

# Medical Emergency In Dentistry By Local Anaesthetics

Aureliano Da Silva Guedes, Phd

Professor At Federal University Of Pará, Postdoc In ICPD.

Aureliano Da Silva Guedes II

Master Of Science In Risk Management And Disasters/UFPA

Catarynna Maciel Quaresma Da Silva Guedes

Dental Surgeon, Specialisation In Sports Medicine

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## Abstract:

*Justification: Local anaesthesia is widely used in various procedures in dental specialties. However, even though it is rare, a medical emergency may occur.*

*Objective: The article aims to show the necessary care in the administration of local anaesthetic in dentistry and the medical emergencies, signs and symptoms and first procedures. Show the importance of the dental surgeon be alert to any signs and symptoms during the application of anaesthetic, and able to intercede in any risk to health or the patient's death and knowing the formula and possible side effects of anaesthetic use and their medicine interactions with legal and/or illegal drug. Methodology: research on the main electronic health platforms, BIREME, LILACS and Medline, using as descriptors: LOCAL ANAESTHETIC +/- ODONTOLOGY and MEDICAL EMERGENCIES/AND/ODONTOLOGY, in Portuguese, French, Spanish and English, and the professional experience of the authors in First Aid and Medical Emergency in Dental Offices. Conclusion: There are risks in the administration of local anaesthetics, however they are minimal and can be predicted when there is a correct anamnesis and treatment plan and/or surgical adequate for each identified situation. Knowledge of the anatomy of irrigation and drainage, foramen, among others, besides of the physiology and neuroanatomy of the region where the anaesthetic will be applied, is important to minimise the risks. The dental surgeon should be alert to any signs and symptoms during the application of anaesthetic, and able to intercede in any risk to health or of the patient's death and knowing the formula and possible side effects of anaesthetic use and their medicine interactions with legal and/or illegal drug. The most serious side effects of a local anaesthetic focus on the central and peripheral nervous system, the cardiovascular tract and renal tract. Hence, there need to know both the physiology of the systems and the interaction of the medications with the specific anaesthetics. However, the patient may not always be able to receive anaesthetics with vasoconstrictors, and surgery is not always elective to know such medicine interactions, and not always is possible to know if there is any allergy to any specific anaesthetic without prior testing before surgery. Hence, there is needed to know emergency medical procedures in dental offices and clinics.*

**Keywords:** Local anaesthetics, dentistry, medical emergencies

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## I. Introduction

Various types of emergencies can occur in a dental office, caused by material and/or equipment of dubious quality, for example, needles breaking in the fabric for poor quality of material, drill that can break due to fabrication problems or stress of use, but can also occur due to malpractice in the use of equipment and medicine by the professional, or by a very superficial anamnesis and/or negligence the information provided by the patient, or even incorrect or inaccurate information provided by the patient and/or companions during the anamnesis, in many cases, lack of general and specific laboratory tests to analyse the general clinical condition of the patient.

One of the medical emergencies in clinics or dental clinics, even though rare, is related to the administration of local anaesthetics either from the esters group (-COO) or amide group (-NHCO-).

Local anaesthetics in current use as injectable agents are amides. The procaine ester is only used in patients with allergies to amides Topical anaesthetics such as benzocaine is from esters. There are two major differences between esters and amides; these differences are related to the metabolism and the provocation of allergy. The esters are metabolised in plasma. For the most part, amides are primarily subject to hepatic metabolism, although prilocaine is also subjected to some breakdown in the lungs. The articaine is an exception: although it is an amide, its primary metabolism occurs in plasma<sup>1</sup>.

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Local anaesthetics determine reversible nerve conduction blockade, causing loss of sensation, abolition of autonomic and motor functions. Since this reversibility of effect constitutes its main characteristic<sup>1</sup>.

All anaesthetics have similar chemical structure, being characterised as weak and unstable bases. The pharmaceutical presentation is generally in the form of acid salts, which need to be deployed to exert their anaesthetic activity. Therefore, the pH of the solution and the tissues where the anaesthetic agent will have to act plays an important role, which means that, in the presence of inflammation or infection, the anaesthesia is insufficient or does not occur<sup>2</sup>.

In rare cases, the patient may present tachyphylaxis by medicine interaction, by using illicit drugs or by constant use of anaesthetics in prolonged treatments. The Dentist should also be attending to these signs and symptoms.

Other anaesthetic risks are in addition to local anaesthesia, there are several complications that may occur after the use of local anaesthetics in the oral and maxillofacial region. These occurrences can be separated into localized and systemic complications. Localized complications may arise because of the physical damage caused by the needle, or chemicals, because of the local anaesthetic<sup>1</sup>.

As for epidemiological data, according to most statistics, 4.5% incidence of complications was observed, with dizziness (1.3%), tachycardia (1.1%), flutter (1.1%), nausea (0.8%) and tremor (0.7%). Patient hypersensitivity reactions in less than 1% of patients: severe complications (convulsion and bronchospasm) in 0.07% of cases. Naturally, previous pathologies are a risk factor for these events. According to Brown (1994), there are few deaths associated with the administration of local anaesthetics, with a rate of 1 in 1.4 million administrations<sup>3</sup>.

The objective of this article is to address the main medical emergencies related to local anaesthetics in dental offices, their signs and symptoms and how to provide the first aid and/or definitive aid for these cases.

The methodology occurred through research on the main electronic health platforms, BIREME, LILACS and Medline, using as descriptors: LOCAL ANAESTHETIC +/- ODONTOLOGY and MEDICAL EMERGENCIAS /AND/ ODONTOLOGY, in Portuguese, French, Spanish and English, and the professional experience of the authors in first aid and medical emergency in dental offices.

## **II. Risk In Dental Local Anaesthesia**

Before starting anaesthesia, it is essential to check if the patient can tolerate the administration of anaesthetic. There are some contraindications to the use of anaesthetics and the patient's medical history will alert them<sup>4</sup>.

As contraindications to local anaesthetics, in addition to the patient's reference to hypersensitivity to local anaesthetics, infections in the region to be anaesthetised and patients less than two months of age, there are absolute contraindications, such as: cardiovascular diseases, uncontrolled hyperthyroidism, uncontrolled diabetes mellitus, pheochromocytoma and hypersensitivity to sulphites; The relatives are: use of tricyclic antidepressants, monoamine oxidase inhibitors (MAOIs) only for phenylephrine, compounds, phenothiazines, nonselective adrenergic beta-blockers and cocaine (chronically)<sup>3</sup>.

In this context, in theory all antihypertensive medications may interact with epinephrine; for example, adrenergic beta-blockers may result in unexpected increases in systolic blood pressure, calcium channel blockers and diuretics may increase epinephrine-induced hypotassaemia. Similarly, adrenergic beta-blockers may increase the toxicity of local anaesthetics by reducing hepatic blood flow, which inhibits metabolism. As with the prescribed medication, illicit drugs such as cocaine and methamphetamine may interact with epinephrine, and its suspension or dose reduction of epinephrine-containing anaesthetics is an indicated manoeuvre for patients who have recently used substances (usually within 48h precedents). Although there are no absolute contraindications to the use of local anaesthetics in particular because of medicine interactions, there are some clinical conditions in which the use of a solution containing epinephrine should be avoided. Among these conditions are unstable angina, severe cardiac arrhythmias, pheochromocytoma and untreated hyperthyroidism<sup>1</sup>.

The toxicity is rare and small if it respects the recommended maximum doses. When there are collateral effects, drowsiness is the most common initial complaint; in the cardiovascular system, by direct action, local anaesthetics decrease cardiac excitability and contractility, causing bradycardia, decreased cardiac output and eventually cardiac arrest. In parallel, they cause arteriolar dilatation, which can lead to hypotension and main shock<sup>3</sup>.

When absorbed by the circulatory system, local anaesthetics determine a series of systemic reactions that can culminate in accidents and sometimes fatal complications. The best thing to do about clinical manifestations of toxicity of local anaesthetics is their prophylaxis. This is done with the use of appropriate injection technique (prior aspirations to avoid the rapid introduction of the anaesthetic into the circulation) and with the restriction of the amount of anaesthetic at effective doses and minimum concentrations for the situation<sup>2</sup>.

Factors that may interfere with the action of local anaesthetics are: pH of the area to be anaesthetised; excessive supplementation (Anaesthetic concentration); distance from application; myelination and non-myelination; diameter and position of the nerve fiber<sup>5</sup>.

It is emphasized that the use of a computerised injector of anaesthetic and the technical knowledge of the anaesthetic substance by the dental surgeon eliminates many risks related to the speed and dosage of injection.

Another thing concerning local anaesthetics is the vessels that are used.

With the sole exception of cocaine, which is intrinsically vasoconstrictive, one of the side effects of local anaesthetics is vasodilation that can cause, to a greater or lesser extent, the site of injection. This fact is highly undesirable because localized vasodilatation greatly favours the absorption of the agent, that is, it favours its removal from the application site and, consequently, reduces its useful clinical time. Thus, there are many pharmaceutical preparations of local anaesthetics in association with vasoconstrictors to compensate for this effect and increase the duration of anaesthetic effect<sup>6</sup>.

Anaesthesia with vasoconstrictors such as adrenaline, epinephrine, phenylephrine, felipressin noradrenaline, norepinephrine, among others, has many advantages for dental procedures, such as promoting homeostasis, prolonging the effect of anaesthesia, lower toxicity, among others.

There are few known contraindications to the administration of vasoconstrictors at concentrations that are found in local anaesthetics. For all patients and for, some in particular, the benefits and risks of including the vasopressor in the local anaesthetic solution should be evaluated in relation to the benefits and risks of using a 'pure' anaesthetic solution. In general, these groups are: Patients with more significant cardiovascular disease (American Society of Anesthesiologists - ASA 3 and 4); patients with certain non-cardiovascular diseases (Eg. thyroid dysfunction, diabetes, sulphite allergy); patients taking monoamine oxidase (MAO) inhibitors, tricyclic antidepressants and phenothiazines. In each of these situations, it is necessary to determine the severity of the underlying disorder to determine whether a vasoconstrictor can safely be included or should be excluded from the local anaesthetic solution. It is not uncommon to consult a doctor so that it assists in determining this information<sup>7</sup>.

Overdose of vasoconstrictors, which are generally incorporated into local anaesthetic solutions, has also been associated with fatal cases, resulting in abrupt increases in blood pressure followed by intracranial haemorrhage in susceptible patients. It should be emphasized the importance of controlling the patient's anxiety, because during stress there is intense release of norepinephrine and epinephrine by the suprarenal gland, which, added with the vasoconstrictor present in the injected anaesthetic solution, can result in a significant alteration of blood pressure with other interferences<sup>8</sup>.

### III. Emergency procedures

During application of the anaesthetic should be observed, among other things, the speed of injection, patient's breathing, possible signs of asphyxia and the patient's state of consciousness. However, if there is any complication, discontinue blocking process, observe the specific signs and symptoms and proceed as shown below.

Emergency	Signals and symptoms	Procedure
Cardiopulmonary arrest	Cardiac: Unconsciousness, absence of respiratory movement, cold and yellow skin, mydriasis. Death. Respiratory: Unconsciousness, absence of respiratory movement, cyanosis, mydriasis. Death.	Call ambulance, begin CPR (Cardiopulmonary Resuscitation) or use the Automated External Defibrillators (AED), if the patient recovers vital signs put it in rescue position and watch it until you get the ransom. CPR: 1 <sup>st</sup> - Assess the level of consciousness, carotid pulse, etc. 2 <sup>nd</sup> Call for help 3 <sup>rd</sup> Position the victim in supine position on a hard surface. 4 <sup>th</sup> Start CPR (sequence C-A-B - Circulation, airways, Breathing). Obs. In adults: Compress about 5 cm; 100 compressions per minute. Counting the compressions. 5 <sup>th</sup> Keep the CPR segment until the ambulance arrives. NOTE.1: In adults: Press with both hands in the middle of the sternum (between the two nipples) about 5 cm deep; 100 compressions per minute. Count the compressions.

		<p>NOTE.2: In children aged 0 to 8 years, five compressions of 1/3 anteroposterior depth, approximately 4 cm with 2 fingers/1 breath. Children 8 to 12 years: Fifteen deep compressions of 1/3 depth anteroposterior, approximately 5 cm with 3 fingers/two breaths. Always count compressions.</p> <p>NOTE.3: In case of pregnant women, observe the decompression of the inferior vena cava, if you know the procedure, move, if possible, the uterus to the left side. Inform the rescue of the need for an obstetrician and neonatologist.</p> <p>NOTE.4: In cases where the patient is in the prone position (ventral decubitus), and there are no conditions to change to the supine position (supine decubitus), perform cardiac massage immediately below the scapulae (medial third of the thorax), with the same intensity recommended above.</p> <ul style="list-style-type: none"> <li>• Install mechanical ventilation at the appropriate time for age; if not, every 30 compressions, 2 ventilations with AMBU, or through a mask for portable breathing, except in the case of acute myocardial infarction (AMI), a condition in which ventilations should not be performed, only cardiac compression. Oxygen therapy in 5 at 6/l min. Observe WHO recommendations for SARS COVID for aerosol hazards. Ventilations are not recommended in case of AMI (Acute Myocardial Infarction). In paediatric dentistry events, use oxygen therapy from 2l to 4l/min., depending on the age of the child.</li> <li>• Maintain the CPR segment until help arrives.</li> <li>• If you have technical knowledge, administer intravenously epinephrine (Adrenaline) 1:1000 0.3 to 0.5 Intramuscularly. In paediatric cases, epinephrine 1:10,000, each 1ml diluted in 9ml of distilled water, from 0.1 to 0.3ml/kg, intramuscularly, preferably in the vastus lateralis muscle according to age, weight and height. (Must have knowledge and training for this decision).</li> <li>• If the patient recovers vital signs, place him in the lateral decubitus position, a position that prevents obstruction of the air passage through the tongue, and prevents asphyxia with saliva.</li> </ul> <p>NOTE.5: Cervical hyperextension cannot be sudden, as it can cause dislocation or cervical fracture.</p> <p>NOTE.6: Ventilate with AMBU with sufficient pressure.</p> <p>NOTE.7: Count during the cardiac compressions manoeuvre.</p> <p>NOTE.8: You should not flex your knees and arms during compressions.</p> <p>NOTE.9: Do not perform ventilations in case of AMI.</p> <p>NOTE.10: In case the AED does not touch the patient when the device warns that it will give the shock.</p> <p>NOTE.11: Artificial ventilation must be maintained until the patient can breathe spontaneously.</p>
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<p>Convulsion</p>	<p>Fainting, diplopia, muscle spasms, hypertonia and hypotonia, disordered movements, sialorrhoea, trismus, loss of consciousness or mental confusion usually occurs.</p>	<p>Remove objects, if possible, put the patient on the floor, put a cloth in the patient's mouth, loosen and their clothes. Support the head (without impeding the movements, just protecting it from hurting itself). Place it in the lateral position for the saliva drain. Never put your hand or objects in patient's mouth. There is no need to pull the tongue of the victim.</p> <p>NOTE: do not give slaps and/or wet the patient. Lead him to an emergency service. Never let the patient leave the office alone after a seizure.</p> <p>Administer benzodiazepine, observing the contraindications. If the occurrence was over 10 minutes, or there was some trauma, lead the patient to a hospital.</p>
<p>Anaesthetic overdose (rare situation)</p>	<p>They depend on the type of anaesthetic - pulmonary oedema, slurred speech, hyperventilation, diplopia, tremors, respiratory depression, hypoglycaemia, hypotension, miosis, tinnitus, mental confusion, hallucinations, lethargy, convulsions, toxic reactions, encephalic depression, hypoxia, cyanosis, cardiac arrhythmia, among others. May progress to cardiorespiratory arrest and death.</p>	<p>Interrupt the procedure, request rescue, complete any suturing, place the patient in a supine position with the chair completely horizontal, oxygen therapy at 4L to 6L/min, monitor vital signs. If there is cardiorespiratory arrest, start AED or CPR.</p> <p>NOTE 1: Always use the smallest possible amount of anaesthetic.</p>
<p>Toxic anaesthetic reactions (rare situation)</p>	<p>Pay attention to application speed, the type of anaesthetic. Anxiety, headache, mental confusion, convulsion, delirium, abdominal pain, angioedema laryngeal, gingivorrhagia. Hypertension at first, followed by hypotension or haematuria, haematemesis, nausea, complaint of small bright spots in the vision and metallic taste, sleepiness, tremors, much talk, tinnitus. It can progress to syncope, respiratory depression, coma and death.</p>	<p>Interrupt the procedure by finishing any sutures, place the patient in a supine position with the chair completely horizontal. Monitor vital signs, call for rescue, administer oxygen therapy at 4L to 6L/min. If there is cardiorespiratory arrest, start AED or CPR</p> <p>NOTE 1: Always perform anaesthetic sensitivity tests on the patient when you are not sure if the patient has any sensitivity</p> <p>NOTE 2: Always perform the anaesthetic infusion slowly and observe the patient</p>
<p>Angioedema</p>	<p>Allergic reaction to some chemical substance, medication, local anaesthetic and/or vasoconstrictor, medicines interactions, latex gloves, stress or other reason that produces histamine, high production of natural bradykinin by the patient for various reasons, allergic reaction to preservative substances in some anaesthetics (methylparaben, sulphites, etc.), food, insect bites, dust, etc. Some cases may be a reaction to environmental temperature, thyroid disorders, idiopathic, hereditary (HAE), among others.</p> <ul style="list-style-type: none"> <li>• Pruritus.</li> <li>• Erythema.</li> <li>• Lip oedema.</li> <li>• Periorbital oedema.</li> <li>• Laryngeal angioedema (glottis oedema), rarer and more complex.</li> <li>• Oedema in deep dermal layers of feet and/or hands and/or other regions</li> <li>• Sensation of heat in the oedematous region</li> <li>•Dyspnoea (indicates complexity)             <ul style="list-style-type: none"> <li>• Abdominal pain may occur.</li> <li>• May progress to anaphylaxis.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• If anaesthetic is being injected – stop.</li> <li>• If surgery is already underway – Stop the procedure by finishing any sutures.</li> <li>• If the angioedema is being caused by an environmental factor, remove the patient from the room. If this is not possible, remove the patient from the area.</li> <li>• Place the patient in a supine position with the dental chair completely horizontal.             <ul style="list-style-type: none"> <li>• Monitor vital signs.</li> </ul> </li> <li>• Administer oxygen therapy at 4 to 5 l/min.             <ul style="list-style-type: none"> <li>• Call for rescue.</li> </ul> </li> <li>• If complications develop and rescue has not yet arrived:             <ul style="list-style-type: none"> <li>• Antihistamine (e.g. 1 intramuscular ampoule of promethazine hydrochloride 50 mg IM).</li> </ul> </li> <li>• If dyspnoea occurs, administer oxygen therapy at 4 to 6 l/min.</li> <li>• If the patient is unable to retreat and is familiar with the procedure, administer 0.5 ml of epinephrine 1:1000 subcutaneously.</li> </ul> <p>NOTE 1: Always ask in the anamnesis if the patient has any allergies and to what?</p> <p>NOTE 2: In the anamnesis, it is interesting to ask the patient if he has ever had oedema and if he knows the cause.</p>

		<p>NOTE 3: Many times, the patient develops allergies after a certain age</p> <p>NOTE 4: It is interesting to request allergy tests after the crisis.</p>
<p>Vasovagal syncope (Sudden onset, it can be considered a mild form of shock, usually caused by sudden emotions, fatigue, hunger, nervousness, white coat syndrome, fear, distress, anaemia, bulky bleeding, abrupt change of position, may be related to the local anaesthetic and/or vasoconstrictor, etc.).</p>	<p>Dizziness, asthenia, nausea, complaint of small bright spots in the vision, diplopia, cadaveric pallor, loss of consciousness, fainting.</p>	<p>Place the patient in the Trendelenburg position.</p> <p>NOTE 1: Some dental chairs have the option of raising the lower limbs a few centimetres above the level of the head and/or lowering the head a few centimetres from the level of the legs.</p> <ul style="list-style-type: none"> <li>• Monitor vital signs.</li> <li>• 5 l/min of oxygen may be administered until the signs and symptoms disappear.</li> <li>• If the cause is identified and there are no contraindications, administer vitamin B6 (pyridoxine hydrochloride).</li> <li>• Refer to a general practitioner or specialist in the identified case.</li> </ul> <p>NOTE 2: Always measure the patient's blood pressure before inducing anaesthesia.</p>
<p>Lipothymia (Temporary feeling of almost losing consciousness, significant decrease, or momentary interruption of blood flow to the brain)</p>	<p>Dizziness, asthenia, nausea, cold sweats, complaints of small bright spots in the vision, diplopia, mydriasis, cadaveric pallor. May progress to syncope</p>	<p>Placing the patient sitting, with his head between the knees; Request that the patient lift the head and pressing on the occipital region, forcing it from top to bottom, or place the patient in the Trendelenburg position. NOTE: Some dental chairs have the option of raising their legs a few inches above head level and / or lowering their head a few inches from the level of their legs. Or 5l/min. of oxygen can be administered until the signs and symptoms pass.</p>
<p>Shock (Acute Circulatory Collapse).</p>	<p>Anxiety, pallor, mydriasis, metabolic acidosis/lactate acidosis (observe breath), hypotension, thready pulse, hypothermia, hypovolemia, hypoxia, cold sweat (hypodynamic), anhidrosis (hyperdynamic), redness (hyperdynamic), warm skin (hyperdynamic), polydipsia (hypodynamic), emesis, anuria or oliguria (depending on the case), tachycardia, tachypnoea, impairment of the urinary, blood and cardiac tracts, mental confusion (hyperdynamic), lethargy, fever (suspect sepsis) (hyperdynamic). May rapidly progress to coma, anoxia and death.</p>	<ul style="list-style-type: none"> <li>• Place the patient in the Trendelenburg position (lower limbs raised 30 cm). There are dental chairs that have this feature. <ul style="list-style-type: none"> <li>• Call for rescue.</li> <li>• Monitor vital signs.</li> <li>• Oxygen therapy.</li> </ul> </li> <li>• If there is cardiorespiratory arrest, start CPR or AED.</li> </ul>
<p>Anaphylactic shock (Allergic reaction to hypersensitivity) Cause: severe allergy to the anaesthetic, vasoconstrictor, conservative substance such as methylparaben, sodium metabisulphite, sulphites, or latex that may be component of the needle, among others.</p>	<p>Mild: Stomach or abdominal pain, oedema in mucous membranes, face, hands, etc., angioedema, unproductive cough, hives, nausea, emesis, pruritus (differential sign of another type of shock), erythematous skin, metallic taste in the mouth, diarrhoea, sialorrhoea (not always), profuse sudoresis cold sweating, sneezing, constriction of the upper airways, hypotension, tachysphygmia at first, which may change to bradysphygmia, anxiety, paraesthesia</p> <p>Rapid progression to: Severe: metabolic acidosis, angioedema (differential sign of another type of shock), dyspnoea, hypoxia, laryngeal angioedema (differential sign of another type of shock), tachycardia, cyanosis, altered level of consciousness, convulsions, pulmonary oedema (with bronchospasms), respiratory collapse, cardiac arrest. Rapid progression to death (minutes).</p>	<ul style="list-style-type: none"> <li>• If administering an anaesthetic, stop immediately.</li> <li>• If possible, remove the etiological agent or the patient from the site. <ul style="list-style-type: none"> <li>• Keep calm.</li> </ul> </li> <li>• Calm the patient and companion. <ul style="list-style-type: none"> <li>• Call for emergency services immediately.</li> <li>• Monitor vital signs.</li> </ul> </li> <li>• In the event of hypotension - place the patient in the Trendelenburg position (lower limbs raised 30 cm). There are dental chairs that have this feature. <ul style="list-style-type: none"> <li>• Administer oxygen therapy at a total value, approximately 6 l/min for adults. OBS: in children, it depends on height/weight/age.</li> <li>• Intravenous epinephrine in case of bradysphygmia</li> <li>• Antihistamine (e.g., intramuscular route of 1 ampoule of 5 ml of promethazine hydrochloride 50 mg) for adults. In children, follow the paediatric dosage</li> </ul> </li> </ul>

		<ul style="list-style-type: none"> <li>• Intravenous hydrocortisone 500 mg for adults.</li> <li>• If you know the procedure and have adequate medication, administer 0.3 to 0.5 ml of epinephrine 1:1000 intramuscularly, subcutaneously or in serum. In children, epinephrine 1:1000 (0.1 ml/10kg, maximum 0.3 ml) intramuscularly, preferably in the vastus lateralis muscle of the thigh).</li> <li>• If there is cardiorespiratory arrest, start CPR or AED; 0.3 to 0.5 ml of epinephrine 1:1000 intramuscularly every 5 minutes until resuscitation.</li> </ul> <p>NOTE 1: Always perform an anaesthetic sensitivity test if the patient reports allergies in the anamnesis or if you have any doubts, however, there are some anaesthetics that cannot be tested.</p> <p>NOTE 2: Humans can be sensitive to unexpected things; there are reports of allergic reactions even to water. Therefore, never neglect when the patient reports sensitivity to some substance, even the simplest and most unexpected one.</p> <p>NOTE 3: All patients with a history of allergic reactions, anaphylaxis, or other related reactions should be thoroughly evaluated before any indication for anaesthesia, antibiotic therapy, among others, and, preferably, should be referred for evaluation by an allergist and/or immunologist.</p> <p>NOTE 4: The more sudden the reaction, the more severe it is.</p> <p>NOTE 5: Anaphylactic reactions to medications and/or substances are independent of the dose or quantity.</p> <p>NOTE 6: The use of vasoconstrictors in anaesthetics is not recommended for patients who have some sensitivity to sulphites.</p>
<p>Hypoglycaemia (Glycaemia less than 70mg. Risk especially when less than 50mg).</p>	<p>Anxiety, asthenia, lethargy, headache, hypertension, ataxia, mydriasis, tremors, sudoresis, convulsion, mental confusion, chills, paleness, blurred vision and/or diplopia, drowsiness, palpitation, tachycardia, syncope or fainting, may progress to coma.</p>	<p>Use the glucometer to identify. If confirmed, administer glucose, candy, fruit juice or one soda cup (about 50 to 70 mg of sugar), wait a few minutes. If this does not resolve, or if there is syncope or lipothymia, or even finding that there is some relationship with local anaesthetic, take the patient to emergency care.</p> <p>NOTE 1: Only perform elective dental surgeries when the patient is with stabilised glycaemic control.</p> <p>NOTE 2: Do not let the patient leave the office after an episode of hypoglycaemia without an accompanying person.</p>
<p>Angina pectoris (symptom of acute cardiopathies, in case of anaesthetic and/or vasodilator related. Chronicity can be due to heart diseases not identified in the anamnesis and to have had triggering by the anaesthetic or vasodilator).</p>	<p>Hypoxia, anxiety, intense algesia in the retrosternal region for a few minutes, and may extend to the shoulder and left arm, neck and mandible. Attention to possible complications such as acute myocardial infarction (AMI), cardiac arrhythmia and death.</p>	<p>Oral acetylsalicylic acid and/or <math>\beta</math>-blocker, observing first whether there is any contraindication and/or interaction with any medication the patient has used and/or anaesthetic/vasoconstrictor that has been administered.</p> <p>Or a 5mg sublingual isosorbide dinitrate tablet (do not to chew or swallow), observing first whether there is any contraindication or interaction with any medication the patient has used and/or anaesthetic (e.g. prilocaine or articaine - in these cases, consider the risks of methaemoglobinemia) and/or vasoconstrictor that has been administered.</p>

		<ul style="list-style-type: none"> <li>• Refer the patient to the cardiology department as an emergency.</li> <li>In case of complications such as:</li> <li>• Cardiopulmonary arrest, perform CPR or AED procedures.</li> <li>• Do not administer oxygen if the condition progresses to AMI</li> <li>• In the event of a stroke, cardiac arrhythmia, atrioventricular block, AMI, cardiorespiratory arrest, or other complications, call an ambulance and go to the emergency room.</li> </ul> <p>NOTE 1: Attention, anaesthetics with the vasoconstrictor felypressin should not be administered to people with a history of Angina pectoris.</p> <p>NOTE 2: Be very careful when using vasoconstrictors in patients with a history of angina pectoris; it is suggested that the patient consult the cardiologist.</p>
Hyperglycaemia (Glycaemia above 110 Hg)	High blood glucose, asthenia, headache, polyphagia, polydipsia, xerostomia, pollakiuria, emesis (consider emergency), drowsiness, bradypnea (consider emergency), breath showing acidosis (consider emergency), mental confusion (consider emergency), among others	<ul style="list-style-type: none"> <li>• Observe laboratory tests and medical history to identify whether the patient has diabetes mellitus</li> <li>• Carry out glucometry</li> <li>• If the patient's history shows diabetes mellitus in the anamnesis, ask if he/she took the medication correctly; if not, help him/her with this.</li> <li>• Contact the patient's endocrinologist</li> <li>• Instruct the patient</li> </ul> <p>NOTE 1: Hyperglycaemia is not always a medical emergency; however, the necessary precautions must be taken.</p> <p>NOTE 2: Only perform elective dental surgeries when the patient's blood glucose levels are stable.</p> <p>NOTE 3: There is always a risk of hypoglycaemia.</p> <p>NOTE 4: In dental offices, if it is necessary to administer local anaesthetics with vasoconstrictors, note that epinephrine (adrenaline), noradrenaline and levonordefrin have hyperglycaemic characteristics, therefore, it is suggested, if necessary, prilocaine with felypressin, observing other risks, or administering mepivacaine without vasoconstrictor, also observing the interaction with some medications and other pathologies of the patient.</p>
Fall of the dental chair Very long procedures, where the patient remains in the same position, advanced age, inappropriate local anaesthetic for the type of patient, medicines interactions, fainting, convulsions, anaesthetic overdoses, etc, and the lack of support arms on the dental chair.	It depends on the fall and region hit.	<p>Observe for any fractures or luxation and the state of consciousness, if there are no signs and symptoms, lift it.</p> <p>If there are fractures and/or luxations, and in the head, neck or spine, keep the patient in the position they are in and call for help.</p> <p>NOTE 1: Depending on the severity, this may be an emergency, urgent or even neither.</p> <p>NOTE 2: This is very unlikely to happen, but it is possible. Therefore, all patients, regardless of age, should be helped to sit down or get up from the dental chair, especially when undergoing anaesthesia or long procedures.</p>
Needle breaking	Several causes: Abrupt movement of the patient. Needles of poor quality and/or inadequate to the type of anaesthetic procedure. Needle bending; penetrate the needle completely in the region without giving the space of security.	<p>Reassure the patient; explain the procedure that will be done</p> <p>If visible, try to remove with the homeostatic forceps.</p> <p>If there is no visibility, make a radiography of the region and perform the fragment removal surgery if you</p>



	Sequence of perforations; malpractice or negligence of the professional; etc.	<p>have technical knowledge, otherwise, send it to the oral and maxillofacial surgeon.</p> <p>NOTE 1: This is an urgency, but if neglected, it can become an emergency.</p> <p>NOTE 2: Avoid bending needles.</p> <p>NOTE 3: Always use the appropriate anaesthetic technique for the area where the anaesthetic and/or medication will be injected.</p> <p>NOTE 4: Be very careful when performing an anaesthetic block on the Inferior Alveolar Nerve, as this is the procedure where most needle fractures occur.</p>
Nerve injury by needle	<p>Persistent pain, oedema, hemilateral paraesthesia, facial asymmetry, pruritus, persistent anaesthetic sensation, the patient in some cases presents or reports accidentally biting the lips and/or cheeks, dysgeusia (involvement of the lingual nerve), dysphagia, dysesthesia, dysarthria, hyperesthesia (pain due to stimuli, sensitivity, etc.).</p> <p>Depending on the degree of injury, the following occurs: Neuropraxia, axonotmesis and/or neurotmesis (rare in local anaesthesia in dentistry).</p>	<p>The procedure will depend on which nerve was affected and the degree of injury - neuropathy, axonotmesis or neurotmesis (rare in anaesthesia).</p> <p>Simple cases:</p> <ul style="list-style-type: none"> <li>• Reassure the patient</li> <li>• CT scan of the affected region</li> <li>• Corticosteroids for faster reduction of oedema, with the dose according to the severity of the case and, observing the contraindications and instructions for use contained in the package insert</li> <li>• Anti-inflammatory of choice, for example: ibuprofen 600mg every 8 hours for 3 days, observing the package insert and contraindications contained and medicine interactions with the corticosteroid used.</li> <li>• Oral B complex, observing the package insert and contraindications contained and medicine interactions with the corticosteroid used.</li> <li>• Laser therapy (optional).</li> </ul> <p>Complex cases:</p> <ul style="list-style-type: none"> <li>• Multidisciplinary monitoring (neurologist, physiotherapist, etc.)</li> <li>• Microsurgery for neurotmesis may be necessary when the nerve in question is completely severed.</li> <li>• Laser therapy (optional)</li> <li>• TENS – Transcutaneous Electrical Nerve Stimulation (optional)</li> </ul> <p>NOTE: In simple cases, normal characteristics are restored within a maximum of one week.</p>
Accidental intra-arterial anaesthetic injection	<p>Local ischemia, algesia. Complicated cases present temporary diplopia, temporary hypoacusis and hemiparesis. Some cases may present neurotoxicity and/or reverse carotid*. Respiratory depression may occur, cardiac stimulation or depression (as appropriate).</p>	<p>Always do aspirations to identify if hit an artery.</p> <p>Never penetrate a needle while injecting the anaesthetic liquid. Inject the anaesthetic slowly.</p> <p>*Presenting neurotoxicity and/or reverse carotid, take the patient urgently to cardiological service.</p>
Respiratory depression related to the anaesthetic	<p>Unidentified neurological disorders triggered by the anaesthetic, overdose due to chemical dependency interaction or medicine interaction with the anaesthetic, intravascular injection and/or dose above the maximum suggested for the use of the local anaesthetic, among others. Major dental surgeries using opioid anaesthetics.</p> <p>Signs and symptoms:</p> <ul style="list-style-type: none"> <li>• Dyspnoea</li> <li>• Discomfort</li> <li>• Cyanosis</li> <li>• May lead to death</li> </ul>	<p>Use Amsterdam Medical Breath Unit (AMBU) and/or oxygen therapy</p> <p>Administer bronchodilator (<math>\beta</math>-adrenergic, sympathomimetic) to be known as indications and form of administration. Administer corticosteroids if you know the indications, contraindications and method of administration.</p> <p>Refer the patient for emergency service.</p>

<p>Haemorrhagic cerebrovascular accident or Haemorrhagic stroke (Rupture of bloods vessels. Very rapid progression.).</p> <p>Ischemic cerebrovascular accident or ischemic stroke (Blockage of one or more arteries and/or arterioles - is the most frequent).</p>	<p>Very fast progression. Signs and symptoms will depend on the affected region and generally consist of:</p> <ul style="list-style-type: none"> <li>• Severe headache, asthenia, arterial hypertension, cerebral hypertension, sensation of/or emesis, hemiplegic paraesthesia of face, arm and leg, diplopia or scotoma on the same side as the paresis, dysarthria, dysgeusia, aphasia, anosmia (when the anterior region of the brain is affected), dysphagia or aphasia or Wernick's aphasia, anacusic (in some cases), nystagmus, loss of cognition, walk and/or postural disorder, syncope or lipothymia, fall, convulsion, coma, among others. May progress to death.</li> </ul>	<p>Request rescue and/or lead the patient urgently to a hospital. If cardiorespiratory arrest occurs, start CPR or AED.</p> <p>NOTE 1: The longer it takes to send the patient to the hospital with adequate staff, the greater the risks.</p> <p>NOTE 2: There are subtle differences between Ischemic CVA and Haemorrhagic CVA. However, in both cases, if they occur in a dental office, there is little that can be done. An ambulance should be called, and the patient taken to a hospital.</p>
<p>Brain lesions</p> <p>It usually occurs when there is anaesthetic toxicity in a child. However, it can also occur as a consequence of a haemorrhagic stroke, encephalitis, neoplasms, among others.</p>	<p>Signs and symptoms depend on the region involved, some are more common: hypoxia, hypotension in some cases and hypertension in others, urinary and/or faecal incontinence, difficulty recognising people and objects, loss of the notion of space, convulsion, cardiopulmonary arrest, and there may be irreversible damage or death.</p>	<p>Request rescue.</p>
<p>Metaemoglobinaemia or Meta-Hb</p> <p>Metaemoglobin &gt;2%. In dental offices, it is generally related to the injection of the anaesthetics prilocaine, articaine, benzocaine, most often in children, resulting in toxic methemoglobinemia of an acute nature; It can also occur through interaction with other substances capable of causing iron oxidation in the human body, such as drug interactions, water contaminated by nitrates and nitrites consumed by children, interactions with ammonia, anilines, chlorates, hydroxylamine hydrochloride, chlorobenzenes, chloroquine, diaminodiphenyl sulfone, chloroquine diphosphate, primaquine diphosphate, ethylene glycol dinitrate, dinitrobenzene, dinitrotoluene, phenazopyridine, naphthalene, nitrophenol, sodium nitroprusside, nitrotoluene, ortholuidine, paracetamol, hydrogen peroxide, quinine, sulphonamides, tetradimethylaminophenol, tetranitromethane, among others with the ability to oxidize organic iron. Other non-toxic forms of chronic characteristics are related to anaemia or other pathological and/or physiological situations, hereditary (very rare) or congenital. Therefore, care must be taken when choosing an anaesthetic and prescribing medications that have iron oxidizing capacity for children, pregnant women, among others.</p>	<p>Cyanosis, headache, asthenia, pruritus, dizziness, fatigue, drowsiness, syncope or lipothymia, emesis, dyspnoea, complex hypoxia, tachycardia, cardiac arrhythmias, tremors, grey or bluish skin coloration, blood with a darkened hue with a rusty tone, blood hyperviscosity, mental confusion, convulsion. May occur risk of coma and death.</p>	<ul style="list-style-type: none"> <li>• Call rescue.</li> <li>• Oxygen therapy 6 l/min.</li> <li>• If immediate help is not possible, administer intravenous methylene blue through a serum, at a rate of 1 to 2 mg/kg, infused at a rate of 500 mg of serum in 1 hour, following the instructions in the package insert and the percentage per kilogram (weight) of the patient.</li> </ul> <p>NOTE 1: There are asymptomatic or atypical cases, however, with the same risk of death.</p> <p>NOTE 2: In children, if there is no rapid and accurate help, there may be a risk of cognitive deficit or other permanent damage.</p> <p>NOTE 3: Do not administer prilocaine hydrochloride with paracetamol, as this increases the risk of meta-Hb occurrence.</p> <p>NOTE 4: Do not administer prilocaine to anaemic patients, as this increases the risk of meta-Hb occurrence.</p> <p>NOTE 5: Prilocaine is contraindicated in pregnant women, as it increases the risk of meta-Hb occurrence in the foetus.</p>
<p>Postural hypotension</p>	<p>The patient usually has pre-existing respiratory and/or cardiac disorders, arterial hypotension, diabetes mellitus, habits such as alcohol consumption and/or smoking, elderly patients, among others. It can also occur due to an adverse reaction to some medication, such as antihypertensives, opioids, among others. Hence the importance of a good anamnesis. In dental offices, it is usually related to long procedures and/or problems related to local anaesthetics,</p>	<ul style="list-style-type: none"> <li>• Monitor vital signs</li> <li>• Have the patient sit down, with the head down between the knees, ask them to raise their head, and apply gentle pressure 10 times from top to bottom on the back of the head (occipital).</li> <li>• Or place the patient in the Trendelenburg position. OBS: Some dental chairs have the option of raising the lower limbs a few centimetres above the level of the head and/or lowering the</li> </ul>

	<p>vasoconstrictors or medicine interactions and white coat syndrome.</p> <p>The patient has difficulty getting up from the dentist's chair and staying in the orthostatic position because of dizziness, asthenia, syncope or lipothymia, hypotension, etc. Usually, the patient has preexisting respiratory and/or cardiac disorders, diabetes mellitus, habits such as alcoholism and / or smoking, among others. Hence the importance of a good anamnesis.</p> <p>Signs and symptoms:</p> <ul style="list-style-type: none"> <li>• Astasia to get up from the dentist chair and remain in an orthostatic position             <ul style="list-style-type: none"> <li>• Asthenia</li> <li>• Arterial hypotension</li> <li>• Nausea</li> <li>• Darkened vision</li> </ul> </li> <li>• Syncope or lipothymia</li> <li>• Cold sudoresis</li> </ul>	<p>head a few centimetres from the level of the legs.</p> <ul style="list-style-type: none"> <li>• Instruct the patient to perform the Valsalva manoeuvre.</li> <li>• If the cause is identified and there are no contraindications, administer vitamin B6 (Pyridoxine hydrochloride)</li> <li>• 5l/min can be administered. oxygen until signs and symptoms attenuate</li> <li>• Refer to a general practitioner or specialist in the identified case.</li> </ul> <p>NOTE 1: Always measure the patient's blood pressure before injecting the anaesthetic.</p> <p>NOTE 2: Always help the patient get up from the chair slowly after any dental procedure.</p>
Trismus (lockjaw)	<p>Pain, usually spasm of the middle pterygoid muscle or another, resulting from trauma due to improper needle movements, causing difficulty opening the mouth and chewing.</p>	<p>Administer muscle relaxants according to the package insert.</p> <ul style="list-style-type: none"> <li>• Analgesic.</li> <li>• Low-level laser therapy.</li> <li>• Empirical antibiotic therapy and request a laboratory culture test to prescribe a specific antibiotic. Specific antibiotic therapy when the cause(s) related to the infections are identified. Check whether the patient does not have any contraindications to a certain antibiotic(s).</li> <li>• Physical therapy through therapeutic exercises, moist heat, laser therapy, TENS, assisted active exercises, among others.</li> </ul> <p>NOTE 1: In general, it is considered an urgency and not an emergency.</p> <p>NOTE 2: Depending on the cause, it may recede in 3 days.</p> <p>NOTE 3: When trismus is chronic or repetitive, specific surgical indication may be required.</p> <p>NOTE 4: When performing an anaesthetic injection, be careful not to injure the patient's nerves, avoid repeating local puncture, among others that may cause trismus.</p> <p>NOTE 5: Whenever performing elective surgery, check whether the patient is up to date with antitetanic vaccination.</p>
Local haematoma	<p>Breaking of some vascular plexus. Colour reddish or purplish, progressing to yellow after about a week. Attention: observe in anamnesis and/or signs and symptoms if the patient has vitamin K deficiency, decompensated diabetes mellitus, haemophilia, among others.</p>	<ul style="list-style-type: none"> <li>• Check if there is any artery or arteriole contributing to the haematoma, if so, perform the appropriate suture</li> <li>• X-ray to check if there is any fracture or dislocation</li> <li>• Ice pack for 15 to 20 minutes every 4 hours, for 3 days.</li> <li>• Check for pathologies that predispose to haematoma, if any, refer to a specialist doctor             <ul style="list-style-type: none"> <li>• Follow-up</li> </ul> </li> </ul>
Pressure ulcer.	<p>In a dental office, it is generally caused by injection of the anaesthetic too quickly to the point of forming ischemia; repeated punctures with the needle; contaminated needle, patient with allergy to some component of the needle (e.g. latex), friction of instruments or equipment resting on some soft tissue of the patient, among other causes.</p>	<p>Guidance for oral hygiene, Mouthwash containing 0.12% chlorhexidine or another equivalent antiseptic, application of desensitizing cream, laser therapy (optional).</p>

	Signs and symptoms: Burning, mild localized pain, tissue ischemia, discomfort.	
Necrosis at the puncture local.	Injection of the anaesthetic substance, usually with a vasoconstrictor, in a sudden or rapid manner, repeated anaesthetic injections in the same location, anaesthetic unsuitable for the region (e.g. articaine for truncal anaesthesia), among others. The main sign is an injury with pruritus in local a few days after the anaesthetic procedure. However, in rare cases, it may progress to bone sequestration.	Generally, if the patient does not have systemic pathologies, it regresses naturally in one or two weeks. • Analgesic. • Mouthwash with 0.12% chlorhexidine gluconate or other. • Oral hygiene guidance. • Follow-up. • In persistent cases or with sequestrations, perform debridement or curettage. • Low-level laser therapy (optional). NOTE 1: Always perform correct sterilization of instruments and equipment NOTE 2: Always use the anaesthetic puncture technique appropriate to the type of anaesthetic and location.
Xerostomia	Dry mouth sensation, difficulty chewing, dysphagia, dyslalia, dysgeusia, pain in the oral mucosa may occur due to lack of lubrication in the region, polydipsia, halitosis (in some cases). • Patients who use removable dentures have difficulty using them.	Carmellose sodium gel or spray, or another salivary stimulant such as pilocarpine 2% mouthwash 3 to 4 times a day and/or some mouthwash. Oral hygiene guidance. Laser therapy (optional). Monitor until regression, follow-up. If there are no better results, oral administration of pilocarpine hydrochloride 5mg tablets, 2 times a day, is suggested. In systemic cases, refer to a specialist doctor at the same time. NOTE: There may be an increased risk of dental caries.
Post surgery bacterial infection	It may occur a few days after anaesthesia, and it is usually related, among others, the reinsertion of the needle after some time to complete anaesthesia and/or from one region with infection to another, improper handling of needles, inadequate antisepsis, etc. Signs and symptoms: Pain in the operated region (intense if cellulitis; localised or painless, it may be an abscess), oedema, erythema, purulent exudate, fever, unpleasant taste in the mouth, halitosis, regional lymphadenopathy. Severe infection: trismus, cellulitis (when there is gas caused by bacterial activity that expands between the fascia and muscles. It is serious), abscess (when there is a purulent collection), it may evolve into septicaemia, bacterial endocarditis, bacterial meningitis, among others	• Radiography. • Analgesic. • Broad-spectrum antibiotic therapy – empirical. • Culture test. • Antibiogram. • When identifying the causative microorganism(s), treat with specific antibiotic(s). • If an abscess is identified, perform adequate drainage • When tissue necrosis is present, perform debridement. • Prophylaxis with 0.9% saline solution. NOTE 1: Always request laboratory tests before performing any elective surgeries. NOTE 2: Never perform elective surgical manoeuvres on diabetic patients without glycaemic stabilization. NOTE 3: Do not perform elective surgeries on patients with anaemia and/or leukaemia without first contacting the patient's physician. NOTE 4: Always observe the risks of multiresistance before administering antibiotic therapy.
Death	Several situations mentioned in this article, even though rare, can cause the patient's death.	Keep calm, inform and reassure the patient's family. Request removal for autopsy. Seek help from a lawyer for bureaucratic procedures in the country.

Source: Guedes, Guedes II, Guedes<sup>9</sup>

There are rare risks to local anaesthetics and/or vasoconstrictors, preservatives, or even some material that makes up the needle. It should be emphasized that there are conditions that are not present in this paper that are complications relative to the local anaesthetic and that even the literature and the great experience of the professionals cannot predict, are the idiosyncratic causes. However, it is important that the dental surgeon has first aid and emergency training and, at place of care, have basic equipment for interventions in case of medical emergencies, so that he can intervene in an eventuality.

It is suggested to have a stethoscope, sphygmomanometer, Amsterdam Medical Breath Unit (AMBU) with balloon and mask suitable for the type of patient (paediatric, adult) and/or mask for resuscitation with valve, laryngoscope, endotracheal tube and cannulas of Guedel type (various sizes), oxygen balloon, emergency medications (benzodiazepines, injectable adrenaline, anti-haemorrhagic, bronchodilator, antihistamine, antihypertensive, glucose, among others).

Hupp<sup>9</sup> suggests as medicine for medical emergency in dental office:

Emergency Medicines for the Dental Office <sup>10</sup>	
General Medicines Group	Common examples
Parenteral Preparation	
Analgesics	Morphine Sulfate
Anticonvulsant	Diazepam, midazolam
Antihistamine	Diphenhydramine (Benadryl), chlorpheniramine (Chlortrimeton)
Antihypoglycaemic	50% dextrose in water, glucagon
Corticosteroid	Methylprednisone (Solumedrol), dexamethasone (Decadron), Hydrocortizone (Solucortel)
Narcotic antagonist	Naloxone (Narcan)
Sympathomimetic	Epinephrine
Vagolytic	Atropine
Oral Preparations	
Antihistamine	Diphenhydramine (Benadryl), chlorpheniramine (Chlortrimeton)
Antihypoglycaemic	Candy, fruit juice, sugar
Inhaled preparation	
Vasodilator	Nitroglycerine (Nitrostat, Nitrolingual)
Oxygen	-
Respiratory stimulant	Aromatic ammonia

Source: Hupp (2013)<sup>10</sup>

It is worth mentioning that the dental surgeon should also worry about the risks to his safety and therefore at the time of manipulating the needle, both in the puncture, injection of the anaesthetic into the patient, withdrawal of the needle and discard, must be careful so that there is no accident.

It is suggested that the following recommendations should be observed when handling local anaesthetics:

- a) To know a formula and other side effects of the anaesthetic and its medication interactions or with medicines or illicit drugs.
- b) Do always a good anamnesis, observing if there is any type of contraindication to certain anaesthetics salts and/or vasodilators, as well as possibility of interaction with some medication of the patient.
- c) If possible, prefer glass cartridge, since plastic cartridge may contain more sulphites to preserve. (Many patients are allergic to sulphites and methylparaben material used to conserve anaesthetic salts and vasoconstrictors and what are used in greater amounts in plastic than glass.).
- d) Observe the expiration date and physical characteristics of the anaesthetic as well as its conservation form.
- e) The material must always be sterilised, including the asepsis of the cartridge and correct hygiene of the hands of the professionals to avoid infections.
- f) To know the anatomy and physiology of the region to be silenced.
- g) Know the contraindications of anaesthetics.
- h) Remember that the lower the pH of the region to be anaesthetised the lower the anaesthetic effect. Therefore, in infected areas the anaesthetic may not have the desired effect, so look for alternatives.
- i) To observe that the pain threshold is idiosyncratic.
- j) If an isolation of the operative field is necessary, perform the anaesthesia before.
- k) If topical anaesthetic is used, prophylaxis and drying of the area should be performed first.
- l) Use suitable, good-quality, procedure-appropriate needles.
- m) Always perform reflux to avoid injecting into the blood supply (intravascular). For ease it is suggested a syringe with self-aspiration.
- n) To know the anaesthetic techniques for each procedure.
- o) Never force anaesthetic injection.

- p) Inject the anaesthetic slowly and steadily. It is suggested the glass cartridge and at least 1 minute to inject a cartridge of 1.8ml.
- q) Be alert to any signs and symptoms during anaesthesia injection.
- r) Observe the latency period of each anaesthetic.
- s) Always be able to intercede in any situation of risk to the health or death of the patient.

#### **IV. Conclusion**

There are risks in the administration of local anaesthetics, however they are minimal and can be predicted when there is a correct anamnesis and treatment plan and/or surgical adequate for each identified situation.

Knowledge of the anatomy of irrigation and drainage, foramen, among others, besides of the physiology and neuroanatomy of the region where the anaesthetic will be applied, is important to minimise the risks.

The dental surgeon should be alert to any signs and symptoms during the application of anaesthetic, and able to intercede in any risk to health or the patient's death and knowing the formula and possible side effects of anaesthetic use and their medicine interactions with legal and/or illegal drug. This is important because if there is an accident and there is no aid in due form the professional is liable malpractice and negligence according to the laws of each country.

The most serious side effects of a local anaesthetic focus on the central and peripheral nervous system, the cardiovascular tract and renal tract. Hence, there need to know both the physiology of the systems and the interaction of the medications with the specific anaesthetics. However, the patient may not always be able to receive anaesthetics with vasoconstrictors, and surgery is not always elective to know such medicines interactions, and we do not always know if there is any allergy to any specific anaesthetic without prior testing before surgery. Hence, there is needed to know medical emergency procedures in dental offices and clinics.

It should be noted that the knowledge of anaesthetic blocking technique, time of action and pharmaceutical composition is of great importance to avoid anaesthetic failures and part of medical emergencies by local anaesthetics in dentistry.

It is obvious, but it is worth mentioning, that it is always necessary the correct sterilisation of the equipment and instruments, as well as the adequate hygiene of the hands of the professional to avoid infections, including cross-infection.

NOTE: The health area is very dynamic, so, many procedures presented here may over time, emerge more efficient and effective and/or to the according to each country's laws compliance, needing to be constantly evaluated and upgraded by the reader.

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