ELECTIVE (SSC5c) REPORT (1200 words)

A report that addresses the above four objectives should be written below. Your Elective supervisor will assess this.

The Anaesthetics Triad

Anaesthesia (loss of sensation) involves use of certain drugs to induce unconsciousness and enable surgery or certain procedures e.g. endoscopies to be carried out. Anaesthesia has developed since the discovery and use of Nitrous oxide in the 18th century to the introduction of choloform and spinal anaesthesia in the 19th century to neuromuscular blocking drugs and Propofol introduced in the 20th century. Currently there are a wide range of agents that can be used to induce anaesthesia. These can be classified into 3 broad groups, commonly referred to as the anaesthetic triad:

- **Hypnotics**
- **Analgesics**
- **Muscle relaxants**

Hypnotics

There are intravenous and inhalation agents of hypnosis e.g. Isofluorane and Desfluorane. Inhalation agents are used in children or patients with difficult IV access. However, here I will discuss the commonly used intravenous agents of hypnosis which are more commonly used. These work by stimulating inhibitory receptors in the Central Nervous System (CNS). In addition to inducing anaesthesia, they are also used to sedate patients in ITU. In addition to inducing hypnosis, these drugs also have systemic effects on the patient. Propofol (2,6-diisopropylphenol) is the most commonly used inducing agent. It is believed to be a GABA receptor agonist and is highly lipid soluble. This enables it to rapidly cause loss of consciousness after administration. It also has a fast recovery. However, it can cause some discomfort when given.

In addition to sedation, it reduces intracranial pressure (ICP) and cerebral blood flow. It affects the cardiovascular system by reducing blood pressure. It does this by direct myocardial depression and reduction of systemic vascular resistance. It causes respiratory depression with reduces response to hypercarbia and hypoxia. In addition to being safe for use in patients with porphyria, other reasons propofol is commonly used is its anti-emetic properties, and its minimal post-operative hangover effect which makes it suitable for day cases1.

Thiopentone is a barbiturate that is a GABA agonist. Repeated doses can cause accumulation in fatty tissues, causing prolonged anaesthesia2. It is metabolised slowly therefore is not suitable for maintenance of anaesthesia. Like Propofol, Thiopentone reduces ICP and cerebral blood flow and has anticonvulsant properties. It affects the cardiovascular system by reducing preload and systemic vascular resistance. However, it causes tachycardia and increased myocardial oxygen consumption therefore can cause ischaemia in hypovolaemic patients or patients with impaired coronary blood flow. It has the same effects on the respiratory system as Propofol.

It is less suitable for day surgery because of its prolonged hangover effect and is contraindicated in porphyria. It can also cause dose-dependent histamine release.

Ketamine is an NMDA receptor antagonist. It is lipid soluble with a rapid onset. It increases heart rate and blood pressure while maintaining cardiac output by direct sympathetic input. This makes it suitable for use in patients in shock. It causes minimal respiratory depression while preserving pharyngeal and laryngeal muscle activity, making it suitable for procedures like interventional radiology or radiotherapy. On the CNS it causes analgesia and increases cerebral blood flow and ICP. It should be avoided in patients with Ischaemic Heart Disease, Hypertension, Pre-eclampsia and increased ICP1.

Muscle Relaxants

Muscle relaxants bind to post-synaptic Acetylcholine(ACh) receptors, preventing transmission of an action potential inhibiting muscle contraction. Muscle relaxants can be further divided into:

Depolarising Muscle relaxants

Suxamethonium is the main non-depolarising muscle relaxant. It has a fast onset (60 seconds) and wears off after roughly 10 minutes. It is mainly used for endotracheal intubation when rapid intubation is required. Its main side effects include Malignant Hyperthermia, Suxamethonium apnoea, Anaphylaxis, Hyperkalaemia, Bradycardia, raised intraocular pressure and Myalgia.

Non-depolarising Muscle Relaxants

These drugs have a slower onset than Suxamethonium and compete reversibly with ACh at the neuromuscular junction e.g. Rocuronium, Atracurium, Mivacurium. Muscle block starts when 70-80% of receptors are blocked and is complete when 90% of receptors are blocked. These drugs are highly ionized and poorly lipid soluble with muscle function returning when the drug diffuses out into the plasma.

Muscle block is reversed with anticholinesterases which increase ACh concentration enabling muscle contraction. Neostigmine is used for this. However, it also affects muscarinic receptors causing bradycardia, bronchospasm, increased salivation and bronchial secretions. To prevent this, Neostigmine is given with an antimuscarinic e.g. Atropine or Glycopyrronium1.

Analgesia

Opioids are used in perioperative analgesia, most commonly morphine or Fentanyl. Fentanyl- an opiate receptor agonist that inhibits the ascending pain pathway- is commonly used in peri-operative analgesia. In addition to analgesia, it also causes sedation. Its main adverse effects are effects associated with other opioids and include respiratory depression, nausea and vomiting and constipation3. Other opioids are Remifentanil and Alfentanil which work on the same receptors and are less potent and have quicker onsets. As these drugs can cause nausea and vomiting, it is important to administer some anti-emetics peri-operatively and prescribe some to use post-operatively.

Reflection

Spending 6 weeks in Anaesthetics gave me a better idea and experience into what a career in this specialty would involve. Having thoroughly enjoyed it during my placement I started thinking about pursuing it as a career choice which is why I organised my elective in Anaesthetics. Working at the Royal London Hospital which is a large acute care and trauma centre gave me an opportunity to experience the high pressure environments that come with trauma and emergency cases along with

the more relaxed environments that come with the elective cases. The numerous theatres located within the hospital provided me with many opportunities to practise and improve on my cannulation, blood taking and oxygen delivery skills.

As I practised more I developed an appreciation for the importance of proper oxygenation in unconscious patients as well as improved my cannulation abilities. As I improved my practical skills, I also had an opportunity to further develop my understanding of human physiology and clinical science because of the great teaching I got from the different Anaesthetists I spent time with.

In addition to reinforcing what I have learnt over the past 5 years, I also was able to identify small gaps in my knowledge regarding certain medications and medical conditions that I may have forgotten. The teaching I received gave me an opportunity to go back and revise what I felt that I did not know well enough and I think this will be very beneficial to me in the long term. Working with the Anaesthetists showed me the teamwork essential for an effective theatre environment. Leadership, communication skills and good interpersonal skills were demonstrated and I believe these are aspects that I should strive to develop in my career as I seek to become an Anaesthetist.

References

1. Stone J, Fawcett W (2013). Anaesthesia At A Glance. England: Wiley. 10- 35.

2. Fink, Mitchell et al. Textbook of Critical Care. 5th edition 2005.

3. http://reference.medscape.com/. (2015). fentanyl . Available: http://reference.medscape.com/drug/sublimaze-fentanyl-343311#4 . Last accessed 23rd May 2015