

# MEDICAL EMERGENCIES IN GENERAL DENTAL PRACTICE: A REVIEW

Sowmya M. K<sup>1</sup>, Chethan Hegde<sup>2</sup>, Varsha Rajeev<sup>3</sup>, Bharathraj Shetty<sup>4</sup>

1. Reader, Dept. of Prosthodontics, A. B. Shetty Memorial Institute of Dental Sciences, Mangalore

2. Head of Department, Dept. of Prosthodontics, A. B. Shetty Memorial Institute of Dental Sciences, Mangalore

3. P.G Student, Dept. of Prosthodontics, A. B. Shetty Memorial Institute of Dental Sciences, Mangalore

4. Reader, Dept of prosthodontics, A.B. Shetty Memorial Institute of Dental Sciences

## ABSTRACT:

Medical emergencies can occur in one's general dental practice. Dentists must be prepared to manage these medical emergencies. The subject of emergency medicine must be thoroughly dealt with by all dental personnel. Identification of patients at risk of developing a medical emergency will allow for modification in treatment planning and their treatment may be conducted at specific times or specialist centres. It is important that every dental office have an established, written and practised routine for handling any kind of medical emergency. The speciality of emergency medicine is a dynamically evolving one. This only highlights further the need for every dental professional to be confident in one's skill as well as one's clinical facilities in terms of management of these medical emergencies.

**Key Words:** Medical emergencies, emergency drugs, emergency management protocol.



## INTRODUCTION:

Medical emergencies can and do occur in the general dental practice. Dentists must be prepared to manage these medical emergencies. The recognition of "at-risk" patients and subsequent management is mandatory in reducing the probability of an adverse event. Identification of "at-risk" patients will allow modification to be made in treatment planning and may highlight these patients whose treatment may be conducted at specific times or specialist centres. It is important that every dental office have an established, written and practised routine for handling emergencies.

The subject of emergency medicine must be thoroughly dealt with by the dental surgeon, the dental hygienist, dental

assistant as well as all other office personnel. There ought to be a constant improvement and maintenance of skill in the handling, prevention as well as management of medical emergencies. <sup>[1]</sup>Up to three quarters of medical emergencies that are encountered during dental practice can be prevented through proper patient evaluation, management and treatment modification. The increased life span has inadvertently caused a rise in population suffering from diseases that predispose them to medical emergencies. <sup>2</sup>Aging individuals have a higher predilection for disease and drug reactions. <sup>[3,4]</sup>

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only highlights further the need for every dental professional to be confident in one's skill as well as one's clinical facilities in terms of management of these medical emergencies.

### **Classification of medical emergencies:**

From a clinical point of discussion, medical emergencies can be broadly divided into cardiovascular and non cardiovascular emergencies. This may be further categorised as stress related and non stress related emergencies. (Table 1)

In the dental office more often than not, the dentist is unaware of the underlying pathologic condition of the patient. Rather, he is able to recognise a situation to be medically emergent because of the obvious signs and symptoms exhibited by the patient. Hence, a classification of medical emergencies based on the signs and symptoms clinically seen proves to be of immense help. (Figure 1)<sup>[1]</sup>

### **General Dental Council Guidelines on Medical Emergencies** <sup>[5]:</sup>

The General Dental Council advocates that the person who is in charge of a team in a dental practice should ensure that:

- There are arrangements for at least two people available to deal with medical emergencies when treatment is planned to take place
- All members of staff, not just the registered team members, know their role if a patient collapses or there is another kind of medical emergency

- All members of staff who might be involved in dealing with a medical emergency are trained and prepared to deal with such an emergency at any time
- Practise together regularly in a simulated emergency so they know exactly what to do.

### **Prevention of medical emergencies in the dental office:**

Providing and utilising a comprehensive system of physical evaluation of the patient can prevent approximately 90% of medically emergent situations. <sup>[6]</sup> Preventing a medical emergency from occurring in one's practice is symbiotic with preparing for the infinite possibility of an emergency to occur. In other words, the more we are prepared to handle an emergency, the more miniscule are the chances of an emergency being fatal. <sup>[7]</sup>

When physically examining the patient, the following goals ought to be achieved:

- ✓ Physical tolerance of stress should be determined.
- ✓ Psychological tolerance of stress should be determined.
- ✓ Whether modification of treatment plan should be incorporated to enable the patient to tolerate the treatment better.
- ✓ Whether psychosedation is required.

Physical evaluation includes medical history questionnaire, physical examination and dialogue history. A medical history, regardless of short or long, has the potential to be extremely useful or absolutely useless. It is the doctor's ability that adds on to the significance of the medical history questionnaire.

Physical examination is essential to confirm or correct the information collected from the questionnaire. Time and again, the patient unknowingly misleads the doctor by giving incorrect information or withholding important details. In dental practice, physical examination of the patient includes:

- ✓ Monitoring vital signs
- ✓ Visual inspection
- ✓ Auscultation and laboratory testing

#### **Preparing for medical emergencies:**

The dentist must be well prepared and ever ready to tackle a medical emergency effectively. Various surveys conducted report that medical emergencies though infrequent, are definitely not uncommon. A four year survey conducted under the supervision of the Japanese Dental Society concluded that 19% to 44% of dental professionals reported a medical emergency in any one year.<sup>8,9</sup> Studies conducted in Canada and the US have arrived at the consensus that syncope is the most regularly encountered medical emergency for dental surgeons.<sup>[10]</sup> Aside from syncope incidents, the next most

commonly reported emergency was seizure. This contributed to approximately one-third of all recorded occurrences. This was followed by swallowed foreign bodies, hypoglycemia, angina pectoris and diabetes associated symptoms.

It is imperative that the dentist be confident in administering basic life support (BLS) or cardiopulmonary resuscitation (CPR).<sup>[11, 12]</sup> The BLS training should include an intimate knowledge of the positioning (P), airway maintenance (A), breathing (B), circulation (C) and defibrillation (D) protocol. Although a single rescuer can effectively perform BLS, the procedure becomes more efficient with a team of rescuers, where one performing the chest compression and the other is ventilating the patient.

The CPR sequence for an adult patient is as follows:

Step1: Recognition of unconsciousness – stimulate the victim by gently shaking his shoulders while shouting out his name. Lack of response establishes a diagnosis of unconsciousness.

Step 2: Summon assistance and position (P) the patient – place the patient in the supine position on the floor with the feet elevated slightly (10 degrees), to facilitate the return of blood from the periphery.

Step 3: Assessment and maintenance of airway (A) –the most important procedure in airway maintenance is head tilt-chin lift procedure. It is performed by extending the patient's forehead back and lifting the chin

up and removing the tongue from the posterior wall of the pharynx.

Step 4: Assessment of breathing (B) and ventilation – assess if the patient has any respiratory movement. In its absence, perform the rescue breathing. To perform mouth-to-mask ventilation the head tilt-chin lift should be maintained. The mask is held in position on the patient and the rescuer forces air for 1 second, into the breathing port of the mask to make the chest rise. If the breathing is inadequate then deliver two rescue breaths and the pulse is checked. If pulse is palpable then continue only the P – A – B.

Step 5: Assessment of circulation (C) – once the rescue breaths are given then the circulation of blood is checked by palpating the carotid artery using only the index and middle finger. The artery is palpated for 5-10 seconds only. If the carotid pulse is absent then the chest compression is immediately started. The rescuer should compress the lower half of the sternum in the middle of the chest between the nipples. The heel of one hand is placed on the sternum and the heel of the other hand is placed over it with the fingers interlaced. Each compression should be 1.5-2 inches deep and should include 100 compressions in a minute. A compression-ventilation ratio of 30:2 should be performed in all single rescuer scenarios.

Step 6: Defibrillation (D) – if the patient still remains unresponsive and pulseless the automated external defibrillator is used.

Drugs that are to be stocked in the clinical office can be categorised under two

groups. These are called the essential drugs and the supplementary drugs. They are listed in tables 2 and 3 respectively. [12-14]

### **Essential Emergency Drugs**

#### *Oxygen :*

Oxygen has indications in every emergency with hyperventilation being the exception. [12, 14] A portable source of oxygen must be available. An “ E” size cylinder with a capacity to hold 600litres would be an ideal means for the same. In case the patient has not lost consciousness, or is unconscious but breathing independently, oxygen delivery should be performed via full-face mask with a flow rate of 6-10ml/minute. In the case of an unconscious and apneic patient, a bag-valve-mask oxygen delivery device ought to be used with a flow rate of 10-15ml/minute. [15]

#### *Epinephrine :*

In the event of a case of anaphylaxis or asthma, unresponsive to its first drug of choice albuterol, epinephrine is the most viable option. For cardiac arrest, the dosage is 1mg intravenously. [12, 14] Management of anaphylaxis advocates initial doses of 0.3-0.5mg intramuscularly or 0.1mg intravenously. [16-18]

#### *Nitroglycerin :*

Indicated for acute angina and myocardial infarction, Nitroglycerin is available as sublingual tablets of 0.3, 0.4 or 0.6mg or as a sublingual spray of 0.4mg.

#### *Injectable Antihistamine:*

Although mild allergic reactions can be effectively managed by oral administration of the drug, life-threatening reactions require parenteral administration. Their uses include as part of anaphylaxis management or as the main drug for lesser allergic reactions primarily those involving dermatological signs and symptoms.

*Albuterol :*

This is the drug of choice in the management of bronchospasm. Albuterol can be availed as metered dose inhalers capable of providing 90 or 100 micrograms of drug per administration.

*Aspirin :*

A widely known and recognised drug in dentistry, aspirin is more recently known for its life saving potential. This is in reference to its ability to reduce overall mortality from acute myocardial infarction. [19, 20]

*Oral Carbohydrate:*

Every clinic must have a readily available supply of oral carbohydrate in the form of fruit juices, non diet soft drink etc. It is essential in the management of the hypoglycemic conscious patient.

**Supplementary Emergency Drugs:**

*Glucagon :*

This drug is indicated in the management of the unconscious hypoglycemic patient. Although the standard management protocol involves a 50% intravenous administration of dextrose, glucagon comes into the picture when an intravenous line

has not been established. This is usually the scenario with regard to the dental clinic. Given intramuscularly, glucagon acts within 15 minutes.

*Atropine :*

Atropine finds use in the management of hypotension that presents with bradycardia. The patient is considered to be bradycardic if his heart rate drops below 60 beats per minute. Atropine can be procured in various strengths with a range from 50 micrograms per mL to 1mg per mL. In the management of emergencies, a concentration of 0.5mg per mL is advised.

*Ephedrine :*

A less potent vasopressor than epinephrine, this drug is indicated in the management of significant hypotension. Hypotension is generally considered when blood pressure levels are below 90/60mm Hg. The recommended administration is intravenously in increments of 5mg and 10-25mg intramuscularly.

*Corticosteroid :*

Corticosteroids like hydrocortisone are used in the management of recurrent anaphylaxis as well as adrenal crisis. Their slow onset of action is however a significant disadvantage and the prime reason for not being an essential emergency drug.

*Morphine :*

Morphine is used to manage severe pain accompanied with myocardial infarction. Advanced cardiac life support (ACLS) recommendations proclaim morphine to be the standard analgesic for

this. <sup>[21]</sup> A dosage titration of 1-3mg intravenously is advised till pain is relieved.

#### *Naloxone :*

Being an opioid antagonist, naloxone should be a part of the drug kit if morphine is included so as to reverse a possible morphine overdose. Due to the possible adverse effects, prudence is advised whilst use.

#### *Nitrous oxide :*

A viable option in the event of not having morphine available on site is the use of nitrous oxide. It should be administered with oxygen in a concentration of 35%.

#### *Injectable benzodiazepine :*

Benzodiazepines are indicated in the management of status epilepticus and is also the drug of choice for the same. Since it requires an intravenous line, a water soluble alternative such as midazolam or lorazepam is used. Lorazepam is also considered as the drug of choice for status epilepticus <sup>[21]</sup> and has an intramuscular route of administration. <sup>[22]</sup>

#### *Flumazenil :*

This drug must be a part of the emergency drug kit when oral or parenteral sedation is used in one's clinical practice. <sup>[23]</sup> Being the antagonist of benzodiazepine, its actions reverse the effects of benzodiazepines on the system.

#### **Drug management of specific emergencies:**

Needless to say that attempting to discuss all treatment protocols would be well beyond the limits of this article. Discussed below is a gist of certain emergencies that may be encountered in one's practice which require use of the aforementioned drugs. The management of all emergencies include the basic assessment and treatment of ABCs along with oxygen supply except in the case of hyperventilation. Due consideration must also be given as to whether and when it is wise to call for help.

#### *Syncope:*

Deemed the most common emergency one comes across in clinical practice, syncope requires only oxygen for its effective management. ABCs must be assessed and airway must be kept unobstructed. The patient must be placed in a supine position with the legs slightly elevated in order to facilitate blood flow to the brain. Oxygen must be administered and once the patient regains consciousness, the patient can be given oral glucose.

#### *Anaphylaxis :*

Anaphylaxis can be described as a severe form of an allergic reaction. <sup>[24]</sup> Its life threatening manifestations include bronchospasm, laryngeal edema, hypotension or a combination of these signs. The symptoms experienced by the patient include itching of the eyes or face, difficulty in swallowing and breathing difficulty, abdominal cramps and vomiting. Timing is of the essence for this emergency as the manifestations are extremely serious.

Once an anaphylactic reaction has been determined, the clinician is expected to follow the ABCs and administer epinephrine. This involves an initial dose of 0.1mg intravenously Or 0.3 to 0.5 mg intramuscularly repeated as needed. Once the patient is stable, antihistamines like 25-50mg of diphenhydramine or 10-20mg of chlorpheniramine may be administered via the intramuscular route. Oxygen must be given throughout.

#### *Bronchospasm :*

Albuterol, the first drug of choice should be given. A lack of response advocates the use of epinephrine is the anaphylaxis dosage. Oxygen should be administered as well.

#### *Cardiac arrest:*

If trained personnel in Basic life Support (BLS) or Advanced Cardiac Life Support (ACLS) are present, then this condition can be managed according to their principles and recommendations. If trained in usage of a bag-valve-mask device, then 100% oxygen may be administered. An external defibrillator if available may also be used. 1mg epinephrine can be administered as well.

#### *Angina / Myocardial infarction:*

These emergencies require nitroglycerin, oxygen and aspirin for their management. Patients experiencing angina complain of pressure, fullness, squeezing or pain in the chest which radiates to the neck, jaw, left shoulder, back or arm. Known angina patients need sublingual nitroglycerin, following which relief will be felt within

minutes. Oxygen must be administered. In the event of no relief, a second dosage is given. No relief after three administrations indicates myocardial infarction and the patient must be managed accordingly. If there is no history of ischemic heart disease, the same protocol must be followed after which the patient must be transferred to the hospital for medical assessment.

#### *Hypotension :*

Management begins with syncope management protocol. This is followed ideally by administration of IV fluids, but it may not be possible to get an IV line in the dental clinic. So atropine can be given at 0.5mg if the heart rate is less than 60 beats per minute. Ephedrine may also be considered in doses of 5-25mg. These drugs should however be used judiciously.

#### *Diabetic emergencies :*

Both hyperglycemia as well as hypoglycemia can be fatal if left untreated. That being said, the rapidity in onset of signs makes hypoglycemia the greater evil. As long as the patient is conscious, management is simple. The hypoglycemic patient is given a source of oral carbohydrate while the hyperglycemic patient is given insulin as provided by the accompanying individual. The unconscious hypoglycemic patient however should be managed with the basic ABCs oxygen and 50% dextrose IV or 1mg of glucagon IM.

#### *Seizures :*

First and foremost, protecting the patient must be ensured. In the event of

status epilepticus, injectable benzodiazepine should be administered. Alternatively, lorazepam 4mg or midazolam 5mg may be administered IM.

### Summary :

One simply cannot expect to have a practice devoid of any medical emergencies. Medical emergencies could happen anytime when one least expects it. The key however, is to be well prepared and equipped to handle any emergency that may befall a patient during dental treatment. Proper training of dentists as well as other personnel in the dental clinic will better enable the effective management of an emergent situation. Ultimately, it is the patient's life that is being entrusted in the clinician's hands, and

preservation of that life is paramount concern.

### CONCLUSION:

It has been estimated that one or two life threatening emergencies will occur in the lifetime practice of a dentist. With the aging population and individuals frequently appearing in the dental office with underlying medical conditions, the possibility of problems occurring will only increase. Obtaining a health history and a set of vital signs is the first step in identifying the patient likely to develop a medical emergency. With proper training, knowledge, thorough preparation, and regular practice of such training, the staff of the dental office can provide appropriate medical care should the need arise.

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**TABLE:**

Table 1: Cardiac oriented classification of medical emergencies

	<b>Non Cardiovascular</b>	<b>Cardiovascular</b>
<b>Stress-related</b>	Vasodepressor syncope Hyperventilation Seizure Acute Adrenal Insufficiency Thyroid storm Asthma	Angina pectoris Acute myocardial infarction Acute heart failure Cerebral ischemia and infarction Sudden cardiac arrest
<b>Non-stress-related</b>	Orthostatic hypotension Overdose reaction Hypoglycemia Hyperglycemia Allergy	Acute myocardial infarction Sudden cardiac arrest

Table2: Essential emergency drugs.

DRUG	INDICATION	INITIAL ADULT DOSE
Oxygen	Almost any medical emergency	100% inhalation
Epinephrine	Anaphylaxis Asthma unresponsive to albuterol Cardiac arrest	0.1mg IV or 0.3-0.5mg IM 0.1mg IV or 0.3-0.5mg IM 1mg IV
Nitroglycerine	Pain of angina	0.3-0.4mg sublingual
Antihistamine (diphenhydramine or chlorpheniramine)	Allergic reactions	25-50mg IV,IM 10-20mg IV, IM
Albuterol	Asthmatic bronchospasm	2 sprays( 180µg-200µg) inhalation
Aspirin	Myocardial infarction	160mg-325mg

Table 3: Supplementary emergency drugs

DRUG	INDICATION	INITIAL ADULT DOSE
Glucagon	Hypoglycemia in unconscious patient	1mg IM
Atropine	Clinically significant bradycardia	0.5mg IV or IM
Ephedrine	Clinically significant hypotension	5mg IV or 10-25mg IM
Hydrocortisone	Adrenal insufficiency Recurrent anaphylaxis	100mg IV or IM
Morphine or nitrous oxide	Angina like pain unresponsive to nitroglycerin	Titrate 2mg IV, 5mg IM , ~35% inhalation
Naloxone	Reversal of opioid overdose	0.1mg IV or 0.4mg IM
Lorazepam or midazolam Flumazenil	Status epilepticus Benzodiazepine overdose	4mg IM or IV 0.1mg IV

**FIGURES:**

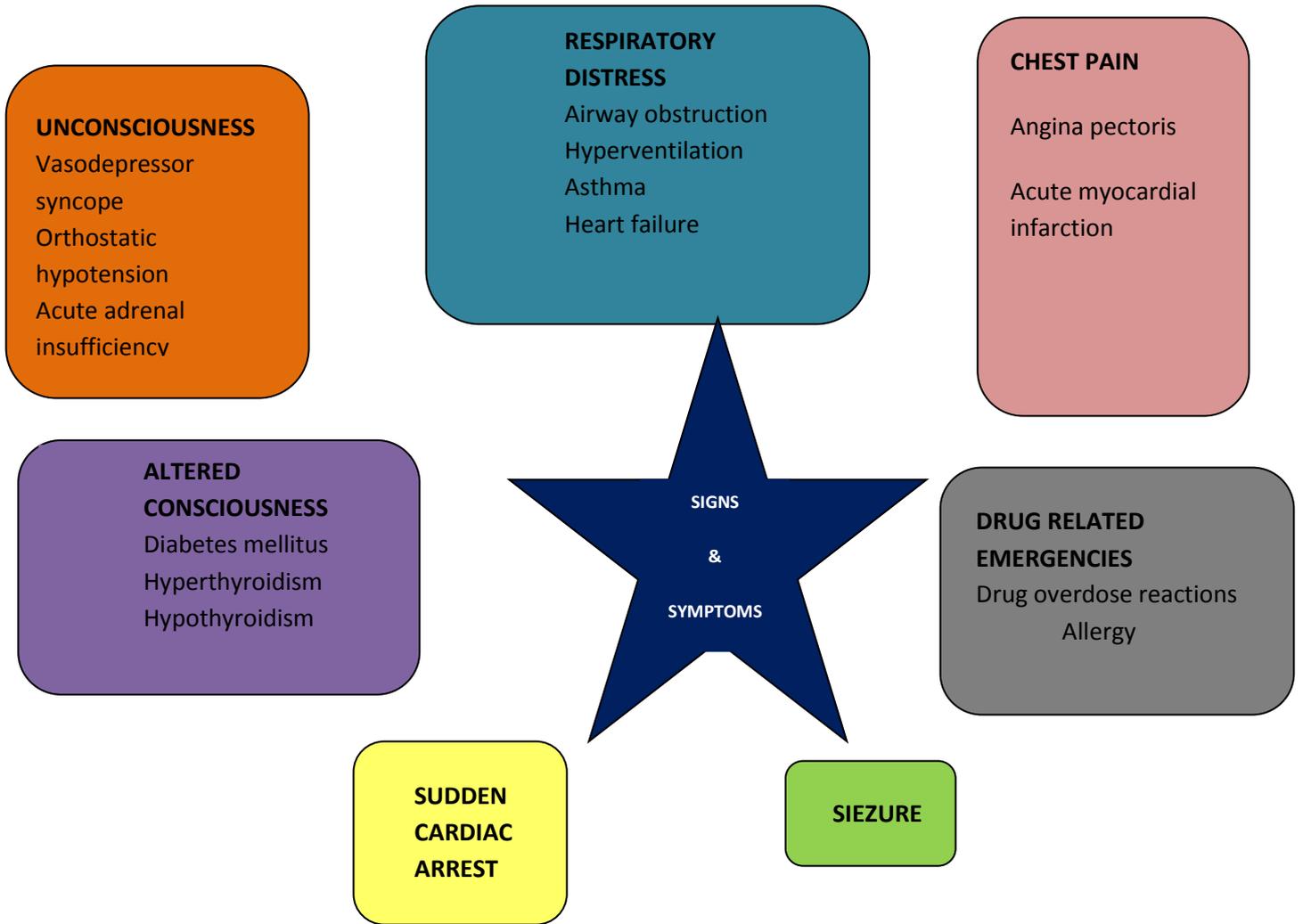


Figure 1: Common medical emergencies classified according to clinical signs and symptoms.