

The 'simple' general dental anaesthetic

Dental anaesthesia should not be underestimated.

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Dental anaesthesia is often underestimated and considered ideal for the less experienced practitioner. This perception has proved to be devoid of truth and is a dangerous notion. The 'simple' general dental anaesthetic has proven time and time again to be fraught with caveats that may, if ignored, ultimately lead to serious patient harm or even death. The patient who receives dental treatment under general anaesthesia is usually a child, one with special needs, or one who requires an extensive dental procedure. The term 'simple' general dental anaesthetic is therefore a misnomer. The concept of procedural sedation for dentistry is beyond the scope of this article. It deals with general dental anaesthesia.

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History of dental anaesthesia

Early developments in the modern history of anaesthesia were sparked by the quest for painless dentistry. Horace Wells, dentist and mayor of Hartford, Connecticut, USA, witnessed by chance the analgesic effect of nitrous oxide when attending a 'laughing gas travelling show' in his hometown. A show participant cut his leg when falling while he was under the influence of nitrous oxide, a commonly used recreational substance at such events. The injured man showed no signs of experiencing pain. On 11 December 1844 Wells asked a colleague to extract his troublesome wisdom tooth under the influence of nitrous oxide. Painless dentistry was born. However, when Wells failed to successfully demonstrate the use of N₂O at Harvard in 1845, he was ostracised by the medical community. A

few months later, in 1846, a dental colleague of Wells successfully demonstrated the anaesthetic properties of diethyl ether at the same venue.¹

Local anaesthetic agents were introduced in the early 20th century. The introduction of lignocaine to clinical practice in the 1940s was a major advance in the development of present-day dentistry. This meant that general anaesthesia was only indicated in special circumstances. Currently, in order to curtail expenditure, there is also a trend by medical aid groups to limit the use of inappropriate general anaesthesia in dentistry.

Techniques and misconceptions

Dental procedures can be performed under various anaesthetic techniques and combinations of techniques. The commonly used regional and local blocks are usually stand-alone techniques or combined with procedural sedation or general anaesthesia. Procedural sedation may be delivered orally, intravenously or via inhalation of a nitrous oxide-oxygen mixture (Entenox[®]).

Parenteral sedation for dental procedures is not commonly used in South Africa and dental anaesthesia is limited to hospitals or well-equipped facilities (with standards of the average operating theatre) located close to district general hospitals.

Indications for general dental anaesthesia

The generally accepted indications for dental procedures under general anaesthesia are limited to specific indications:²

- Extensive dentistry (extent and/or duration) not possible in the awake patient, e.g. multiple extractions or patients requiring complex dental procedures.
- Small children, who do not tolerate dental

procedures under local anaesthesia or acceptable sedation.

- Patients with special needs, e.g. mental disabilities.
- The rare case of being allergic to local anaesthetic agents (allergy to amides is more common than to esters).
- The patient with a pathological phobia for dental procedures.
- Acute local inflammation limiting the effectiveness of local anaesthetic agents owing to tissue pH lowering.
- Medical conditions, making dentistry in the awake patient impossible, e.g. the inability to maintain adequate mouth opening, hyperactive gag reflex.

Potential risks and complications

Patient factors

Patients who undergo dental treatment under general anaesthesia are usually children, those with special needs and the highly anxious and phobic adolescent or adult. Geriatric patients often require full dentectomies. Patients with congenital cardiac lesions or valvular lesions are also commonly referred for extensive dentistry under general anaesthesia.

Problems in children are the common presence of airway infections and adenotonsillar hypertrophy. The first general anaesthetic that children receive, is usually for a dental procedure. This inherently holds potential risks, such as the unmasking of allergies or rare pharmacogenetic conditions, i.e. malignant hyperthermia. Anaesthesia in a child requires the anaesthetist to know all the specific paediatric anaesthetic issues, in addition to considerations specific to dental anaesthesia.

Mentally challenged children and adults present unique anaesthetic challenges.

A gentle approach and the presence of a parent, guardian or supervisor are essential.³ Institutionalised patients have a higher incidence of hepatitis B. In addition to challenging communication and co-operation, the following are common and should not be overlooked: very poor oral hygiene, oesophageal reflux, physical abnormalities, malnutrition, epilepsy and cardiac abnormalities. Always remember the possible perioperative impact of chronic medication, e.g. anti-epileptics.

The phobic adult who requires dental treatment under general anaesthesia is highly anxious, with a needle aversion. Preoperative administration of heavy sedation may be counterproductive if the patient is a day case. A high level of autonomic activity is common, resulting in dysrhythmias, hypertension and vasovagal responses.

Surgical factors

The commonest problem is that the anaesthetist and surgeon share the airway. This is always a potentially dangerous situation and the primary responsibility in ensuring and maintaining airway

patency lies with the anaesthetist, always remembering that the dental surgeon has limited training in airway management.

There should be limited airway soiling by the surgeon and the airway needs to be meticulously cleaned after surgery is complete and before emergence and extubation (including removal of the throat pack).

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Surgical stimulation of the trigeminal nerve is probably the cause of the high incidence of dysrhythmias in dental patients. Sympathetic bursts are common and are managed effectively using regional anaesthetic blocks before starting the dental procedure. Hypercarbia and/or hypoxia due to airway obstruction will exacerbate dysrhythmias. Halothane is another potent precipitant of cardiac dysrhythmias in the presence of high sympathetic outflow.

The dental anaesthetist must know the maximum safe dosages of local anaesthetics commonly used in theatre for local dental anaesthesia. The dental surgeon must inform the anaesthetist of his intention to infiltrate locally. The maximum dose has to be verified by the anaesthetist. Adrenaline/noradrenaline in a local anaesthetic, when administered in large dosages, may exacerbate dysrhythmias in the presence of halothane (especially adrenaline).

The duration of surgery may vary from 1 to 2 minutes for the extraction of one or a few primary teeth to hours for extensive dental conservation surgery or extraction of deeply impacted wisdom teeth. An estimation of the duration of surgery is essential to an anaesthetic plan.

Approach to general dental anaesthesia

Preoperative assessment

Ideally, children should be examined preoperatively in the presence of a parent or caregiver. The assessment should determine the suitability of day-case anaesthesia, focusing on medical conditions, social circumstances and nature of the procedure. Reassure about safety and postoperative analgesia, as appropriate. Valid informed consent has to be obtained under all circumstances. The need for general anaesthesia must be confirmed with the dental surgeon when alternative options seem viable.

Difficulties in risk assessment in special-needs patients⁴

- Limited or lacking medical and/or surgical history
- Limited or lacking medical work-up
- Unco-operative behaviour
- Lack of support systems, often making postoperative care less optimal
- Lack of adequate presurgical work-up:
 - extent of surgery difficult to estimate
 - difficult estimation of duration of anaesthesia
 - surprise adverse events more likely.

Premedication

Chronic medication must be continued on the day of surgery and as soon as possible thereafter, particularly in the special-needs patient. Sedative premedication is often not necessary and should be used only for specific indications in day-case patients. A short-acting benzodiazepine is ideal when necessary. The constant presence of a parent, from admission to induction, is usually all that is needed in paediatric cases. Intranasal midazolam (0.2 - 0.3 mg/kg) is an option in children in whom a rapid onset of sedative action is required. The anxious adult patient needs to be sedated preoperatively, keeping the possibility of delayed postoperative recovery in mind. Short-acting oral midazolam is again the agent of choice (for the average adult 7.5 - 15 mg orally, 1 - 2 hours preoperatively).

In conventional teaching antibiotic prophylaxis is needed in patients with cardiac valve lesions, an endocarditis history and most cases of congenital cardiac defects. However, the current NICE guidelines advise against antibiotic prophylaxis for dental procedures in endocarditis-susceptible people.⁵ These guidelines are not, however, universally accepted. The motivation behind not giving antibiotic prophylaxis is that it appears to be ineffective as a preventive measure and the incidence of allergic reactions to the antibiotic is more prevalent in these patients than infective endocarditis.

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Induction

Induction may take various forms, depending on patients' requirements. Inhalation induction, ideally with sevoflurane or halothane, is nearly always preferred in the small paediatric patient being held on the parent's lap or knee. It is essential to have an oximeter and ECG in place before starting the induction. The child is placed on the operating table when unconsciousness has been established and the parent is escorted to the waiting area. Intravenous access is essential and fluid deficit is replaced.

During the preoperative visit older children must be offered the option of intravenous induction. If intravenous induction is chosen, EMLA 5% cream (lidocaine and prilocaine) should be used one hour pre-induction and covered. The burning sensation of propofol is especially disturbing to children and can be prevented by venous access in the antecubital fossa (large vein) and then moved to a more suitable site (e.g. the dorsum of the hand) after intravenous induction.

Induction of special-needs patients (e.g. cerebral palsy patients) by stealth is often

possible and avoids physical restraint. Airway management in a syndromic child with a potential problematic airway may be challenging and a gaseous induction is the safest. Such children should not be anaesthetised by an inexperienced practitioner and must preferably be referred to a specialist anaesthesiologist. The presence of advanced airway management apparatus ('difficult airway' trolley with emergency airway devices) in theatre is mandatory before starting induction. Additional airway management plans must be in place and implemented immediately if the chosen, preferred approach fails.

Airway management

The route of endotracheal tube placement must be discussed with the dental surgeon in advance. It is often possible to complete the surgical procedure with a south-facing oral tube but a nasal tube offers unspoiled access to the oral cavity, additional stability, and is less likely to be disturbed by the surgeon. A reinforced tube is preferable (as it resists kinking) but is more costly and most practitioners prefer to use normal RAE™ nasal or oral tubes. The reinforced tube may be useful when placed orally if the above-mentioned tubes are not available. Cuffed paediatric tubes can be used by an experienced anaesthetist but may do harm when overinflated and are best avoided by an inexperienced anaesthetist.

The placement of a pharyngeal pack prevents liquids and solid debris from entering the glottis, moving down to the tube cuff or further down the trachea in a spontaneously breathing child with an uncuffed tube that is too small. A correct size uncuffed tube starts to leak at a positive airway pressure of 20 cmH₂O.

Maintenance of anaesthesia

As most dental operations are performed in day patients, any anaesthetic technique that permits rapid recovery is suitable. Spontaneous breathing is often preferred for short procedures as it permits more flexibility and rapid recovery. Extensive and prolonged procedures will need positive pressure ventilation and muscle paralysis. Maintenance of anaesthesia can be provided, preferably via a low-solubility vapour with

shorter-acting opioids (sufentanil, fentanyl), or target-controlled infusion of propofol and remifentanyl, ensuring rapid recovery.

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Prophylactic anti-emetics and dexamethasone must be considered to prevent postoperative nausea and vomiting in all dental patients, as the incidence is high.

Extubation and recovery

Thorough cleaning of the pharynx is essential before extubation. Removal of the pharyngeal pack is often done by the surgeon at termination of the procedure. Good communication is essential. A note on a piece of plaster placed on the anaesthetic machine or the patient's forehead reminds the anaesthetist about the removal of the pharyngeal pack. Awake extubation, preferably in the lateral position, is always indicated unless a (rare) contraindication exists, e.g. severe asthma. Placing the patient in the left lateral position

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without a pillow (classic recovery position) is ideal for keeping the airway open and preventing possible aspiration of blood and unrecovered debris. The awake patient can swallow and cough, protecting the airway against potential aspiration, and significant laryngospasm is rare in this scenario.

Gauze is often placed in dental cavities after extraction, but poses a potential airway risk and must be guarded by the anaesthetist to prevent it being aspirated immediately after surgery. Allowing the gauze tape or part of the gauze to protrude at the mouth corner helps in keeping track of gauze placed in extracted tooth cavities, preventing aspiration.

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More than 50% of deaths related to dental anaesthesia occur in the recovery room.⁶ Experienced recovery room staff are required to look after dental patients. The anaesthetist must maintain an adequate airway and should not leave until the patient is fully conscious. Adults can be placed in a slight head-up position after awake extubation.

Postoperative analgesia

Extraction of deciduous teeth and conservation dentistry are not painful postoperatively. The presence of a parent at emergence from anaesthesia or soon thereafter is extremely helpful in counteracting the stress caused by waking up uncomfortably in a strange environment. A loading dose of 20 mg/kg oral paracetamol is often all that is needed, with follow-up if necessary. Rectal analgesia given during anaesthesia is not effective in a short procedure. Intravenous paracetamol and non-steroidal analgesics (continued orally postoperatively) are effective analgesic options after the extraction of permanent teeth, especially impacted teeth where a gingival flap and bone drilling were needed. Regional blocks performed intraoperatively will alleviate immediate postoperative pain and are essential when permanent teeth have been extracted.

The use of suppositories requires specific consent and is awkward in adults. Oral diclofenac administered preoperatively is as effective as intraoperative rectal diclofenac. Intravenous tramadol is mainly effective in treating breakthrough pain. The use of morphine during dental anaesthesia often causes postoperative nausea and vomiting, delaying discharge.

Midazolam premedication (and other premedicants) may delay recovery. The use of flumazenil must be discouraged; it

is contraindicated in the epileptic patient. Flumazenil has a short duration of action and sedation may return after initial recovery and subsequent discharge.

Discharge criteria for day-case dental anaesthesia

- Fully awake with normal muscle strength
- Stable and satisfactory cardiorespiratory parameters
- Availability of an escort home
- Home support
- No bleeding
- Pain under control
- Nausea and vomiting under control

The potential for dizziness and even blackouts during the first 16 - 24 hours after general anaesthesia is a real danger. Therefore, the day-case patient who received general anaesthesia is not allowed to operate a vehicle or machinery or to swim, cook, etc.

Summary

The inexperienced practitioner must refrain from attempting to administer general dental anaesthesia before adequate experience has been gained. The 'simple' general dental anaesthetic may become complicated and a real potential for catastrophe exists as problems occur rapidly and mostly need quick, effective management.

References available at www.cmej.org.za

IN A NUTSHELL

- The quest for anaesthesia during dental procedures has played a leading role in the development of general anaesthesia.
- Dental procedures can be performed under various modalities of anaesthesia, with general anaesthesia reserved for specific indications, including children, the very anxious adult, patients with special needs, and patients who need extensive surgery.
- Most dental operations are performed as day cases, and have specific anaesthetic challenges.
- In dental anaesthesia the airway is shared between the anaesthetist and the dental surgeon, both having the responsibility of ensuring a patent airway at all times.
- Severe sympathetic discharge is often seen during dental procedures, presenting with hypertension, tachycardia and ventricular extrasystoles.
- Cleaning of the potentially soiled airway is essential before emergence from anaesthesia and awake extubation.
- Specific discharge criteria for day-case surgery have to be adhered to.
- Administering a local dental anaesthetic block intraoperatively significantly decreases the need for intraoperative and immediate postoperative analgesia.
- The anaesthetist must stay with the patient in the recovery room until consciousness and reflexes are regained, and experienced recovery room personnel are mandatory in caring for the dental patient.
- More than half of dental anaesthetic deaths occur in the recovery room.