GENERL SUR.LEC.8

Anesthesia & Pain Control

**HISTORY**

Anesthesia, as we know it today was first successfully demonstrated by William

Morton, a local dentist, at the Massachusetts General Hospital in Boston, USA on

October 16, 1846 when he administered ether to Gilbert Abbot for operation on a

vascular tumor on his neck. Earlier, Horace Wells had successfully used nitrous

oxide in 1844 for painless extraction of teeth.

Optimum patient care is dependent on a collaborative approach from anesthetic and

surgical teams

GENERAL ANAESTHESIA

General anesthesia is commonly described as the triad of unconsciousness, analgesia and muscle relaxation.

Induction of general anesthesia is most frequently done by intravenous agents.

Propofol has replaced thiopentone as the most widely used induction agent and can

be used for maintenance of anaesthesia. Other infrequently used intravenous agents

include etomidate and ketamine.

Inhalational induction using agents such as non-pungent sevoflurane is useful in

children, needle-phobic adults and those in whom a difficult airway is anticipated.

Total intravenous anaesthesia (TIVA) is becoming popular following the introduction of propofol and ultra-short acting opioid remifentanil. The lack of a cumulative effect, better haemodynamic stability, excellent recovery profile and concerns over the environmental effects of inhalational agents have made TIVA an attractive choice. TIVA is routinely used in

during cardiopulmonary bypass and for day-case anaesthesia Maintenance of anaesthesia, on the other hand, can be done using continuous

infusion of intravenous agent (propofol) The use of nitrous oxide is declining despite its analgesic and weak anaesthetic properties due to concerns over postoperative nausea and vomiting. It also increases the size of the air bubble causing adverse effects, for example in eye, ear and abdominal surgery.

**Management of airway during Anesthesia**

Loss of muscle tone as a result of general anesthesia means that the patient can no

longer keep their airway open. Therefore, the patients need their airway maintained

for them.

Laryngeal mask airway or endotracheal tube are inserted and the patient is allowed

to breathe spontaneously or is ventilated during the procedure.

The addition of a cuff to the endotracheal tube facilitates positive pressure ventilation and protects the lungs from aspiration of regurgitated gastric contents.

Laryngeal mask airway (LMA). Developed by Dr Archie Brain in the UK, the mask with an inflatable cuff is inserted via the mouth and produces a seal around the glottic opening, providing a very reliable means of maintaining the airway. Its placement is less irritating and less traumatic to a patient’s airway than endotracheal intubation. The technique can be easily taught to non-anaesthetists and paramedics and can be used as an emergency airway management tool.

Difficult intubation. Endotracheal intubation is feasible in most patients, but in a certain proportion of patients this may be difficult or impossible.

protocols have been created by specialized societies to deal with such situations. The gold standard for intubation in difficult situations is the use of the fibreoptic intubating bronchoscope, facilitated by topical local anaesthetic in awake patients or using general anaesthesia. The anaesthetist places the endotracheal tube in the trachea by threading the tube over the bronchoscope and so places the tube in the trachea under direct bronchoscopic vision.

**Complications of intubation**

1. Failed intubation

2. Accidental bronchial intubation

3. Trauma to teeth, pharynx and larynx

4. Aspiration of gastric contents during intubation

5. Disconnection, blockage, kinking of tube

6. Delayed tracheal stenosis

**Ventilation during anaesthesia**

Mechanical ventilation is required when the patient’s spontaneous ventilation is

inadequate or when the patient is not breathing because of the effects of the

anaesthetic, analgesic agents or muscle relaxants.

In volume control ventilation, a preset volume is delivered by the machine irrespective of the airway pressure. The pressure generated will be in part dependent on the resistance and compliance of the airway. In laparoscopic surgery requiring the Trendelenburg position (the patient is positioned head down), and in morbidly obese patients and those with lung disease, this may result in excessive pressures being developed, which may lead to barotrauma (pneumothorax).

In pressure control mode, the ventilator generates flow until a preset pressure is reached. The actual tidal volume delivered is variable and depends on airway resistance, intra-abdominal pressure and the degree of relaxation.

Positive end expiratory pressure (PEEP) is often applied to help maintain functional

residual capacity (FRC). This avoids lung collapse by opening collapsed alveoli, and maintains a greater area of gas exchange so reducing vascular shunting

**Monitoring and care during anesthesia**

A minimum basic monitoring of cardiovascular parameters is required during

surgery. This includes:

• Vascular

1. electrocardiogram (ECG)

2. blood pressure

• Adequacy of ventilation:

1. inspired oxygen concentration

2. oxygen saturation by pulse oximetry

3. end tidal carbon dioxide concentration.

Monitors of temperature, ventilation parameters and delivery of anesthetic agents

are also routinely used, while measurement of urine output and central venous

pressure are recommended for major surgery.

**Chronic pain management**

In surgical practice, the patient with chronic pain may present for treatment of the

cause (e.g. pancreatitis, malignancy) or concomitant benign pathology. Acute pain

after surgery may progress to chronic pain and is believed to be due to inadequate

treatment of acute pain itself.

**Chronic pain may be of several types:**

Nociceptive pain may result from musculoskeletal disorders or cancer activating

cutaneous nociceptors (pain receptors).

Prolonged ischemic or inflammatory processes result in sensitization of peripheral

nociceptors and altered activity in the central nervous system leading to exaggerated

responses in the dorsal horn of the spinal cord.

Neuropathic (or neurogenic) pain is dysfunction in peripheral or central nerves. It

is classically of a ‘burning’, ‘shooting’ or ‘stabbing’ type and may be associated with

numbness and diminished thermal sensation.

Examples include.

trigeminal neuralgia, postherpetic and diabetic neuropathy.

tricyclic inhibitors and anticonvulsant drugs are the mainstay of treatment.

• Psychogenic pain is associated with depressive illness; chronic pain and the illness

may exacerbate each other Chronic pain control in benign disease Surgical patients may have persistent pain from a variety of disorders including chronic inflammatory disease, recurrent infection, degenerative bone or joint disease, nerve injury and sympathetic dystrophy.

• Drugs

Paracetamol and the non-steroidal anti-inflammatory drugs (NSAID) are the

mainstay of musculoskeletal pain treatment.

The tricyclic antidepressant drugs and anticonvulsant agents are often useful for the

pain of nerve injury, although side effects can prove troublesome and reduce

compliance. (pregabalin and gabapentin)

In more severe and debilitating non-malignant chronic pain, opioid analgesic drugs

are used in slow-release oral preparations of morphine and oxycodone, and

transcutaneous patches delivering fentanyl and buprenorphine.

Combinations of drugs often prove useful to achieve the optimum of efficacy with

minimal side effects.

• Local anaesthetic and steroid injections can be effective around an inflamed

nerve and they reduce the cycle of constant pain transmission with consequent

muscle spasm.

Epidural injections are used for the pain of nerve root irritation associated with minor

disc prolapse along with active physiotherapy to promote mobility.

• Nerve stimulation procedures such as acupuncture, transcutaneous nerve

stimulation, and spinal cord stimulators increase endorphin production in the central

nervous system.

Nerve decompression craniotomy rather than percutaneous coagulation of the

ganglion is now performed for trigeminal neuralgia.

**Pain control in malignant disease**

Pain is a common symptom associated with cancer, more so during the advanced

stages. In intractable pain, the underlying principle of treatment is to encourage

independence of the patient and an active life in spite of the symptom. The World

Health Organization’s booklet advises use of a ‘pain step ladder’:

• First step. Simple analgesics: aspirin, paracetamol, nonsteroidal anti-inflammatory

agents, tricyclic drugs or anticonvulsant drugs.

• Second step. Intermediate strength opioids: codeine, tramadol or

dextropropoxyphene.

• Third step. Strong opioids: morphine (pethidine has now been withdrawn).

Oral opiate analgesia is necessary when the less powerful analgesic agents no longer

control pain on movement, or enable the patient to sleep. Fear that the patient may

develop an addiction to opiates is usually not justified in malignant disease. It is also

important to distinguish between the addiction and dependence; the former being a

psychosocial phenomenon while the latter is a pure physiological response to a given

drug.