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DEPARTMENT OF ORAL AND MAXILLOFACIAL SURGERY MANAGEMENT OF MEDICAL EMERGENCIES IN ORAL AND MAXILLOFACIAL SURGERY A COMPREHENSIVE REVIEW

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ABSTRACT

Oral and maxillofacial surgeons must be equipped to handle a range of emergencies during office-based procedures, particularly when advanced anesthesia techniques are employed. This article provides a comprehensive review of essential emergency drugs and medications required for effective management of perioperative crises. Core emergency drugs such as oxygen, nitroglycerin, aspirin, and epinephrine are crucial for addressing conditions like hypoxemia, myocardial infarction, and anaphylaxis. Additionally, specific medications for advanced anesthesia, including vasopressors like [6]relaxants like succinylcholine, and reversal agents such as naloxone and flumazenil, are reviewed. Proper preparation, including the presence of resuscitative equipment and familiarity with dosage and administration techniques, is vital for preventing deterioration in medical emergencies. The article emphasizes the importance of having a well-rounded knowledge of these interventions to enhance the safety and efficacy of oral and maxillofacial surgical practices.

Keywords: Oral and Maxillofacial Surgery, Emergency Drugs, Advanced Anesthesia, Resuscitative Equipment, Medication Dosage

INTRODUCTION

Oral and maxillofacial surgery is the branch of surgery concerned with the diagnosis, surgical treatment, and management of diseases, injuries, and defects of the oral cavity, jaws, facial structures, and neck.[1] This specialty should, therefore, represent a blend between medicine and dentistry for diseases that require an in-depth knowledge of facial anatomy and surgical skills. Procedures in OMFS include dentoalveolar surgery, orthognathic surgery, facial trauma repair, cleft lip and palate surgery, and benign and malignant facial tumors. It is a specialty that commands a high degree of accuracy and skill because of the anatomy of the face, which accommodates many important structures like the airway, nerves, and major blood vessels.[2] As one would expect, medical emergencies inherently carry a high risk with complex procedures in OMFS, most often involving critical anatomical areas. It is therefore imperative that surgeons and their teams are fully prepared for management in view of ensuring the safety of the patient. Emergencies can result from airway obstruction, severe bleeding, allergic reactions, or cardiovascular events.[3,4,5] Their timely recognition and management can be the difference between life and death. Emergency preparedness forms part of OMFS, which is not just about knowledge in respect of the clinic, but requires a proactive approach, which involves rigorous preoperative assessment, continuing training in emergency protocols, and the availability of appropriate emergency equipment.[6] The preparedness of the surgical team to respond quickly and appropriately to unexpected complications requires regular drills and practice with simulation. Knowledge of these emergencies and their management is very vital in the safe management of patients.[7,8] In this review, common medical emergencies will be discussed with practical guidelines for management in this field.

REVIEW OF LITERATURE

In a retrospective study conducted by Xiao Shao et al., a total of 53 critical patients were treated in the oral emergency department over the past 14 years, averaging four cases annually, with an incidence rate of 0.00506%. The predominant type of emergency encountered was hemorrhagic shock and active hemorrhage, with the highest incidence observed in patients aged 19 to 40 years. Notably, 67.92% (36 out of 53) of these emergencies and critical conditions developed before the patients arrived at the oral emergency department, and 41.51% (22 out of 53) had underlying systemic diseases. Following emergency intervention, 48 patients (90.57%) stabilized, while 5 patients (9.43%) did not survive.[9] In a retrospective study by H. T. Chen et al. on day visits to the emergency department at Peking University School and Hospital of Stomatology, the most common systemic conditions observed among

patients were cardiovascular and cerebrovascular diseases (6.4%), hypertension (13.4%), and endocrine system diseases (4.2%). The study also found that as patients' age increased, there was a corresponding rise in the number of associated systemic diseases and higher ASA (American Society of Anesthesiologists) classifications. Regarding dental conditions, periapical disease (24.6%), dental pulp disease (24.4%), and periodontal disease (18.0%) made up approximately two-thirds of the cases.[10] Ghassan M. Al-Iryani et al. found that 22% of the dental clinics surveyed lacked an emergency kit. Additionally, only 38% of the dentists interviewed felt confident in performing CPR, while 18% expressed having no confidence in managing any medical emergency.[11] In a study by Jacek Smereka et al., 8.99% of participants had undergone basic life support (BLS) training within the previous 12 months, while 35.89% had completed such training within the last 2 to 5 years. Additionally, 15.17% had encountered at least one emergency situation requiring an EMS call in the past 12 months. The most common medical emergency was vasovagal syncope (15.97%), followed by moderate anaphylactic reactions (13.87%), seizures (8.81%), hyperventilation crises (7.50%), and hypoglycemia (7.34%).[12] A study conducted in Japan from 1980 to 1984 by the Committee for the Prevention of Systematic Complications During Dental Treatment found that 19% to 44% of dentists experienced a medical emergency with a patient each year. While 90% of these incidents were mild, 8% were serious. Among the patients, 35% had underlying conditions, with cardiovascular disease present in 33%. Medical emergencies most commonly occurred during and after local anesthesia, especially during tooth extractions and endodontic procedures. Over 60% of the emergencies were cases of syncope, followed by hyperventilation at 7%.[13] In a study by Franco Arsati, the most common medical emergency reported by respondents was presyncope (54.20%), followed by orthostatic hypotension (44.37%), moderate allergic reactions (16.86%), hypertensive crisis (15.06%), and asthma (15.06%). Other emergencies included syncope (12.65%), angina (6.82%), convulsions (6.22%), hypoglycemia (5.62%), hyperventilation crisis (5.22%), choking (2.20%), and cerebrovascular accident (0.8%). Rare emergencies like anaphylaxis, myocardial infarction, and cardiac arrest were reported by just 0.4%, 0.2%, and 0.2% of dentists, respectively. Only 41% of the dentists felt confident in diagnosing the cause of an emergency during a dental visit.[14] In a study by Mostafa Alhamad, 145 dentists participated, yielding a 73.2% response rate, with 50.3% being male and 56% working in private dental clinics. About 67% of respondents reported encountering medical emergencies, with vasovagal syncope being the most common (53.1%), followed by hypoglycemia (44.8%). Only 5.5% had faced foreign body aspiration. The dentists reported 599 episodes of medical emergencies over the past three years. Nearly 45% felt competent in performing CPR. While 74.3% had emergency kits in their clinics and over 70% stocked oxygen, adrenaline, and glucose, one-third were either not confident or unsure how to use these emergency drugs.[15] In a study by Jessica Joanna Zachar et al., the frequency of medical emergencies in a dental setting over a six-year period was 0.037% (n = 108) based on the number of dental services provided. The most common emergencies were syncope (25.0%), hypoglycemia (16.7%), and foreign body ingestion (13.9%). These incidents occurred most frequently during dental extractions (26.9%), followed by local anesthesia administration (16.7%), and restorative procedures (13.0%). The majority of emergencies took place during dental treatment (62.0%), with fewer occurring before (12.0%) or after (26.0%). Most incidents occurred in the dental student clinic (72.2%), followed by the dental waiting room (19.5%) and private dental clinics (8.3%).[16]

ASTHMA ATTACKS

Acute asthmatic attacks can be triggered by stress, anxiety, or infection, which are not uncommon in oral and maxillofacial surgery (OMFS) settings. The symptoms of an asthmatic attack include difficulty breathing, coughing, wheezing, the use of accessory muscles for respiration, chest tightness, rapid breathing, tachycardia, and a pale, anxious appearance. Management involves keeping the patient seated and administering two puffs of Salbutamol (100 µg per puff) via inhaler. If there is no quick response, additional puffs can be given through a spacer device, and oxygen supplementation should be considered. If the patient does not improve, an urgent transfer to a medical center is necessary, as severe attacks may not respond to standard bronchodilator therapy and can be fatal without proper treatment. Indicators of a severe, life-threatening asthma attack include silent chest sounds, poor respiratory effort, cyanosis, SpO2 below 92%, exhaustion, altered consciousness, and a weak or irregular pulse. In such cases, immediate hospital transfer is crucial, along with oxygen supplementation. Treatment includes administering Salbutamol (100 µg per puff) in four puffs through a spacer device, with additional puffs every 2 minutes as needed, up to a maximum of ten puffs, or Salbutamol 5 mg via nebulizer if available. Hydrocortisone 100 mg IV or Prednisolone 40–50 mg orally should be given, with children aged 5 years and above receiving Oral Prednisolone 30–40 mg. For children under 5 years, Salbutamol inhalation can be given up to ten puffs while awaiting transfer to a suitable medical facility.[17,18]

ADDISONIAN CRISIS

Acute adrenal insufficiency, also known as adrenal crisis, steroid crisis, or Addisonian crisis, is characterized by sudden and severe hypotension in patients who are unable to produce a normal cortisol response to stress, whether physiological or psychological. This condition is commonly observed in individuals who have been on long-term glucocorticoid therapy, those with Addison's disease, hypopituitarism, or other conditions that result in decreased production of adrenocorticotropic hormone (ACTH). Symptoms include severe hypotension, which may present as weakness, confusion, dizziness, drowsiness, or loss of consciousness, along with nausea, vomiting, and possible seizures. Immediate treatment involves laying the patient flat, providing high-flow oxygen, and arranging urgent transfer to a medical center. Intravenous (IV) access should be established, and Hydrocortisone sodium succinate should be administered: 2–4 mg/kg body weight for children aged 2 to 11 years, and 100 mg IV for individuals over 11 years, or the same dose via intramuscular (IM) injection if IV access cannot be secured. Additionally, an IV infusion of 0.9% Normal Saline should be started.[19,20]

AIRWAY OBSTRUCTION

In oral and maxillofacial surgery, dealing with acute airway obstruction is crucial due to the mouth being the primary focus of the specialty. Effective prevention is key. Signs of airway obstruction include a distressed patient, abnormal noises such as gurgling, crowing, or snoring, forced inspiratory efforts, and in severe cases, no sounds at all indicating complete obstruction, leading to varying degrees of cyanosis and potential loss of consciousness. Immediate treatment involves encouraging the patient to cough and, if visible, retrieving any obstruction with appropriate instruments. For fluid-related obstructions, high-volume suction should be used. Perform back slaps (up to five blows between the scapulae) while the patient is leaning forward,

followed by abdominal thrusts (Heimlich maneuver) performed up to five times from behind the patient. If these measures do not relieve the obstruction, alternate between back blows and abdominal thrusts. Should the patient lose consciousness, lay them on the floor and initiate CPR, starting with chest compressions even if a pulse is present, as this can help dislodge the obstruction. For partial obstructions that cannot be resolved by these methods, arrange for emergency transfer and oxygen supplementation. In cases of complete obstruction where standard measures and laryngoscopy are not available, emergency invasive procedures such as jet insufflation or cricothyroidotomy may be necessary. Jet insufflation involves inserting a wide-bore cannula (12–14 gauge) through the cricothyroid membrane and connecting it to a high-flow oxygen source.[21]

ANAPHYLAXIS

Anaphylaxis is a sudden, severe, and life-threatening allergic reaction that can occur after exposure to an allergen, such as topical anesthetic gels, chlorhexidine mouthwash, or latex gloves in sensitive individuals. Immediate recognition and response are crucial for effective management. Symptoms include a red, hot face, generalized skin rash with itching, breathing difficulties such as stridor, wheezing, or hoarseness, a pulse that may start rapid but become weak or undetectable, and potentially progressing hypotension leading to cardiac arrest. Treatment involves ensuring the airway is clear and administering adrenaline. Position the patient supine unless they prefer to sit due to breathing difficulties, and arrange for emergency transfer to a medical center. While awaiting transfer, provide oxygen supplementation at 15 L/min, continuously assess and support the airway, and administer Chlorpheniramine maleate and Hydrocortisone sodium succinate either IM or IV. Establish IV access and administer Ringer's lactate or 0.9% Normal saline to support circulation, and reassess the need for additional adrenaline. Begin CPR if the patient experiences cardiac arrest.[22,23,24]

ANGINA AND MYOCARDIAL INFARCTION (MI)

Angina is characterized by transient chest pain due to a temporary decrease in oxygen supply to the cardiac muscle, often triggered by factors such as anxiety, stress, exertion, strong emotions, heavy meals, or extreme weather conditions. Symptoms may include chest pain or heaviness, pain radiating to the neck, throat, arms, stomach, or back, and associated symptoms like light-headedness, nausea, shortness of breath, and sweating. Management involves halting the procedure, reassuring the patient, clearing the mouth of any foreign bodies, and allowing the patient to assume a comfortable position. Administer Glyceryl trinitrate sublingual spray or tablets and provide oxygen supplementation. Monitor the pulse for irregularities; simple angina typically resolves quickly with rest and glyceryl trinitrate. If the pulse is irregular, suspect myocardial infarction (MI), especially if chest pain persists despite nitroglycerin or worsens progressively.[25,26]

Myocardial infarction (MI) involves progressive or sudden ischemia of the cardiac muscle leading to necrosis, which can result in cardiac arrest. Symptoms are similar to angina but more severe and prolonged, including central chest pain radiating to the neck, arms, jaw, back, or stomach, accompanied by sweating, vomiting, shortness of breath, lightheadedness, and dizziness. The pain may be associated with a feeling of weakness, an irregular pulse, and worsening chest discomfort despite nitroglycerin. Management includes arranging an emergency transfer to a medical facility, positioning the patient comfortably (often sitting up), and administering soluble Aspirin (300 mg) to chew and swallow. At least two doses of sublingual Glyceryl trinitrate should be given, and while awaiting transfer, establish IV access, administer Metoclopramide hydrochloride (10 mg for adults >60 kg or 5 mg for smaller adults) and analgesia (Paracetamol 1000 mg IV for adults >50 kg or 750 mg IV for smaller adults). Oxygen should only be administered if hypoxic. Watch for deteriorating consciousness and signs of cardiac arrest, and initiate CPR if needed.[27]

CARDIAC ARREST

Cardiac arrest is a sudden loss of heart function that leads to hypoxic damage to vital organs, primarily due to the lack of oxygen reaching the brain. This condition causes the victim to lose consciousness, fall to the ground, and cease normal breathing, with onset often being abrupt and potentially without prior warning. Neurons begin to die within 4-6 minutes without oxygen, and the chances of survival improve significantly with prompt defibrillation (if indicated) and high-quality Cardiopulmonary Resuscitation (CPR) performed quickly and with minimal interruptions. Automated External Defibrillators (AEDs) are increasingly available and can analyze the heart rhythm, guide CPR through voice commands, and advise on shock delivery. In areas without AEDs, CPR should be continued until professional help arrives, which may be delayed, especially in busy regions like India, highlighting the need for hospitals to invest in AEDs.[28]

To recognize cardiac arrest, look for signs such as unconsciousness, unresponsiveness, and absence of normal breathing or gasping. Seizures may occur due to severe cerebral hypoxia. Management includes calling for help, requesting a defibrillator and emergency drug kit, and initiating CPR immediately. Begin CPR with chest compressions, and a second person should prepare to provide ventilations using a bag valve mask. Perform CPR in a 30:2 ratio of chest compressions to ventilations until expert help or an AED arrives. If using an AED, continue CPR while attaching the pads, then pause CPR when the AED analyzes the rhythm. Follow AED instructions for shocks—ensure no one is touching the patient during a shock—and resume CPR at a 30:2 ratio after the shock is delivered. Once the patient shows signs of life, place them in the recovery position, maintain oxygen saturation above 94%, and provide supplemental oxygen if needed. Continuous post-resuscitation care is crucial as the risk of a second cardiac arrest is high. Improving outcomes involves early recognition and call for help, early CPR to provide oxygen to starving cells, timely defibrillation for shockable rhythms, and transferring patients to a cardiac care facility for further treatment.[29,30]

HYPOGLYCEMIA

Hypoglycemia, characterized by dangerously low blood glucose levels, impairs brain function and can cause permanent neurological damage if not addressed promptly. This condition often affects diabetic patients who are insulin-dependent, those who skip meals, and it is a common cause of loss of consciousness in children. Symptoms typically arise when blood glucose drops below 70 mg/dL and include anxious or aggressive behavior, sweating,

nausea, hunger, visual disturbances, convulsions, and loss of consciousness. Management strategies depend on the patient's level of consciousness. For conscious individuals, administering 10-20 grams of glucose is effective. This can be given as 10 grams of granulated sugar or 15 grams of glucose from two teaspoons of Glucon-D powder, with repeat doses possible every 10-15 minutes if needed. After initial treatment, a carbohydrate-rich snack or meal should be provided to stabilize glucose levels. In cases where the patient is unconscious, first ensure that the airway is clear and place the patient in the recovery position. Administer oxygen at 15 L/min and inject Glucagon intramuscularly into the anterolateral thigh. If Glucagon is unavailable, prepare for emergency transfer and administer 100 mL of 10% dextrose intravenously. For severe hypoglycemia, 50 mL of 50% dextrose may be required; note that higher dextrose concentrations are thicker and necessitate a larger bore cannula. Once consciousness is regained, follow up with oral glucose and a carbohydrate-rich meal to prevent recurrence.[31]

TONIC-CLONIC SEIZURES

Grand Mal seizures, also known as tonic-clonic seizures, are characterized by their dramatic presentation and can occur in individuals with epilepsy or other seizure disorders. Before proceeding with dental treatments, it's important to assess patients' seizure frequency and medication adherence, as those with frequent seizures or irregular medication use are at higher risk. Provide treatment in a calm, stress-free environment and avoid seizure-triggering factors.[32] During a Grand Mal seizure, the patient may first experience an aura, characterized by altered behavior and detachment. This is followed by a tonic phase where the body becomes rigid, accompanied by loss of consciousness, balance, and potentially a cry. The subsequent clonic phase involves rhythmic jerking movements lasting up to two minutes, with rigidity of the mouth and frothy saliva. Cyanosis around the mouth may occur due to halted breathing, and urination is possible. Post-seizure, the patient may be confused and fall asleep. In managing a Grand Mal seizure, focus on preventing injury by clearing sharp objects, creating a safe space, and providing cushions or blankets, particularly for the head. Do not restrain the patient or insert objects between their teeth. Administer supplemental oxygen at 15 L/min and have suction available to clear fluids from the oral cavity once the seizure ends. Check blood glucose levels to rule out hypoglycemia, particularly if there is no prior history of epilepsy.[33] After the seizure, offer reassurance and empathy, explain the event, and examine the mouth and body for any injuries or bleeding. Place the patient in a recovery position, provide oxygen if needed, and stay with them until fully recovered. Avoid giving oral substances until the patient is fully conscious to prevent aspiration and do not attempt to awaken a sleeping patient post-seizure. If seizures last longer than 5 minutes or there is recurrent seizure activity without full recovery, this may indicate status epilepticus, a medical emergency that requires urgent care.[34] Arrange for immediate transfer to a medical facility and administer midazolam intravenously if possible. If intravenous access is not feasible, use rectal midazolam, buccal midazolam gel, or nasal midazolam spray, noting that availability may vary. Always consult updated guidelines for the most suitable formulations.[35]

SYNCOPE

Syncope occurs when the brain's glucose and oxygen supply is insufficient, leading to a sudden loss of consciousness and collapse. This often results from a decrease in effective brain perfusion. Symptoms of syncope include feeling unwell, nausea, lightheadedness, blurred vision, pallor, and sweating, especially on the forehead. The patient may suddenly lose consciousness and collapse, with possible seizures if not quickly placed in a horizontal position. To manage syncope, ensure the airway is clear and reassure the patient. Position them flat or with elevated legs, and provide fresh air by opening a window or using a fan. Avoid crowding around the patient and place a cold towel on their forehead. Supplemental oxygen can be administered, though recovery is usually swift if it's a simple fainting episode. Once the patient regains consciousness, encourage them to drink something sugary and check for any injuries sustained from the fall.[36]

OTHER MEDICAL EMERGENCIES

Postural hypotension occurs when a person loses consciousness due to a rapid change in posture from lying down or sitting to standing up, particularly in patients who are on antihypertensive medications or are elderly. To manage this, place the patient in a supine position and gradually bring them to an upright position. Hyperventilation, on the other hand, results from excessive breathing during states of anxiety or prolonged crying, which lowers blood CO2 levels. This condition can cause symptoms such as lightheadedness, dizziness, chest discomfort or pain, muscle spasms (particularly in the hands and feet), and tingling or numbness in the arms and perioral region. To address hyperventilation, manage the breathing or crying through calming techniques and use a paper bag to help the patient rebreath their exhaled air, thus increasing CO2 levels.[37]

Table 1 : EMERGENCY DRUGS FOR ORAL AND MAXILLOFACIAL SURGERY

Resuscitative Equipment:	Essential equipment includes oxygen sources, stethoscopes, respiratory support tools, and devices for IV and intraosseous access.
Core Emergency Drugs:	**Oxygen:** For hypoxemia; delivered via various methods including bag-valve masks. **Nitroglycerin:** For acute chest pain; relaxes vascular smooth muscle in coronary arteries. Aspirin: For suspected myocardial infarction; inhibits platelet aggregation. **Epinephrine 1:1000:** For anaphylaxis; stimulates alpha- and beta-adrenergic receptors. **Albuterol:** For bronchospasm; bronchodilator. **Aromatic Ammonia:** For syncope; respiratory stimulant. **Diphenhydramine:** For allergic reactions; antihistamine. **Glucose (Dextrose 50%):** For hypoglycemia; administered orally or via IV/IM

	if the patient is unconscious.
Vasopressors:	**Ephedrine:** For hypotension with bradycardia; increases vascular resistance and cardiac output. **Phenylephrine:** For hypotension with tachycardia; causes vasoconstriction.
Corticosteroids:	**Dexamethasone:** For severe allergies and edema; provides anti-inflammatory effects. **Hydrocortisone:** For acute adrenal insufficiency**.**
Muscle Relaxants:	**Succinylcholine:** For laryngospasm; depolarizing neuromuscular blocker. **Dantrolene:** For malignant hyperthermia; interferes with calcium release from the sarcoplasmic reticulum. **Sugammadex:** For reversal of neuromuscular blockade from rocuronium.
Anticonvulsants:	**Diazepam, Lorazepam, Midazolam:** Used for seizures; act on the GABA system.
Reversal Agents:	**Naloxone:** For opioid overdose; opioid receptor antagonist. **Flumazenil:** For benzodiazepine overdose; inhibits GABA receptors.
Anticholinergics:	**Atropine:** For bradycardia; blocks vagal stimulation.
Antihypertensives:	**Esmolol:** For short-term management of hypermetabolic states. **Labetalol:** For hypertension; blocks alpha-1 and beta receptors. **Hydralazine**: For hypertension; vasodilator.
Antiarrhythmics:	**Amiodarone:** For ventricular arrhythmias; blocks potassium channels. **Adenosine:** For paroxysmal supraventricular tachycardia; slows AV node conduction.
Diuretics:	**Furosemide (Lasix):** For fluid buildup; loop diuretic.

CONCLUSION

Maxillofacial surgeons must be capable of recognizing and managing emergencies promptly, especially since they often work alone and are the sole responders in urgent situations. It is essential for these surgeons to understand what actions to take and what to avoid to maximize outcomes in adverse scenarios. Thorough knowledge of the pathophysiology of emergencies and the ability to manage them swiftly and efficiently is imperative. Surgeons should regularly update their knowledge and skills through appropriate training courses. The protocols provided are based on current evidence and consider local healthcare systems and access. However, these protocols are suggestive, and clinicians should exercise their own judgment when addressing medical emergencies.

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