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A Foremost Emergency In Dental Private Clinic - Anaphylactic Shock

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Abstract

Anaphylactic shock is one of the solitary medical emergencies occurring in dental clinical practice. It is a type I hypersensitivity reaction which come back with to the exposure of an allergen. Most commonly in dental practice the reaction is caused by impression materials like alginate and anesthetic injections used in dentistry. It affects other than one body systems and manifests with quite a lot of signs and symptoms. The appropriate diagnosis of acute anaphylactic reaction at precise time plays a crucial role in saving life of an individual. As the reaction occurs spontaneously, the clinician should be aware and act promptly for emergency. An instantaneous action plan should be initiated in emergency which includes the fundamental life support measures like CPR to avoid any life threatening consequences .It should be followed by definite pharmacotherapy. The preclusion of the anaphylactic shock starts from the correct history taking of the individual. So every dentist should suppose to be aware about this medical emergency and the importance of history taking. The article describes about the overall idea of anaphylactic shock with its sign ,symptoms and management of this emergency condition.

Keywords: Anaphylactic shock, dental, hypersensitivity, injection, CPR, Medical emergency

Introduction

Medical emergencies are to be expected in the clinical practice of dentistry. These are astonishing complications which happen during or immediately after the dental treatment. The frequently occurring emergencies in dental practice are syncope, airway obstruction, anaphylaxis, local anesthetic toxicity, asthmatic attack and seizure. Following syncope, the majority emergency usually encountered is allergic reactions [1]. It is caused by the use of some drugs like local anesthesia and other materials like latex,acrylic,amalgam.The allergic reactions may be instantaneous or late and manifested as a anaphylactic reactions. The acute reaction of anaphylaxis includes the association of various body systems which every so often manifests as life threatening signs and symptoms which require emergency management.

Anaphylactic shock basically is defined as an acute, potentially life-threatening hypersensitivity reaction, involving the release of mediators from mast cells, basophils and recruited inflammatory cells. Anaphylaxis occur in an human being after re-exposure to an antigen to which that individual has created a specific IgE antibody. The antigen to which

one produces an IgE antibody result that leads to allergic reaction is called an allergen.[2] The IgE antibodies produced may distinguish a variety of epitopes of the allergen. These IgE antibodies then connect to the high affinity IgE receptor on the surface of mast cells and basophils. Upon re-exposure to the sensitized allergen, the allergen might cross-link the mast cell or basophil surface-bound allergen-specific IgE ensuing in cellular degranulation in addition to de novo synthesis of mediators.[3]

Histamine is the main mediator of anaphylactic shock. The signs and symptoms of anaphylaxis like pruritis, rhinorrhea, tachycardia and bronchospasm binds to H1 receptors. Both H1 and H2 receptors contribute in producing headache, flushing, and hypotension[4]. Metabolites of arachadonic acid like prostaglandins (PGD2) and leukotrienes, primarily leukotriene C4 (LTC4), are elevated by mast cells and basophils during anaphylaxis [5,6]. PGD2 mediates bronchospasm and vascular dilatation. LTC4 is transformed into LTD4 and LTE4, mediators of hypotension, bronchospasm, and mucous secretion during anaphylaxis in adding together to acting as chemotactic signals for eosinophils and neutrophils.[5,6]

Relevance of History Taking:

A complete medical history must be taken previous to starting the treatment and it should be regularly recorded and updated for all patients [7].The patient should be asked about the materials which caused the allergic reaction. It helps the clinician to know about the patient's overall response to the allergic condition and also in treating the patient by avoiding the previous circumstances which caused the same. The patients with systemic history which includes asthma and cardiovascular disease are more prone to get affected by the poor outcome of anaphylaxis [8].

The use of angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) can affect a compensatory physiologic comeback of the patient to anaphylaxis, leading to further severe reactions [9]. The patients with more risk of medical problem should be documented and extra care should be taken. If required, the patient should be referred for medical assistance. Proper ,rapid diagnosis and management are required for the acute manifestation like anaphylactic shock.

Signs and Symptoms:

Anaphylaxis is a comprehensive condition which affects the whole body systems which includes cutaneous,respiratory, gastro-intestinal, cardiovascular systems and central nervous system.Gastrointestinal symptoms are commonly associated with food induced hypersensitivity. The signs and symptoms may extend within minutes after the exposure of the allergen [10]. Anaphylaxis may lead to life-threatening complications due to respiratory compromise and cardiovascular collapse[11]. Early symptoms and signs start with a sensation of warmth, itching, and a feeling of anxiety and panic. These may progress into an erythematous or urticarial rash, edema of the face and neck, bronchospasm and laryngeal edema.

System Signs and symptoms:

Sr.No	System	Sign & Symptoms
1	Cutaneous	Urticaria, angioedema, erythema/flush, pruritus, conjunctival erythema, tearing
2	Respiratory	Stridor, wheeze, shortness of breath, dysphonia, dysphagia, persistent cough, hypoxia, upper airway angioedema, rhinorrhea

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3	Cardiovascular	Hypotension, syncope, cardiac arrhythmias, tachycardia, bradycardia, cardiac arrest, pale and floppy
4	Central Nervous	Decreased level of consciousness, unconsciousness, dizziness,confusion, headache, blurred vision, sudden behavioural changes
5	Gastrointestinal	Nausea, vomiting, diarrhoea, crampy, abdominal pain

Diagnosis:

Diagnosis of anaphylaxis is primarily based on the clinical signs and symptoms after the exposure to an allergen. The acute phase may extend within few minutes as it involve the skin and mucosa firstly .The clinical sign and symptoms includes flushing, swollen lips,tongue and uvula leading to respiratory system complications like dyspnea, wheeze, bronchospasm, stridor, hypoxemia, hypotonia, syncope. Hypotension is also seen in infant,children and adults in acute stages[10].

In the routine dental practice, the clinician should discriminate the allergic symptoms and the undesirable reactions of drugs administered by the dentist during the treatment. Considering one case of vasovagal syncope.It is caused by the intravascular injection of local anaesthetic or it might be psychogenic in origin[13].They may be short of the typical cutaneous manifestations and bronchospasm of anaphylaxis[14]. The laboratory investigation of the blood sample shows the increase in plasma histamine level or serum total tryptase level, but these tests are not precise for anaphylaxis[12]. The patients with a history of allergy, the specific diagnostic tests like skin prick, intradermal patch testing and drug provocation test are carried out for confirmation of the test. On the other hand; no direct tests are necessary for the identification of anaphylactic shock.

Emergency Management

The acute signs and symptoms of anaphylaxis must be predicted early and accurately. The fundamental preparation should be on track as in any further medical emergency with a consideration of position, airway, breathing, circulation and level of consciousness. It should be followed by cutaneous examination[15].It should be managed as a group work which includes the practitioner and the staff. In the case of assumed anaphylaxis, all the dental procedures should be closed as in other emergencies. The allergen which caused the emergency should be recognized and removed instantaneously.

Position:

The patient is placed in such a way that it can maintains the airway, breathing and circulation. If the patient is conscious, the patient is told to sit in a comfortable position. If the patient is unconscious, supine position with the legs raised slightly to about 10˚ to 15˚. This helps to increase the blood flow to the brain [16]. When there is pregnant patient, a left lateral position is chosen to stay away from the compression on inferior venacava[17].

Airway:

The clinician should try to retain the patent airway of the patient by removing all intra oral instruments or materials like cotton rolls so that it will eliminate the blockage of the airway. Then adjust the patient's position. The clinician should look at the throat to identify any airway compression from laryngeal edema. Managing the airway becomes critical if thepatient is unconscious. In unconscious patients, tilt the patient's head by stimulating the chin up.This helps to get rid of the obstruction by moving the tongue away from the back of the pharynx and improves oxygenation. If the airway is not apparent, a jaw thrust manoeuvre is performed by placing his or her thumbs posterior to the angle of the patient's mandible and advancing them (and the mandible) anteriorly [16].

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Breathing:

As soon as the airway is maintained, the clinician should think the next step, breathing. It is not at all a trouble if the patient is conscious. In allergic conditions like asthma, assessement for any wheezing and respiratory rate should be monitored. During anaphylactic attack, respiratory rate is decreased which may result in inadequate oxygenation and hypoventilation. A pulse oximeter should be made available in the clinic and is used to assess the oxyhemoglobin saturation. The colour of the mucosa, skin should also be checked to rule out signs of cyanosis. If the patient is unconscious, Basic Life Support (BLS) should be initiated to achieve normal breathing rate. A pocket mask should be available and used to administer the rescue breath at a rate of 10 – 12 per minute for adult[18].

Circulation:

The dental team should assess the patient's circulation instantaneously after the breathing step. If the patient is conscious, a group member should check the pulse by palpating the radial/brachial/carotid artery. In an unconscious patient, the carotid is the best artery for checking the pulse. Health care professionals are should be capable to detect a pulse. If no pulse

can be palpated after 10 seconds, it indicates the chances of cardiac arrest that the patient Experiencing and care should be taken to start chest compressions at a rate of 100 per minute, constant with current BLS measures including artificial breathing.

The compression to ventilation ratio for adults is 30:2[18].The blood pressure of the patient should be monitored in regular intervals by using ascultatory method. The colour of the mucosa and skin also gives the suggestion of adequate circulation with pink and red indicating adequate and pale or blue indicating insufficient circulation.Skin reactions should be examined and managed instantaneously after the management of the life threatening symptoms. If the patient is not on the road to recovery after all the basic life support measures, call for an ambulance to transfer the patient to a hospital for better management of the complications.

Pharmacotherapy

Before transferring the patient to the hospital, the pharmacotherapy should be started for the allergic reactions directly after the management of emergency to lessen the severity of the symptoms. They include both emergency and supportive therapy. The emergency pharmacotherapeutics drugs includes epinephrine, supplemental oxygen and IV fluids. The supportive therapy like the usage of bronchdialators, antihistamines and corticosteroids.

Epinephrine/Adrenaline:

Epinephrine is the drug of choice for anaphylaxis and should be given immediately to any patient with a uspected anaphylactic episode. Treatment should be provided even if the diagnosis is uncertain since there are no contraindications to the use of epinephrine.[19] The administration of adrenaline is the most important treatment in anaphylaxis and should be given by the dentist without hesitation.[15] Adrenaline functionally antagonises all of the important pathomechanisms of anaphylaxis by vasoconstriction, reduction of vascular permeability, bronchodilatation, edema reduction and positive inotropy in the heart. When administered intravenously, it shows the fastest onset of action of all anaphylaxis drugs. Usually adrenaline is injected intramuscularly into the anterolateral aspect of middle third of the thigh as it helps in rapid absorption and higher plasma epinephrine levels compared to subcutaneous administration.[9] The dosage is given in Auto injectors are easier to administer drug into the body. They are commonly used in children. E.g.:- Epipen.IM adrenaline (epinephrine) should be repeated after 5 min if there is no clinical improvement. Instead of giving repeated IM doses, IV adrenaline (epinephrine) may be beneficial to the patient. But this should be done by an expert such as anesthetists, intensivists and emergency department physician[20].

Age Dosage Of Adrenaline in Anaphylaxis

Sr. No	Age	Dosage
1	Adult	0.5 mg IM (500μg = 0.5 ml of 1:1000)

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	.	
2	>12 years	0.5mg IM (500µg = 0.5 ml)
3	6-12 years	300 µg IM (0.3 ml)
4	<6 years	150 µg IM (0.15 ml

Supplemental Oxygen:

It should then be delivered if required. It is administered via a one-way valve face mask with oxygen running at a rate of at least 6–8 l/min and can be titrated according to pulse oximetry [12].

Intravenous Fluid Challenge:

In some cases if fluid is to inserted it can be inserted by inserting one or more large-bore IV cannulae. Give a speedy fluid in Adults - 500 ml of warmed crystalloid solution in 5-10 min if the patient is normal or 1000 ml if the patient is hypotensive. In children we have to give 20 ml/kg of warmed crystalloid.

Bronchodilators:

If the patient is having any respiratory difficulties, it should be managed with the use of bronchodilators like salbutamol (inhaled or IV), inhalers as Asthalin, Salbair etc. and inj. alsol. Ipratropium (inhaled) – commercially accessible in trade names such as Ipranase AQ, Ipratop and aminophylline (0.25-0.5 g IV) as inj. Aminophylline.

Antihistamines:

They act by blocking or dropping histamine liberate and by acting as competitive inhibitors of histamine at various target-organ sites [21]. They include chlorphenaramine and diphenhydramine. Chlorpheniramine: (after initial resuscitation).It is accessible in the trade names as Chloram,Chlorpheniramine maleate)

Diphenhydramine : 50 mg or 1 mg/kg IV slowly repeated if necessary

For example:- Benadryl

Chlorpheniramine dosage –

Sr.No	**Age**	**Dosage**
1	12 years and adults	10 mg IM or IV slowly.
2	6-12 years	5 mg IM or IV slowly.
3	6 months to 6 years	2.5 mg IM or IV slowly.
4	<6 months	250 µg/kg IM or IV slowly

Corticosteroids:

They are powerful anti-inflammatory and immunomodulator agents which can be used to treat the inflammatory conditions of allergic reactions[22].The most commonly used hydrocortisone which is existing in the brand names like Cort-S, Efcorlin inj.

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Hydrocortisone Dosage

Sr.No	Age	Dosage
1	>12 years and adults	200 mg IM or IV slowly
2	>6-12 years	100 mg IM or IV slowly
3	>6 months to 6 years	50 mg IM or IV slowly
4	<6 months	25 mg IM or IV slowly

Prevention:

The preventive measures initiate by recording a appropriate record concerning the preceding exposure to any allergen through the dental treatment. So further concerned must be taken to evade the additional exposure of the known allergen. If the individual with allergic reaction is unknown, the individual should be concerned for allergy test and the test can be carried out to the identify the possible triggers factors.

Conclusion:

Dentists should be aware of this medical condition as it may reason of life frightening complications. They should build up the skill to distinguish and administer the emergency situations like anaphylactic shock,syncope. Instantaneous management should be started by clearing the airway and avoid any likely contact with the allergen, IM adrenaline, oxygenation and supine positioning. They should mandatory know the necessitate to undergo the basic life support training previous to starting the practice. The emergency drugs like epinephrine, oxygen should be readily available in a clinic and the practitioner should be able to administer the drug in an emergency. The proper diagnosis and early medical reference is advised in critical situations and a follow up should be maintained for such individual. The management of a crisis in a right time, in a right way is forever appreciated in saving a life.

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