The Critical Inductions in Anaesthesia

After you have performed your first 1000 or so inductions in anaesthesia you’ll probably realise that they are mostly the same. Most patients are reasonably well and as long as you give a reasonable dose of propofol, opioid (alfentanil or fentanyl) and muscle relaxant your patient will like have stable haemodynamics. Sometimes a dose of metaraminol or ephedrine might be required to maintain the blood pressure but the patient is unlikely to have a cardiac arrest.

But you may have realised that there is the occasional patients who might have a potentially devastating or critical disease. If you were to go about your induction without appreciating the key priorities for each disease, the patient may have a needlessly adverse outcome.

I will outline what I believe are the most important or critical inductions relevant to a patients haemodynamic status.

After exploring this topic I want you to be able to

1. Assess a patient and identify the unique priorities for the patient’s disease

and

1. Create a definitive plan for the induction

These critical patients include:

1. Critical cardiac
2. Hypovolaemic shock
3. Severe pulmonary hypertension
4. Subarachnoid haemorrhage
5. Tamponade
6. Valve lesions – see other section

## 1) Critical cardiac (60yo male - 70kg, ischaemic cardiomyopathy ejection fraction 15%)

Key priorities

*Maintain preload, normal HR, normal rhythm, contractility and normal afterload for coronary perfusion.*

Induction meds and doses

*Fentanyl 300mcg, Midaz 5mg, rocuronium 100mg. Slowly increase depth of anaesthesia with bag mask ventilation with volatile until ready to intubate maintaining BP with metaraminol and ephedrine.*

Reasoning

*By using minimal (if any) Propofol, I minimize decrease in contractility and afterload. Fentanyl is typically a very cardiovascularly stable opioid that will decrease propofol requirements and minimize tachycardia on intubation.*

*The period of bag mask ventilation is to slowly build up the volatile concentration to allow a slow increase in depth of anaesthesia. This has less haemodynamic compromise thnt may occur with a larger dose of propofol.*

*Fentanyl has the appropriate balance of onset and efficacy. It does not commonly cause sudden bradycardia or chest wall rigidity that can occur with faster onset opioids like alfentanil or remifentanil .*

*Any hypotensive episodes could be due to vasodilation or poor contractility so I adjust metaraminol and give ephedrine boluses to maintain BP during this period.*

## 2) Hypovolaemic (21yo male -70kg, motor vehicle accident, abdomen bleed 3L blood loss)

Key priorities

*I aim to maintain preload and afterload in a severely hypovolaemic patient*

Induction meds and actual doses

*Note that in a severely hypotensive patient you may need very little medication to achieve anesthesia. I’ve given ranges of agents that I have given in my experience.*

*Midazolam 2-5mg, ketamine 20-50mg, 100mg suxamethonium with metaraminol running and ephedrine/adrenaline ready and fluids/blood running.*

Reasoning

*This induction is less about avoiding tachycardia. The patient is suffering a devastating loss of preload and afterload and will need tachycardia to maintain cardiac output. I care far more about minimizing loss of preload/afterload and using metaraminol to maintain a lower but adequate BP (termed hypotensive resuscitation).*

*The term hypotensive resuscitation refers to the maintenance of a low but adequate BP to simultaneously maintain vital organ perfusion without having a high BP that increases blood loss and could dislodge a clot that has already formed on an injured vessel. I usually aim for a systolic BP of 70-90mmHg as long as there is no evidence of end organ compromise eg ischaemic ECG changes.*

## 3) Severe Pulmonary Hypertension (50yo female - 50kg with pulmonary fibrosis)

Key priorities

*I aim to maintain cardiac function especially right heart function with good preload, contractility and afterload whilst keeping pulmonary vascular resistance low*

Induction meds and actual doses

*Fentanyl 200-300mcg, Propofol 50mg, rocuronium 100mg, with metaraminol running. I would prioritize achieving good oxygenation and ventilation with minimal ventilating pressures throughout the induction to avoid rises in pulm vascular resistance.*

Reasoning

*I think of this situation as all about right heart function and maintaining cardiac output against a very high afterload (due to the pulmonary vasculature) to the right heart.*

*i.e. Make sure the right heart is happy (adequate BP for coronary perfusion with metaraminol, fluid for preload, use lower doses hypnotics to avoid loss of contractility. Avoid tachycardia with cardiostable opioid like fentanyl.*

*The main factors that increase pulmonary vascular resistance include hypoxaemia, hypercapnoea, acidosis and high ventilating pressures. I pay close attention to airway management and ventilation to minimise the effects of intubation*

## 4) Subarachnoid Haemorrhage (50yo female -80kg with grade 3 SAH, for early clipping)

Key priorities

*To avoid an increase in transmural pressure gradient (TMPG), whilst maintaining cerebral oxygen delivery.*

Induction meds and actual doses

*Alfentanil 1500mcg, Propofol 150-200mg, suxamethonium 100g (or rocuronium 80mg) with esmolol 40mg ready for in case of tachycardia/hypertension*

Reasoning

*The highest mortality event with SAH, is due to a rebleed (mortality 50-70%). Therefore, I prioritize avoiding a high BP above avoiding transient hypotension. To do this I give reasonable doses of all agents and use suxamethonium so I am confident the patient is well paralysed prior to intubation. AND I have an agent (esmolol or propofol) ready in case the patient does become hypertensive.*

## 5) Tamponade (60yo male, 80kg, with tamponade post CAGS)

Key priorities

*Maintain high preload, contractility and high afterload to maintain coronary perfusion pressure*

Induction meds and actual doses

Inhalational induction with Sevoflurane and lignocaine to spray the cords prior to passing the ETT.

Metaraminol, ephedrine and adrenaline given as required to maintain key priorities above.

Reasoning

*Typically in the highest risk cases this would be done with a cardiac anaesthetist and cardiothoracic surgeon. You would attempt a partial drainage of the pericardial fluid to relieve the tamponade effect. The surgeons and patient would be prepped and draped ready for sternotomy in the event that the patient haemodynamics collapsed.*

*The induction would often be an inhalational induction to avoid positive pressure ventilation compromising venous return, however this induction has also been done safely as cautious intravenous induction.*

## Summary

This is obviously a guide but one that I found very useful is thinking about the most important cardiovascular lesions. It becomes even more difficult if a patient has more than 1 critical pathology so I found this is good framework to think about the most complex situation that could arise in your practice.

If you have experience with any other lesions please contact us here(link) and contribute