

MEDICAL EMERGENCIES IN DENTISTRY

Dr. Isha Brahmhatt*

College of Dental Sciences and Research Centre, Ahmedabad, Gujarat, India.

Received date: 13 April 2021

Revised date: 03 May 2021

Accepted date: 23 May 2021

*Corresponding author: Dr. Isha Brahmhatt (B.D.S)

College of Dental Sciences and Research Centre, Ahmedabad, Gujarat, India.

ABSTRACT

Any dental professional can encounter an emergency during the course of their treatment. Every Dental specialist should have the knowledge to identify and manage a potentially life-threatening situation. Prompt recognition and efficient management of an emergency by the specialist results in a satisfactory outcome. Though rare, emergencies do occur in a dental clinic. The ultimate goal in the management of all emergencies is the preservation of life. The prime requisite in managing an emergency is maintenance of proper Position (P), Airway (A), Breathing (B), Circulation (C), and Definitive treatment (D). The purpose of this article is to provide a vision to the commonly occurring medical and dental emergencies and complications in dental practice and their management. Data for the study was collected from PubMed data base search.

KEYWORDS: Anaphylaxis; Asthmatic shock; Complications; Local anaesthetic attack; Medical emergencies; Syncope.

INTRODUCTION

An emergency is a medical condition that demands immediate attention and successful management. These are the life-threatening situations of which every practitioner must be aware of so that unwarranted morbidity can be avoided.

A survey of 4000 dental surgeons conducted by Fast and others revealed an incidence of 7.5% emergencies per dental surgeon over a 10-year period.^[1]

Emergencies can be prevented to a certain extent by a detailed medical history, physical examination, and patient monitoring. Preparation for an emergency and sound knowledge about the management of all emergencies in general is of prime concern to dental specialists.

Basic principles of management of medical emergencies

The golden rule in managing any emergency is rendering basic life support (BLS) measures and cardiopulmonary resuscitation (CPR). This is done by following the basic principles: Position (P), Airway (A), Breathing (B), Circulation (C), and Definitive therapy (D)^[2] [Figure 1]. The primary positions to manage an emergency are supine position, Trendelenburg position and semi-erect position.^[3] Maintaining a patent and functioning airway

is the first priority in managing an emergency. This is achieved usually by the head tilt-chin lift manoeuvre.^[4] If clear airway is still not achieved, then invasive procedures like direct laryngoscopy and cricothyrotomy can be followed. The next priority is to check for the presence of adequate breathing which is assessed by the look-feel and listen technique.^[4] If spontaneous breathing is not evident then rescue breathing should be accomplished immediately either by the mouth-to-mouth technique or the bag-valve-mask technique. After establishing a patent airway and breathing, circulation is assessed. The most rapid and reliable method is by palpating the carotid pulse at the region of the sternocleidomastoid muscle. If pulse is absent, then CPR is initiated immediately. Once airway, breathing, and circulation is maintained, definitive treatment is begun if the emergency is acute and cause is clear to the dental specialist. Definitive therapy involves administration of drug when indicated and contacting for emergency care.

The medical and dental emergencies that are commonly encountered in dental practice involve syncope, airway obstruction, anaphylaxis, local anaesthetic toxicity, asthmatic attack, chest pain, haemorrhage, and seizure. Myocardial infarction and cardiac arrest are extremely rare. Analysis of history and patient counselling and motivation also play a role in minimizing the emergencies.



Figure 1: Principles of emergency management.

Syncope

Syncope is caused due to inadequate cerebral perfusion. Causes of sudden loss of consciousness and collapse include hypotension, adrenal crisis, anaphylaxis, cardiac arrest, diabetic collapse, hypoglycemia, epileptic seizure, fainting, or stroke.^[5] The early manifestations include nausea, warmth, perspiration, baseline blood pressure, and tachycardia. Late manifestations include hypotension, bradycardia, pupillary dilation, peripheral coldness, and visual disturbance. Most of the syncopal attacks can be prevented by ensuring that the patient has had their meal before treatment in case of systemic diseases like diabetes and also making the patient lie in the supine position before administering local anaesthetics.^[5]

Management: The patient should be in the supine position [Figure 2]. Recovery is almost instantaneous if the patient has simply fainted. Then maintain airway, check pulse (if absent, indicates cardiac arrest), and start CPR immediately. If pulse is palpable and the patient has not completely lost consciousness, four sugar lumps may be given orally or intravenous 20ml of 20-50% sterile glucose. A hypoglycemic patient will improve with this regimen. But if there is still no improvement medical assistance should be summoned. Meantime, hydrocortisone sodium succinate 200 mg IV should be given.^[5]



Figure 2: Syncope management: Trendelenburg Position.

Airway obstruction

Airway obstruction is usually caused due to accidental slippage, aspiration of foreign objects, or laryngeal spasm. Patient manifests with inability to speak, grasps the throat (universal sign), coughs, inability to exchange air (in spite of respiratory movements), cyanosis, and loss of consciousness. These might eventually lead to cardiac arrest finally.

Management: Main priority is to clear the airway, but the method differs depending upon whether the patient is

conscious or unconscious. If the patient is conscious, then he/she must be made to sit straight, support chest with one hand, and deliver five sharp back blows between the shoulder blades with the heel of the other hand. But if the patient is choking, an attempt is made to expel the object with upward thrusts using Heimlich thrust [Figure 3]. It acts as artificial cough that produces a rapid increase in intra-thoracic pressure thus helping to expel the foreign body [Figure 4].



Figure 3: Heimlich Thrust.

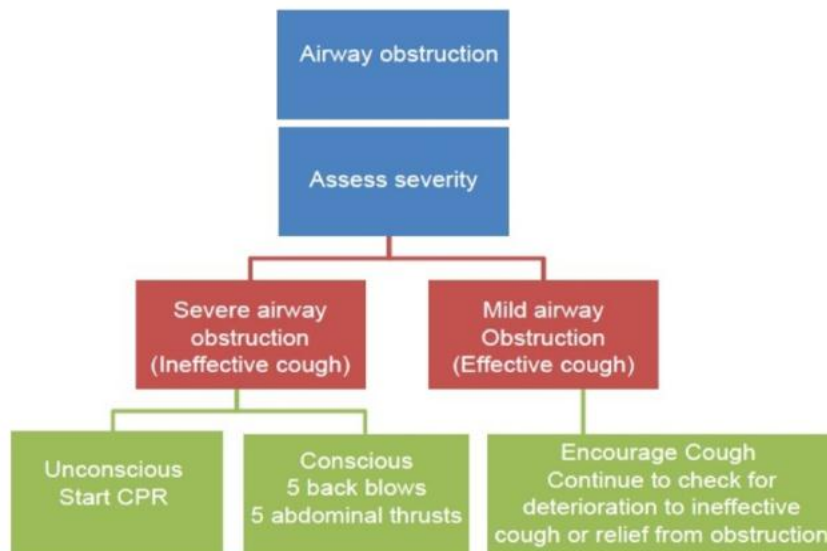


Figure 4: Airway obstruction management.

In an unconscious patient, the patient is got to a supine position and deliver inward and upward thrust five times. This thrust is followed by turning patient to one side to clear oral cavity. Attempt to re-ventilate, commence CPR and administer oxygen. If the foreign object is still not dislodged and patient's condition deteriorates, then a surgical airway is created by Laryngoscopy or cricothyrotomy.^[5]

A 10-year institutional review on aspiration and ingestion in dental practice concluded that dental procedures involving single-tooth cast or prefabricated restorations involving cementation have a higher likelihood of aspiration. This can be prevented by measures such as use of rubber dams or gauze, throat screens, or floss ligatures.^[6]

Anaphylaxis

It is a hypersensitive state that results from exposure to an allergen. The most common allergen in a dental setup is latex.^[2] Manifestations vary from a mild form where the patient presents with erythematous rash, cyanosis, nausea, vomiting, tachycardia, urticaria, or angioedema to a severe form which leads to airway obstruction or

inadequate blood pressure and blood flow to the brain which is a life-threatening situation [Figure 5].

Management: It involves lying the patient in the supine position with legs raised [Figure 6], administer oxygen, and the drug of choice being 0.5 ml of 1:1000 adrenaline IM or SC.^[5]

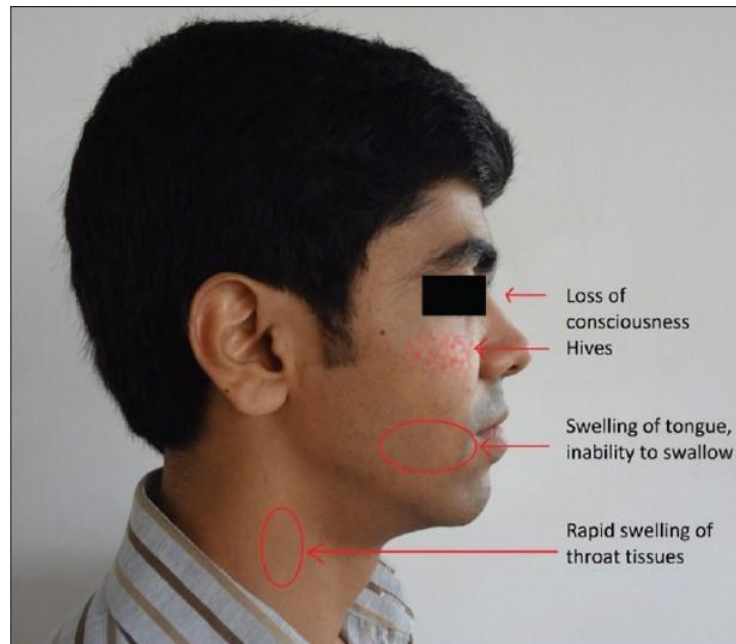


Figure 5: Schematic representation of the area to be observed for the signs and symptoms of anaphylaxis.



Figure 6: Patient position for the management of Anaphylaxis.

Local Anaesthetic toxicity

Local anaesthetics are the most commonly used drugs in dentistry. Toxicity is usually either due to the local anaesthetic itself or the vasoconstrictor which can be due to rapid infusion or failure to aspirate before injection. Generally, the reactions are self-limiting. Toxicity presents with talkativeness, slurred speech, anxiety, confusion, drowsiness, or even seizure and cardiac arrhythmias in extreme cases.

Management: To treat the patient cease the administration of injection immediately and monitor vital signs. Administer oxygen and in adverse cases administration of diazepam 5 mg slowly is advised.^[5]

Asthmatic attack

Anxiety, infection, exposure to an allergen or drugs can precipitate an asthmatic attack. The goal of management during an acute asthmatic episode on a dental chair should be to relieve the bronchospasm associated with the attack. Patient presents with thickness or heaviness in the chest, difficulty in breathing, spasmodic and unproductive cough, expiratory wheeze, and anxious behaviour. Hence, the patient should primarily be relieved of irritants and all articles should be removed from oral cavity.^[5]

Management: Drug of choice is 2 puffs of albuterol. If no improvement is seen in 15 seconds then administer 1:1000 adrenaline 0.5 ml SC/IM and if still no response

is observed in 2-3 min then salbutamol slow IV injection is advised.^[5]

Chest pain

Factors that precipitate chest pain include angina, acute myocardial infarction, gastrointestinal reflux disease, anxiety, costochondritis and paroxysmal supraventricular tachycardia.^[2] Patients generally present with tightness, fullness, constriction, or heavy weight on the chest. Angina pectoris and acute myocardial infarction (AMI) are the two commonly occurring cardiac problems in a conscious patient. Patient's history is of prime concern here. If this is the first time patient has ever experienced a chest pain, then dental specialist should treat him or her as if it were an acute myocardial infarction and have emergency medical service transfer immediately. If not then it is an angina pectoris situation. Quality of pain can also indicate whether the patient is having an angina or acute myocardial infarction. In angina pectoris pain is significant but not severe whereas an acute myocardial infarction pain generally radiates to left side of the body- left shoulder, left mandible, left arm.^[2]

Management: For angina pectoris, drug of choice is a nitrate, commonly nitroglycerine, sublingual tablet, translingual or transmucosal spray.

Management for a patient with suspected acute myocardial infarction involves administration of morphine, oxygen, nitroglycerine, and aspirin (MONA) in addition to emergency medical service. If morphine is unavailable, the specialist can also substitute nitrous oxide/oxygen in a 50:50 concentration.^[2]

Haemorrhage

Haemorrhagic disorders, though uncommon, should always be considered, as dental specialists deal with blood routinely and there are instances when significant bleeding could lead into an emergency.

Management: Emergency management begins by gently cleaning the mouth and locating the source of bleeding and the application of cold compress, pressure packs, or styptics. Suture the area under L.A when necessary. Tranexamic acid -500 mg in 5 ml by slow IV injection is the drug of choice.^{[2],[5]}

Seizures

Patients who convulse in dental office generally have a seizure history and are often characterized as having epilepsy.

Management: If the patients experiencing seizure is unconscious, they should primarily be placed in the supine position and the head tilt-chin lift manoeuvre is performed. Dental specialist should remove all instruments from patient's mouth and protect the patient. Clear airway, loosen clothing and help patient breath adequately.

If seizure continues for long, then the condition is known as status epilepticus. This is a life-threatening emergency and is best managed with I.V. diazepam 5 mg IV/ IM or by maintaining BLS till patient is shifted to emergency medical care.

Dental complications

More than dental emergencies which require an immediate attention and management, the occurrence of "complications" are of higher incidence in dental practice. The complications may be immediate or delayed and are related to patient's tolerance level, materials used and treatment procedures.

In an interdisciplinary dental practice the most common complication is aspiration. Aspiration may be of the denture as a whole or a fractured part, a minimal extension acrylic removable prosthesis, crowns during removal, instrument slippage especially broaches reamers or files. Aspiration causes airway obstruction which is manifested as the universal sign "choking." Removal of broken instruments is performed using ultrasonics, operating microscopes or microtube delivery methods.^[7]

Allergy is another complication commonly encountered by a dental specialist

Allergy can be to latex, mercury, rubber dam, and impression material. Manifestations of allergy include pruritis, erythema, urticaria, and angioneurotic edema. Minimizing latex exposure is most effective when treating latex-sensitive patients. Latex alternatives (vinyl, nitrite, or silicone) and powder-free gloves should be used to prevent sensitization. Fixers like formocresol and devitalizers are to be used carefully to prevent chemical burns. Allergy to alloys like nickel-chromium and chromium-cobalt has also been encountered.

Complications involving local anaesthetics are hypersensitivity, toxic reactions, and allergy.^[8] The most severe form of hypersensitivity is anaphylaxis which is a life-threatening generalized or systemic reaction.^[9] Anaphylaxis can be either allergic or non-allergic. Allergic hypersensitivity can be immediate due to IgE or delayed which is T-cell mediated.^[10]

Management involves administering prophylactic antihistamines, such as diphenhydramine or corticosteroids such as prednisone before dental treatment to those at known risk^{[8],[9]} and the drug of choice is 0.3-0.5 ml intra-muscular or subcutaneous doses of 1:1000 epinephrine.^[10]

Allergic reactions can also occur to acrylic resins, which can be minimized by following proper monomer polymer ratio, correct curing cycle so as to minimize the residual monomer content in the prosthesis.

Interference of a cardiac pacemaker by an electronic dental device was studied by *Roedig et al.* The pacing

activity of both pacemakers and the dual-chamber ICD was inhibited by a battery-operated composite curing light at between 2 and 10 cm from the leads. The use of an ultrasonic scaler interfered with the pacing activity of the dual-chamber pacemaker between 17 and 23 cm from the leads, the single-chamber pacemaker at 15 cm from the leads and both ICDs at 7 cm from the leads. Operation of the electric toothbrush, electrosurgical unit, electric pulp tester, high- and low-speed handpiece, and an amalgamator did not alter pacing function.

The article concluded that the use of the ultrasonic scaler, ultrasonic cleaning system, and battery-operated composite curing light may produce deleterious effects in patients who have pacemakers or ICDs.^[11]

Complications and emergencies encountered during implant therapy

Complications can be either related to the surgery or implant placement. The intra-operative complications related to surgery are haemorrhages, neurosensory alteration, damage to the adjacent teeth, and mandibular fractures.^[12]

Haemorrhages in the mandible most frequently occur in the intra-foraminal region by damage to the descending palatine artery or the posterior palatine artery. Respiratory obstruction has also been reported due to perforation of the arteries supplying the mandible.^[13] This is believed to be due to the massive internal haemorrhage caused due to the vascular injury in the floor of the mouth which creates a swelling, producing protrusion, and displacement of the tongue, thus obstructing the airway.^{[14],[15]}

Haemorrhages can be managed by strong finger pressure at the point of bleeding but if compressions don't obtund bleeding then at times anastomoses necessitates ligation. Another complication related to surgery is neurosensory disturbance which manifests as anaesthesia, paraesthesia, hypoesthesia, or dysesthesia. If the patient suffers from paraesthesia but implant is placed correctly with no damage to the nerve, then retrieval of implant is not advised; instead wait for recovery. However, if the nerve is being compressed, it is always advisable to remove the implant to avoid permanent neural damage.^[16] Damage to the adjacent teeth occurs due to lack of parallelism of the implant with the adjacent teeth. Hence, it is always mandatory that a distance of 1.5 mm be maintained from the adjacent teeth.

In case of damage, treatment of the affected teeth include endodontic therapy, periapical surgery, apicectomy, or extraction.^[17] Mandibular fractures are rare and occur when implants are placed in atrophic mandible.

Complication associated with implant placement most importantly involves loss of primary stability which can be attributed to overworking of the implant bed, poor bone quality or use of short implants.^[12] An increase in

temperature due to excessive speed of the drill produces necrosis, fibrosis, osteolytic degeneration, and increased osteoclastic activity.^[18] Loss of primary stability can be managed by using a wider and longer self-tapping implant.^[19] Another possible complication is manifestation of dehiscence or fenestration, managing which involves filling the bone defect with bone grafts and resorbable or non-resorbable membranes.^[20] During implant placement in the maxilla in areas close to sinus or during sinus lift procedures, complications involving rupture of Schneider membrane can occur. Depending on the width of the tear, a resorbable membrane may be used which serves to contain the bone graft material, or if the tear is very wide, then surgery is postponed.

Another complication is the displacement of the implants into the maxillary sinus during the surgery or in the postoperative period. In some cases, it can lead to sinusitis or even remain asymptomatic.

These emergencies and complications can be minimized by appropriate pre-surgical planning, use of accurate surgical techniques, postsurgical follow-up, respecting the osseointegration period, appropriate design of the superstructure, biomechanics, and advocating meticulous hygiene during the maintenance phase.

Recent advances in the management of emergencies

The most recent advancement is the revised CPR guideline by the American Heart Association (AHA) in 2010. Instead of ABC, now compressions come first only then do airway and breathing. Initially, it was believed that the chest compressions should be at least 1-1.5 inches deep but now at least 2 inch deep compressions are recommended and also instead of pushing on the chest at about 100 compressions per minute, AHA now recommends to push at least 100 compressions per minute.^[21]

DISCUSSION

As always believed, prevention is the best medicine. Hence, being prepared for an emergency and believing that emergency is a real possibility in a dental clinic is of utmost importance. Preparation for emergencies involves personal, staff, and office preparation wherein personal and staff preparation include an in depth knowledge of signs, symptoms, and management of emergencies, basic life support (BLS) measures, and cardiopulmonary resuscitation (CPR). Office preparation involves maintaining emergency equipment, emergency drugs, and backup medical assistance.

Whenever an emergency has been recognized, most important is to follow DRS-ABC Emergency equipment that are indispensable in a dental set-up involve a dental chair which can be readily adjusted to Trendelenburg position, high volume suction to clear oral secretions, disposable needle and syringe, oxygen cylinder with face mask and AMBU bag, and maintenance of IV access. Dental specialist should always remember that

administration of drugs is not necessary for management of an emergencies and primary management always involves BLS measures.

CONCLUSION

Emergencies cannot be totally prevented but can be managed appropriately with thorough knowledge of the signs, symptoms, and accurate treatment of the emergencies. Accomplishing this depends on the combined effort of the dental specialist, staff, and immediate availability of the critical drugs and equipment for the procedure. However, no drug can replace an efficiently trained health care professional in managing an emergency but an emergency drug kit and equipment does play an integral role in the course and outcome of management of emergencies and complications in interdisciplinary dental practice.

REFERENCES

- Morrison AD, Goodday RH. Preparing for medical emergencies in dental office. *J Can Dent Assoc*, 1999; 65: 284-6. [PUBMED]
- Reed KL. Basic management of medical emergencies: Recognizing a patient's distress. *J Am Dent Assoc*, 2010; 141 Suppl 1: 0S-24. [PUBMED]
- Malamed SF. *Medical Emergencies in the Dental Office*. 6th ed. St. Louis: Mosby, 2007; 51-92.
- Medical emergencies and resuscitation: Standards for clinical practice and training for dental practitioners and dental care professionals in general dental practice. A statement from the Resuscitation council (UK), 2006. revised May 2008.
- Emergencies. In: Scully C., Cawson RA. *Medical Problems in dentistry*. 5th ed, 2005; 563-70.
- Tiwana KK, Mortan T, Tiwana PS. Aspiration and ingestion in dental practice. *J Am Dent Assoc*, 2004; 35: 1287-91.
- Gencoglu N, Helvacioglu D. Comparison of the different techniques to remove fractured endodontic instruments from root canal systems. *Eur J Dent*, 2009; 3: 90-5.
- Grzanka A, Misio³ek H, Filipowska A, Mi⁷kiewicz-Orczyk K, Jarz⁴b J. Adverse effects of local anaesthetic allergy, toxic reactions or hypersensitivity. *Anaesthesiol Intens Ther*, 2010; 42: 175-8.
- Johansson SG, Hourihane JO, Bousquet J, Brujnzeel-Koomen C, Dreborg S, Haahtela T, et al. A revised nomenclature for allergy. an EAACI position statement from the EAACI nomenclature task force. *Allergy*, 2001; 56: 813-24. [PUBMED]
- Thyssen JP, Menné T, Elberling J, Plaschke P, Johansen JD. Hypersensitivity to local anaesthetics - update and proposal of evaluation algorithm. *Contact Dermatitis*, 2008; 59: 69-78.
- Roedig JJ, Shah J, Elayi CS, Miller CS. Interference of cardiac pacemaker and implantable cardioverter-defibrillator activity during electronic dental devices use. *J Am Dent Assoc*, 2010; 141: 521-6. [PUBMED]
- Lamas Pelayo J, Peñarrocha Diago M, Martí Bowen E, Peñarrocha Diago M. Intraoperative complications during oral implantology. *Med Oral Patol Oral Cir Bucal*, 2008; 13: 239-43.
- Flanagan D. Important arterial supply of the mandible, control of an arterial hemorrhage, and report of a haemorrhagic incident. *J Oral Implantol*, 2003; 29: 165-73. [PUBMED]
- Niamtu J 3rd. Near fatal airway obstruction after routine implant placement. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*, 2001; 92: 597-600.
- Kalpidis CD, Setayesh RM. Hemorrhaging associated with endosseous implant placement in the anterior mandible: A review of the literature. *J Periodontol*, 2004; 75: 631-45. [PUBMED]
- Guarinos J, Peñarrocha M, Donado A. Complicaciones y fracasos. In: Peñarrocha M, editor. *Implantología oral*. Barcelona: Ars Médica, 2001; 245-56.
- Kim SG. Implant-related damage to an adjacent tooth: A case report. *Implant Dent*, 2000; 9: 278-80.
- Tehemar SH. Factors affecting heat generation during implant site preparation: A review of biologic observations and future considerations. *Int J Oral Maxillofac Implants*, 1999; 14: 127-36.
- Guisado B. Complicaciones y fracasos en implantología. In: Bascones A, editor. *Tratado de odontología*. Tomo IV. Madrid: Smithkline Beecham, 1998; 3877-86.
- Goodacre CJ, Bernal G, Rungcharassaeng K, Kan JY. Clinical complications with implants and implant prostheses. *J Prosthet Dent*, 2003; 90: 121-32.
- Available from: http://firstaid.about.com/od/cpr/qt/09_2010_CPR_Guidelines.htm [Last accessed on 12.12.2011].
- ADA Council on Scientific Affairs. Office emergencies and emergency kits. *J Am Dent Assoc*, 2002; 133: 364-5.