Pediatric surgical stomatology

General anesthesia by surgery in maxillofacial area in children.

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Contents

- 1 Overview
- 2 Indications for general aneshesia
- 3 Preanaesthetic evaluation
- 4 Premedication
- 5 General anaesthesia
- 5.1 Induction of anaesthesia
- 5.2 Maintenance
- 5.3 Muscle relaxation / Neuromuscular blockade
- 5.4 Airway management
- 5.5 Monitoring
- 6 Stages of anaesthesia
- 7 Perioral cleaning, draping, and placement of pharyngeal throat pack
- 8 Postoperative care
- 9 Post-operative analgesia
- 10 Outpatient versus inpatient surgery
- 11 Clinical presentation the using of conscious sedationin outpatient clinic of pediatric dentistry

Overview

- In modern medical practice, general anaesthesia (AmE: anesthesia) is a state of total unconsciousness resulting from general anaesthetic drugs. A variety of drugs are given to the patient that have different effects with the overall aim of ensuring unconsciousness, amnesia and analgesia. The anaesthetist (AmE: anesthesiologist) selects the optimal technique for any given patient and procedure. The biological mechanism of action of general anesthetics is not well understood.
- General anaesthesia is a complex procedure involving:
- Preanaesthetic assessments
- Administration of general anaesthetic drugs
- Cardiorespiratory monitoring
- Analgesia
- Airway management
- Fluid management
- Postoperative pain relief

Indications for general anesthesia in the treatment of children

- Patients with certain physical, mental, or medically compromising conditions
- Patients with dental needs for whom local anesthesia is ineffective because of acute infection, anatomic variations, or allergy
- The extremely uncooperative, fearful, anxious, or uncommunicative child or adolescent with dental needs that are deemed sufficiently important, for which dental care cannot be deffered
- Patients who have sustained extensive orofacial and dental trauma
- Patients with dental needs who otherwise would not obtain necessary dental care
- Patients requiring dental care for whom the use of general anesthesia may protect the developing psyche

Preanaesthetic evaluation and premedication

- Prior to surgery, the anesthetist interviews the patient to determine the best combination of drugs and dosages and the degree to which monitoring is required to ensure a safe and effective procedure. Key factors of this determination are the patient's age, weight, medical history, current medications, previous anesthetist, and fasting time. Patients are typically required to fill out this information on a separate form during the pre-operative evaluation. Depending on the existing medical conditions reported, the anaesthetist will review this information with the patient either during the pre-operative evaluation or on the day of the surgery.

- Anesthesiologists may prescribe or administer a sedative pre-medication by injection or by mouth anywhere from a couple of hours to a couple of minutes before induction. The most common drugs used for pre-medication are narcotics (opioids such as fentanyl) and sedatives (most commonly benzodiazepines such as midazolam).

Anatomic and Physiologic Differences
(between the adult patient and pediatric patient)

- Basal metabolic activity is greater in children, which ultimately affects not only drug response but also important physiologic parameters as well. Because oxygen demand is greater, along with a less mature alveolar system, the respiratory rate is far greater in children than in adults. This is an important consideration when administering drugs that depress the respiratory system.
- The narrow nasal passages and glottis, combined with hypertrophic tonsils and adenoids, enlarged tongue, and greater secretions, produce a much greater risk of airway obstruction.
- Cardiovascular parameters are different for children. Children are more susceptible to bradycardia, decreased cardiac output, and hypotension.
- The effect and duration of drugs is much more variable for children. For agents that are more lipophilic there may be prolonged retention, especially in children who may be obese. For some types of patients, drug metabolism may be increased. Because of better peripheral perfusion in children, the onset of effect may be more rapid.
- Drug dosages for children should be carefully individualized for each patient following established guidelines.

Induction of anesthesia

- The general anaesthetic is administered in either the operating theatre itself or a special ante-room.

- General anaesthesia can be induced by intravenous (IV) injection, or breathing a volatile anaesthetic through a facemask (inhalational induction). Onset of anaesthesia is faster with IV injection than with inhalation, taking about 10-20 seconds to induce total unconsciousness.[citation needed] This has the advantage of avoiding the excitatory phase of anaesthesia (see below), and thus reduces complications related to induction of anaesthesia. An inhalational induction may be chosen by the anesthesiologist where IV access is difficult to obtain, where difficulty maintaining the airway is anticipated, or due to patient preference (e.g. children). Commonly used IV induction agents include propofol, sodium thiopental, etomidate, and ketamine. The most commonly-used agent for inhalational induction is sevoflurane because it causes less irritation than other inhaled gases.

Maintenance

- The duration of action of IV induction agents is generally 5 to 10 minutes, after which time spontaneous recovery of consciousness will occur. In order to prolong anaesthesia for the required duration (usually the duration of surgery), anaesthesia must be maintained. Usually this is achieved by allowing the patient to breathe a carefully controlled mixture of oxygen, nitrous oxide, and a volatile anaesthetic agent or by having a carefully controlled infusion of medication, usually propofol, through an IV. The inhalation agents are transferred to the patient's brain via the lungs and the bloodstream, and the patient remains unconscious. Inhaled agents are frequently supplemented by intravenous anaesthetics, such as opioids (usually fentanyl or a fentanyl derivative) and sedative-hypnotics (usually propofol or midazolam). Though for a propofol-based anaesthetic, supplementation by inhalation agents is not required. At the end of surgery the volatile or intravenous anaesthetic is discontinued. Recovery of consciousness occurs when the concentration of anaesthetic in the brain drops below a certain level (usually within 1 to 30 minutes depending upon the duration of surgery).

- Other medications will occasionally be given to anaesthetized patients to treat side effects or prevent complications. These medications include antihypertensives to treat high blood pressure, drugs like ephedrine and phenylephrine to treat low blood pressure, drugs like albuterol to treat asthma or laryngospasm/bronchospasm, and drugs like epinephrine or diphenhydramine to treat allergic reactions. Sometimes glucocorticoids or antibiotics are given to prevent inflammation and infection, respectively.

Muscle relaxation / Neuromuscular blockade

- "Paralysis" or temporary muscle relaxation with a neuromuscular blocker is an integral part of modern anaesthesia. The first drug used for this purpose was curare, introduced in the 1940s, which has now been superseded by drugs with fewer side effects and generally shorter duration of action.

- Muscle relaxation allows surgery within major body cavities, eg. abdomen and thorax without the need for very deep anaesthesia, and is also used to facilitate endotracheal intubation.

- Acetylcholine, the natural neurotransmitter substance at the neuromuscular junction, causes muscles to contract when it is released from nerve endings. Muscle relaxants work by preventing acetylcholine from attaching to its receptor.

- Paralysis of the muscles of respiration, ie. the diaphragm and intercostal muscles of the chest requires that some form of artificial respiration be implemented. As the muscles of the larynx are also paralysed, the airway usually needs to be protected by means of an endotracheal tube.

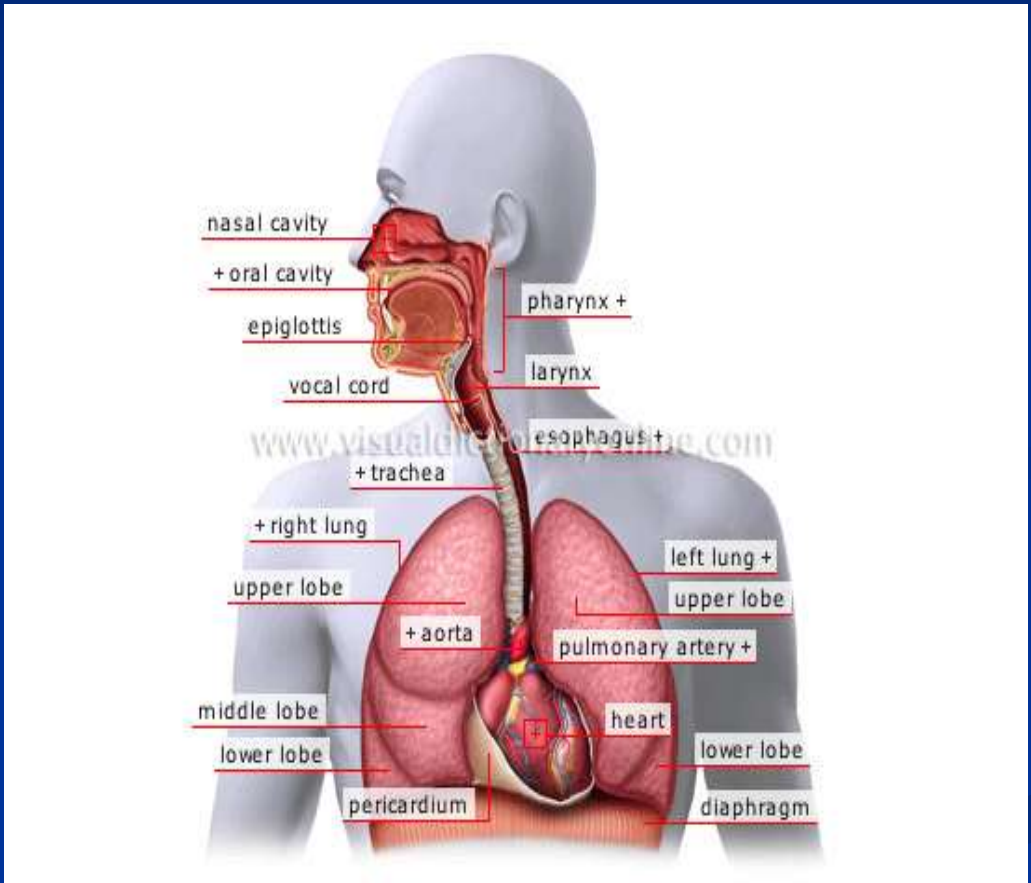
- Monitoring of paralysis is most easily provided by means of a peripheral nerve stimulator. This device intermittently sends short electrical pulses through the skin over a peripheral nerve while the contraction of a muscle supplied by that nerve is observed.

- The effects of muscle relaxants are commonly reversed at the termination of surgery by anticholinesterase drugs.

- Examples of skeletal muscle relaxants in use today are pancuronium, rocuronium, vecuronium, atracurium, mivacurium, and succinyl

Airway management

- With the loss of consciousness caused by general anaesthesia, there is loss of protective airway reflexes (such as coughing), loss of airway patency and sometimes loss of a regular breathing pattern due to the effect of anaesthetics, opioids, or muscle relaxants. To maintain an open airway and regulate breathing within acceptable parameters, some form of "breathing tube" is inserted in the airway after the patient is unconscious. To enable mechanical ventilation, an endotracheal tube is often used (intubation), although there are alternative devices such as face masks or laryngeal mask airways.



Airway management

- Suctioning is a common nursing activity performed for the purpose of removing accumulated secretions from the patient's nose, mouth, and/or tracheobronchial tree in order to maintain a patent (open) airway as well as to remove lung secretions that block gaseous exchange. Removal of these secretions can be carried out through the **oropharyngeal** (mouth and pharynx), **nasopharyngeal** (nose and pharynx), or nasotracheal (nose, pharynx, and trachea) **routes**. Artificial airways, such as an endotracheal tube (a tube inserted into the trachea through the nose or mouth) or a **tracheostomy** tube (a tube inserted through a surgical incision into the trachea), can also be used as routes for suctioning

Monitoring

Monitoring involves the use of several technologies to allow for a controlled induction of,maintenance of and emergence from general anaesthesia.

- 1. Continuous Electrocardiography (ECG): The placement of electrodes which monitor heart rate and rhythm. This may also help the anaesthetist to identify early signs of heart ischemia.

- 2. Continuous pulse oximetry (SpO2): The placement of this device (usually on one of the fingers) allows for early detection of a fall in a patient's haemoglobin saturation with oxygen (hypoxemia).

- 3. Blood Pressure Monitoring (NIBP or IBP): There are two methods of measuring the patient's blood pressure. The first, and most common, is called non-invasive blood pressure (NIBP) monitoring. This involves placing a blood pressure cuff around the patient's arm, forearm or leg. A blood pressure machine takes blood pressure readings at regular, preset intervals throughout the surgery. The second method is called invasive blood pressure (IBP) monitoring. This method is reserved for patients with significant heart or lung disease, the critically ill, major surgery such as cardiac or transplant surgery, or when large blood losses are expected. The invasive blood pressure monitoring technique involves placing a special type of plastic cannula in the patient's artery - usually at the wrist or in the groin.

Monitoring

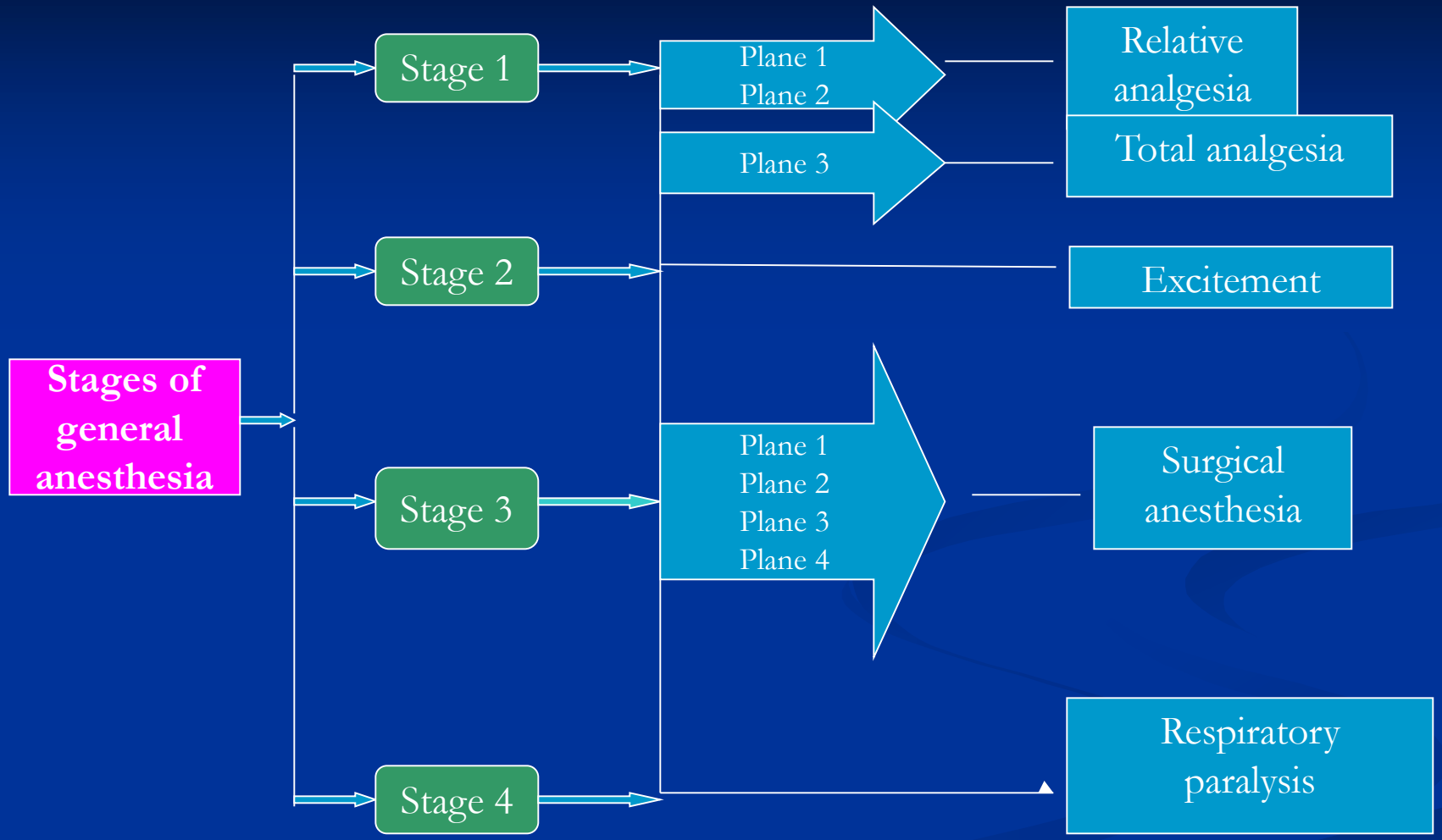
- 4. Agent concentration measurement - Common anaesthetic machines have meters to measure the percent of inhalational anaesthetic agent used (e.g. sevoflurane, isoflurane, desflurane, halothane etc).

- 5. Low oxygen alarm - Almost all circuits have a backup alarm in case the oxygen delivery to the patient becomes compromised. This warns if the fraction of inspired oxygen drops lower than room air (21%) and allows the anaesthetist to take immediate remedial action.
- 6. Circuit disconnect alarm - indicates failure of circuit to achieve a given pressure during mechanical ventilation.

- 7. Carbon dioxide measurement (capnography)- measures the amount of carbon dioxide expired by the patient's lungs. It allows the anaesthetist to assess the adequacy of ventilation

- 8. Temperature measurement to discern hypothermia or fever, and to aid early detection of malignant hyperthermia.

- 9. EEG or other system to verify depth of anaesthesia may also be used. This reduces the likelihood that a patient will be mentally awake, although unable to move because of the paralytic agents. It also reduces the likelihood of a patient receiving significantly more amnesic drugs than actually necessary to do the job.


Stages of general anesthesia
Stage 1
Stage 2
Stage 3
Stage 4
Plane 1
Plane 2
Plane 3
Plane 1
Plane 2
Plane 3
Plane 4
Relative analgesia
Total analgesia
Excitement
Surgical anesthesia
Respiratory paralysis

Postoperative care and analgesia

Postoperative orders and the operative note for the staff should be completed by the dentist and recorded in the medical chart while the child is in the recovery room. The operative report should be distated as soon after the completion of the procedure as possible.

After the child has been in the recovery area (if treated as an outpatient) for several hours and has been closely monitored for stable vital signs, retention of liquids, and voiding, a decision is made whether to release the child or keep the child overnight for forther evaluation.

If the child is to be kept for 23-hour observation, an appropriate note is recorded in the medical chart and a dissharge summary is dictated after the child is released.

The anaesthesia should conclude with a pain-free awakening and a management plan for postoperative pain relief. This may be in the form of regional analgesia, oral, transdermal or parenteral medication. Minor surgical procedures are amenable to oral pain relief medications such as paracetamol and NSAIDs such as ibuprofen. Moderate levels of pain require the addition of mild opiates such as tramadol.

Perioral cleaning, draping, and placement of pharyngeal throat pack

Before the dental procedure is begun, the perioral area is cleansed with three sterile 4:4 inch gauze pads. The first gauze pad is saturated with a bacteriostatic cleansing agent, the second with sterile water, and a third with alcohol. This procedure is not intended to sterilize the area but only to remove gross debris. A surgical sheet is then positioned over the remainder of the child's body. This helps to maintain body temperature and provides a clean field during the procedure. The head is draped with three towels arranged to form a triangular access space for the mouth. The towels are secured in place with towel clamps or hemostats. The mouth should be fully exposed. The anesthesiologist may request that part of the nasotracheal tube remain exposed so that all connections can be easily monitored. The assistants then place all supporting carts and stands around the table in positions that the dentist finds comfortable and efficient.

The patient's mouth is opened with the aid of a mouth prop. Care should be taken not to impinge on the lips or tongue with the prop. The mouth is thoroughly aspirated. The pharyngopalatine area is sealed off with a strip of moist 3-inch sterile gauze approximatelly 18 inches long. This packing reduces the escape of anesthetic agents and prevents any material from entering the pharynx. The gauze should be tightly packed around the tube, so that a good seal is ensured. Once the pack is in place, a thorough intraoral examination is performed, followed by a dental prophylaxis. The dentist should then evaluate any new x-ray studies that have been obtained and formulate a final treatment plan.

Outpatient versus inpatient surgery

In the past decade, criteria and advantages of ambulatory outpatient general anesthesia have been recognized. The increasing costs of inpatient hospital care, advances in anesthetic management, and quality assessment of patient care have led to changes in preoperative and postoperative management of many surgical procedures done under general anesthesia previously assumed treatable only an inpatient basis. Ambulatory care is more expeditious, better tolerated by both family and hospital team, and less traumatic for patient.

A young child or adolescent who requires a general anesthetic, is free of any significant medical disorders, and lives in the general area of the hospital can be considered a candidate for **outpatient surgery.**

When the outpatient is planned, the child undergoes a complete preoperative evaluation, including a comprehensive medical history and physical examination, anesthesia assessment, and limited hematologic evaluation. Many medical facilities allow this preadmission preparation to be done outside of the medical outpatient treatment facility.

As an outpatient, the child should be brought by the parents to the hospital at least 1,5 hours before the dental surgery. The nursing staff will verify that all preoperative instructions have been followed and that the appropriate laboratory tests have been completed. Several hours after the procedure is completed, the patient is released to the parent or guardian. Postoperative instructions are given, and a follow appointment is scheduled.

Sedation techniques

There are a variety of methods for producing sedation or alteration of mood in the pediatric patient. These systemic procedures are based on thoughtful utilization of various drugs that produce sedation as one of their principal effects, as well as utilizing differing routes of administration. Sedative drugs may be administered by inhalation, or by the oral, rectal, submucosal, intramuscular, or intravenous routes. Combinations of drugs and specific selection of routes, as well as patient acceptability, are common. Inhalation of a nitrous oxide-oxygen mixture is often coupled with any of the other routes.

It is often advantageous to consider combining methods and agents of **conscious sedation**. One reason for doing this is augmentation or potentiation of one drug by another. The combination might be used to enable the operator to reduce the dosage of a stronger drug, such as a narcotic, and thus reduce the possibility or degree of a side effect, such as severe respiratory depression. Another reason would be to better quiet the behavior of the patient for the introduction of a method requiring more patient cooperation.

Conscious sedation is usually most effective with the combined use of local anesthesia. Sedation techniques are not pain-control techniques are not pain-control techniques and are often overridden when intraoperative pain is experienced by the patient.

Inhalation sedation is the next most frequently combined technique. Nitrous oxide and oxygen can be combined with all other methods of conscious sedation.

Clinical presentation
the using of conscious sedation
in outpatient clinic of pediatric dentistry

Patient D., 4 years old, female

Diagnosis: Abnormal attachment of frenum of the tongue (tongue-tia)

Surgical treatment : plasty of frenum

Clinical presentation
the using of conscious sedation
in outpatient clinic of pediatric dentistry

A : inhalation sedation (nitrous oxide and oxygen) after intravenous entrance of anesthetic agent (ketamine)

B : appliance of mouth gag

Clinical presentation
the using of conscious sedation
in outpatient clinic of pediatric dentistry

A : tongue forceps

B : appliance of tongue forceps at patient

Clinical presentation
the using of conscious sedation
in outpatient clinic of pediatric dentistry

A : Carrying out of lingual nerve block

B : Short and abnormal attachment of lingual frenum

Clinical presentation
the using of conscious sedation
in outpatient clinic of pediatric dentistry

A : operative wound after section of frenum

B : operative wound after suturing (three catgut sutures)