.
- **Venovenous (VV ECMO)** – Drains systemic venous deoxygenated blood, oxygenates it and removes carbon dioxide, and returns oxygenated blood to the systemic venous system. Provides pulmonary support (blood still goes through native heart and lungs) and is effective in respiratory failure w/ **intact cardiac function**.
- **Venoarterial (VA ECMO)** – Drains systemic venous deoxygenated blood, oxygenates it and removes carbon dioxide, and returns oxygenated blood to systemic arterial system. Provides cardiopulmonary support (some blood bypasses native heart and lungs) and is effective in patients w/ **cardiopulmonary failure**.

ECMO continued on next page →

ECMO	
Definition	 VA ECMO. Maslach-Hubbard A, Bratton SL. Extracorporeal membrane oxygenation for pediatric respiratory failure: History, development and current status. World J Crit Care Med 2013; 2(4): 29-39
Indications	• Hypoxemic respiratory failure w/ PaO2/FiO2 < 100 or Oxygenation Index (OI) > 40 despite optimized ventilator settings (PIP > 35 cm H20, PEEP > 10 cm H20, MAP > 18 cm H20; failure of high frequency ventilation) (OI = FiO2 * Mean Airway Pressure * 100/PaO2, note, multiply by 100 because FiO2 is correctly expressed as a decimal, even though colloquially referred to as a percentage) • Persistent hypercapneic respiratory failure w/ arterial pH < 7.2 refractory to all ventilation modes. • Refractory cardiogenic shock • Cardiac arrest • Failure to wean from intraoperative cardiopulmonary bypass • VA ECMO or ventricular assist device may be used as a bridge to cardiac transplantation • VV ECMO is potential bridge to lung transplantation in certain circumstances
Relative Contra-indications	• Lack of reversible etiology of critical illness • Poor pre-existing functional status *multiorgan failure is probably more of a consideration than functional status • Contraindications to systemic anticoagulation (i.e. massive IVH in neonates)
Pre-ECMO Initiation	1. Type and cross, arterial blood gas, electrolytes, CBC, coags, lactic acid, LFTs and chem 10 2. Head US in neonates to rule out severe IVH 3. Echocardiogram to evaluate cardiac function and for structural CHD
Titration	• Titrate to achieve an arterial O2 saturation > 90% for VA ECMO and > 80% for VV ECMO (there is mixing of oxygenated and deoxygenated blood w/i the RA during VV ECMO) and mixed venous O2 saturation of >70% for VA ECMO • Target normal lactates and arterial BP (measures of perfusion)
Complications	• Bleeding is the most common complication (30-40% by some estimates), can be life-threatening and may require immediate surgical intervention, brief cessation of heparin infusion or use of plasminogen inhibitors (i.e. aminocaproic acid) • Thromboembolism is infrequent, but can be catastrophic, especially in VA ECMO where embolization is systemic. Sudden changes in circuit pressure gradients are concerning for thromboembolism • Vessel perforation, dissection and occlusion of vessels resulting in distal ischemia (latter can be seen in femoral arterial cannulation, treated w/ placement of a distal perfusion cannula)