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A brief review on medical emergencies in dental practise

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Abstract

Medical emergencies in dental practice are those adverse medical events that may present in the course of dental treatment. Each of those events requires a correct diagnosis for effective and safe management. Medical emergencies in dental practice are uncommon but could occur at any time. Dentist should be able enough to handle the emergency.

Keywords: Dental emergency, medical emergency, emergency drugs in dental practice

Introduction

An emergency may be a medical condition that demands immediate attention and successful management. These are the life threatening situations of which every practitioner must be aware^[1]. The occurrence of life threatening emergencies in dental office is in frequent, many factors can increase the likelihood of such incidents^[2]. Emergencies can sometimes be anticipated as a result of having obtained a thorough medical history^[3]. Medical emergencies occurring in dental practice can be alarming and the keys to minimizing these alarms include thorough history and general examination of the patient, and having a good working knowledge of how to manage them⁴. In fact, available evidence suggests that many dentists on graduation do not feel competent in managing medical emergencies, while some feel insecure in doing so; a problem requiring an improved undergraduate training^[5, 6, 7, 8]. Medical emergencies were most likely to occur during and after local anesthesia, primarily during tooth extraction and endodontics. Over 60% of the emergencies were syncope, with hyperventilation the next most frequent at 7%. In the United States and Canada, studies have also shown that syncope is the most common medical emergency seen by dentists. Syncope represented approximately 50% of all emergencies reported in one particular study, with the next most common event, mild allergy, represented only 8% of all emergencies^[9]. The extent of treatment by the dentist requires preparation, prevention and then management, as necessary. Prevention is accomplished by conducting a thorough medical history with appropriate alterations to dental treatment as required^[10]. Drugs that should be promptly available to the dentist can be divided into two categories. The first category represents those which may be considered essential. The second category contains drugs which are also very helpful and should be considered as part of the emergency kit^[10].

Different types of medical emergencies are as follows

- a) **Sudden Loss of Consciousness:** Due to fainting, acute hypoglycaemia, myocardial infarction, cardiac arrest, anaphylactic shock, stroke, adrenal shock and circulatory collapse secondary to corticosteroid therapy.
- b) **Acute Chest Pain:** Due to angina pectoris and myocardial infarction.
- c) **Difficulty in Breathing:** Due to asthmatic attack, anaphylactic shock, foreign body obstruction, bronchospasm, and laryngospasm.
- d) **Seizure:** From epilepsy and other causes of impairment of consciousness.
- e) **Others:** Local anesthetic toxicity (overdose), haemorrhage, drug reaction/interaction, trauma, psychiatric emergencies, hyperventilation syndrome^[11].

Table 1: Essential Drugs ^[10]

Drug	Indication	Initial adult dose
1. Oxygen 2. Epinephrine	almost any medical emergency Anaphylaxis asthma unresponsive to salbutamol cardiac arrest	100%: inhalation 0.1 mg i.v., or 0.3–0.5 mg i.m. 0.1 mg i.v., or 0.3–0.5 mg i.m. 1 mg i.v. 0.3–0.4 mg sublingual
3. Nitroglycerin 4. Antihistamine (Diphenhydramine or chlorpheniramine)	pain of angina allergic reactions	25–50 mg i.v., i.m. 10–20 mg i.v., i.m.
5. Albuterol/salbutamol 6. Aspirin	asthmatic bronchospasm myocardial infarction	2 sprays: inhalation 160–325 mg

Table 2: Additional Emergency Drugs ^[10]

Drug	Indication	Initial adult dose
1. Glucagon 2. Atropine 3. Ephedrine 4. Hydrocortisone	hypoglycemia in unconscious patient clinically significant bradycardia clinically significant hypotension adrenal insufficiency recurrent anaphylaxis	1 mg i.m. 0.5 mg i.v. or i.m. 5 mg i.v., or 10–25 mg i.m. 100 mg i.v. or i.m. 100 mg i.v. or i.m.
5. Morphine or nitrous oxide	angina-like pain unresponsive to nitroglycerin angina-like pain unresponsive to nitroglycerin	titrate 2 mg i.v., 5 mg i.m. ~ 35%, inhalation

Essential Drugs

- a) Oxygen:** Oxygen is indicated for every emergency except hyperventilation. This should be done with a clear full face mask for the spontaneously breathing patient and a bag valve- mask device for the apneic patient. If the patient is conscious, or unconscious and still spontaneously breathing, oxygen should be delivered at a flow rate of 6-10 litres per minute which is appropriate for most adults, and if the patient is unconscious and apnoeic, a flow rate of 10-15 liters per minute will be sufficient.
- b) Epinephrine:** Drug of choice for the emergency treatment of anaphylaxis and asthma which does not respond to its drug of first choice, albuterol or salbutamol. Epinephrine is also indicated for the management of cardiac arrest, but in the dental office setting, it may not be as likely to be given, since intravenous access may not be available. As a drug, epinephrine has a very rapid onset and short duration of action, usually 5 to 10 minutes when given intravenously. For emergency purposes, epinephrine is available in two formulations. It is prepared as 1: 1,000, which equals 1 mg per ml, for intramuscular, including intralingual, injections. More than one ampule or pre-filled syringe should be present as multiple administrations may be necessary. It is also available as 1: 10,000, which equals 1 mg per 10 mL for intravenous injection. Auto injector systems are also present for intramuscular use (such as the EpiPen) which provides one dose of 0.3 mg as 0.3 mL of 1: 1,000, or the pediatric formulation which is 1 dose of 0.15 mg as 0.3 mL of 1: 2,000. Initial doses for the management of anaphylaxis are 0.3 to 0.5 mg intramuscularly or 0.1 mg intravenously.
- c) Nitroglycerin:** This drug is indicated in acute angina or myocardial infarction. It is characterized by a rapid onset of action. For emergency purposes it is available as sublingual tablets or a sublingual spray.
- d) Antihistamines:** Indicated for the management of allergic reactions. Whereas mild non-life threatening allergic reactions may be managed by oral administration, life-threatening reactions necessitate parenteral administration of either diphenhydramine or chlorpheniramine.
- e) Salbutamol:** This is a selective beta-2 agonist.

Salbutamol is the first choice drug for bronchospasm. By inhalation it provides selective bronchodilation with minimal systemic cardiovascular effects. It has peak effect in 30-60 minutes and duration of 4-6 hours.

- f) Aspirin:** (Acetylsalicylic acid) is one of the more newly recognized life-saving drugs, as it has been shown to reduce overall mortality from acute myocardial infarction. The purpose of its administration during an acute myocardial infarction is to prevent the progression from cardiac ischemia to injury to infarction. There is a brief period of time early on during a myocardial infarction where aspirin can show this benefit. For emergency use there are relatively few contraindications. These would include known hypersensitivity to aspirin, severe asthma or history of significant gastric bleeding. The lowest effective dose is not known with certainty, but a minimum of 162 mg should be given immediately to any patient with pain suggestive of acute myocardial infarction.
- g) Oral Carbohydrate:** An oral carbohydrate source, such as fruit juice or non-diet soft-drink, should be readily available. Whereas this is not a drug, and probably should not be included in this list, it should be considered essential. If this sugar source is kept in a refrigerator it may not be appreciated that it is a key part of the emergency armamentarium. It is indicated in the management of hypoglycemia in conscious patients.

Other Drugs

^[11]

- a) Glucagon:** The ideal management of severe hypoglycemia in a diabetic emergency is the intravenous administration of 50% dextrose. Glucagon is indicated if an intravenous line is not in place, as may often be the case in a dental office. The dose for an adult is 1 mg. If the patient is less than 20 kg, the recommended dose is 0.5 mg. Glucagon is available as 1 mg formulation, which requires reconstitution with its diluent immediately prior to use.
- b) Atropine:** Indicated for the management of hypotension, which is accompanied by bradycardia. The dose recommended is 0.5 mg initially, followed by increments as necessary until one reaches a maximum of 3 mg. paradoxically, doses of less than 0.4 mg have been associated with induction of a bradycardia.

- c) **Ephedrine:** This drug is a vasopressor agent which may be used to manage significant hypotension. It has similar cardiovascular actions as adrenaline, except that ephedrine is less potent and has a prolonged duration of action, lasting 60-90 minutes.
- d) **Corticosteroids:** Corticosteroids such as hydrocortisone may be indicated in the prevention of recurrent anaphylaxis. Hydrocortisone may also play a role in the management of an adrenal crisis. The notable drawback in their use in emergencies is the slow onset of action, which approaches one hour.
- e) **Morphine:** This is indicated in the management of severe pains such as occurring myocardial infarction, being listed in recommendations for advanced cardiac life support as the analgesic of choice for this purpose.
- f) **Naloxone:** In situations which include morphine in the emergency pack, or where opioids are used as part of a sedation regimen, naloxone should also be present for the emergency management of inadvertent overdose. Doses should ideally be titrated slowly in 0.1mg increments to effect.
- g) **Nitrous Oxide:** This is a reasonable second choice if morphine is not available to manage pain from a myocardial infarction. For management of pain associated with a myocardial infarction, it should be administered with oxygen, in a concentration approximating 35%, or titrated to effect.
- h) **Benzodiazepines:** The management of seizures which are prolonged or recurrent, also known as status epilepticus, may require administration of a benzodiazepine. In most dental practices, it would not be realistic to assume that the dentist could achieve vein puncture in a patient having an active seizure, and so, the need arises for a water-soluble agent such as midazolam or lorazepam as the drug of choice for status epilepticus and can be administered intramuscularly. Otherwise, the drug of choice is intravenous diazepam.
- i) **Flumazenil:** The benzodiazepine antagonist flumazenil should be part of the emergency pack for an effective use of benzodiazepines. Dosage is 0.1-0.2mg intravenously, incrementally ^[11].

Management of Medical Emergencies ^[12, 13]

General Response

When an emergency is immediately life-threatening such as complete laryngeal obstruction, cardiac arrest associated with acute myocardial infarction, or bronchospasm associated with anaphylaxis, there is no time to delay; an immediate diagnosis must be made and definitive treatment initiated. These steps are to ensure an adequate delivery of oxygenated blood to the brain prior to the delivery of definitive care (DRSABC) ^[14]

D = Check for Danger.

Ensure your safety and then safety of patient. The patient/victim may need to be moved.

R = Assess Responsiveness

The most important assessment that decides much of your following actions is a simple tap or shake and a command "Are you okay?" Keep in mind a simple assessment of level of consciousness (AVPU)

A-alert

V-response to verbal stimulus

P-response to pain

U-unresponsive

S= Send or Shout for Help

Shout for or send an assistant for help (colleague, nearby hospital).

A = Check the Airway for Obstruction

Open the airway by head tilt and chin lift. If the casualty is a victim of trauma, then the cervical spine may need to be protected so, use jaw thrust to open the airway and hold the head to keep the head and neck still and in alignment with the rest of the body and apply a rigid neck collar or an improvised one, whichever is available. Finger sweep may clear airway of blood clot, denture or other causes of obstruction.

B = Assess Breathing

The breathing must be assessed quickly. If there is no breathing, start rescue breathing. Consider intubation to protect the airway, and if the breathing is inadequate, the rescuer may need to give assisted rescue breathing.

C = Assess Circulation

Quickly assess circulation, and if there is no circulation, chest compressions / cardiac massage must be started immediately. If there is bleeding, use direct compression to stop further blood loss.

Specific Responses

Syncope:- This is defined as a transient loss of consciousness due to cerebral ischaemia caused by a reduction in blood supply to the brain. It presents with feeling of light headedness or dizziness and patients may possibly be nauseated, uncomfortable or agitated and will appear pale and sweaty with a slow pulse and hypotension.

Management

Lay the patient flat. Relieve any compression on the neck and maintain an airway. Raise patient's legs. Once pulse and blood pressure recover, slowly raise patient to seated position. In patients with significant medical problems, or when syncope is prolonged or complicated by seizure activity. In addition to the above, the patient should be transferred to a hospital.

Anaphylaxis: This is a potentially life-threatening hypersensitivity reaction to foreign material. It presents with urticarial rash, angioedema, hypotension, tachycardia and bronchospasm.

Management: Assess the degree of cardiovascular collapse (pulse and blood pressure) and airway obstruction (upper – angioedema; lower – bronchospasm), and stop further administration of the offending drug(s)/agent(s). Give oxygen and monitor consciousness, airway, breathing, circulation, pulse, blood pressure. If in shock, angioedema or bronchospasm, then raise legs if blood pressure is low. Give adrenaline and repeat every five minutes while waiting for help/ambulance.

Acute Chest Pain: Myocardial infarction is usually initiated by rupture or erosion of a thin cap which overlies these atheromatous plaques. It presents with persisting central chest

pain, with possible radiation to the left or right arms, jaw, or neck. There may be nausea or vomiting, a sense of impending doom, restlessness and shortness of breath, pallor with cold sweaty skin. Associated pump failure leads to hypotension, raised venous pressure, tachycardia and possibly, pulmonary oedema.

Management

Reassure the victim, keep warm, sit up if breathless, but lay flat if faint. Give glyceryl trinitrate tablets to chew or spray, under the tongue, and repeat in 5minutes; if pain is unrelieved, activate emergency medical service. Give high flow oxygen by face mask, and 300mg aspirin chewed or sucked if there is no allergy.

Cardiac Arrest

This usually presents with a collapse, and there is no respiration or pulse.

Management

Commence CPR and activate avenues to get help. In the first instance begin with Basic Life Support.

Foreign Body – Upper Airway Obstruction

Severe or complete upper airway obstruction due to a foreign body rapidly progresses to unconsciousness and cardiac arrest within minutes and presents with distress, choking, coughing and cessation of breathing.

Management

Partial Obstruction: Encourage the patient to cough up or spit out. If there is poor air entry, increasing high pitched stridor or respiratory distress, manage as for complete airway obstruction.

Complete Obstruction: The victim cannot speak, breathe or cough. If he is in the dental chair sit him up, turn patient side on in chair. Support the chest with one hand and deliver five sharp back blows between the shoulder blades with the heel of the other hand. If back blows fail, five abdominal thrusts (Heimlich) should be done.

Unconscious Obstruction: Commence CPR with finger sweep between each cycle. It is important to consider cricothyroidotomy if there is no air entry at all.

Epilepsy

In a major seizure there is a sudden spasm of muscles producing rigidity (tonic phase). Jerking movements of the head, arms and legs may occur (clonic), then unconsciousness, with noisy or spasmodic breathing, excessive salivation and urinary incontinence. Status epilepticus occurs when a convulsion lasts longer than 30minutes or when a tonic-clonic seizure occurs repeatedly.

Management

Remove dangerous objects from the mouth and around the patient e.g. dental cart. Loosen tight clothing, avoid restraining the patient or forcing open the mouth and do not insert any object into the mouth. Turn the victim into a stable side position (recovery position) as soon as the seizure stops, open and maintain a clear airway and avoid aspiration. Check for breathing and if absent, follow the guidelines for collapse. Allow the victim to sleep under supervision at the end of the seizure and on recovery, reassure. Paraldehyde or diazepam injections could be administered to break the seizures.

Transfer to hospital under the following conditions:

a) First fit b) tonic phase lasts longer than 5minutes c) repeat seizure d) any post-seizure respiratory difficulty e) patient has suffered an injury and f) post-seizure confusion greater than 5minutes.

Hyperventilation

Prolonged rapid deep breathing often in very anxious patients can lead to profound metabolic changes that may result in loss of consciousness. A fall in arterial CO₂ concentration causes cerebral vasoconstriction and respiratory alkalosis. The patient may notice tingling of the fingers or lips, tetanic spasm of the peripheries and dizziness, eventually, becoming unconscious due to cerebral hypoxia. The patient is apnoeic for a period due to reduced respiratory drive with low arterial carbon dioxide concentration. As the arterial carbon dioxide level rises and cerebral vasoconstriction reverses, the patient starts breathing and regains consciousness. Hyperventilation recommences and the cycle continues with further loss of consciousness.

Management

Reassure the patient if conscious, then, re-breathe into paper bag to increase inspired carbon dioxide. In the unconscious patient, maintain airway until patient regains consciousness.

Diabetic Emergencies

The most common diabetic emergencies are: low blood sugar - hypoglycaemia in patients on anti-diabetic medications and high blood sugar - hyperglycaemia, particularly diabetic ketoacidosis.

Hyperglycaemia: Clinical symptoms include thirst, increased urine output and dehydration, and also, there may be hypotension, progressive reduction in level of consciousness, coma or cessation of urinary output in severe cases.

Management

Primary assessment and resuscitation is to secure the airway, breathing and circulation. Then transport to a hospital facility.

Hypoglycaemia: Clinical symptoms of hypoglycaemia include sweating, hunger, tremor, agitation, with progressive drowsiness, confusion and coma. Assume any diabetic with impaired consciousness has hypoglycaemia until proven otherwise.

Management

Conscious patients can usually be treated with rapid acting oral carbohydrates, e.g. fruit juice, packets of granulated sugar, glucose powder dissolved in water. After 10 minutes this short acting carbohydrate should be followed up with food which contains longer acting carbohydrate. The victim should not be left alone until all the dangers of hypoglycaemia are resolved. If the patient is unconscious, attend to the airway, breathing and circulation.

Conclusion

It is important that each member of the dental team knows what his/her role should be in the event of a medical emergency. Training should be updated regularly and at least on annual basis. Medical emergencies cannot be prevented completely, a staff that can render appropriate assistance to a patient can increase the chances of patient survival.

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