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THE PANIC ROOM: DEALING WITH EMERGENCIES IN DENTAL CLINICS

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Abstract

Objectives: The purpose of this review is as follows:

1. To identify and study some of the most frequent medical emergencies that occur within dental clinics
2. To explore the manners in which each medical emergency can be prevented
3. To explain the management protocol, if they do occur.

Methods

Books and articles in relation to medical emergencies in dental clinics were largely found through the CRAI library of University Europea de Madrid, while PubMed and the NCBI database were also used utilised. The articles were selected based on their relevance as well as the year of publication.

Conclusions

The occurrence of medical emergencies can generally be minimised using a thorough medical history, and physical examination. In the event of an emergency, dental treatment should immediately be terminated, the most suitable position for the patient must be established, followed by verification of the patient's circulation, breathing and airways, as per the basic life support protocol. Definitive care should then be initiated.

Keywords

Medical emergencies, dental clinic, emergency drugs, basic life support, emergency medical services syncope, medical history and physical examination

Resumen

Objetivos: El propósito de esta revisión es el siguiente:

1. Identificar y estudiar algunas de las emergencias médicas más frecuentes que ocurren dentro de las clínicas dentales.

2. Investigar sobre las formas en las que se puede prevenir cada emergencia médica.

3. Explicar el protocolo de gestión, en caso de que se produzcan.

Métodos

Los libros y artículos relacionados con las urgencias médicas en las clínicas dentales se encontraron en gran parte a través de la biblioteca CRAI de la Universidad Europea de Madrid, además de la que también se utilizaron PubMed y la base de datos NCBI. Los artículos fueron seleccionados en función de su relevancia y el año de publicación.

Conclusiones

La aparición de emergencias médicas generalmente se pueden minimizar mediante la realización de un historial médico completo y un examen físico. En caso de emergencia, se debe suspender inmediatamente el tratamiento odontológico, establecer la posición más adecuada para el paciente, seguida de la confirmación del mantenimiento del pulso, la respiración y permeabilidad de las vías respiratorias del paciente, según el protocolo básico de soporte vital. Luego se debe iniciar el cuidado definitivo.

Palabras clave

Emergencias médicas, clínica dental, medicamentos de emergencia, soporte vital básico, síncope de servicios médicos de emergencia, historial médico y examen físico

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1. Introduction

Medical emergencies in the profession of dentistry are inevitable. [1][2] However, despite their infrequent nature, on the rare occasion that they occur, they can pose a serious threat to life and in some unfortunate cases, may even lead to an untimely death.[3] Nevertheless, fatality is a rare occurrence. Data suggests that only 8% of medical emergencies are perceived to be life-threatening. However, irrespective of the nature of the emergency, utmost care and precaution should be exercised to safeguard the wellbeing of the patient, so as not to further exacerbate a seemingly minor or entirely avoidable incident. [4][1]

Despite medical emergencies being relatively uncommon within the dental clinic, there are a plethora of factors that may heighten the occurrence of such events, namely the growing number of geriatric patients that are attending dental clinics. This can be attributed to the gradual increase in the life expectancy of the global population over recent years. [1] [5] Longer life expectancies, especially amongst developed countries, is largely due to significant medical advances. For instance, the greater availability of, and accessibility to existing therapeutic and preventative interventions, coupled with the introduction of newer and more effective drugs and treatment options. [1] Consequently, dentists are treating numerous elderly patients, many of whom have active and chronic medical conditions. Thereby, it can be acknowledged that a contributing factor to the increased prevalence of medical emergencies over time is the number of geriatric patients with pre-existing medical conditions who are more susceptible to medical emergencies.[1] [5] This is made evident in a report stating that close to 35% of patients who had previously suffered a medical emergency, also had a prior history of systemic diseases - the most widespread disease amongst patients being cardiovascular

related. [6]

Increased age is also associated with a higher use of medication, many of which can have complex and adverse effects, especially when taken in conjunction with numerous other drugs. Therefore, the dental practitioner is obligated to pre-empt any potential drug interactions to avoid any fatal outcomes. Similarly, factors such as longer appointments and extended waiting times may induce considerable fear, anxiety and stress, especially amongst medically compromised patients.[1][2][7] With dental anxiety already present amongst one in six adults in the western countries, it is imperative that at risk patients are identified at the earliest convenience in order to take the suitable measures, such as reduced appointment times or in more severe cases, through the use of pharmacological agents.[8][9]

Fortunately, there are certain preventative measures that the dentist and the wider dental team as a whole can employ to help limit the occurrence of fatal incidents. Nevertheless, it is important to recognise that they are not completely avoidable, as even after having exercised the most stringent and rigorous precautionary steps, 10% of medical emergencies can still be expected to occur. [1]

To a certain extent, the vast majority of medical emergencies can be limited by conducting a complete and thorough medical history check, followed by a physical examination.[1] A detailed anamnesis provides the dental practitioner with a more accurate and comprehensive overview of the patient at hand. It also alerts them to any medical conditions, as well as potential risks or predisposing factors before commencing with the treatment. [10] Anamneses

are also essential in order to establish the correct diagnosis and treatment plan.[11] In the event that the dentist cannot formulate an adequate medical history, the risk of an improper diagnosis and treatment may be intensified and subsequently, lead to an completely avoidable emergency situation.[12]

The medical history should include but it is not restricted to: the chief complaint, past and present medical conditions as well as personal, social and familial history.[10] Whilst the majority of dentists rely on medical health questionnaires that are completed prior to the appointment to collect patient data, it is important to review and verify all of the information first hand with the patient when they enters the dental clinic.[11] This verbal confirmation is especially important when the patient presents a positive response to any section of the anamnesis.[1] This allows for more specific and more detailed questioning in regards to that particular response and thereby permits more individualized and personalised care.

Similarly, when a patient steps foot inside the dental office, the dentist should immediately perform basic visual assessment of the patient. Closely analysing the patient's body language and manner of communication, whilst also making a note of any present skin abnormalities, can provide an indication of the existence of any pre-existing medical conditions.[1] For instance, if the moderately reclined dental chair position, conventional at most dental offices, provokes orthopnoea, it can be indicative of long term respiratory disease or even possibly heart failure.[13][14][1] Likewise, if a patient presents skin pallor, the dentist can assume one of two conditions; the skin condition can either be pathologically induced, as is illustrated in cases of anaemia, or it can be attributed physiologically to patient distress and anxiety. [1]

More critically, patients showing signs of cyanosis can indicate a possible history of heart failure, long term respiratory disease, methemoglobinemia or polycythaemia. Such information regarding the patient is pertinent, especially as methemoglobinemia and polycythaemia are challenging to diagnose and quite often go underdiagnosed [15][16][1] These are just a few of the myriad examples of how visual inspection at the first encounter can aid the medical history and henceforth contribute to limiting the occurrence of medical emergencies.

Aside from visual inspection, another valuable sensory modality would be the clinician's sense of smell. In cases where the practitioner can recognise a patient's fruity scented breath, for example when further questioning the patient during the verbal interview, it would be suggestive of diabetic ketoacidosis.[17][18][1] In the same manner, patients with chronic kidney diseases diagnosed as uremic, may give off a distinctive ammonia like odour.[1] All in all, it is imperative for the dentist to realise that olfaction can serve as another valuable diagnostic tool while conducting the medical history.

A familial medical history can also provide critical information regarding a patients predisposition for a particular disease.[19] Asthma, type 2 diabetes and cardiovascular diseases are just three examples of common medical conditions that are genetically predisposed. Acclimatising oneself with patients through the use of familial history is an alternate, but equally important approach in preventing medical emergencies in the dental clinic. In cases where the dental practitioner suspects a patient to be of high risk, due to a multi-generational family history of a disease, they can refer the patient to a specialist for testing as well genetic

screening. This is especially true for cancer related cases. Detecting any possible deformities at the earliest and most practical stage is critical due to the odds to a more favourable prognosis.[19] However, it is critical to note that hereditary factors alone do not determine the likelihood of developing a disease; social factors such as living conditions and education can also influence the probability of a patient's predilection for a particular disease. For this reason, the dentist may suggest lifestyle modifications such as physical activity and healthier dietary choices to help minimise the risk of disease.[10][19] Regardless of the case at hand, the dentist should remain alert and vigilant to identify potentially predisposed patients through the use of family history in order to prevent any unforeseen circumstances.

The patient's medical history can also serve as a form of legal documentation in the regrettable event of a medical emergency, or in allegations of negligence, and/or malpractice. For this reason, regularly updating and accurately completing the medical history of each and every patient is of paramount importance.[20] In cases where many years have passed since the patient's most recent dental appointment, or alternatively when the patient has experienced substantial changes in their general health or medication it is advisable to perform a completely new anamnesis to gauge and accurate and up-to-date medical background[1] This is especially important in this day and age due to the ever-growing population who tend to present multiple, chronic and inter-related pathologies [3]

While the use of a medical history is mandatory in preventing medical emergencies from occurring in the dental clinic, they can and do present some limitations. For instance, a dentist may experience cases where the patient is completely unaware of an underlying pathology.

This could be explained by the lack of any current significant signs and symptoms, as some medical conditions do exist in subclinical states; diabetes and hypothyroidism are two examples that are testimony to this.[21][22] However, it should be noted that it can also be due to a deliberate and conscious desire of the patient to conceal or withhold small but vital pieces of his or her medical history from the dentist. [1] Without conducting any physical tests, it is completely conceivable that the dentist inadvertently overlooks a medical disorder, and therefore the medical condition continues to remain un-diagnosed.

For this reason, physical examinations through careful monitoring of a patient's vital signs is indicated. The vital signs are unbiased, impartial and objective tests that typically consist of measuring blood pressure, pulse, respiratory rate and temperature.[23] While it is completely plausible that they are not conducted on each and every patient entering the dental clinic due to the imposed time-constraints, at the very least, physical tests should be performed on patients deemed to be high risk, namely geriatric, comorbid patients. [1] This in turn reduces the possibility of these patients suffering complications, or a medical emergency in the dental clinic. They may also be indicated on the basis of the dental treatment to be executed, for example, in cases before delivering local anaesthesia. [24]

Traditionally, mercury, aneroid or digital sphygmomanometers are generally used to monitor blood pressure in the dental clinic. In order to obtain an accurate reading of a patient's blood pressure, the protocol dictates that the patient should be seated upright, with their arm stable and positioned at heart level. This is typically achieved by resting the patients arm flat on a table. Similarly, the patients back and legs should be supported. Two to three recordings

should be taken during the visit to ensure reliability and accurate readings. Additionally, in order to maintain consistent and standardised results between different patients, they should be advised not smoke or consume any caffeinated drinks one hour before. They should also be instructed to empty their bladder as this can also modify recordings. [25][26]

According to 1998 Glick classification, values less than 120 and 80mmHg for systolic and diastolic blood pressure would be considered optimal.[24] However, they can vary significantly depending on age, gender, ethnicity and other lifestyle factors.[24][25]

Ideally, the patients' blood pressure should be well controlled at levels below 140/90 mmHg regardless of the dental treatment to be performed and particularly in patients who are perceived to be more susceptible to emergencies such as those with diabetes or kidney disease.[24] Routine monitoring of blood pressure, especially in high risk patients provides a brief synopsis of the their cardiovascular state, and can avoid the occurrence of complications such as a heart attack or a hypertensive crisis. [1][24]

Aside from the blood pressure, another vital sign used to assess patients is the pulse rate. Pulse rates are an indirect measure of heart rate, and is most commonly assessed using the radial artery on the lateral aspect of the forearm, close to the wrist joint. [1][26] Although several other sites to measure the pulse do exist, such as the branchial and femoral artery. However the radial artery appears the most convenient and reliable. Despite this, in the case of a medical emergency, it would be recommended to use the carotid artery since it supplies blood to the head and brain regions.[1]

Three different parameters should be evaluated based on the pulse reading: heart rate, heart rhythm and the characteristics of the pulse.[1][26] In general, the heart rate should be measured for at least 30 seconds typically ranging in between 60-110 beats per minute. Healthier individuals normally display bradycardia with values less than 60 beats per minute, while compromised patients exhibit tachycardia, presenting values of more than 110 beats per minute. Although the heart rate for different individuals may vary depending on factors including, but not limited to, age and pathological conditions, patients with a heart rate outside of the above ranges, with no apparent cause, should be referred for further analysis.[1][26] Similarly, sinus rhythm, also known as the normal heart rhythm corresponds to the contractions of the heart. Irregularities in the heart rhythm can be indicative of serious atrial or ventricular dysrhythmias, such as atrial or ventricular fibrillation. However, accurate diagnosis of the heart rhythm using heart pulse is extremely challenging and non-viable. Instead it would require the use of an electrocardiogram (ECG) which would in turn provide more in-depth and detailed analysis.[1]

The respiratory rate and body temperature represent the remaining two vital signs. While they are less informative than pulse and blood pressure, they can be equally significant. Breathing rate typically ranges from 12-20 breathes per minute. When a patient's breathing rate exceeds this range, it can suggest pathological conditions such as asthma, pneumonia and pulmonary embolism. In contrast, respiratory failure and cardiopulmonary arrests are common situations where a dentist can expect bradypnea i.e. less than 12 breathes per minute.[26] Similarly, body temperature is usually measured orally and ranges from 36.1^{oC} to 37.5^{oC}. Therefore, temperatures above 38.3^{oC} can indicate an active disease or pathology.[1]

All things considered, it is indispensable that baseline measures of vital signs are taken in high risk patients. Primarily, it allows for comparisons to be made between the recordings during and prior to a medical emergency.[1]

2. Objectives

i. To identify and study some of the most frequent medical emergencies that occur within dental clinics

ii. To explore the manners in which each medical emergency can be prevented

iii. To explain the management protocol, if they do occur.

3. Methodology

Several books and research databases were consulted in the writing of this topic. As of yet, a total of 65 sources have been consulted. The majority of the articles were largely found through the CRAI library of University Europea de Madrid, while the PubMed and NCBI database was also used utilised. The articles were selected based on their relevance as well as the year of publication. For this particular topic, all selected articles had been published in the last 20 years i.e. since 2000. This was to ensure all the information was relevant, recent and upto date. Given that emergencies protocol have changed and been updated over time, emphasis was placed on finding the most up to date sources. The search for these articles was aided through the use of keywords related to the topic at hand. This included terms such as “Medical Emergency”, “Dental Clinic”, “Syncope”, “Medical History” and “Physical Examination”.

4. Discussion

Whilst the nature of each medical emergency is unique, general guidelines and protocols have been established to effectively manage the large majority of emergency situations.

When dealing with medical emergencies, the primary aims are to manage the situation so as to prevent any fatalities or a deterioration of the patient's state, either until the patient recovers or until the emergency services arrive at the dental office. [27][28][29] This is typically achieved through implementing certain elements of basic life support (BLS), also known as cardiopulmonary resuscitation (CPR). [1][29] According to BLS, effective management of an emergency is based on 4 fundamental principles, known as the P-C-A-B.[30][1] This approach involves implementing a proper patient position (P), followed by assessing the patient's circulation (C), breathing (B) and finally airways (A). If managed correctly, the dentist can then explore a definitive treatment or diagnosis (D) for the patient.[29]

The recommended sequence of CPR, P-C-A-B, has been the subject of international review and change.[30] In the years preceding 2010, the recommended sequence for CPR was described to P-A-B-C. However, as of 2010, both European and American guidelines, altered the internationally recommendations from the conventional P-A-B-C to the newer P-C-A-B.[31][30] Otherwise stated, the inspection of patient circulation or the initiation of chest compressions should be performed prior to assessing the patients airways and breathing. The change has been introduced to eliminate the delay in establishing a correct breathing pattern, as it proved to be costly and time consuming.[32] However, currently the priority is to initiate blood flow to the heart and brain, especially in cases of non-asphyxial cardiac arrest as it is considered more significant to patient survival. [32][31]

In regard to patient position during an emergency situation, the patient is typically placed in the supine or horizontal position, parallel to the floor with their legs slightly elevated at an angle of 10^0-15^0, a position that is naturally achieved in the dental chair. Elevation of the legs aims to encourage the return of blood flow from the legs back to the heart, whilst also increasing the flow of blood and oxygen to the brain. The latter being especially important in the event of unconsciousness.[1][29] [28]

Once a correct position has been established, the dentist can proceed to check the patient's circulation, through determination the patient's heart rate and blood pressure. In situations where the patient is deemed unconscious or unresponsive, the heart rate is best determined through the carotid artery, located at the junction between the sternocleidomastoid muscle and the thyroid cartilage. [1][29]. Other alternative sites to identify a pulse include the femoral artery, localised in the groin region, while the radial and brachial artery in the arm can be palpated in conscious patients. [1][29] If the rescuer is unable to detect a pulse within ten seconds, the patient is assumed to be suffering a cardiac arrest and chest compressions must be initiated immediately.[33] The purpose being to physically induce blood flow to the cerebral and myocardial tissues. The greater the oxygen perfusion of these tissues, the greater the chances of success will be. [34][1][33]. Likewise, the success of chest compressions is dependent on an adequate technique.[33] Hence, it is imperative that dental practitioners are familiar with the correct method and approach.

With the patient already in the previously established horizontal supine position, the rescuer should be positioned at the side of the patient. In order to maximise compressive forces, a

firm stable surface is recommended. [1][33][34] Using both hands with the fingers interlocked, the heel of the rescuers dominant hand should be positioned in the centre of the victims chest, corresponding to the lower half of the sternum. Ensuring the deliverers arms are straight, with locked elbows, and the shoulders located perpendicular to the sternum, hard and rapid compressions should be given. [1][33][34][35]

According to professional guidelines released by the American Heart Associated in 2020, compressions are optimal when prescribed at a rate of 100 per minute, with pressure sufficient to squeeze the patient's chest to a depth of 50mm.[35][30] Allowing the patient's chest to fully recoil after each compression should be duly noted to enable a greater venous return of blood flow back to the heart, since studies have demonstrated its effectiveness in enhancing the overall success of CPR. [1][34][33] The guidelines also highlight the need of swift action in these critical but delicate situations, with the chances of patient survival or a good prognosis being drastically reduced with each passing moment, estimated at approximately between 7%-10% for each minute lapsed.[27]

Naturally one can expect the protocol for CPR to differ moderately between a layperson and qualified and adept healthcare individuals working in a dental office.[31] Henceforth, in the event of a cardiopulmonary arrest (CPA) occurring in the dental office, the rescuer is required to administer rescue breathes in addition to chest compressions in a compression-ventilation ratio of 30:2.[31][30][34][1][36] This was in contrast to earlier guidelines released in 2005, which recommended a ratio of 15:2. This can be explained due to newer research suggesting minimal interruptions during chest compressions allow for greater blood flow to critical

organs such as the heart and brain.[30][35] Additionally within a dental clinic, where access to barrier devices is usually available, healthcare providers have the option to utilise them where possible to reduce risk of transmission, on the condition that it doesn't delay proceedings.[34][31]

Unsurprisingly, a dentist can expect an emergency situation whilst the patient is in the dental chair. An important consideration is whether CPR can be adequately performed whilst the patient is reclined in the dental chair, or whether it would be necessary to first lower the patient to the floor in order to provide a more efficient transfer of forces and maximise the success of chest compressions.[37][1][38] However, recently conducted studies have indicated that there is no statistical difference between the mean chest compression depth achieved by the rescuer in patients treated on the floor and on the dental chair.([37] Moreover, there is evidence to suggest that transferring the patient to the floor could possibly impede the chances of a successful CPR. Firstly due to the time squandered and secondly due to the fact that many dental clinics have restricted space, and do not permit for optimal positioning of both the patient, and the rescuer. [1][37]

The following step in the four stage P-ABC procedure involves evaluating the patient's airways. Generally, in the case that the patient is no longer conscious, some level of airway obstruction can be expected, and re-establishing patent airways will always be a priority for the dentist. This is predominantly achieved using the 'head tilt-chin lift' procedure.[1][29][28] To perform the head tilt maneuverer, the dentist should incline the patients head backwards through the application of firm pressure on the patients forehead. Similarly the chin lift is

conducted by pulling on the mandible using two fingers. If patency is not achieved, despite attempts to carry out the 'head tilt-chin lift' maneuverer, a more invasive approach, known as the 'jaw thrust' technique can be employed. This involves pushing the posterior border of the mandible forward, again using 2 fingers, whilst the thumbs retract the chin and lips. [1][29][28][31]

Once the airways are deemed patent, assessment of the patient's breathing should be made.[29][1] If the patients breathing patterns are not clear and apparent, with no visible movements of the chest or no obvious passage of air through the nose and mouth, the patient can be said to be in a state of respiratory arrest.[31][1] In this case, rescue breathing should be initiated, to provide oxygen and ventilation to the patient. Rescue breathing can be provided through one of two methods. Traditionally, the mouth-to-mouth technique was more frequent and involved the rescuer pinching the patients nose and creating an airtight seal with rescuers mouth over the patients. One breath per second should be given, repeated every 5 seconds whilst looking out for visible elevations of the patient's chest. More recently however, the use of barrier devices such as the bag-valve-mask (BVM) have become more common as some health care professionals have been reluctant to give mouth-to-mouth ventilation due to fears of disease transmission.[1][31]

4.1 Syncope

Undoubtedly, the most frequently encountered medical emergency within a dental clinical setting is Syncope. [1][39][40][3]. In one particular study, conducted over a 12 month period, on average each dentist had experienced approximately 2 syncope related cases per year.[3] Syncope can be defined as a sudden and temporal loss of consciousness with simultaneous loss of muscle tone, and is typically associated with spontaneous recovery.[3][40] It can be attributed to insufficient blood supply to the cerebral cortex and cerebral reticular activating system.[41][40] Thus, an individual promptly regains consciousness once sufficient blood flow to the brain has been re-established.[1]

Syncope can be differentiated into 5 distinct categories: Neurocardiogenic, Orthostatic, Neurologic, Cardiac and Syncope of unknown causes.[41][42] However, within a dental clinic, a practitioner is most likely to encounter one of two types: either Neurocardiogenic or Orthostatic Syncope, with the former, alternatively known as Vasovagal Syncope, being the most frequent form.[43][39][41]

As mentioned, vasovagal syncope essentially occurs due to a reduction in cerebral blood flow, following a substantial fall in systemic blood pressure. It occurs typically in response to either bradycardia or widespread vasodilation.[39] The factors that can trigger an episode of vasovagal syncope can be all be categorised into 2 main groups.[1] The first set of predisposing factors are psychologically related and include periods of emotional stress, anxiety, pain and fear. This might help to explain the high incidence rates within dental clinics, especially before the administration of a local anaesthetic other distressing treatments. In contrast, the second

category of factors are concerned with lengthy periods of standing upright, due to the accumulation of blood in the lower portions of the body. Similarly, depleted cerebral blood glucose levels as a consequence of extended fasting periods or fatigue in general can provoke fainting, and fall into this second category.

The clinical symptoms of vasovagal syncope can be divided into three distinct phases: Presyncope, Syncope, Postsyncope.[1][42][44] Presyncope can be characterised by light-headedness, pale coloured skin normally accompanied with a cold sweat, coldness in the hands and feet but a sensation of warmth in the head and neck. Enlarged pupils, increased heart rate and visual interferences may also be experienced[1][42]. The period of syncope implies the loss of consciousness, and is generally seen with the loss of muscle tone and bradycardia, typically with a heart rate below 50 beats per minute.[1] Twitching of the hands and legs can be expected, as well as impediment of the oropharynx by the tongue may result in airway obstruction.[42][1]

The pathophysiology behind vasovagal syncope can be attributed to bouts of pain or stress invoke the release of certain catecholamines , namely epinephrine and norepinephrine into the blood stream. The release of these hormones triggers a series of physiological changes at a systemic level, collectively known as the “fight or flight” response. Amongst these changes include vasodilation of arteries supplying skeletal muscle tissues in order for the body to combat the stress or pain. However, when anxious patient is seated in the dental chair, with very little or no subsequent increase in muscle load, despite the increase in perfusion, it can create an accumulation of blood at the level of the muscles. This can have secondary effects

for instance, a lower venous return of blood, with a subsequent relative decrease in blood volume, blood pressure, cardiac output and ultimately cerebral blood flow.[45][1]

Prevention of vasovagal syncope relies on controlling or eliminating its causative factors. Given that in the dental clinic, the large majority of syncope episodes are stress induced, prevention would be overwhelmingly be based on managing patient anxiety and fears, prior to the consultation.[1] As mentioned previously, this can be achieved through establishing good rapport and trust between the patient and the dentist, appropriate use of non-verbal communication as well as addressing any concerns they may have.[8][9] Similarly, the patient should be advised to have a pre-appointment meal or snack to prevent a drop in blood glucose levels. The use of a written anxiety questionnaire prior to the appointment as opposed to direct verbal questioning in the dental office has demonstrated to be more effective in identifying apprehensive individuals.[1] Likewise the dentist should explore the possibility of any treatment modifications such as shorter waiting and appointment times and in more extreme cases, the possibility of sedation or general anaesthesia should be considered.[8][1]

If the patient is suffering from symptoms corresponding to the presyncope stage, during or prior to a dental appointment, the dentist should establish the supine position. Equally, the dentist can encourage the patient to perform robust movements with his feet to provoke muscular contraction and thus prevent the accumulation of blood in the lower half of the body.[1]

Management of syncope is based on addressing the fundamental etiology: insufficient cerebral perfusion. Therefore, once it has been established that the patient has lost consciousness and is experiencing a syncopal episode, it is crucial that they are immediately placed in the supine position.[42][1][3][39] Ideally, the legs should also be elevated slightly at an angle of 10^0-15^0. One exception to this rule would be pregnant women, approaching parturition. Studies have indicated these supine position can actually impede blood flow to the brain. Instead, the patient should be rolled on to her right hand side with back support in order to maintain that position, to encourage the venous return of blood. Delay in initiating the supine position can result in lasting brain damage.[1] The subsequent stages involves monitoring the patients airway patency and pulse as per the basic life support protocol. If absent, CPR should be performed.[42][1] However, if deemed adequate, the dentist can proceed to prescribe oxygen in order to facilitate recovery, whilst simultaneously monitoring the patients vital signs.[3][42]

Typically, the dentist can expect complete spontaneous recovery within 15 minutes. Upon regaining consciousness, the patient should be raised cautiously to their feet and ideally be given fruit juice or glucose water, to aid in recovery. No further dental treatments should be performed on the patient due to the risk of a relapse. If within 15 minutes after the onset of vasovagal syncope, the patient is still not thought to have recovered completely, the emergency medical services must immediately be alerted, and the dentist should explore the possibility of another unexpected etiology, for example seizures or strokes.[42][1][39]

4.2 Seizures

Seizures are a further class of medical emergencies that can transpire within a dental clinic. A seizure or a convulsion can be defined as a sudden, simultaneous and disproportionate release of electrical energy within the brain which can have implications at a motor, sensory and a behavioural level. Typically, twitching like movements or convulsions can be seen. [46][47][48][1][39] However, a distinct differentiation should be made between seizures and epilepsy as the terms are not synonymous. Epilepsy is the pathological condition involving chronic, recurrent or continuous seizures and can occasionally affect the state of consciousness of an individual. Hence, an individual or isolated seizure cannot be considered as epilepsy.[1][48]

Data suggests that close to 1% of the world's population have been diagnosed with epilepsy and the third most commonly encountered medical situation within the dental clinic.[39][47][3] Epilepsy typically presents higher level of incidence amongst children under one years of age, adults over 75 as well as in individuals with disability such as autism, cerebral palsy and mental retardation.[1][39][47] In the latter, epilepsy prevalence levels can rise upto 50%.
Studies have also implied that epilepsy presenting in younger individuals is hereditary at birth, whilst amongst elderly patients is thought to be acquired or pathological.[47]

Epilepsy can be classified according to their etiology and the seizure type. When the causative factor is considered unknown, the condition is known as primary epilepsy. It currently accounts for 70% of all epileptic cases. In contrast, in situations where there is a clear etiology, the condition is referred to as secondary epilepsy. Common causes for secondary epilepsy

include cerebrovascular diseases, brain tumours, and metabolic disorders such as hyper and hypoglycaemia.[39][47]

According to the 2017 International League Against Epilepsy (ILAE) classification, when grouping epilepsies based on the nature of seizure, there exists 3 types: focal, generalised and unknown onset seizures. Focal seizures, originate and are restricted to a specific localised are of the brain.. It may or may not be associated with a diminished sense of awareness, or convulsive movements. However, when the seizure simultaneous begins on, or expands from a focus to both sides of the brain, it is referred to as a generalised seizure. Typically, the patient is unconsciousness and presents tonic-clonic contractions. When abnormal movements do not happen, the seizure is is defined as an absent seizure.[49]

As is the case with numerous other pathological conditions, there are certain predisposing factors that can heighten the risk of an individual suffering an epileptic seizure. These factors include flashing or bright lights, stress, sleeplessness, hypoglycaemia along with alcohol and drug abuse. For this reason, dentists must be familiar with them if applicant to their patient and must take the necessary precautionary steps to minimise their effects.[1][47][39]

Irrespective of the manner of the seizure that may transpiring in front of a clinician, swift recognition and action is required. Given that epilepsy is recurrent in nature, the patient is likely to present a history or seizures. Hence, a compressive medical history will be the hallmarks of managing an epileptic patient.[40][39] Information surrounding the type, frequency and duration of a seizures, specific auras that can trigger it, degree of control and

awareness, as well as the efficiency of certain drugs to prevent or control epileptic seizures should be sought prior to any treatment.[39][1][47]

All things considered, dentists have the responsibility to make an informed decision on how or if they should proceed with the treatment. Treatment modification such as the use of sedation in the form of inhaled nitrous oxide or oxygen may be indicated in patients with a mild to moderate risk of a seizure. However, considering the fact that the majority of anti-epileptic drugs function on suppressing the central nervous system, caution should be exercised by the clinician to avoid excessive sedation.[1] Situations involving a greater risk can be referred to a specialist for intravenous sedation or alternatively, can be performed under general anaesthesia.[1][39] For instance, if the patient is mentally impaired, general anaesthesia would be indicated, as a seizure can be provoked by stress during the dental appointment. Other possible amendments that can be made to accommodate the patient include the use of morning appointments, along with eliminating bright lights or excessive external noise.[47]

Slight variations do exist depending on the nature of the patient's epileptic seizures. However the general principles remain unchanged. During a seizure, especially in those involving convulsions, prevention of further injuries and ensuring adequate levels of ventilation will be a priority for a dentist. However, in the case of absent seizures, where twitching movements do not occur, the probability of harm is minimal. In some cases, a dentist may be unaware that a seizure has lapsed.[1]

Despite this, the protocol for a seizure management suggests immediate cessation of the

dental procedure, removal of any potential seizure stimulating factors, withdrawal of all dental instruments or other objects with risk of inflicting damage, followed by the placement of the patient in the supine position. In the seizure presents with convulsions, the dental chair should be lowered as far as possible, to minimise harm to the patient in the event of a fall.[39][1] Similarly, the patients limbs can moderately be restricted to prevent excessive movements, but ensuring slight movements so as to prevent any bone fractures.[1]

However, if the patient is suffering from an focal or absent seizure, dental treatment can continue once the patient has recovered, since the threat to life is considered negligible.[39] Similarly, modifying the patient position may not be necessary for absent seizures.[1]

Given the fact the majority of epileptic seizures last only a short duration, emergency medical services should be called if the seizure lasts longer than 3 minutes.[1][39] In the meantime, the patients circulation, airways and breathing patterns should be assessed along with their vital signs. The head tilt chin lift procedure may be necessary to allow suitable airflow.[1][40] In the event of prolonged seizures lasting more than 5 minutes, or for recurrent seizures, the protocol indicates for the clinician to prescribe 10mg Midazolam through the buccal or intranasal route for adults. For children, doses less than 10mg should be given, and varies with age.[40][39][3]

Upon recovery, the dentist has a duty of care and must decide the best course of action for the patient. If the patient is judged to have fully recovered, the patient can be dismissed but only in the company of a responsible guardian to overlook matters, since post-seizure, patients tend to present disorientation. Failure to do so can result in the dentist being found

liable. In contrast, if it was the patients first ever reported seizure, or there is a risk of second seizure, or the patient's condition is inadequate, referral to the hospital may be necessary.[39][1]

4.3 Angina Pectoris

Angina pectoris is one of the more frequently encountered medical emergencies within a dental clinic. According to the figures derived from two separate studies, angina pectoris ranked as the second and third most common medical emergencies within dental clinics.[1][3] This can be anticipated considering that ischemic heart disease is one of the leading causes of death amongst the global population, and especially within developed countries given the more sedentary lifestyle choices.[50]

Angina pectoris is characterised by chest pain and in the large majority of cases, the pathology is attributed to myocardial ischemia. [1][51] [50] It is often described by patients as a "tightening" or a "squeezing" like sensation in the chest region. Prompt recognition and treatment is critical to prevent more lasting injury in the form of a myocardial infarction.

The presence of angina typically indicates coronary artery disease due to atherosclerosis, which is the accumulation of fatty deposits within blood vessels that impede blood flow. Normally, 70% of an artery would have to be blocked for angina to develop.[52] This blockage results in a disparity between the oxygen demand and supply available to the myocardial tissues causing a series of biochemical changes and the release of specific metabolites, for

instance, Adenosine which has shown to be responsible for the chest pain. In a few exceptional circumstances, other possible aetiologies for angina include aortic stenosis, coronary artery spasm, or hypertensive heart disease.[1][50]

Angina can be subdivided into stable and unstable angina. Stable angina occurs when chest pain caused by myocardial ischemia is provoked in response to activity, stress or physical exertion. A common acronym for the known triggers is the "four E's": exercise, emotion, exposure to cold and eating. Pain from acute angina is relived through the use of nitroglycerine, typically prescribed in the form of a tablet or spray. Alternatively, unstable angina, also referred to as acute coronary syndrome is described when myocardial ischemia and corresponding chest pain occurs at rest. It is deemed to have a significantly worse prognosis as a large proportion of patients go on to suffer from myocardial infarction.[1][52]

Pain felt in the thoracic region does not necessarily indicate an myocardial ischemia etiology. Chest pain can be felt for a number of reasons. Other possible causes of chest pain include: gastroesophageal reflux, costochondritis or anxiety. Therefore, it is important for a clinician to be adept in being able to differentially diagnose between them. Typically when the patient describes the pain as dull, difficult to localise but within the wider substernal area, pain of gradual onset and lasting a short duration, normally a matter of several minutes and not hours, it is more than likely the patient is experiencing angina. Similarly, it is not usually associated with pain upon breathing or palpation of the chest wall, and if the pain is known to radiate to the left arm or left mandible, it is more likely to be an AMI.[51] However, it is possible for anginal pectoris pain to radiate to regions such as the epigastric and mandibular

area.[1]

Prevention of an angina pectoris within a dental clinic is based on controlling the potential triggers to limit oxygen demand by myocardial cells. In the large majority of these patients, prior to or during a dental appointment, they are likely to experience high levels of stress resulting in an anginal attack. Hence, minimising stress during their dental experience is a priority for the dentist. For this reason, the protocol according to the American Society of Anaesthesiologist, states that patients suspected of unstable angina are considered a physical stage of four (ASA 4). Hence the protocol dictates that these patients should not be treated, with the exception of emergency treatments. The reason behind is the heightened risk of a myocardial infarction occurring, especially in the dental clinic.[1]

As always, the prevention of emergency situations is based on a complete and thorough medical history. Patients with angina pectoris tend to present a history of previous attacks. That is to say, it is rare for patients to experience their first sensation of chest pain within the dental clinic. If however the dentist suspects myocardial ischemia in a previously asymptomatic patient, the dentist must treat the situation as an AMI. Likewise, if the pain is more severe than normal or it is not relieved within fifteen minutes of nitroglycerine treatment AMI should again be suspected and the emergency medical services should be summoned.[53]

In the unfortunate event of a suspected anginal attack within the dental clinic, as always, the dental treatment should be halted immediately and the patient should be permitted to move

themselves in the position that they perceive most comfortable, usually standing upright or seated. Contrary to the other medical emergencies mentioned previously, patients with chest pain tend not to prefer the supine position and can aggravate the painful sensation. Subsequently, the patient's circulation, breathing and airways should be monitored as per basic life support protocol. Once verified, the clinician can proceed to administer oxygen, preferably through the use of a device such as the nasal canula as well as nitroglycerine. Possible routes of administration for nitroglycerine include the sublingual and transmucosal route with a typical dose of 0.3-0.6mg every 5 minutes as required, with a maximum of three tablets or sprays in a 15 minute period. If pain is not relieved within 15 minutes despite the use of nitroglycerine, the emergency medical services should be summoned as soon as possible.[1]

4.4 Myocardial Infarction

Despite being a relatively uncommon in the dental clinic, acute myocardial infarctions (AMI) can pose a serious risk to life, and remains one of the leading causes of death worldwide. Hence, a clinician must be alert, ready and prepared to oversee and handle the situation given that in 60% of cases, death occurs within 1 hours of an AMI.[1] Similar to angina pectoris, in 90% of the cases, the underlying pathology is attributed to impaired blood supply to the heart typically caused by atherosclerosis, and resulting in the death or necrosis of the myocardial tissues. Simply put, there is a longterm imbalance between oxygen demand and oxygen supply to the heart. The extent of the irreversible damage is dependent on the duration and the level of the ischemia. [3][54] This highlights the need for urgent and effective treatment as

potential complications especially given that 50% of deaths after an AMI occur within the first hour of its occurrence. Similarly, for patients who have gone on to survive an AMI, the future prognosis tends to be poor, with a list of potential complications including heart failure and cardiac arrest.[1]

Three important symptoms suggestive of an AMI include: chest pain that is not relieved in response to nitroglycerine or rest, more frequent or more severe chest pain in a patient with a history of stable angina, and lastly, the appearance of a compressive chest pain for the first time. Other minor signs consist of: a feeling of general weakness, light headedness, nausea, vomiting, coughing, dyspnoea and a cold sweat. While the symptoms of AMI and angina pectoris appear similar, subtle differences to exist. To differentiate between them, patients with AMI tend to present pain of greater intensity and of a longer duration, and more importantly is not relieved in response to nitroglycerine or rest. [1] Also, given that in the large majority of cases of AMI, the atherosclerosis plaque typically obstructs the left coronary artery supplying the myocardium, causing ischemia and necrosis within the anterior aspect of the left ventricle.[1] Therefore, patients complaining of pain radiation towards the left arm, as well as the left side of the neck, epigastrium and mandible can be expected.[55][56]

There are certain risk factors that can predispose an individual to suffer an AMI. The majority of these factors are modifiable and include elements such as obesity, diabetes mellitus, hypertension, smoking, high cholesterol. Non controllable risk factors include age and gender, with males of around 50-70 years of age also being more susceptible. It is valuable for a dentist to acknowledge and be mindful of these risk factors, especially amongst patients with

a history of ischemic heart disease.[54][1]

Unsurprisingly, preventing an AMI attack from occurring within a dental clinic is based on minimising patient stress levels. Stress is known to cause tachycardia and increase cardiac output and ultimately an increase in myocardial oxygen demand.[1] If the dentist observes the patient having extreme anxiety or dental phobia, the use of benzodiazepines prior to the appointment may be indicated. In most cases, 5-10mg of diazepam is given, both the night before and 1 hour before the treatment.[57]

Similarly, for patients at risk of suffering an AMI, the dentist can recommend the patient to adopt some dietary or lifestyle changes to reflect a healthier way of life. For instance, giving up smoking, reducing salt and fat intake as well as moderate exercise can aid in cardiac rehabilitation.[58] However, there appears to be less evidence to suggest it can aid in recurrence or mortality rate. Likewise, the use of a comprehensive anamnesis in preventing ischemic heart disease has already been emphasised. Given that a patient at risk of AMI is likely to previously have experienced chest pains, information regarding the duration, intensity, medication used to alleviate pain and the time elapsed since the last attack should be sought. The dentist should also inquire about other associated symptoms such as pain radiation, in addition to the presence or absence of breathlessness and swollen ankles.[1]

As one can expect, a few adjustments have to be made when treating patients who have already suffered a myocardial infarction. For instance, the dental protocol dictates patients should not be treated for 6 months after a AMI, with the only exception being emergency

treatments.[57] After this period has lapsed, interconsultation between the dentist and the patient's medical doctor is highly recommended. Moreover, stress reduction procedures as previously described, should be implemented when treating the patient to minimise the risk of an AMI. Also, the use of supplementary oxygen, at a rate of 3-5L/min may be indicated, in an attempt to reduce the risk of ischemia and AMI. In more extreme cases, sedation in the form of nitrous oxide may be necessary, but must be given with oxygen, to again avoid the risk of hypoxia.[1]

Once it has been established by the clinician that a patient is suffering from an AMI, as is customary, dental treatment should be ceased and the patient positioned in whichever way is deemed most comfortable. Thereupon, circulation, breathing and airways should immediately be assessed as per BLS protocol, followed by summoning of the emergency medical services and monitoring the patient's vital signs. In the meantime, prehospital care includes the use of oxygen, delivered through a nasal cannula as well as the use of anti-platelets to act as an anti-thrombus agent. 300mg of Aspirin is typically used, unless contraindicated. Statistics show it can reduce mortality rate by 25%-50% and can significantly reduce reoccurrence. Possible routes of administration include through chewing and sucking. However, contraindications include allergy and gastrointestinal haemorrhage. In the event of the patient presenting aspirin allergy, 300mg of Clopidogrel can be used. If the patient continues to present chest pain, the use of Morphine Sulphate is indicated. A dose of 2-5mg is given, administered through the intravenous route and repeated every 5 to 30 minutes as per necessary. It functions as an anxiolytic and anxiolytic and indirectly reduced myocardial oxygen demand. Alternatively, a combination of gaseous nitrous oxide combined with oxygen

can also be used. It has the advantage of maintaining blood pressure levels.[1]

Whilst waiting for the emergency medical services, complications such as heart failure, cardiac arrest and ventricular dysrhythmias can occur. In the event of the latter, intravenous lidocaine and atropine can be administered, and ideally the dentist should be trained to work with a electrocardiogram (ECG). Once the emergency services have arrived and is stable, the patient can be transferred to a hospital site for more detailed diagnosis and treatment options.[1]

4.5 Cardiac Arrest

A cardiac arrest is defined as the abrupt loss of heart function, combined with the termination of normal breathing and circulation. An individual subject to a cardiac arrest can be described as 'clinically dead' and can further progress to biological death if left untreated. Biological death is caused by irreversible damage at a cellular level, primarily as a result of oxygen starvation. However, prompt and correct treatment typically through cardiopulmonary resuscitation or defibrillation can reinitiate the normal functioning of the heart. The underlying etiology for a sudden cardiac arrest in 70% of white men can be attributed to coronary artery disease. Other less frequent causes include myocardial hypertrophy, valvular heart disease, or abnormal cardiac rhythm. This ultimately leads to an inability of the heart to pump blood effectively. For this reason, in the dental office, a clinician should remain vigilant, especially in patients with a known history of ischemic heart disease.[59][1]

It is one of the emergencies that is known to have more fatal consequences with less than

10% of victims recovering well enough to be released from hospital care after treatment by the emergency medical services. The probability of survival is dependent on 4 principles, all of which are vital. The absence of any one of the principles, greatly reduces the chances of a good prognosis. Collectively these 5 principals are known as the 'Chain of Survival'. A dentist must be familiar with them in order to maximise the possibility of full recovery. These principles are as follows: (1) immediate recognition of a sudden cardiac arrest; (2) basic life support with CPR; (3) rapid defibrillation; (4) advanced life support (5) post cardiac care.[1][59][60]

The dentist must first recognise a case of sudden cardiac arrest, and immediately alert the emergency medical services, even prior to initiating basic life support treatment. This allows for the dentist to perform CPR while awaiting for the specialist response team. The basis of effective CPR has been outlined earlier. Also, the sooner CPR is initiated, the better the prognosis. However, it is important for the clinician to realise that bystander CPR alone is not sufficient to reinitiate blood flow to the brain and other vital organs. It is essential to supplement it through the use of a defibrillator or suitable drugs. However, it is the best available option until the emergency services arrive.[1][35]

Once access to a defibrillator is possible, the cardiac rhythm should be analysed. If a rhythm is detected, the dentist or a specialist should defibrillate the patient. Fortunately, semi-automatic external defibrillators (AED) are now common and simple to use, leaving very little lost time. Similarly, many dental clinics, especially in the developed world now have access to an AED. Once specialist help has arrived, advanced life support can be provided, for instance

through the use of drugs or ventilation support. Lastly, upon recovery, post cardiac care such as identifying the principle cause of the cardiac arrest should be performed as studies have shown it to reduce mortality rates.[1][59]

4.6 Asthma

Asthma is a chronic respiratory disease characterised by transient obstruction or inflammation of the respiratory tract.[61][62] In spite of the prevalence of an asthmatic attack being relatively low in dental clinics, asthma presents a widespread condition, with more than 200 million people affected worldwide.[3][1][61] Individuals who are more susceptible to developing the condition include children younger than 10 years of age, ethnic minorities, as well as those from hailing from urban or impoverished backgrounds.[62][1]

Asthma can be characterised into two distinct groups based on the underlying etiology: namely intrinsic and extrinsic asthma. Extrinsic asthma, or allergic asthma, occurs in about 50% of asthma cases and in response to inhalation of certain allergens. It has a tendency to be more frequent and severe amongst youngsters. Typical allergens consist of pollen, dust, animal fur or hair, fungal spores and occasionally food and certain medication. It has shown to have a greater level of genetic predisposition in comparison with intrinsic asthma

On the other hand, intrinsic asthma, also referred to as irritant or non-allergic asthma, occurs in response to triggers such as air pollution, exercise, tobacco smoke and stress. Hence, if an asthmatic attack develops in a dental clinic in response to stress and anxiety, the clinician can suspect a case of intrinsic asthma.[61][62][1]

The pathophysiology behind asthma can be explained by the fact that the presence of these allergens or irritants initiate inflammation and contraction of the smooth muscles of the respiratory tract in addition to increased mucosal secretions. The contraction of muscles is known as bronchoconstriction. Collectively, these pathological changes function to increase air resistance and restrict air flow towards the lungs, thus producing the typical symptoms of asthma, reducing the efficiency of gas exchange and reducing overall oxygen levels in the blood.[1][62]

The principal symptoms indicative of asthma include difficulty breathing, wheezing, coughing, hyperventilation and chest tightness. Other more general symptoms such as increased heart rate and blood pressure can and do exist. Considering the etiology behind asthma, the medication used to manage and control asthmatic attacks are based on two groups of pharmacological agents. The first set of drugs include glucocorticosteroids which principally act as an anti-inflammatory agent. Secondly, drugs classed as beta 2 agonist which function as bronchodilators can also be used. Some of the more common examples of beta 2 agonists include salbutamol and beclomethasone.[1]

As is the case with all medical emergencies, prevention of an asthma attack within a dental clinic is based upon reviewing the patient's medical history, especially given the fact that asthmatic patients present a history of attacks prior to a dental appointment. Emphasis is placed on the clinician for acquiring details such as the type of asthma, frequency of attacks, time elapsed since the last known attack, known allergens or irritating factors as well as whether any medication is taken to help ease possible symptoms. If a patient respond in the

affirmative for using medication, the clinician should advise the patient to bring them to each of their following dental appointments, while noting the type of pharmacological agent. Similarly, stress relieving factors should be implemented, to mitigate the risk, especially in intrinsic asthmatic patients.[14][62] A combination of verbal and non-verbal communication, treatment modifications such as shorter waiting and appointment times, and removing dental equipment from direct view of the patient can all contribute towards this.[1] Moreover, a clinician may elect to use sedation to in more severe cases of anxiety or an asthmatic attack. In such instances, the dentist should be mindful of the fact that barbiturates and opioids are contraindicated as they can cause further deterioration in the patient's state, as they are known to cause bronchoconstriction. As an alternative, gaseous nitrous oxide and oxygen can be used, or oral benzodiazepines may be indicated, both the night before and one hour before the appointment.[1]

Despite the implementation of these preventative procedures, an asthmatic attack can still occur. Upon realising it, the clinician should immediately terminate the ongoing dental treatment, remove all instruments from the patient mouth, and let patients position themselves in the position they feel most comfortable. Typically this is an upright position. The dentist should reassure the patient, followed by verification of the patient's circulation, breathing and airways, as the basic life support protocol dictates. Once established that the breathing and circulation is fine, oxygen should be administered. This can be achieved through the use of a full face mask or nasal canula.[62] A bronchodilator should then be given to ease the smooth muscle contractions. Ideally, the patient should bring their own bronchodilator to the clinic, typically in the form of an aerosol inhaler and should be used

when an emergency situation arises in the dental clinic. Upon recovery, the clinician should determine the cause of the asthma attack and with the benefit of hindsight, decide where improvements can be made in the following appointments to avoid a repeat.[1]

In more severe cases of bronchospasm, an aerosol inhaler may not be sufficient in alleviating distress and symptoms. Hence, an intravenous or intramuscular dose of epinephrine may be indicated. A typical dose of epinephrine would be 0.3mL of 1:10 000 and can be repeated every hour as required. If a case of severe inflammation is suspected, intravenous systemic corticosteroids can be given, but only if the dentist is confident and possess the sufficient skills to do so. If not, emergency medical services should be called. However, if the patient has fully recovered, the patient can be discharged.[61][1]

4.7 Diabetes Mellitus: Hypoglycaemia and Hyperglycaemia

Diabetes mellitus (DM) refers to a group of metabolic disorders characterised by excessively high glucose levels in the bloodstream. It is typically attributed due to insufficient production of, or impaired response to the hormone insulin, which allows for glucose uptake by cells for use as an energy supply.[63][64] If poorly controlled or managed, DM can give rise to a number of serious health complications, ranging from cardiovascular diseases, kidney diseases, neuropathy, retinopathy, whilst also being twice as more likely to suffer from periodontal disease. Given that diabetes is known to effect more than 300 million individuals worldwide, with millions more unaware that they may have the condition, dentists should be well rehearsed in dealing with such patients, exercising utmost care and precaution.[1]

According to the American Diabetes Association, diabetes is defined as a fasting blood glucose level greater than 126mg/dL, or a 2 hour post prandial blood glucose level of 200mg/dL or more. Given this, there are numerous factors that can make an individual more likely to suffer from diabetes. These include age, with the condition being more prevalent amongst the elderly population, ethnicity, with levels disproportionately higher amongst ethnic minority groups. It is also proportionally related to obesity, and a genetic relation is also known to exist.[65][1]

Based on its etiology, Diabetes Mellitus can be largely be classified into 3 distinct groups: type 1 diabetes mellitus, type 2 diabetes mellitus and gestational diabetes. Type 1 diabetes mellitus is less frequent, typically accounting for 5%-10% of all diabetic cases. It occurs due to an absolute lack of insulin production, caused by an autoimmune destruction of the beta cells of the pancreas. Considering this, type 1 diabetic patients are considered 'insulin dependent' and rely on the regular administration of exogenous insulin, typically through a subcutaneous injection. It is thought to be largely hereditary and hence more often seen in younger individuals. In contrast, type 2 diabetes accounts for 90-95% of all diabetic cases. It develops in response to insulin resistance, meaning sufficient levels of insulin are produced, but the body can no longer effectively use insulin to initiate the desired response. Type 2 diabetes is strongly associate with a sedentary lifestyle, with obesity, inactivity, high blood pressure being significant contributing factors. Therefore, the first line of treatment of type 2 diabetes is aimed at tacking unhealthy diets and encouraging aerobic exercise. Once these habits have been formulated, oral antidiabetic drugs such as biguanides and sulfonylureas can be used.

The third form of diabetes mellitus is referred to as gestational diabetes, and occurs in pregnant women who have never previously experienced the disease. Affecting about 18% of all pregnant women, the underlying pathology is similar to type 2 diabetes, that is to say, insulin resistance. If left undiagnosed or untreated, the risk of perinatal illness and death is significantly increased.[65][1][64][63]

Acute complications of diabetes mellitus include: hyperglycaemia, hypoglycaemia, diabetic ketoacidosis and hyperglycaemic hyperosmolar nonketotic coma. Hyperglycaemia exists in the event of excessively high blood glucose levels, typically after food intake. When glucose levels in the blood are high enough to exceed the renal threshold for reabsorption of approximately 180mg/100mL, glucose molecules will begin to appear in urine. Given its large molecular size, the presence of glucose creates an osmotic pressure large enough to draw large amounts of water and electrolytes into the urine. This principle gives rise to the three typical symptoms of hyperglycaemia which include excessive urination, thirst and hunger. Patients may also experience weight loss and decreased muscle mass, as fat, glycogen stores and amino acids are converted into glucose to compensate for the inability to use the glucose from food consumption. However, the breakdown of fat to produce glucose results in the production of an important by product known as ketone bodies. High levels of ketone bodies in the bloodstream can cause a decrease in the pH of the blood, a condition known as diabetic ketoacidosis. If the blood pH drops below 7.3, the body will try to counteract acidic pH through hyperventilating. This produces a state known as Kussmaul's respiration and can potentially cause the patient to enter into a diabetic coma and lose consciousness.[1]

On the other hand, when blood glucose levels drop below 50mg/dL in adults, or 40mg/dL in children, the patient is said to be hypoglycaemic. It is said to be much more common in the dental clinic and usually occurs in response to prolonged periods without eating or alternatively excessive insulin secretions by the beta cells of the pancreas. Common signs and symptoms include decreased brain function, confusion and decreased alertness in response to reduced flow of glucose to the cerebral tissues. Similarly, in response to the low glucose levels, the body stimulates the release of endogenous adrenaline and can cause anxiety, tachycardia, increased blood pressure and sweating. It is also important for a dentist to note that hypoglycaemic emergencies are more critical and life threatening occurrences in dental clinics given the rapid nature in which patients can lose consciousness or a hypoglycaemic coma if not treated in time.[64][1][65]

As is the case with all medical emergencies, the prevention of acute complications of diabetes is hugely dependent on a comprehensive medical history, physical evaluation and complementary tests. Whilst naturally most patients who are at risk will present a history of diabetes, information surrounding the type of diabetes, the patient normal blood glucose range, common symptoms as well as current medication should be sought. Especially amongst patients who remain undiagnosed and are unaware that they have diabetes, a correct medical history is vital in avoiding a diabetic emergency in the dental clinic. Most important of all, prior to any dental procedure, the diabetic patient should be questioned as to whether their blood glucose levels are well controlled, within the normal limits, and whether they have eaten and taken their medication the day of the appointment.[64][1]

Physical assessments can also indicate the presence of acute complications. For example, one marked variation between hyper and hypoglycaemia, easily differentiated within the dental clinic through visual inspection, is the moisture level and appearance of the patients skin. This is because hypoglycaemics tend to display cold and wet skin in contrast to the hot dry red skin of hyperglycaemic patients. Similarly, during an intraoral examination, in patients unaware of their diabetic condition, signs and symptoms such as xerostomia, candidiasis, burning mouth syndrome, gingivitis and periodontal disease are all indicative of the diabetes mellitus. Likewise, a practitioner may be able to recognise a patient's fruity scented breath, a characteristic of diabetic ketoacidosis. Vital signs such as blood pressure can also be taken.[1]

Recognising which type of acute diabetic complication that a patient presents in an emergency situation is essential for good management. As mentioned, signs such as rapid onset, a station of confusion, decreased alertness are all indicative of hypoglycaemia. However, when doubt remains, the protocol dictates that the patient should be treated as hypoglycaemic, unless proven otherwise. This is based on the rapid rate of onset and the potential risk of severe neuropathies. In the event of a hypoglycaemic emergency, the patient should first be positioned comfortably, followed by verification of the patients circulation, breathing and airways as described per basic life support protocol. If the patient is conscious, oral carbohydrates in the form of soft drinks and sweets should be given every 10 minutes until symptoms disappear. However, if the patient is conscious but is no longer responsive, 1mg of glucagon may be administered intramuscularly, with the patients vital signs being recorded every 5 minutes. The use of glucagon allows for an increase in blood glucose levels through the breakdown of glycogen stores in the liver.[1][40][64][65]

In the event of complete unconsciousness, an intravenous injection of 50% dextrose solution is normally used, while glucagon and epinephrine can also be administered intramuscularly. It should be stressed that oral carbohydrates should never be given in non-responsive or unconscious patients due to the risk of airway obstruction and pulmonary aspiration. Upon regaining consciousness, the patient should be monitored, supplemented with oral carbohydrates, and undergo further tests once the emergency medical services have arrived.[1]

However, in the event of a hyperglycaemic emergency where the patient has lost consciousness, as always, a correct, comfortable position and BLS protocols should be established. In the meantime, an assistant should summon the emergency medical services especially if the patient doesn't show signs of improvement after establishing BLS. The dentist can then proceed to administering an intravenous solution of 5% dextrose and saline solution, for the purpose of replenishing normal fluid and electrolytes that are typically lost due to the excessive urination. Once the emergency medical personnel have arrived, intravenous insulin can then be administered, while closely monitoring the patient's blood glucose levels. The patient should then be referred to the hospital for further monitoring and treatment.[1]

5. Conclusion

i. Vasovagal syncope is the most frequently encountered emergency. A clinician can expect to manage at least one case throughout his or her career. Other common emergencies include seizures, angina pectoris, asthma and acute myocardial infarction.

ii. Medical emergencies are unavoidable in the dental clinic and clinicians can expect to manage at least one emergency situation throughout their career.

The occurrence of medical emergencies can generally be minimised to some degree using a comprehensive and thorough medical history, accompanied with a physical examination. A positive response in the anamnesis denotes the clinician to make further inquiries and evaluate the patient further. Similarly, it allows more vulnerable patients to be identified, thus enabling the relevant treatment modifications to be made prior to the appointment. Typically, these changes are based around stress reduction.

iii. Despite the nature of each medical emergency being unique, the overall management protocol remains the same. Dental treatment should immediately be terminated, the most suitable position for the patient must be established, followed by verification of the patient's circulation, breathing and airways, as per the basic life support protocol. Definitive care can then be initiated, and can include drugs and the use of defibrillation. Similarly, all members of staff should have a basic level of emergency training, for a more collaborative approach.

6. **Responsibility**

Dentists

Ultimately, as a trained health care professional, the dentist is responsibile to correctly recognise and manage an emergency situation. They have a duty to themselves, their patients and the wider public for continued education and professional development.

Keeping up to date with the latest medical advancements, the most recently published guidelines, new potential drug therapies and management devices to improve patient care and treatment quality ensures patients are always receiving the best possible care, whilst maximising the chances of a complete recovery in the event of an emergency.

Similarly, by containing and controlling the emergency situation, through good training as well as prompt and accurate intervention, summoning of the emergencies medical services may not be necessary. Especially, in this age of a global pandemic, where immense pressure is heaped onto hospitals and hospital staff, it is more important than ever to alleviate some of the pressures on health services through adept management to minimise hospital referrals. Thus these valuable human and economic resources to be utilised elsewhere.

Dental Team

Identifying and dealing with a medical emergency also requires a combined, collaborative effort from all healthcare staff including dental hygienists, assistants and receptionists. Improving overall efficiency through effective communication, adhering to a fixed action plan and periodic team rehearsals can improve overall performance and efficiency in the event of a real medical emergency.

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8. **Annexes**

STANLEY F.
MALAMED

MEDICAL EMERGENCIES
in the DENTAL OFFICE

SEVENTH EDITION

ELSEVIER

Emergency Drugs for the Dental Office

Harry Dym, DDS, Golaleh Barzani, DMD*, Naveen Mohan, DDS

KEYWORDS

• Emergency drugs • Management of airway emergencies • Dental office emergencies

KEY POINTS

- The health care professional and the staff should always be prepared to use emergency drugs to deal with emergency situations in their dental office.
- Preparedness of the dental office staff and their prompt recognition of emergencies will be the most important factor in managing the emergencies in any dental office.
- Health care professionals should follow the recommendations in this article to maintain a guideline for their staff and office and conduct regular emergency drills to examine the equipment and preparedness of their staff.

INTRODUCTION

Medical emergencies in the dental office are an unavoidable part of the profession. Even though precautions to prevent such events are undertaken, these events are inevitable and the dental practitioner must be prepared. Malamed[1] reported in his book that 96.6% of respondents of a survey among practicing dentists had a medical emergency occur in the office.

Emergencies can range from relatively benign conditions to life-threatening situations. Syncope and hyperventilation are two of the most common complications seen in the dental office. One must keep in mind that even these seemingly mild issues can escalate and cause significant morbidity. Although uncommon, major emergencies, including cardiac, pulmonary, and neurologic events, can occur. The dentist must be able to manage such situations until emergency medical responders arrive to the clinic.

Lastly, urgent or emergent situations can occur at any point during the patients' visit to the dental office. The patients' anxiety about the procedure can cause an event in the waiting room or even intraoperatively. Medications administered can also cause adverse reactions intraoperatively or even postoperatively.

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Medical emergencies in dental practice

Abstract

Serious medical emergencies are fortunately a rare occurrence in the dental practice environment; however, if an emergency situation is encountered a delay in treatment may result in potentially avoidable consequences. The risk of mortality or serious morbidity can be reduced by ensuring that basic emergency equipment and medications are in place, and that the dental team is appropriately trained in basic life support measures. This article aims to provide an overview of the basic emergency medications and equipment that should be present in dental practices, and to discuss specific responses to some of the more common adverse medical events that can present while providing dental treatment.

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Introduction

Medical emergencies can and do occur in a dental practice setting. The dentist has a responsibility to recognise them and initiate primary emergency management procedures in an effort to reduce morbidity and mortality when such adverse events arise. This article aims to provide an overview of the basic emergency drugs and equipment that should be present in dental practices, and to discuss specific responses to some of the more common adverse medical events that can be encountered while providing dental treatment.

Incidence

Fortunately, the incidence of emergency events seen in the general practice setting is rare but when an emergency does occur it can be life threatening. The more common problems include vasovagal syncope (faints), hypoglycaemic episodes, angina, seizures, choking, asthmatic attack and anaphylaxis (**Table 1**). Excluding syncope, adverse medical events have been reported to occur at a rate of 0.7 cases per dentist per year[1] or on average an event once every three to four years.[2] It has also been reported that medical emergencies occur in dental hospital practice more frequently but in similar proportions to those in general dental practice.[3]

Table 1. Prevalence of medical emergencies reported by dentists over a 12-month period.[1]

Emergency	Cases per dentist per year	Average number of years before a case is encountered
Vasovagal syncope	1.9	0.5
Angina	0.17	5.7
Epileptic fit	0.13	7.2
Hypoglycaemia	0.17	5.6
Asthma	0.06	15.1
Choking	0.09	11.2
Anaphylaxis	0.013	75.5
Myocardial infarction	0.006	151
Cardiac arrest	0.003	302
Unspecified collapse	0.026	37.6

Management of Medical Emergencies in the Dental Office: Conditions in Each Country, the Extent of Treatment by the Dentist

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Dentists must be prepared to manage medical emergencies which may arise in practice. In Japan, a study was conducted between 1980 and 1984 by the Committee for the Prevention of Systematic Complications During Dental Treatment of the Japan Dental Society of Anesthesiology, under the auspices of the Japanese Dental Society.[1] The results from this study showed that anywhere from 19% to 44% of dentists had a patient with a medical emergency in any one year. Most of these complications, approximately 90%, were mild, but 8% were considered to be serious. It was found that 35% of the patients were known to have some underlying disease. Cardiovascular disease was found in 33% of those patients.

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.[2,3] 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. In addition to syncope, other emergencies reported to have occurred include allergic reactions, angina pectoris/myocardial infarction, cardiac arrest, postural hypotension, seizures, bronchospasm and diabetic emergencies.

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. The most important aspect of nearly all medical emergencies in the dental office is to prevent, or correct, insufficient oxygenation of the brain and heart. Therefore, the management of all medical emergencies should include ensuring that oxygenated blood is being delivered to these critical organs. This is consistent with basic cardiopulmonary resuscitation, with which the dentist must be competent. This provides the skills to manage most medical emergencies, which begin with the assessment, and if necessary the treatment of airway, breathing and circulation (the ABCs of CPR). Usually, only after these ABCs are addressed should the dentist consider the use of emergency drugs.

Drugs that should be promptly available to the dentist can be divided into two categories.[4] The first category represents those which may be considered essential. These drugs are summarized in Table 1. The second category contains drugs which are also very helpful and should be considered as part of the emergency kit. These supplementary drugs are summarized in Table 2. The precise composition of the drug kit can vary as the presence of the drugs in this latter group may depend on the nature of the dental practice.

Those with training in Advanced Cardiac Life Support would also have additional drugs. Dentists who are trained to administer general anesthesia or intravenous sedation would be expected to have additional drugs. These dentists should have a patent intravenous line in place and therefore drug administration could use this route, which may be considered ideal. It may be assumed that dentists without advanced training in anesthesia or sedation may not be proficient in venipuncture. In this case the intramuscular route of administration, which can include the intralingual injection, would be appropriate. The intralingual intramuscular injection should provide a more rapid onset of action compared with the more traditional sites, although not as rapid as intravenous. This manuscript will assume that the intramuscular route will be the one most likely to be used.

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Research Article

A survey on the knowledge of medical emergencies among dental practitioners in Chennai and their choice of emergency drugs and equipment

T. Pranati, Marian Anand Bennis*, R. Subhashree

ABSTRACT

Aim: The aim of the study was to survey the knowledge of medical emergencies among dental practitioners in Chennai and their choice of emergency drugs and equipment. **Materials and Methods:** An online survey was conducted through Google Forms. The link for the survey was circulated among dental practitioners, including interns, in Chennai. **Results:** A total of 71 responses were obtained. Only 31% of the responders felt they are confident to handle medical emergencies. 70.4% of the responders have faced at least one medical emergency situation with the highest being syncope (98%). Only 83.1% of the responders believed that it is necessary for a dentist to procure all medical emergency drugs and equipment. When asked about the chair position for syncope and hyperventilation, only 74.6% and 53.5% of the responders answered correctly. **Conclusion:** The results clearly show the lack of knowledge and interest in the importance of handling medical emergency situations in dental practice. This shows the increased need for refreshment courses for dentists in medical emergency training.

KEY WORDS: A survey on medical emergencies, Emergencies in dentistry, Emergencies on dental chair, Emergency drugs and equipment in dental practice, Emergency drugs, Medical emergencies in dental practice

INTRODUCTION

Medical emergencies are common in general dental practice. As there is a drastic increase in the quality of health care, there is an increase in life expectancy, and as a result, dentists are treating a growing number of elderly and medically compromised patients.[1] Studies have found that half of all patients treating a dental school have at least one chronic disease or condition.[2,3] Poswillo in his report stated that a collapse can occur in a dental practice at any time.[4,5] Most often these emergencies can be life threatening.[6] If a major medical emergency occurs in practice and the dentist is unprepared, the outcome can be disastrous.[7] On the other hand, with adequate preparation through knowledge of the patient's medical history, having emergency-related drugs and equipment available, and having either knowledge or a written protocol to follow, a dentist can successfully manage most medical emergencies without assistance.[8]

Training in the management of medical emergencies is considered an essential component of the undergraduate dental curriculum, with a recommendation for annual training in first aid, including cardiopulmonary resuscitation (CPR).[9,10] Despite these efforts, management of medical emergencies is a major concern for dental practitioners. High levels of anxiety have been found to be associated with dealing with medical emergencies by dental practitioners.[11] In literature, very little information has been published on the awareness of medical emergencies among drugs and equipment among dentists and also their competence in handling medical emergencies.[12]

This study is done to assess the knowledge and awareness of medical emergencies among dental practitioners in Chennai and also to know the emergency drugs and equipment which they consider important and which they have in their dental clinic/ hospital. This study also gives information on the

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Original Article

Medical emergencies encountered in dental clinics: A study from the Eastern Province of Saudi Arabia

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ABSTRACT

Objectives: To report the prevalence of medical emergencies in dental clinics and self-perceived competence of dentists in the Eastern Province of Kingdom of Saudi Arabia (KSA). **Materials and Methods:** In this cross-sectional study, a self administered questionnaire was distributed to a random sample of 198 dentists working in private and government dental clinics in the Eastern Province of KSA. The respondents were approached twice to ensure good participation in the study. **Results:** One hundred and forty-five dentists returned the questionnaires yielding a response rate of 73.2%. Half were male (50.3%) and 56% worked in private dental clinics. About 67% of the respondents reported having encountered any episodes of medical emergencies. Vasovagal syncope was the most common medical emergency experienced by 53.1% of the dentists, followed by hypoglycemia (44.8%) and only 5.5% had faced foreign body aspiration. The responding dentists had encountered 599 episodes of medical emergencies in the last 3 years. Almost 45% of the participants felt competent to perform cardiopulmonary resuscitation (CPR). Most of the participants (74.3%) reported that they had emergency kits in their clinics; more than 70% of the dentists kept oxygen, adrenaline, and glucose. One-third of them were either not confident or did not know how to use the emergency drugs. **Conclusions:** The study findings revealed that dentists quite commonly encounter medical emergency situations during their practice in dental clinics, but a considerable proportion of dentists did not feel competent enough to handle medical emergency conditions.

Key words: Cardiopulmonary resuscitation, dentists, drugs, medical emergency, Saudi Arabia

INTRODUCTION

Dentists encounter medical emergencies in their clinics which can be life-threatening.[1] Almost 90% of emergency episodes are considered mild, and 8% are regarded as serious.[2] A cross-sectional study reported 20 deaths resulting from medical emergencies in dental clinic settings.[3] Patients with medical conditions are more likely to experience emergency situations during dental treatment.[4] It was observed that approximately 35% of patients who experienced emergency situations had some systemic disease, and cardiovascular disease accounted for 33% of such episodes. Medical emergencies most commonly occur during and after the administration of the local anesthetic agent.[2] In addition, the reaction to certain dental materials (resins, latex), and the invasive dental procedure can also increase the risk of emergencies.[5]

The dental professionals' expertise and skills in basic life support, and the availability of essential emergency drugs and equipment can reduce the morbidity or mortality associated with medical emergencies.[6] The Resuscitation Council, United Kingdom (UK), requires

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Prevalence of Medical Emergencies in Dental Clinics

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Abstract:

Aim:The aim of this research is to study the prevalence of medical emergencies in dental clinics.

Objective:The objective of this study is report the occurrence of medical emergencies in dental clinics and self perceived competence of dentists among chennai population. Medical emergencies in dental practice are generally perceived as being rare but when an emergency does occur it can be life-threatening.

Background:Dentists encounter medical emergencies in their clinic which can be life-threatening. The dental professionals expertise and skills in basic life support and the availability of essential emergency drugs and equipment can reduce the morbidity or mortality associated with medical emergency. As health care improves and life expectancy increases, dentists and dental students are treating a growing number of elderly and medically comprised patients,increasing the likelihood of a medical emergency during treatment.

Methodology:A self administered questionnaire was prepared and distributed to a random sample 50 dentists in chennai population in order to find the data on the prevalence of emergency events.

Results:Dental practitioners encounter medical emergencies, mostly benign ones but also, more rarely, life-threatening emergencies. 65% of dental practitioners reported adrenaline is most commonly used during medical emergency in dental clinics. The recommended emergency equipment for dental practices should be kept to the minimum necessary in order to increase the number of offices properly equipped.

Keywords: Medical Emergency, drugs, clinic, dentists.

INTRODUCTION:

Dentistry is a clinical activity potentially at risk of medical emergencies and dental practitioners need to be prepared to handle them effectively. (1).A medical emergency in the dental office may be an unexpected event that can include accidental or willful bodily injury, central nervous system stimulation and depression, respiratory and circulatory disturbances, as well as allergic reactions.Dentists, through their academic, clinical and continuing education, should be familiar with the prevention, diagnosis, and management of common emergencies. In addition, they should provide appropriate training to their staff so that each person knows what to do and can act promptly. As a result, dentists and their staff should be prepared to recognize, respond and effectively manage a medical emergency. Every dental practice has a duty of care to ensure that an effective and safe service is provided for its patients.The satisfactory performance in a medical emergency or resuscitation attempt in the dental practice has wide-ranging implications in terms of resuscitation equipment,resuscitation training,standards of care,clinical governance,risk management and clinical audit.(2)

Medical emergencies can occur at any time in the dental office. They can happen to anyone, from the anxious patient in the reception room to the elderly diabetic who was told to skip breakfast prior to coming to her appointment. They can happen to the receptionist with a seizure disorder or to the dentist experiencing prolonged chest discomfort. The best way to handle an emergency is to be prepared in advance. Whether the medical emergency occurs years in the future or this afternoon, preparation is the key. All health care providers should be prepared to recognize and handle medical emergencies in the office.The increasing numbers of older patients with significant medical problems requiring dental care, longer dental appointments, and the increasing use of new medications with complex interactions all increase the risk of a life-threatening problem occurring in the dental office. The majority of medical emergencies in the dental office, however, can be anticipated and avoided with appropriate risk reduction. One key to reducing risk is to take a health history and vital signs to identify the “at risk” patient. In some cases, extensive procedures on “at risk” patients might are best performed in a hospital setting(3). The aim of this study is to determine the prevalence of medical emergencies in dental clinics.

METHODOLOGY:

Study design:

In order to study the prevalence of medical emergencies in dental clinic, .structured questionnaire was made containing 3 survey items. The sample was selected based on certain inclusion and exclusion criteria.

Inclusion criteria:

1. South chennai dental practitioners
2. Dental assistant

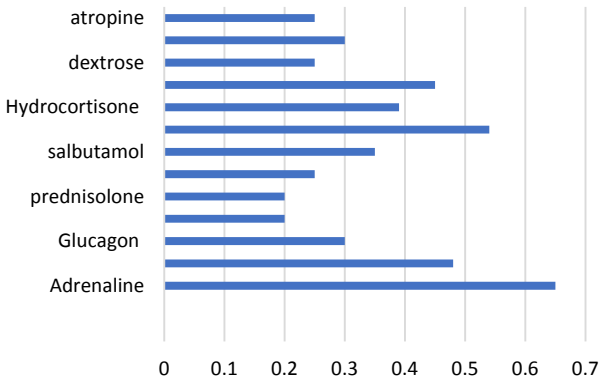
Exclusion criteria:

1. Students
2. Dental technicians

RESULT:

A total of 52 dental practitioners participated to answer the survey items. The essential drug used in the dental treatment includes adrenaline, aspirin, glucagon, glyceryltrinitrate, prednisolone, chloropheniramine, salbutamol, glucose, hydrocortisone, midazolam, dextrose, oxygen, atropine of which adrenaline accounts for the mostly used drug in the dental clinic during medical emergency(65%)[Tab.1]

Tab.1 Essential drugs used in dental treatment



Among dentists equipped with oxygen, 30% of the respondents reported to have used oxygen bottle in their dental clinics. Single use syringe seem to be the most common used equipment in dental clinic(60%).[Tab.2].

Furthermore, only a small portion of respondents have reported to have used the automated external defibrillator(24%). The dental practitioners are mostly confident is using the essential equipments in dental clinics(85%)[Tab.3] of which 20% of the respondents have reported that they are unsure of using the essential medical equipments in the dental clinics during any

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REVIEW

Strategies to manage patients with dental anxiety and dental phobia: literature review

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Abstract: Dental anxiety and phobia result in avoidance of dental care. It is a frequently encountered problem in dental offices. Formulating acceptable evidence-based therapies for such patients is essential, or else they can be a considerable source of stress for the dentist. These patients need to be identified at the earliest opportunity and their concerns addressed. The initial interaction between the dentist and the patient can reveal the presence of anxiety, fear, and phobia. In such situations, subjective evaluation by interviews and self-reporting on fear and anxiety scales and objective assessment of blood pressure, pulse rate, pulse oximetry, finger temperature, and galvanic skin response can greatly enhance the diagnosis and enable categorization of these individuals as mildly, moderately, or highly anxious or dental phobics. Broadly, dental anxiety can be managed by psychotherapeutic interventions, pharmacological interventions, or a combination of both, depending on the level of dental anxiety, patient characteristics, and clinical situations. Psychotherapeutic interventions are either behaviorally or cognitively oriented. Pharmacologically, these patients can be managed using either sedation or general anesthesia. Behavior-modification therapies aim to change unacceptable behaviors through learning, and involve muscle relaxation and relaxation breathing, along with guided imagery and physiological monitoring using biofeedback, hypnosis, acupuncture, distraction, positive reinforcement, stop-signaling, and exposure-based treatments, such as systematic desensitization, "tell-show-do", and modeling. Cognitive strategies aim to alter and restructure the content of negative cognitions and enhance control over the negative thoughts. Cognitive behavior therapy is a combination of behavior therapy and cognitive therapy, and is currently the most accepted and successful psychological treatment for anxiety and phobia. In certain situations, where the patient is not able to respond to and cooperate well with psychotherapeutic interventions, is not willing to undergo these types of treatment, or is considered dental-phobic, pharmacological therapies such as sedation or general anesthesia should be sought.

Keywords: behavioral therapy, cognitive therapy, general anesthesia, psychotherapeutic intervention, pharmacological intervention, conscious sedation

Introduction

Fear and anxiety toward the dentist and dental treatment are both significant characteristics that contribute to avoidance of dental care.[1,2] Anxiety associated with the thought of visiting the dentist for preventive care and over dental procedures is referred to as dental anxiety. It has been cited as the fifth-most common cause of anxiety by Agras et al.[3] Anxiety is an emotional state that precedes the actual encounter with the threatening stimuli, which sometimes is not even identifiable. It is normally experienced in day-to-day life, such as during exams, while making crucial decisions, in the workplace, and in several other circumstances.

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Management of fear and anxiety in the dental clinic: a review

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ABSTRACT

People who are highly anxious about undergoing dental treatment comprise approximately one in seven of the population and require careful and considerate management by dental practitioners. This paper presents a review of a number of non-pharmacological (behavioural and cognitive) techniques that can be used in the dental clinic or surgery in order to assist anxious individuals obtain needed dental care. Practical advice for managing anxious patients is provided and the evidence base for the various approaches is examined and summarized. The importance of firstly identifying dental fear and then understanding its aetiology, nature and associated components is stressed. Anxiety management techniques range from good communication and establishing rapport to the use of systematic desensitization and hypnosis. Some techniques require specialist training but many others could usefully be adopted for all dental patients, regardless of their known level of dental anxiety. It is concluded that successfully managing dentally fearful individuals is achievable for clinicians but requires a greater level of understanding, good communication and a phased treatment approach. There is an acceptable evidence base for several non-pharmacological anxiety management practices to help augment dental practitioners providing care to anxious or fearful children and adults.

Keywords: Dental anxiety, management, treatment, review, non-pharmacological.

Abbreviations and acronyms: ART = atraumatic restorative treatment; CARL = Computer-Assisted Relation Learning; IDAF-4C$^+$ = Index of Dental Anxiety and Fear; GA = general anaesthesia; MDAS = Modified Dental Anxiety Scale.

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INTRODUCTION

High dental fear affects approximately one in six Australian adults[1,2] and this prevalence figure is similar to that of many Western countries around the world.[3–7] Among some sub-groups of the population, such as middle-aged women, the prevalence of high dental fear may be as high as one in three individuals.[1] The impact that this relatively high level of dental fear in the community can have is appreciable. First, people with high dental fear are much more likely to delay or avoid dental visiting,[1,8–10] and a number of fearful people regularly cancel or fail to show for appointments. Second, people with high dental fear, children and adults, may prove difficult to treat, require more time, and present with behavioural problems which can result in a stressful and unpleasant experience for both the patient and treating dental practitioner. Research indicates that trying to manage patients with dental fear is a source of considerable stress for many dentists.[11] Finally, dentally anxious individuals, because of their avoidant behaviours, often have poorer dental health.[12,13] In particular, those people who delay dental visiting for a prolonged time, even if experiencing considerable pain, might have extensive problems that require more complex and complicated treatment.

If patients are not managed appropriately, it is quite possible to establish what has been referred to as a vicious cycle of dental fear.[14,15] Patients avoid making dental visits because of their fear, which results in a worsening of problems, requiring more intensive and potentially traumatic treatment, which then reinforces or exacerbates the fear, which leads to continued avoidance.[16] In Australia, estimates suggest that about 40% of people with high dental fear fit the vicious cycle profile.[17] In this scenario, the patient, the dental practitioner and the dental care system all lose out.

Given the negative impact of dental fear for all concerned, it is important that patients with dental fear are managed correctly. Like many countries, Australia does not have an established referral pathway for patients identified with dental fear. Certainly, the needs of some patients with high levels of dental fear might best be met if they first receive psychological treatment in a non-dental setting. Additionally,

A guide to taking a patient's history

Lloyd H, Craig S (2007) A guide to taking a patient's history. *Nursing Standard*. 22, 13, 42-48.
Date of acceptance: August 24 2007.

Summary

This article outlines the process of taking a history from a patient, including preparing the environment, communication skills and the importance of order. The rationale for taking a comprehensive history is also explained.

Authors

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Keywords

Assessment; Communication; History taking

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TAKING A PATIENT history is arguably the most important aspect of patient assessment, and is increasingly being undertaken by nurses (Crumbie 2006). The procedure allows patients to present their account of the problem and provides essential information for the practitioner.

Nurses are continually expanding their roles, and with this their assessment skills. It is likely that history taking will be performed by a nurse practitioner or specialist nurse, although it can be adapted to most nursing assessments. The history is only one part of patient assessment and is likely to be undertaken in conjunction with other information gathering techniques, such as the single assessment process, and nursing assessment.

History taking for assessment of healthcare needs is not new. Many nursing theorists have examined health deficits (Henderson 1966, Roper *et al* 1990, Orem 1995), all of which rely on careful assessment of patients' needs. Other nursing theorists identified interaction theories (Peplau 1952, Orlando 1961, King 1981), which sought to develop the relationship between the patient and the nurse through systematic assessment of health.

This article provides the reader with a framework in which to take a full and comprehensive history from a patient.

Preparing the environment

The first part of any history-taking process and, indeed, most interactions with patients is preparation of the environment. Nurses can encounter patients in a variety of environments: accident and emergency; general wards; department areas; primary care centres; health centre clinics and the patient's home. It is important that the environment in practical terms is accessible, appropriately equipped, free from distractions and safe for the patient and the nurse (Crouch and Meurier 2005).

Respect for the patient as an individual is an important feature of assessment, and this includes consideration of beliefs and values and the ability to remain non-judgemental and professional (Rogers 1951). Respect also involves maintenance of privacy and dignity; the environment should be private, quiet and ideally, there should be no interruptions. When this is not possible the nurse should do everything possible to ensure that patient confidentiality is maintained (Crouch and Meurier 2005).

It is essential to allow sufficient time to complete the history. Not allowing enough time can result in incomplete information, which may adversely affect the patient's care.

Communication

The importance of taking a comprehensive history cannot be overestimated (Crumbie 2006). The nurse should be able to gather information in a systematic, sensitive and professional manner. Good communication skills are essential.

Introducing yourself to the patient is the first part of this process. It is important to let patients tell their story in their own words while using active listening skills. It is also important not to appear rushed, as this may interfere with the patient's desire to disclose information (Hurley 2005). Developing a rapport with the patient includes being professionally friendly, showing interest and actively using both non-verbal and verbal communication skills (Mehrabian 1981) (Box 1).

Practitioners should avoid the use of technical terms or jargon and, whenever possible, use the patient's own words.

EDITORIAL

The importance of collecting patients' medical histories

Clinicians from all disciplines and backgrounds agree that prior to any emergency or routine treatment, a proper diagnosis should be made. This is usually done during the initial interactions with the patient by gathering all the diagnostic information necessary to develop a treatment plan.

Thorough patient interviews that include details of any current conditions as well as the patient's medical history are essential for a proper diagnosis and successful treatment. Many dentists rely on questionnaires patients fill out prior to the appointment, which is extremely efficient in utilizing the time spent in the waiting room. However, I highly recommend that the dentist, assistant, or nurse review the form with the patient.

Some patients do not realize the importance their medical history bears in dental treatment. For example, some might regard controlled hypertension as no hypertension, without knowing that the medication taken to control the disease may interact with local anesthesia containing vasoconstrictors. Another example is a patient who had a malignant disease and underwent treatment, but is considered cured at the time of the dental appointment. The patient may not disclose this information; however, the treatment he or she is exposed to may have permanent adverse effects, such as hyposalivation (radiation-induced), hypothyroidism, and more.

In addition to the dental and periodontal examinations, the physical exam should also include a complete intra- and extraoral head and neck examination evaluating the oral mucosa, lymph nodes, muscles, and temporomandibular joint.

An excellent example that emphasizes the importance of the head and neck examination as well as the personal interview is the diagnosis of dental pain induced by maxillary sinusitis. The diagnosis is easy when the teeth are intact and no dental pathology can be detected. However, it becomes challenging when the scenario is unclear: premolars with large restorations and no conclusive vitality tests, previous root canal treatment, or periodontal pockets. Nevertheless, evidence of infraorbital area hypersensitivity, a history of headaches, or increased pain during movement can lead to diagnostic radiographs of the teeth and maxillary sinuses.

These exams are unquestionably part of the dentist's responsibility and may affect dental treatment. The decision regarding which radiographs and other special tests (ie, biopsies) to use should be made only after careful physical examination.

Eli Eliav
Editor-in-Chief

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RESEARCH ARTICLE

Importance of taking Anamnesis in Dentistry and Assessment of Knowledge and Attitudes of Dental Students

[1]Beste Inceoglu, [2]Elif Naz Yakar, [3]Naile Cura, [4]Hakan Eren, [5]Sebahat Gorgun

ABSTRACT

Aim: The medical history (anamnesis) of a patient is information gained by a physician by asking specific questions, either of the patient or of other people who know the person and can give suitable information. The purpose of the study is to describe the significance level of taking anamnesis among dentists and dentistry students.

Materials and methods: In our study, we designed a self-administered anonymous questionnaire (Fig. 1) consisting of 26 questions which was addressed voluntarily to 332 (208 female, 124 male) students and dentists at the Ankara University, Faculty of Dentistry. Answers were evaluated statistically according to five-point scale. Data were analyzed using the statistical software package SPSS 15.0 (IBM, New York, NY).

Results: Significant differences were found between the responses of male and female participants for some of the questions. On the other hand, all participants knew about the relationship between the ethical-legal issues and taking systemic anamnesis. Results of the study show that participants are aware of the importance of malpractice lawsuits.

Conclusion: According to the results of our study, we found that dentist-patient relationship is strengthened with increasing experience. The ability to reflect on the encounter and learning from the experience is an important component in developing self-awareness and professionalism in dentistry.

Keywords: Medical history, Anamnesis, Dental education.

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INTRODUCTION

The medical history (anamnesis) of a patient is that 'information obtained by a physician by asking specific questions; either of the patient or of other people who know the person and can give suitable information, with the aim of obtaining information useful in formulating a diagnosis and providing medical care to the patient'.[1] Anamnesis varies in their dept and focus. Systemic, familiar, dental, present, sexual, social (occupation, drug use) are types of anamnesis.[2]

Taking a medical history in dentistry is an important tool in the detection of medical problems of patients.[3] Assessment of the patient's general health before any dental approach is necessary to identify any systemic conditions, which may affect treatment procedure and allow the dentist to evaluate the risks and reduce possible complications.[4] The purpose of dental treatment is to satisfy patient's needs. The success of the treatment is built upon careful medical anamnesis taken with a clinical examination for diagnosis of the problem that has been presented. Anamnesis is not only a wise approach to medical history but also, it is essential for the establishment of a successful dentist-patient relationship. If dentist cannot take a detailed anamnesis, an accurate diagnosis cannot be formulated and dental treatment may increase the risk of acute medical complications.

Patients are sometimes not satisfied with the treatment that performed by dentists. In most cases, such dissatisfaction can be resolved with mutual conversation of patient and dentist, but sometimes the patient resorts to a legally judicial authority where judge whether the complaint is reasonable and, if necessary, can take subsequent action against the dentist.[5] General description of dental malpractice that is consistent among countries would be described as medical malpractice for an injury due to negligent dental work, failure to diagnose or treat possible precarious oral conditions, delayed diagnosis or treatment of oral disease or other precarious oral conditions, as well as any malevolent or otherwise intentional misconduct on the dental professional's part.[6] Therefore, well-kept medical history is important for ethical and legal aspects in dentistry. Dentists always must avoid harm to the patient and establish a balance with the helpful principles. This situation is not just a legal responsibility, but also an ethical principle. The well-compatibility between dentists, patients and their relatives protects the dentist from possible difficulties.[7,8]

The purpose of this article is to describe the significance level of taking anamnesis among dentists and dentistry students and getting the knowledge, attitudes and behaviors,

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SECTION E

DIAGNOSIS

16 HISTORY AND PHYSICAL EXAMINATION

J. LUCIAN DAVIS, MD • JOHN F. MURRAY, MD

INTRODUCTION

Taking a careful and complete history and performing a thorough physical examination are hallmarks of the good internist and one of the distinguishing characteristics of a master clinician. The initial visit sets the tone of the immediate and future relationship with the patient and begins the process of diagnosing and managing the illness; it is a dynamic encounter, with each of the patient's responses stimulating further probing and forming of diagnostic hypotheses. The physician must be attentive to the patient's story, piecing together each bit of evidence to form a tentative preliminary diagnosis and differential diagnoses. Nothing should escape the eyes and ears of a watchful diagnostician. History taking is more than information gathering: it affords the opportunity to decipher the patient's body language as the inquiry proceeds. At this stage, no symptom or circumstance should be disregarded. With an understanding of biology and medicine coupled with past experience, the physician tries to connect the salient parts of the patient's story to develop a plausible explanation of the physiologic or pathologic events that lead to illness.

Although striving for a single diagnosis, the physician should realize that more than one disease may be present and that rare diseases are diagnosed only by those who consider them. Nevertheless, the maxim "uncommon presentations of common diseases are more frequent than common presentations of uncommon diseases" is likely to be true. It is important to continue both to gather information and to be open to reforming the diagnostic hypothesis as more information becomes available. Premature judgment or the failure to continue considering reasonable alternatives after an initial diagnosis is made is the single most common diagnostic error.[1,2] In the field of decision science, these failures are postulated to arise from "cognitive dispositions to respond" and include several of the biases in judgment or reasoning defined in Table 16-1.[3] It is hypothesized that a greater awareness of these prejudices among clinicians may facilitate "cognitive debiasing," thereby reducing the frequency of these common errors of reasoning.[4] An alternative or potential complementary approach is to use decision-support software to expand the differential diagnosis and avoid overlooking unusual or severe conditions.[5]

Bayes theorem implies that diagnostic tests will have a higher yield if the prior probability of the diagnosis is high (also called pretest probability). Specific details from the history raise the probability of different diagnoses and direct further tests in a productive manner. Further diagnostic investigations—imaging, blood tests, pulmonary function studies, and even parts of the physical examination—depend on the history. Historical clues raise or lower probabilities, thereby improving the value of subsequent questions and evaluations. Test results plus findings from the history and physical examination may confirm or refute the main and differential diagnoses, setting up either a management plan or the need for an alternative hypothesis.

At the end of the initial evaluation, the assessment and plan should identify problems and a course of action that

Review Article

Physical signs in patients with chronic obstructive pulmonary disease

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ABSTRACT

We reviewed the various physical signs of chronic obstructive pulmonary disease, their pathogenesis, and clinical importance. We searched PubMed, EMBASE, and the CINAHL from inception to March 2018. We used the following search terms: chronic obstructive pulmonary disease, physical examination, purse-lip breathing, breath sound intensity, forced expiratory time, abdominal paradox, Hoover's sign, barrel-shaped chest, accessory muscle use, etc. All types of studies were chosen. Globally, history taking and clinical examination of the patients is on the wane. One reason can be a significant development in the field of medical technology, resulting in overreliance on sophisticated diagnostic machines, investigative procedures, and medical tests as first-line modalities of patient's management. In resource-constrained countries, detailed history taking and physical examination should be emphasized as one of the important modalities in patient's diagnosis and management. Declining bedside skills and clinical aptitude among the physician is indeed a concern nowadays. Physical diagnosis of chronic obstructive pulmonary disease (COPD) is the quickest and reliable modalities that can lead to early diagnosis and management of COPD patients. Bedside elicitation of physical signs should always be the starting point for any diagnosis and therapeutic approach.

KEY WORDS: Accessory muscle use, barrel-shaped chest, chronic obstructive pulmonary disease, Hoover's sign, physical examination, purse-lip breathing

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common, preventable, and treatable disease characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.[1] COPD is a major global public health issue because of its high prevalence, morbidity, and mortality.[2,3] The socioeconomic impact of COPD is also substantial.[4] Adeloye *et al*.[2] in a systematic review and meta-analysis reported a global prevalence of spirometry-defined COPD of 11.7%. According to the World Health Organization report, more than 3 million people died of COPD in 2012 and majority of the deaths occurred in developing countries.[3] The mortality due to COPD is rising, and it is expected to become the third leading cause of death globally by 2030.[5] Underdiagnosis of COPD is a global phenomenon. Lamprecht *et al*.[6] had shown that 81.4% of (spirometrically defined) COPD cases remain undiagnosed. Solution to the problem of underdiagnosis lies with proper planning and implementation of strategies

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Diagnosis and Management of Polycythemia Vera

Proceedings from a Multidisciplinary Roundtable

By Lisa A. Raedler, PhD, RPh

A multidisciplinary roundtable was convened on May 29, 2014, to gain insight and guidance from experts on the diagnosis and management of polycythemia vera (PV), including practical strategies, recent advances, and the emerging science. The roundtable was comprised of 10 experts in relevant fields: hematology, oncology, managed care, specialty pharmacy, translational research, and oncology nursing/nurse navigation. This supplement highlights the discussions and recommendations of the experts who participated in this meeting, with the overarching goal being to improve outcomes by enhancing the quality, delivery, and continuum of care for patients with PV.

Clinical Aspects of Polycythemia Vera

Natural history and presentation

Like myelofibrosis (MF) and essential thrombocythemia (ET), PV is a Philadelphia chromosome–negative myeloproliferative neoplasm (MPN).[1] PV is characterized by clonal stem-cell proliferation of red blood cells (RBCs), white blood cells (WBCs), and platelets.[2,3] Increased RBC mass results in hyperviscosity of the blood, increased risk for thrombosis, and a shortened life expectancy.[4] Effective management of PV is essential, given the risk for morbidity and mortality, complexity associated with diagnosis and treatment, and overall impact on patients' quality of life (QOL).

According to the World Health Organization (WHO) classification scheme for myeloid neoplasms, PV is a BCR-ABL1–negative MPN.[5] MPNs share several common features[6-8]:

- Clonal involvement of a multipotent hematopoietic progenitor cell
- Marrow hypercellularity with effective hematopoiesis (compared with ineffective hematopoiesis, as in myelodysplastic syndrome)
- Extramedullary hematopoiesis; enlarged spleen and/or liver
- Thrombotic and hemorrhagic diathesis
- Potential evolution to MF, as well as to acute myeloid leukemia (AML).

The incidence of PV is higher among men than among women in all races and ethnicities, with rates of approximately 2.8 per 100,000 men and approximately 1.3 per 100,000 women.[3] Based on several small studies, the prevalence of PV is approximately 22 cases per 100,000 population.[3] PV is typically diagnosed in persons 60 to 65 years of age, and the disorder is relatively uncommon among individuals younger than 30 years. The condition is observed more often among Jews of Eastern European descent than among other European populations and Asians.[3]

Approximately 96% of patients with PV have a mutation of the Janus kinase 2 (*JAK2*) gene.[9] *JAK2* is involved directly in intracellular signaling in PV progenitor cells, a process that occurs after exposure to cytokines to which these cells are hypersensitive.[10]

The course of PV is variable. Some patients exhibit few symptoms, such that the condition is discovered only after blood work is performed during a routine medical examination. In other patients, signs, symptoms, and complications of PV arise from the high number of RBCs and platelets in the blood.[3] In patients with milder symptoms, PV can persist for many years without distinct stages or clear progression.[5] Other patients will evolve to post-PV MF, which occurs at a rate of up to 10% of patients every 10 years.[11] Transformation to AML has been observed at a rate of up to 15% of patients with PV every 10 years.[12]

Symptoms of PV stem primarily from high RBC counts, which result in increased blood viscosity, and from high platelet counts, which can contribute to the formation of thrombi. Along with underlying vascular disease, which is common among older persons with PV, the risk for such clotting complications as stroke, heart attack, deep vein thrombosis, and pulmonary embolism is enhanced among persons with the disorder. Blood clots occur in about 30% of patients before a PV diagnosis is made.[3] During the first 10 years after diagnosis, 40% to 60% of patients with untreated PV may develop blood clots.[3]

Thrombotic complications can be divided into 2 categories—microvascular and macrovascular. Microvascular complications, or microcirculatory disturbances, are caused by the formation of thrombi in small blood vessels and can result in the signs and symptoms shown in **Table 1**.[13-15] Macrovascular complications, which are serious events caused by the development of thrombi in large arteries or veins, are often referred to as major thrombot-

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Metemoglobinemia: do Diagnóstico ao Tratamento*

Methemoglobinemia: from Diagnosis to Treatment

Tatiana Souza do Nascimento[1], Rodrigo Otávio Lami Pereira, TSA[2], Humberto Luiz Dias de Mello, TSA[3], José Costa, TSA[4]

RESUMO

Nascimento TS, Pereira ROL, Mello HLD, Costa J — Metemoglobinemia: do Diagnóstico ao Tratamento.

JUSTIFICATIVAS E OBJETIVOS*: A metemoglobina é a forma oxidada da hemoglobina, que além de não se ligar ao oxigênio, aumenta a afinidade deste pela porção parcialmente oxidada da hemoglobina. A concentração aumentada da metemoglobina no sangue decorre de alterações congênitas e de exposição a agentes químicos diversos, resultando em quadro com múltiplos diagnósticos diferenciais, que se não tratado pode levar ao óbito. Foi feita revisão sobre o assunto, dando ênfase às informações relevantes para o manuseio clínico dos pacientes.*

CONTEÚDO*: Quando a concentração sangüínea de metemoglobina está acima de 1,5% surge a cianose, característica principal da doença. Os pacientes apresentam sangue arterial de coloração marrom-escuro com a PaO_2 normal. O diagnóstico deve ser suspeitado em pacientes que apresentem cianose e baixa leitura de saturação ao oxímetro de pulso (SpO_2), sem que haja comprometimento cardiopulmonar significativo. A co-oximetria é o método padrão-ouro e define o diagnóstico. No tratamento dos pacientes devem ser considerados o caráter agudo ou crônico da síndrome (etiologia) e a gravidade dos sintomas. A concentração sangüínea de metemoglobina é importante, sobretudo nos casos agudos. O tratamento básico consiste na remoção do agente causador, administração de oxigênio e observação. Casos graves devem ser tratados com azul-de-metileno, antídoto específico, porém ineficaz em algumas situações.*

CONCLUSÃO*: A metemoglobinemia é condição potencialmente grave, cujo diagnóstico depende do alto grau de suspeição. Em geral, os anestesiologistas, no período perioperatório, são os primeiros a detectarem o problema e devem liderar a condução do tratamento.*

Unitermos: COMPLICAÇÕES: metemoglobinemia; MONITORIZAÇÃO: oximetria de pulso, co-oximetria.

SUMMARY

Nascimento TS, Pereira ROL, Mello HLD, Costa J — Methemoglobinemia: from Diagnosis to Treatment.

BACKGROUND AND OBJECTIVES: *Methemoglobin is the oxidized form of hemoglobin, which does not bind oxygen and increases the affinity of oxygen for the partially oxidized portion of hemoglobin. Increased levels of methemoglobin in the blood are secondary to congenital changes and exposure to several chemical agents, resulting in a disorder with several differential diagnoses, which it can lead to death if it is not treated. The objective of this report was to review this subject, emphasizing relevant information for the clinical management of patients with methemoglobinemia.*

CONTENTS: *When the concentration of methemoglobin in the blood is above 1.5%, the patient develops cyanosis, the main characteristic of this disorder. The color of the arterial blood changes to dark brown with normal PaO_2. One should suspect the diagnosis in patients with cyanosis and low saturation (SpO_2) without significant cardiopulmonary dysfunction. Co-oximetry is the gold standard and defines the diagnosis. Treatment should be based on whether the syndrome is acute or chronic (etiology) and on the severity of symptoms. Blood levels of methemoglobin are important, especially in acute cases. Basic treatment includes removal of the agent responsible for the disorder, administration of oxygen, and observation. Severe cases should be treated with the specific antidote, methylene blue, which is not effective in some situations.*

CONCLUSIONS: *Methemoglobinemia is a potentially severe disorder, whose diagnosis depends on a high degree of suspicion. In general, anesthesiologists are the first to detect the problem in the preoperative period and should lead the treatment.*

Key Words: COMPLICATIONS: methemoglobinemia; MONITORING: pulse oximetry, co-oximetry.

INTRODUÇÃO

A metemoglobinemia (MetHba) é síndrome clínica causada pelo aumento da concentração de metemoglobina (MetHb) no sangue [1], que ocorre tanto por alterações congênitas (crônicas) na síntese ou no metabolismo da hemoglobina (Hb), como em situações agudas de desequilíbrio nas reações de redução e oxidação (desequilíbrio redox) induzidas pela exposição a agentes químicos diversos [2,3]. A principal característica da MetHba é cianose central, que não responde à oxigenoterapia [4-7], podendo levar à diminuição da oferta de oxigênio (DO_2). Com prevalência de difícil estimativa, abrangendo casos leves provavelmente subdiagnosticados e casos fatais, a MetHba muitas vezes se apresenta no período perioperatório, devendo ser do conhecimento de todo o anestesiologista.

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Hyperosmolar Hyperglycemic State: A Historic Review of the Clinical Presentation, Diagnosis, and Treatment

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REVIEW

The hyperosmolar hyperglycemic state (HHS) is the most serious acute hyperglycemic emergency in patients with type 2 diabetes. von Frerichs and Dreschfeld described the first cases of HHS in the 1880s in patients with an "unusual diabetic coma" characterized by severe hyperglycemia and glycosuria in the absence of Kussmaul breathing, with a fruity breath odor or positive acetone test in the urine. Current diagnostic HHS criteria include a plasma glucose level >600 mg/dL and increased effective plasma osmolality >320 mOsm/kg in the absence of ketoacidosis. The incidence of HHS is estimated to be <1% of hospital admissions of patients with diabetes. The reported mortality is between 10 and 20%, which is about 10 times higher than the mortality rate in patients with diabetic ketoacidosis (DKA). Despite the severity of this condition, no prospective, randomized studies have determined best treatment strategies in patients with HHS, and its management has largely been extrapolated from studies of patients with DKA. There are many unresolved questions that need to be addressed in prospective clinical trials regarding the pathogenesis and treatment of pediatric and adult patients with HHS.

The hyperosmolar hyperglycemic state (HHS) is a syndrome characterized by severe hyperglycemia, hyperosmolality, and dehydration in the absence of ketoacidosis. The exact incidence of HHS is not known, but it is estimated to account for <1% of hospital admissions in patients with diabetes (1). Most cases of HHS are seen in elderly patients with type 2 diabetes; however, it has also been reported in children and young adults (2). The overall mortality rate is estimated to be as high as 20%, which is about 10 times higher than the mortality in patients with diabetic ketoacidosis (DKA) (3–5). The prognosis is determined by the severity of dehydration, presence of comorbidities, and advanced age (4,6,7). Treatment of HHS is directed at replacing volume deficit and correcting hyperosmolality, hyperglycemia, and electrolyte disturbances, as well as management of the underlying illness that precipitated the metabolic decompensation. Low-dose insulin infusion protocols designed for treating DKA appear to be effective; however, no prospective randomized studies have determined best treatment strategies for the management of patients with HHS. Herein, we present an extensive review of the literature on diabetic coma and HHS to provide a historical perspective on the clinical presentation, diagnosis, and management of this serious complication of diabetes.

History of Diabetic Coma and HHS

In 1828, in the textbook *Versuch einer Pathologie und Therapie des Diabetes Mellitus*, August W. von Stosch gave the first detailed clinical description of diabetic coma in an

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The view from here

The olfactory examination: a waft of disease

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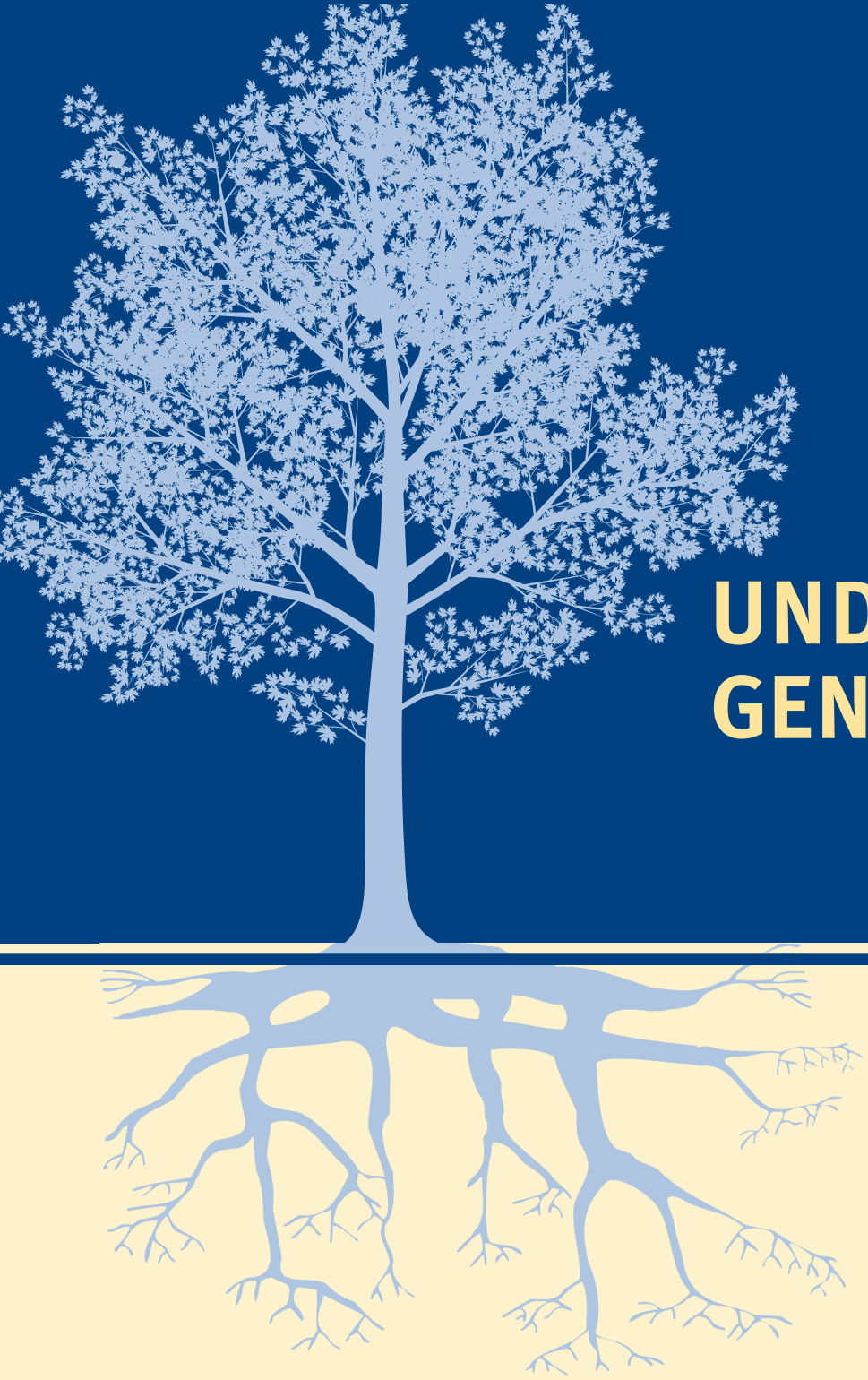
We recently spent a year working in South Africa. Learning opportunities were abundant: in particular our surgical skills developed rapidly. However, there was one lesson we couldn't have predicted learning, which we think is relevant to clinical practice the world over. This was the use of smell as a diagnostic tool.

Our discussion regarding the clinical use of smell evolved from a conversation about a surgical patient, who had a gunshot wound to the abdomen. During initial surgery, an injury to the splenic flexure of the colon was found and repaired. Postoperatively the patient didn't improve as expected, and a missed injury was suspected. He was taken for a second laparotomy. On opening the abdomen, the foul, overpowering stench of faecal contamination of the peritoneal cavity led us to search for a missed bowel injury – which was found. After repairing this, we washed out the abdomen, and as the smell of faeces dissipated, the unmistakable smell of urine arose – the kind of strong odour smelled in a public toilet. So we searched for, and found, a missed ureteric injury.

This incident led us to think of all the other clinical smells we have subconsciously learned to recognise and associate with diseases: the tangy, fruity smell of diabetic ketoacidosis; the rotting, pungent smell of gangrene; the overpowering 'muddy' and meaty smell of melaena. The arrival of a polytrauma patient could be smelled from a distance from the notes of blood, alcohol and petrol. And both authors have been inclined to prescribe antibiotics upon recognition of the noxious, rubbery smell of a urinary tract infection alone.

At medical schools, systems such as 'look, feel, move' for the orthopaedic examination are used to teach a logical order for

There was one lesson we couldn't have predicted learning; the use of smell as a diagnostic tool



UNDERSTANDING GENETICS

A NEW YORK – MID-ATLANTIC GUIDE FOR PATIENTS AND HEALTH PROFESSIONALS

The New York – Mid-Atlantic Consortium for Genetic and Newborn Screening Services

Documentation Tips for Dentists

Donnaline Richman, B.S.N., M.N., J.D.

Documentation of the dental record is a crucial weapon in preventing and defending dental malpractice claims and litigation. Further, good documentation is vital to the investigation and defense of allegations of professional misconduct by the Office of Professional Discipline. The dental record also plays an important role in justifying reimbursement claims made to patients' insurers.

The dental record is considered legal evidence; therefore, it must be accurate, complete, specific and unaltered. Below are tips to help you improve your documentation.

What Comprises the Dental Record?

A dental record must include sufficient information to justify the diagnosis and warrant the treatment plan. The dental record tells the story of the patient's dental care and treatment and how it was managed. The record must include, but may not be limited to:

1. The patient's demographic data, including financial information.
   - When treating a child whose siblings are also your patients, ask the parent for the child's name and date of birth *before* starting treatment. Confirm that you are treating the correct child!
2. The purpose of each visit, e.g., whether it was for regularly scheduled prophylaxis, an emergent problem or part of the patient's dental treatment plan.
3. A detailed medical/social and family history, including current medications and allergies to both medications and food.
   - Allergies must be noted prominently in the front of the record for easy identification by those who treat the patient.
   - When evaluating the patient's medical history, ask questions of the patient. Do *not* rely solely on the information the patient provided in writing. The patient may not be aware of which medications and medical conditions may impact his/her dental care and treatment.
   - If there is a question about the necessity for prophylactic antibiotic treatment, the patient's current medications or any part of the patient's medical history, ask the patient for written permission to contact the patient's primary care physician *before* commencing dental treatment. All conversations with the primary care physician must be documented in the patient's dental record.
4. Any documentation required by the patient's insurer to justify a claim for reimbursement.
5. The results of each dental examination. Do not chart "normal dental examination." Document both positive and negative findings. If a particular tooth is causing problems, identify it by number.
6. Your own assessment of the patient's dental condition. Do not rely upon someone else's assessment. Your assessment may be different and/or the patient's condition may have changed.
7. The dental diagnosis and a written treatment plan, including an estimate of costs associated with such treatment and any anticipated benefit notices received from the patient's insurer. Discuss the treatment plan and estimated costs with the patient and/or parent. Place a copy of the treatment plan in the patient's dental record and provide a copy to the patient. This can eliminate surprises months later.
   - The treatment plan must include the recommended treatment and costs associated with it, the reason why the treatment is recommended, the estimated number of visits required to complete the treatment, anticipated referrals to a specialist for any portion of the treatment and the alternatives to the proposed treatment, together with the costs associated with those alternatives.
8. Consultation reports, study models, photographs, X-rays. When you review consultation reports, initial and date them *before* placing them in the dental record.

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Review Article

Effect of Associated Autoimmune Diseases on Type 1 Diabetes Mellitus Incidence and Metabolic Control in Children and Adolescents

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Type 1 diabetes mellitus (T1DM) is one of the most common chronic diseases developing in childhood. The incidence of the disease in children increases for unknown reasons at a rate from 3 to 5% every year worldwide. The background of T1DM is associated with the autoimmune process of pancreatic beta cell destruction, which leads to absolute insulin deficiency and organ damage. Complex interactions between environmental and genetic factors contribute to the development of T1DM in genetically predisposed patients. The T1DM-inducing autoimmune process can also affect other organs, resulting in development of additional autoimmune diseases in the patient, thereby impeding diabetes control. The most common T1DM comorbidities include autoimmune thyroid diseases, celiac disease, and autoimmune gastritis; additionally, diabetes can be a component of PAS (Polyglandular Autoimmune Syndrome). The aim of this review is to assess the prevalence of T1DM-associated autoimmune diseases in children and adolescents and their impact on the course of T1DM. We also present suggestions concerning screening tests.

1. Introduction

Diabetes is the most common chronic metabolic disease diagnosed in children and adolescents. Although it is not contagious, the disease is the first and only condition regarded by the United Nations as an epidemic of the 21st century [1].

In most parts of the world, type 1 diabetes is the most prevalent chronic disease in the population under 18 years of age although there are no reliable data available from many countries. There are significant differences in the incidence of the disease among different countries, with the lowest rates reported from China and Venezuela (0,1 per 100 000 people per year) and the highest in Finland and Sardinia (37 per 100 000 people per year) [2].

The results of international research (DIAMOND and EURODIAB) reveal an increasing trend in diabetes prevalence in most regions of the world, with the highest growth dynamics in the youngest age group [2].

The global increase in T1DM prevalence is a well-known fact; the incidence of type 1 diabetes in children worldwide has been growing at a rate from 3 to 5% per year since the 1960s, with the highest rate reported from fast developing countries [3–7].

The background of T1DM is probably associated with the autoimmune process of destruction of pancreatic beta cells by autoantibodies, which leads to absolute insulin deficiency and organ damage. However, there is no evidence that the destruction of the pancreatic beta cells is caused by the autoantibodies. The etiopathogenesis of this disease is complex and multifactorial. Most probably, the presence of many factors initiating or modulating the immune response leads to development of the disease [8].

As reported by literature, genetic factors have a crucial effect on the development of T1DM [9].

Genetic predisposition is related to genes located in the major histocompatibility complex (MHC) on chromosome 6p21.3, accounting for at least 40% of the family history of the disease. Depending on the age of the disease onset, between 30% and nearly 50% of individuals with type 1 diabetes have a specific heterozygous genotype

Subclinical hypothyroidism: to treat or not to treat, that is the question! A systematic review with meta-analysis on lipid profile

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Abstract

Previous studies suggested that subclinical hypothyroidism has a detrimental effect on cardiovascular risk factors, and that its effective treatment may have a beneficial impact on overall health. The main purpose of this review and meta-analysis was to assess whether subclinical hypothyroidism treatment is of clinical relevance, based on cardiovascular risk parameters correction. A systemic research of the literature using MEDLINE tool was performed to identify the relevant studies. Only placebo-controlled randomized control trials were included. A quantitative analysis was also performed. This systematic review and meta-analysis of randomized placebo-controlled trials assess the different impact of levothyroxine vs placebo treatment. A significant decrease in serum thyroid-stimulating hormone and total and low-density lipoprotein cholesterol was obtained with levothyroxine therapy (66, 9 and 14%, respectively) and, although modest, this could be significant in terms of reduction of the incidence of coronary artery disease. Other significant results of lipid parameters were not obtained. This systematic review provides a strong evidence-based data in favour of specific changes and beneficial effects of levothyroxine treatment.

Key Words
- subclinical
- hypothyroidism
- treatment
- lipids

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Introduction

Subclinical hypothyroidism (SCH) is diagnosed biochemically when both serum-free thyroxine (FT4) and free triiodothyronine (FT3) are within the normal range, whereas the serum thyroid-stimulating hormone (TSH) is elevated (1). Although considered an asymptomatic disorder, some patients may present non-specific symptoms, which can be suggestive of hypothyroidism (2, 3). The prevalence of SCH in the population is relatively high, and it varies from between 4% and 20%. Furthermore, it depends on gender and age, usually occurring more frequently over the age of 60, with a prevalence of around 15% and 8% for women and men, respectively.

Thyroid dysfunction has significant public health consequences. Overt thyroid disorder has been widely recognized as being a cardiovascular risk factor, as it is associated with dyslipidaemia, insulin resistance, hypertension, inflammation, oxidative stress, endothelial dysfunction, coagulation disorders and, thus, atherosclerosis (4, 5). Recent studies suggest that this may also be true for SCH. In fact, a growing number of studies have associated SCH with an increased number of cardiovascular risk factors, including hypertension (6), weight gain (7), insulin resistance (8), hypercholesterolaemia, dyslipidaemia (9), and coronary and ischaemic heart diseases (10, 11).

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Vital Signs in Older Patients: Age-Related Changes

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Abstract

Vital signs are objective measures of physiological function that are used to monitor acute and chronic disease and thus serve as a basic communication tool about patient status. The purpose of this analysis was to review age-related changes of traditional vital signs (blood pressure, pulse, respiratory rate, and temperature) with a focus on age-related: a) molecular changes; b) organ system changes; c) systemic changes; d) altered compensation to stressors. The review found that numerous physiological and pathological changes may occur with age and alter vital signs. These changes tend to reduce the ability of organ systems to adapt to physiological stressors, particularly in frail older patients. Because of the diversity of age-related physiological changes and comorbidities in an individual, single-point measurements of vital signs have less sensitivity in detecting disease processes. However, serial vital sign assessments may have increased sensitivity, especially when viewed in the context of individualized reference ranges. Vital sign change with age may be subtle because of reduced physiological ranges. However, change from an individual reference range may indicate important warning signs and thus may require additional evaluation to understand potential underlying pathological processes. As a result, individualized reference ranges may provide improved sensitivity in frail, older patients.

Keywords

Aged; Vital Sign; Pulse; Blood Pressure

Introduction

The four traditional vital signs – pulse, temperature, blood pressure, and respiratory rate – are objective measurements of vital function1 and thus constitute a fundamental component of the physical exam and nursing assessment. Dysregulated organ system function as a result of age or age-associated pathophysiology, coupled with age-related loss of protective homeostatic mechanisms, suggests that among older patients vital sign response may not only deviate from normal ranges, but also remain confined to a range of values, unable to respond appropriately to stressors. Thus, healthcare professionals should pay special attention to vital signs in the elderly and perhaps expand the observation beyond the traditional vital signs in the frailest older patients.

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Original Article

Cardiovascular monitoring and its consequences in oral surgery

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ABSTRACT

Objective: Higher life expectancy has lead to an increase of elderly patients in dental practices, thus also causing an increase in high-risk cardiovascular patients. **Study Design:** In all, 3012 patients had oral surgery with local anesthesia at the Department of Oral Surgery, Oral Radiology and Oral Medicine at the University of Basel. The Colin BP 306 compact monitor was used during these surgeries. The patient's heart rate, blood pressure, and oxygen saturation were routinely checked, both before and during the procedure. **Results:** The oral surgical procedure had to be discontinued 17 times, because the patient developed significantly elevated blood pressure. Twice, the procedure had to be discontinued due to cardiac arrhythmia. The average age of these 19 patients was 63.5 years. **Conclusions:** Pre-and intraoperative monitoring allows the dentist to identify patients with high-risk diagnostic findings and to reduce problematic cardiovascular situations.

Keywords: Blood pressure measurement, high-risk patient, hypertension, monitoring

INTRODUCTION

All dental practices now have more high-risk patients, due to an increased life expectancy and more polymorbid patients. Age, ethnicity, and sex all play a role in determining the risk factors for hypertension.[1] If the patient has additional risk factors such as hypercholesterolemia, smoking, abnormal glucose tolerance, and/or left ventricular hypertrophy, hypertension becomes the main high-risk factor for cardiovascular complications.[2] Based on estimates, untreated hypertension reduces a patient's life expectancy by 10–20 years, and even slight hypertension—untreated for 10 years—increases the risk of complications such as apoplectic or cardiac insult.

Monitoring the patient's pulse, blood pressure and oxygen saturation before and during the oral surgical procedure allows the surgeon to identify patients with high-risk diagnostic findings and makes it possible to avoid difficult situations. In addition, the increased safety factor leads to a more relaxed surgical atmosphere. There are instruments that are suitable for a physician's practice and that can take ECGs (i.e., during intubation anesthesia), measure the patient's blood pressure, and his oxygen saturation level. Thus, a decrease in the patient's oxygen saturation level during local anesthesia with or without premedication before the first clinical symptoms manifest themselves can be detected.[3,4] Preoperative blood pressure measurements enable a specific treatment and reduce potential complications that can occur throughout the daily routine of the dental practice. An example for this would be to inject local anesthesia to a hypotonic patient while he is laying down and to help him sit up slowly. If there is a problem, it is vitally important to be able to measure the patient's blood pressure to obtain some diagnostic findings. Especially for patients with circulation problems, and also in general, high blood pressure measurements can be an early warning sign for hypertension. A patient can have hypertension without having any symptoms. It increases the patient's morbidity and mortality risk and is usually discovered by chance.[2] If the patient was already diagnosed with hypertension, taking the patient's blood pressure in the dental office is important to help monitor the therapy in progress. If the patient's medication is insufficient, the dentist needs to refer the patient to his primary care physician or internist. If the patient's blood pressure is not

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REVIEW

Dental management in patients with hypertension: challenges and solutions

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Abstract: Hypertension is a chronic illness affecting more than a billion people worldwide. The high prevalence of the disease among the American population is concerning and must be considered when treating dental patients. Its lack of symptoms until more serious problems occur makes the disease deadly. Dental practitioners can often be on the frontlines of prevention of hypertension by evaluating preoperative blood pressure readings, performing risk assessments, and knowing when to consider medical consultation of a hypertensive patient in a dental setting. In addition, routine follow-up appointments and patients seen on an emergent basis, who may otherwise not be seen routinely, allow the oral health provider an opportunity to diagnose and refer for any unknown disease. It is imperative to understand the risk factors that may predispose patients to hypertension and to be able to educate them about their condition. Most importantly, the oral health care provider is in a pivotal position to play an active role in the management of patients presenting with a history of hypertension because many antihypertensive agents interact with pharmacologic agents used in the dental practice. The purpose of this review is to provide strategies for managing and preventing complications when treating the patient with hypertension who presents to the dental office.

Keywords: high blood pressure, dental, guidelines, inflammation, metabolic disease, blood pressure medicines

Introduction

Hypertension is known as the "silent killer" and affects 80 million adults older than 20 years in the US alone[1] and just <1 billion people worldwide.[1–3] By 2025, the number of patients diagnosed with hypertension is expected to be 1.56 billion.[3] Hypertension is responsible for >7 million deaths annually[4] and is one of the leading risk factors for cardiovascular disease mortality.[5] The disease is defined as systolic blood pressure (SBP) of 140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg, or any persons being currently prescribed antihypertensive medicine for the purpose of managing hypertension.[1,2,6] In addition, hypertension is defined as blood pressure readings elevated on at least two occasions with or without provocation.[1]

Hypertension is divided into two main categories: essential/primary hypertension and secondary hypertension.[7,8] Lack of identifiable causative factors for elevated blood pressure is known as essential or primary hypertension, making up ~90%–95% of all hypertensive cases. Secondary hypertension, for which there is an identifiable cause, affects 5%–10% of US adults who are diagnosed with hypertension.[2,7,9] Disorders associated with secondary hypertension include vascular diseases such as coarctation of the aorta and systemic diseases such as Cushing's syndrome; obstructive sleep apnea; adrenal medullary dysfunction;

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Vital Sign Assessment

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Definition/Introduction

Vital signs are an objective measurement for the essential physiological functions of a living organism. They have the name "vital" as their measurement and assessment is the critical first step for any clinic evaluation. The first set of clinical examinations is an evaluation of the vital signs of the patient. The basis of patient triage in an urgent care /prompt care or an emergency room is on their vital signs as it tells the physician the degree of derangement that is happening from the baseline. Healthcare providers must understand the various physiologic and pathologic processes affecting these sets of measurements and their proper interpretation. If we use a triage method where we select patients without determining their vital signs, it may not give us a reflection of the urgency of the patient's presentation.[1] The degree of vital sign abnormalities may also predict the long-term patient health outcomes, return emergency room visits, and frequency of readmission to hospitals, and utilization of healthcare resources.

Traditionally the vital signs consist of temperature, pulse rate, blood pressure, and respiratory rate. Even though there are a variety of parameters that may be useful along with the traditional four vital sign parameters, studies have only found pulse oximetry and smoking status to have significance in patient outcomes.[2] Pulse oximetry sometimes helps to clarify the patient's physiological functions, which would sometimes be unclear by checking just the traditional vital signs. The inclusion of smoking status has the premise that the patient will be provided counseling by the provider on quitting smoking. In the past, some health care systems in the United States had used "pain as the fifth vital sign'. This approach is being abandoned due to the unintended opioid crises that the country is currently facing.[3]

Issues of Concern

Patient safety is a fundamental concern in any health care organization, and early detection of any clinical deterioration is of paramount importance whether the patient is in the emergency department or on the hospital floor. The early detection of changes in vital signs typically correlates with faster detection of changes in the cardiopulmonary status of the patient as well as up-gradation of the level of service if needed. Vital signs assessment currently uses electronic equipment, but there is evidence that, outside of the intensive care units, respiratory rate assessment through observation, leading to insufficient, subjective, and unreliable results.[4]

In a case-control study conducted by Rothschild and colleagues, early warning criterion among patients on the medical floor, the presence of respiratory rate over 35/min least (OR=31.1) was most strongly associated with a life-threatening adverse event.[5] Early warning score (EWS) tools, mostly using vital sign abnormalities, are critical in predicting cardiac arrest and death within 48 hours of measurement, even though the effect on in-hospital health outcomes and utilization of resources remains unknown.[5]

It seems intuitive that the higher the frequency of vital sign measurement, the faster the chances of clinical deterioration are detected. There is variability between institutes within and across nations depending on the acuity of clinical condition, any active intervention carried out, the amount of staff availability, cost issues, organizational

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RESEARCH

An evaluation of knowledge and practices toward the basic life support/ cardiopulmonary resuscitation among undergraduate dental students

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ABSTRACT

Introduction: Life-threatening emergencies may occur in dental practices. The objective of this study was to evaluate knowledge towards basic life support (BLS)/cardiopulmonary resuscitation (CPR) and its practices among dental undergraduate students. **Methodology:** An educational intervention study was carried out among 3rd and 4th year dental undergraduate students in an academic hospital located in Vadodara, Gujarat, India. For the purpose of the study, a questionnaire with 18 questions was developed, The intervention was done in the form of training and was divided into theoretical and practical parts. The questionnaire was distributed before and after training. **Results:** Overall, 93 undergraduate dental students were enrolled in the study. Of these 48 (51.6%) were 3rd year students, while 48.4% ($n = 45$) were in their 4th year of dental education. A significant difference was noted in the mean pre- and post-training scores on BLS/CPR knowledge amongst the 3rd (5.73 ± 1.94 vs. 12.04 ± 2.14; $P < 0.001$) and 4th year students (9.24 ± 2.22 vs. 12.56 ± 1.75; $P < 0.001$). **Conclusion:** Sensitization in the form of educational intervention led to remarkable improvement in knowledge about BLS/CPR.

Key Words: Basic life support, cardiopulmonary resuscitation, dental students, educational intervention

Introduction

Cardiopulmonary resuscitation (CPR) is an emergency procedure in which the heart and lungs are made to work by manually compressing the chest overlying the heart and forcing air into the lungs. Formally introduced in 1960, CPR is a simple and effective procedure that helps to sustain life in early critical minutes after cardiac and respiratory arrest [1]. In 1966, American Heart Association developed the first CPR guidelines [2]. The main aim of basic life support (BLS)/CPR is early recognition of sudden cardiac arrest and activation of the emergency response system. It has been proved that early access of emergency medical care can save significant lives around the globe [3-5].

Life-threatening emergencies may occur in dental practices. These are plausibly attributed to the risks associated with the administration of local anesthetics and the usage of dental materials that may induce a hypersensitivity reaction in select cohort of patients. Further, association of medical comorbidities such as hypertension, diabetes mellitus, and congestive heart failure may inherently predispose a risk for an adverse event [6]. In the event of a cardiac arrest, the absence of CPR reduces the chances of survival by 7%–10% every lost minute following arrest [7]. This reiterates the significance of CPR among health-care professionals including dentists and allied health professionals. Knowledge about appropriate CPR administration protocols can aid in averting life-threatening adverse events in dental practice, and stabilizing patients until definitive medical care can be instituted [8].

A Bulgarian study stated that 73% of dental students were self-confident in recognizing emergency medical situations but reported deficiency in practical skills relating to CPR/BLS [9]. Therefore, it is pertinent for dentists to be well versed with prevention and management of such emergencies in dental practices. Proper practices of technique of BLS/CPR are essential to effectively resuscitate a patient, and thereby require knowledge of the technique during dental undergraduate education [9]. To this effect, the current study sought to evaluate the awareness regarding BLS/CPR and its practical implementation among 3rd and 4th year dental undergraduate students.

Methodology

A cross-sectional study was conducted following approval from the Institutional Ethical Committee. The study participants included 3rd and 4th year dental students enrolled at our institute, a tertiary dental hospital and college located in Vadodara, Gujarat, India. The objectives of the study were explained, and all participants were assured that their

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Medical and dental emergencies and complications in dental practice and its management

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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.

Key words: Anaphylaxis, asthmatic attack, complications, local anesthetic toxicity, medical emergencies, syncope

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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 needless 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 anesthetic toxicity, asthmatic attack, chest pain, hemorrhage, and seizure. Myocardial infarction and cardiac arrest are extremely rare. Analysis of history and patient counseling and motivation also play a role in minimizing the emergencies.

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Preparing dental office staff members for emergencies

Developing a basic action plan

Daniel A. Haas, DDS, PhD

ABSTRACT

Background and Overview. A medical emergency can occur in any dental office, and managing it successfully requires preparation. The dentist should develop a basic action plan that is understood by all staff members. The goal is to manage the patient's care until he or she recovers fully or until help arrives. The most important aspect of almost all medical emergencies in dentistry is to prevent or correct insufficient oxygenation of the brain or heart. The dentist or a staff member needs to position (P) the patient appropriately. He or she then needs to assess and, if needed, manage the airway (A), breathing (B) and circulation (C). The dentist and staff members then can consider "D," which stands for definitive treatment, differential diagnosis, drugs or defibrillation. A team approach should be used, with each staff member trained in basic life support and understanding the role expected of him or her ahead of time. Clear and effective communication is essential during any emergency.

Conclusions. All staff members should understand the basic action plan so that they can put it into effect should any emergency arise in the dental office.

Clinical Implications. Preparing staff members is integral to the successful management of a medical emergency in the dental office.

Key Words. Medical emergencies; basic life support.

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The dentist's role in managing any medical emergency begins with prevention. This requires that all staff members, including dentists, dental hygienists, dental assistants and receptionists, be prepared for such emergencies. A team approach should be used,[1] and each staff member can play an important role. Appropriate preparation makes this teamwork effective and should improve the patient's chance of achieving a good result.[2,3]

How does one develop a basic action plan for an unforeseen event? There are numerous potential medical emergencies and numerous protocols to follow. Ideally, the dentist and support staff members should be knowledgeable about all of them. However, when an emergency first develops, the precise diagnosis may not be clear. Without a diagnosis, how can one formulate a treatment plan? This problem can be circumvented by following a key principle: the most important objective of nearly all medical emergencies in the dental office is to prevent or correct insufficient oxygenation of the brain or heart.

On a simple level, if a patient has lost consciousness, it is a result of a lack of oxygenated blood in the brain. If a patient is experiencing an episode of acute angina pectoris, it is a result of a relative lack of oxygenated blood to specific sites in the cardiac muscle. The management of all medical emergencies in a dental office should include

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The changes in cardiopulmonary resuscitation guidelines: from 2000 to the present

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This review aims to determine the changes made in the cardiopulmonary resuscitation (CPR) guidelines from 2000 to the present. The study was mainly undertaken by using International Guidelines from American Heart Association. The main change of CPR was chest compression skill. The guidelines have improved high-quality CPR through the change of chest compression skill. The latest adult CPR guidelines are as follows: (a) push chest quickly (100–120/min), (b) compress appropriately (5–6 cm), (c) relax chest fully (complete chest recoil), (d) avoid interruption of compression, and (e) avoid hyperventilation. The understanding of the latest CPR skills will be helpful in improving survival rate from sudden cardiac death.

Keywords: Cardiopulmonary resuscitation, Guideline, Cardiac arrest, Chest compression

INTRODUCTION

The major cause of cardiac arrest (CA) is cardiovascular in origin, and more often than not, it is unpredictable. In about 5 min after cessation of heartbeat, irrespective of its causes, brain cells start to deteriorate dramatically (Safar, 1986). Many people who experience CA eventually die; however, for survivors of CA, familial or social supports such as rehabilitations are provided because of the neurologic sequelae which can result from hypoxic brain damage (Boyce et al., 2019). So far, the only way to save a victim suffering from CA is cardiopulmonary resuscitation (CPR).

The definition of CPR is a skill that can revive the human body when the process of death begins. Resuscitation Medicine in the field of Emergency Medicine has developed for hundreds of years. In 1767, the first rescue organization named "Amsterdam Rescue Society" has been established in the Netherlands (Bierens, 2017). They have started rescuing drowned people in Amsterdam and saved 150 victims since the past 4 years (Trubuhovich, 2006).

The current methods of CPR were based on the ones formed in the 1950s. The American Academy of Science made the first guidelines for CPR in 1966 (Ad Hoc Committee on Cardiopulmonary Resuscitation, 1966). After that, two prominent societies, the American Heart Association in the US and the European Resuscitation Council in Europe have improved their own CPR guidelines respectively. These two societies formed the International Liaison Committee on Resuscitation (ILCOR) for the development of international guidelines in 1992. After 8 years, ILCOR created the "International Guidelines 2000 for CPR & ECC (emergency cardiovascular care)", which became the cornerstone that standardized various CPR methods worldwide. The guidelines are the basis of most currently existing CPR methods that are being used in in-hospital or out-of-hospital circumstances. Furthermore, the renewal of the guidelines has been announced every 5 years since 2000.

The guidelines have basic contents for laypersons as well as advanced contents for healthcare providers (Kleinman et al., 2015; Link et al., 2015). Laypersons are trained globally with basic guidelines in order for the trainees to be able to act as lifesavers. Accordingly, there have been many reports of people who received CPR training successfully resuscitating victims.

The international CPR guidelines have been revised 3 times since 2000, and the latest one was presented in 2015. Several basics in physiologic fundamentals and maneuvers of CPR have changed.

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Part 5: Adult Basic Life Support

2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Robert A. Berg, Chair; Robin Hemphill; Benjamin S. Abella; Tom P. Aufderheide; Diana M. Cave; Mary Fran Hazinski; E. Brooke Lerner; Thomas D. Rea; Michael R. Sayre; Robert A. Swor

Basic life support (BLS) is the foundation for saving lives following cardiac arrest. Fundamental aspects of BLS include immediate **recognition** of sudden cardiac arrest (SCA) and **activation** of the emergency response system, early **cardiopulmonary resuscitation** (*CPR*), and rapid **defibrillation** with an automated external defibrillator (*AED).* Initial recognition and response to heart attack and stroke are also considered part of BLS. This section presents the 2010 adult BLS guidelines for lay rescuers and healthcare providers. Key changes and continued points of emphasis from the 2005 BLS Guidelines include the following:

- Immediate recognition of SCA based on assessing unresponsiveness and absence of normal breathing (ie, the victim is not breathing or only gasping)
- "Look, Listen, and Feel" removed from the BLS algorithm
- Encouraging Hands-Only (chest compression only) CPR (ie, continuous chest compression over the middle of the chest) for the untrained lay-rescuer
- Sequence change to chest compressions before rescue breaths (CAB rather than ABC)
- Health care providers continue effective chest compressions/CPR until return of spontaneous circulation (ROSC) or termination of resuscitative efforts
- Increased focus on methods to ensure that high-quality CPR (compressions of adequate rate and depth, allowing full chest recoil between compressions, minimizing interruptions in chest compressions and avoiding excessive ventilation) is performed
- Continued de-emphasis on pulse check for health care providers
- A simplified adult BLS algorithm is introduced with the revised traditional algorithm
- Recommendation of a simultaneous, choreographed approach for chest compressions, airway management, rescue breathing, rhythm detection, and shocks (if appropriate) by an integrated team of highly-trained rescuers in appropriate settings

Despite important advances in prevention, SCA continues to be a leading cause of death in many parts of the world.[1] SCA has many etiologies (ie, cardiac or noncardiac causes), circumstances (eg, witnessed or unwitnessed), and settings (eg, out-of-hospital or in-hospital). This heterogeneity suggests that a single approach to resuscitation is not practical, but a core set of actions provides a universal strategy for achieving successful resuscitation. These actions are termed the links in the "Chain of Survival." For adults they include

- Immediate recognition of cardiac arrest and activation of the emergency response system
- Early CPR that emphasizes chest compressions
- Rapid defibrillation if indicated
- Effective advanced life support
- Integrated post–cardiac arrest care

When these links are implemented in an effective way, survival rates can approach 50% following witnessed out-of-hospital ventricular fibrillation (VF) arrest.[2] Unfortunately survival rates in many out-of-hospital and in-hospital settings fall far short of this figure. For example, survival rates following cardiac arrest due to VF vary from approximately 5% to 50% in both out-of-hospital and in-hospital settings.[3,4] This variation in outcome underscores the opportunity for improvement in many settings.

Recognition of cardiac arrest is not always straightforward, especially for laypersons. Any confusion on the part of a rescuer can result in a delay or failure to activate the emergency response system or to start CPR. Precious time is lost if bystanders are too confused to act. Therefore, these adult BLS Guidelines focus on recognition of cardiac arrest with an appropriate set of rescuer actions. Once the lay bystander recognizes that the victim is unresponsive, that bystander must immediately activate (or send someone to activate) the emergency response system. Once the healthcare provider recognizes that the victim is unresponsive with no breathing or no normal breathing (ie, only gasping) the healthcare provider will activate the emergency response system. After activation, rescuers should immediately begin CPR.

Early CPR can improve the likelihood of survival, and yet CPR is often not provided until the arrival of professional emergency responders.[5] Chest compressions are an especially critical component of CPR because perfusion during CPR

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ABC versus CAB for cardiopulmonary resuscitation: a prospective, randomized simulator-based trial

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Summary

QUESTIONS UNDER STUDY: After years of advocating ABC (Airway-Breathing-Circulation), current guidelines of cardiopulmonary resuscitation (CPR) recommend CAB (Circulation-Airway-Breathing). This trial compared ABC with CAB as initial approach to CPR from the arrival of rescuers until the completion of the first resuscitation cycle.
METHODS: 108 teams, consisting of two physicians each, were randomized to receive a graphical display of either the ABC algorithm or the CAB algorithm. Subsequently teams had to treat a simulated cardiac arrest. Data analysis was performed using video recordings obtained during simulations. The primary endpoint was the time to completion of the first resuscitation cycle of 30 compressions and two ventilations.
RESULTS: The time to execution of the first resuscitation measure was 32 ± 12 seconds in ABC teams and 25 ± 10 seconds in CAB teams (P = 0.002). 18/53 ABC teams (34%) and none of the 55 CAB teams (P = 0.006) applied more than the recommended two initial rescue breaths which caused a longer duration of the first cycle of 30 compressions and two ventilations in ABC teams (31 ± 13 vs.23 ± 6 sec; P = 0.001). Overall, the time to completion of the first resuscitation cycle was longer in ABC teams (63 ± 17 vs. 48 ± 10 sec; P <0.0001).
CONCLUSIONS: This randomized controlled trial found CAB superior to ABC with an earlier start of CPR and a shorter time to completion of the first 30:2 resuscitation cycle. These findings endorse the change from ABC to CAB in international resuscitation guidelines.

Key words: *cardiopulmonary resuscitation; randomized controlled trial; guideline adherence; ABC; CAB; simulation*

Abbreviations

ABC	Airway-Breathing-Circulation
CAB	Circulation-Airway-Breathing
CPR	cardiopulmonary resuscitation

Introduction

The acronym ABC stands for Airway-Breathing-Circulation while the acronym CAB stands for Circulation-Airway-Breathing. ABC has been the recommended approach to victims of cardiac arrests for decades [1–5]. In 2005, the guidelines of the European Resuscitation Council recommended the initiation of chest compressions before ventilation (i.e. CAB) [6, 7] while the guidelines of the American Heart Association continued to recommend the ABC approach with two rescue breaths preceding cardiac massage [8]. In the current 2010 version, both European and American guidelines jointly recommend CAB [9, 10]. The rationale for changing from ABC to CAB was to emphasize the priority of chest compressions and minimise delays to their execution [6, 7, 10]. As time consuming manoeuvres to facilitate ventilation such as positioning of the head and achieving a tight seal of a bag mask apparatus can be carried out in parallel to cardiac massage, the delay in ventilation due to CAB was hypothesized to be minimal [10].
No published human or animal data demonstrate that choosing ABC or CAB has an impact on outcome. Moreover, there is only limited evidence that CAB actually has the intended effect of minimising the delay to chest compression at the cost of a minimal delay in ventilation [11].
The difference between ABC and CAB is limited to the very beginning of cardiopulmonary resuscitation (CPR) efforts. A clinical study assessing this phase would be extremely difficult to conduct as monitoring equipment should be functional or an observer present at the very onset of a cardiac arrest. As medical simulation allows the recording of data from both "patient" and first responders right from the start of an event [11, 12], this technology is perfectly suited to investigate the very early phase of a cardiac arrest.
Accordingly, the aim of the present randomized controlled trial was to compare ABC with CAB in simulated cardiac arrests.

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RESEARCH ARTICLE Open Access

Technique for chest compressions in adult CPR

Taufiek K Rajab[1*], Charles N Pozner[2], Claudius Conrad[3], Lawrence H Cohn[4] and Jan D Schmitto[5]

Abstract

Chest compressions have saved the lives of countless patients in cardiac arrest as they generate a small but critical amount of blood flow to the heart and brain. This is achieved by direct cardiac massage as well as a thoracic pump mechanism. In order to optimize blood flow excellent chest compression technique is critical. Thus, the quality of the delivered chest compressions is a pivotal determinant of successful resuscitation. If a patient is found unresponsive without a definite pulse or normal breathing then the responder should assume that this patient is in cardiac arrest, activate the emergency response system and immediately start chest compressions. Contra-indications to starting chest compressions include a valid Do Not Attempt Resuscitation Order. Optimal technique for adult chest compressions includes positioning the patient supine, and pushing hard and fast over the center of the chest with the outstretched arms perpendicular to the patient's chest. The rate should be at least 100 compressions per minute and any interruptions should be minimized to achieve a minimum of 60 actually delivered compressions per minute. Aggressive rotation of compressors prevents decline of chest compression quality due to fatigue. Chest compressions are terminated following return of spontaneous circulation. Unconscious patients with normal breathing are placed in the recovery position. If there is no return of spontaneous circulation, then the decision to terminate chest compressions is based on the clinical judgment that the patient's cardiac arrest is unresponsive to treatment. Finally, it is important that family and patients' loved ones who witness chest compressions be treated with consideration and sensitivity.

Introduction

Chest compressions have saved the lives of countless patients in cardiac arrest since they were first introduced in 1960 [1]. Cardiac arrest is treated with cardiopulmonary resuscitation (CPR) and chest compressions are a basic component of CPR. The quality of the delivered chest compressions is a pivotal determinant of successful resuscitation [2]. In spite of this, studies show that the quality of chest compressions, even if delivered by healthcare professionals, is often suboptimal [2]. Therefore it is important that providers carefully familiarize themselves with this technique.

Indications

Chest compressions are generally indicated for all patients in cardiac arrest. Unlike other medical interventions, chest compressions can be initiated by any healthcare provider without a physician's order. This is based on implied patient consent for emergency treatment [3].

If a patient is found unresponsive without a definite pulse or normal breathing then the responder should assume that this patient is in cardiac arrest, activate the emergency response system and immediately start chest compressions [4]. The risk of serious injury from chest compressions to patients who are not in cardiac arrest is negligible [5], while any delay in starting chest compressions has grave implications for outcome. Due to the importance of starting chest compressions early, pulse and breathing checks were de-emphasized in the most recent CPR guidelines [4]. Thus, healthcare providers should take no longer than 10 seconds to check for a pulse. The carotid or femoral pulses are preferred locations for pulse checks since peripheral arteries can be unreliable.

Contraindications

In certain circumstances it is inappropriate to initiate chest compressions. A valid Do Not Resuscitate (DNR) order that prohibits chest compressions is an absolute contra-indication. DNR orders are considered by the attending physician on the basis of patient autonomy and treatment futility.

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European Resuscitation Council Guidelines for Resuscitation 2010 Section 2. Adult basic life support and use of automated external defibrillators

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Basic life support (BLS) refers to maintaining airway patency and supporting breathing and the circulation, without the use of equipment other than a protective device.[1] This section contains the guidelines for adult BLS and for the use of an automated external defibrillator (AED). It also includes recognition of sudden cardiac arrest, the recovery position and management of choking (foreign-body airway obstruction). Guidelines for the use of manual defibrillators and starting in-hospital resuscitation are found in Sections 3 and 4.[2,3]

Summary of changes since 2005 Guidelines

Many of the recommendations made in the ERC Guidelines 2005 remain unchanged, either because no new studies have been published or because new evidence since 2005 has merely strengthened the evidence that was already available. Examples of this are the general design of the BLS and AED algorithms, the way the need for cardiopulmonary resuscitation (CPR) is recognised, the use of AEDs (including the shock protocols), the 30:2 ratio of compressions and ventilations, and the recognition and management of a choking victim. In contrast, new evidence has been published since 2005 that necessitates changes to some components of the 2010 Guidelines. The 2010 changes in comparison with the 2005 Guidelines are summarised here:

- Dispatchers should be trained to interrogate callers with str protocols to elicit information. This information should focus the recognition of unresponsiveness and the quality of breathi In combination with unresponsiveness, absence of breathing any abnormality of breathing should start a dispatch protocol suspected cardiac arrest. The importance of gasping as sign of c diac arrest should result in increased emphasis on its recogniti during training and dispatch interrogation.
- All rescuers, trained or not, should provide chest compressio to victims of cardiac arrest. A strong emphasis on delivering hi quality chest compressions remains essential. The aim should to push to a depth of at least 5 cm at a rate of at least 100 co pressions per minute, to allow full chest recoil, and to minim interruptions in chest compressions. Trained rescuers shou also provide ventilations with a compression–ventilation ratio 30:2. Telephone-guided CPR is encouraged for untrained rescue who should be told to deliver uninterrupted chest compressio only.
- In order to maintain high-quality CPR, feedback to rescuers important. The use of prompt/feedback devices during CPR w enable immediate feedback to rescuers, and the data stored rescue equipment can be used to monitor the quality of CPR p formance and provide feedback to professional rescuers duri debriefing sessions.
- When rescuers apply an AED, the analysis of the heart rhyth and delivery of a shock should not be delayed for a period of CP however, CPR should be given with minimal interruptions befo application of the AED and during its use.
- Further development of AED programmes is encouraged—the is a need for further deployment of AEDs in both public and re dential areas.

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Part 1: Executive Summary

2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

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INTRODUCTION

The *2020 American Heart Association* (AHA) *Guidelines for Cardiopulmonary Resuscitation* (CPR) *and Emergency Cardiovascular Care* provides a comprehensive review of evidence-based recommendations for resuscitation and emergency cardiovascular care. The initial guidelines for CPR were published in 1966 by an ad hoc CPR Committee of the Division of Medical Sciences, National Academy of Sciences—National Research Council.[1] This occurred in response to requests from several organizations and agencies about the need for standards and guidelines regarding training and response.

Since then, CPR guidelines have been reviewed, updated, and published periodically by the AHA.[2–9] In 2015, the process of 5-year updates was transitioned to an online format that uses a continuous evidence evaluation process rather than periodic reviews. This allowed for significant changes in science to be reviewed in an expedited manner and then incorporated directly into the guidelines if deemed appropriate. The intent was that this would increase the potential for more immediate transitions from guidelines to bedside. The approach for this 2020 guidelines document reflects alignment with the International Liaison Committee on Resuscitation (ILCOR) and associated member councils and includes varying levels of evidence reviews specific to the scientific questions considered of greatest clinical significance and new evidence.

Over a half-century after the initial guidelines were published, cardiac arrest remains a leading cause of mortality and morbidity in the United States and other countries worldwide. As reported in the AHA "Heart Disease and Stroke Statistics—2020 Update," emergency medical services respond to more than 347 000 adults and more than 7000 children (less than 18 years of age) with out-of-hospital cardiac arrest (OHCA) each year in the United States.[10] In-hospital cardiac arrest (IHCA) is estimated to occur in 9.7 per 1000 adult cardiac arrests (approximately 292 000 events annually) and 2.7 pediatric events per 1000 hospitalizations.[11] In addition, approximately 1% of newly born infants in the United States need intensive resuscitative measures to restore cardiorespiratory function.[12,13]

Overall, although both adult and pediatric IHCA outcomes have improved steadily since 2004, similar gains are not being seen in OHCA.[10] The proportion of adult patients with return of spontaneous circulation (ROSC) following OHCA that is attended by emergency medical services has remained essentially unchanged since 2012.[10]

Much of the variation in survival rates is thought to be due to the strength of the Chain of Survival (Figure 1), the critical actions that must occur in rapid succession to maximize the chance of survival from cardiac arrest.[14] A sixth link, recovery, has been added to each Chain with this version of the guidelines to emphasize the importance of recovery and survivorship for resuscitation outcomes. Analogous Chains of Survival have also been developed for pediatric OHCA and for both adult and pediatric IHCA. Similarly, successful neonatal resuscitation depends on a continuum of integrated lifesaving steps that begins with careful assessment and

Key Words: AHA Scientific Statements ■ apnea ■ automated external defibrillator ■ capnography ■ cardiopulmonary resuscitation ■ defibrillators ■ delivery of health care ■ echocardiography ■ electric countershock ■ epinephrine ■ extracorporeal membrane oxygenation ■ heart arrest ■ infusions, intraosseous ■ intubation, intratracheal ■ life support care ■ respiration, artificial ■ shock, cardiogenic ■ shock, septic

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AUTOMATED CARDIO PULMONARY RESUSCITATION

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Abstract
Cardio Pulmonary Resuscitation (CPR) has saved the lives of countless patients in cardiac arrest. It generates a small but critical amount of blood flow to the heart and brain to preserve its functioning. CPR procedure demands successive, uniform and quality chest compressions administered to the subject until help arrives. Achieving this through manual technique demands a lot of energy and multiple trained medical personnel. To overcome this bottleneck, we have designed an electro-mechanical device that is intended to deliver the best quality compressions and the best quality life-saving care. Our device works in three modes- (15:2), (30:2), and continuous mode and delivers 120 compressions per minute producing a compression depth of 2 inches. When tested with a load cell, the device delivered a force of 22 pounds (10 kg). This prototype was built at a low cost and is also planned to be scaled up to a commercial, fully working, portable CPR device.

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INTRODUCTION

Cardiopulmonary resuscitation (CPR) is a lifesaving technique useful in many emergencies, including a cardiac arrest or near drowning, in which the subject's breathing or heartbeat has stopped. CPR can keep oxygenated blood flowing to the brain and other vital organs until more definitive medical treatment can restore a normal heart rhythm. When the heart stops, lack of oxygenated blood can cause brain damage in only a few minutes- A person may die within eight to 10 minutes of cardiac arrest [9]. Keeping the blood flow active, even partially, extends the opportunity for a successful resuscitation once trained medical staffs arrive on site. CPR must be performed within four to six minutes after cessation of breathing to prevent brain damage or death. CPR consists of rescue breathing, which delivers oxygen to the victim's lungs, and external chest compressions, which help circulate blood through the heart to vital organs.

Table I: Difference between Cardiac Arrest and Cardiac Attack

Cardiac arrest	Cardiac attack
Occurs suddenly. It is triggered by an electrical malfunctioning of the heart causing an irregular heartbeat (arrhythmia). The heart cannot pump blood to the brain, lungs and other organs and seconds later, the person loses consciousness. Death occurs within minutes if the victim does not receive treatment. Cardiac arrest is an ELECTRICAL problem.	Occurs when a blocked artery prevents oxygen-rich blood from reaching a section of the heart. If the blocked artery is not reopened quickly, the part of the heart begins to die. The longer a person goes without treatment, the greater the damage. Cardiac attack is a CIRCULATION problem.

MANUAL CPR PROCEDURE

In first aid, 'ABC' stands for airway, breathing, and circulation. The recovery position helps minimize further injury [5].

- **A**irway: The airway must be clear. Choking, which results from the obstruction of airways, can be fatal.

METHODS OF CARDIO PULMONARY RESUSCITATION

a. Compressions with rescue breaths

A universal compression to ventilation ratio of 30:2 is recommended for adults. With children, considering 2 trained rescuers are present, a ratio of 15:2 is preferred [11].

b. Compression only

For adults with cardiac arrest, compression-only (hands-only or cardio-cerebral resuscitation) CPR which involves chest compressions without artificial ventilation is recommended for the untrained rescuer [13].

CPR procedure must be done only in the case of cardiac arrests, which is usually confused with cardiac attacks. Table I explains how cardiac arrests differ from cardiac attacks.

- **B**reathing: Once the airways are confirmed to be clear, determining whether the person can breathe, and, if necessary, providing rescue breathing is an important step.
- **C**irculation: If the person is not breathing, the first aider should go straight for chest compressions and rescue breathing. The chest compressions will promote circulation. In some cases, an extra D which stands for Defibrillation or deadly bleeding might be added.
- **D**eadly bleeding or defibrillation: Some organizations consider dressing severe wounds or defibrillation a separate fourth stage, while others include this as part of the circulation step.

CPR technique differs for infants, children, and adolescents[3] where 'adult' includes children aged 8 years and older. Table II depicts the differences in the procedure.

Table II: Difference between Infant, Child and Adult CPR

Parameter	Infants	Child	Adult
Age	28 days to 1 year	1 to 8 years	Greater than 8 years
Hand position	Two fingers over the lower half of sternum	One hand over the lower half of sternum	One hand placed over the lower half of sternum and

SCIENTIFIC ARTICLE

Australian Dental Journal 2003;48:(4):244-247

Efficacy of cardiopulmonary resuscitation performed in a dental chair

AJ Lepere,* J Finn,† I Jacobs‡

Abstract

Background: Within the dental setting, historically there has been some concern as to whether cardiopulmonary resuscitation (CPR) can be performed effectively in the dental chair. This study tested the hypothesis that there is no difference in the efficacy of CPR performed in the dental chair or on the floor.

Methods: Four cycles of two-person CPR were performed by three health professionals on a manikin positioned alternately on the floor and in a dental chair. Ventilation was performed using a Laerdal pocket mask, without oxygen supplementation. Compression and ventilation performance was recorded using a computerized manikin skill meter.

Results: Each of the participants was able to achieve a mean cardiac compression depth of between 41 and 50cm, irrespective of the CPR surface. The only statistically significant difference found in expired air resuscitation (EAR) and external cardiac compression performance was that 37 per cent of ventilations performed on the floor were deemed to be too shallow, compared to only 15 per cent in the dental chair (p=0.001).

Conclusions: It is possible for those trained in basic life support to perform CPR effectively in the dental chair. Each of the participants agreed that CPR, in particular EAR, was easier to perform when the manikin was in the dental chair compared with the floor. Dentists are encourage to regularly update their CPR knowledge and skills, including the practice of CPR in the dental chair.

Key words: Cardiopulmonary resuscitation, cardiac arrest, medical emergencies, dental emergencies.

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INTRODUCTION

In a cardiac arrest situation, the performance of cardiopulmonary resuscitation (CPR) forms part of the 'chain of survival' and 'buys time' until more definitive therapy, e.g., defibrillation is available.[1] However, even when performed by people knowledgeable and experienced in the technique, external cardiac compression (ECC) only achieves around 20 per cent of normal cardiac output.[2] Therefore, it is not surprising that efforts have been made to elucidate factors that maximize the output from CPR, including consideration of the effect of support surfaces such as mattresses on the efficacy of chest compressions.[3,4] Indeed, the International Guidelines for CPR and Emergency Cardiac Care state that 'the victim must be in the horizontal, supine position on a firm surface during chest compressions to optimize the effect of the compressions and blood flow to the brain'.[5]

It was probably this concern about the efficacy of ECC that led to early recommendations that in the event of a cardiac arrest the dental patient should be moved to the floor rather than performing CPR in the dental chair.[6] However, there have been case reports of successful resuscitative efforts being performed in the dental chair.[7,8]

The purpose of this study was to ascertain whether or not CPR could be performed effectively in a dental chair. The broad hypothesis under test was as follows: 'There is no difference in the efficacy of ECC or EAR (Expired Air Resuscitation) performed in the dental chair compared with the floor.'

MATERIALS AND METHODS

Three health professionals (registered nurse, dentist, nurse/paramedic), each of whom had been certified as competent to perform Basic Life Support in the previous 12 months, performed CPR on a resuscitation manikin. The Laerdal Resusci®Anne Modular System manikin with SkillReporter (Laerdal Medical, URL: http://www.laerdal.com. Accessed March 2003) was used and produced a report of summary measures of performance of both ventilation (EAR) and compression (ECC). The primary outcome measures of interest were the depth of compression, the percentage

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BMC Emergency Medicine

RESEARCH ARTICLE Open Access

Usefulness of a stool to stabilize dental chairs for cardiopulmonary resuscitation (CPR)

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Abstract

Background: Cardiopulmonary resuscitation (CPR) requires immediate start of manual chest compression (MCC) and defibrillation as soon as possible. During dental surgery, CPR could be started in the dental chair considering difficulty to move the patient from the dental chair to the floor. However, all types of dental chairs are not stable for MCC. We previously developed a procedure to stabilize a dental chair by using a stool. EUROPEAN RESUSCITATION COUNCIL (ERC) guideline 2015 adopted our procedure when cardiac arrest during dental surgery. The objective of this study was to verify the efficacy of a stool as a stabilizer in different types of dental chairs.

Methods: Three health care providers participated in this study, and 8 kinds of dental chairs were examined. MCC were performed on a manikin that was laid on the backrest of a dental chair. A stool was placed under the backrest to stabilize the dental chair. The vertical displacement of the backrest by MCC was recorded by a camcorder and measured by millimeter. Next, the vertical displacement of the backrest by MCC were compared between with and without a stool.

Results: In all 8 dental chairs, the method by using a stool significantly reduced the vertical displacements of the backrest by during MCC. The reduction ratio (mean [interquartile range]) varied between nearly 27 [20] and 87 [5] %. In the largest stabilization case, the displacement was 3.5 [0.5] mm with a stool versus 26 [5.5] mm without a stool ($p < 0.001$).

Conclusions: Our procedure to stabilize dental chairs by using a stool reduced the displacement of a backrest against MCC in all chairs.

Clinical relevance: Effective MCC could be performed in dental chairs by using a stool when sudden cardiac arrest occurs during dental surgery.

Keywords: Cardiopulmonary resuscitation (CPR), Manual chest compression (MCC), Dental chair, Stool, Dental surgery

Background

The dental office poses special circumstance where life-threatening emergencies of aspiration of dental materials and asphyxia can lead sudden cardiac arrest. We have already proposed supine abdominal thrust as a relief for asphyxia in the dental chair [1]. When the thrust relief is ineffective, immediate cardiac arrest can occur. Or cardiac arrest might occur alone, as dental surgery is often stressful for patients and dental surgery sometimes worsens basic illness. CPR requires immediate start of manual cardiac compression (MCC). The patient must be placed on a hard surface to ensure the effectiveness of MCC. However, given the limited space around a dental chair for effective interventions on the floor and the difficulty in moving a patient to the floor safely requiring multiple staff which may be limited in some clinics, CPR should be started in the dental chair itself. But, all types of dental chair are not always stable for

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Sudden episodes of loss of consciousness in dental practice

Nagłe przypadki w praktyce stomatologicznej przebiegające z utratą przytomności

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ABSTRACT

A visit to the dentist is a highly stressful event for many people. Emotions that accompany dental treatment often lead to loss of consciousness. About 2% of all patients undergoing dental procedures suffer from syncope. Pain and fear are most often the causative factor. When the cause of syncope is trivial, the patient returns to full health after a temporary loss of consciousness, and the procedure can be continued. The problem is when loss of consciousness is the first sign of exacerbation of systemic diseases such as: epileptic seizure, myocardial infarction, hyper- or hypoglycemia. Therefore, the dentist should pay specific attention to the benefit that comes from a properly conducted subjective examination and have the expertise to facilitate the diagnosis, differentiation and treatment of the patient experiencing syncope.

Key words: syncope, epileptic seizure, subjective examination/medical history, procedure

STRESZCZENIE

Wizyta w gabinecie stomatologicznym jest czynnikiem silnie stresogennym dla wielu osób. Emocje, jakie towarzyszą leczeniu niejednokrotnie doprowadzają do utraty przytomności. Około 2% wszystkich pacjentów poddawanych zabiegom w gabinecie stomatologicznym ulega omdleniom. Czynnikiem go wywołującym jest najczęściej ból i strach. Gdy przyczyna omdlenia jest błaha, pacjent po krótkotrwałej utracie przytomności wraca do pełni zdrowia, a rozpoczęty zabieg można kontynuować. Problem pojawia się wówczas, gdy utrata przytomności jest pierwszym objawem zaostrzenia chorób ogólnoustrojowych, takich jak: napad padaczki, zawał mięśnia sercowego, hiper- lub hipoglikemia. Dlatego też lekarz stomatolog powinien zwrócić szczególną uwagę na korzyść, jaka płynie z odpowiednio przeprowadzonego badania podmiotowego oraz posiadać wiedzę ułatwiającą rozpoznanie, różnicowanie oraz postępowanie z chorym, który uległ omdleniu.

Słowa kluczowe: omdlenie, napad padaczki, badanie podmiotowe, postępowanie

INTRODUCTION

Syncope is a sudden, short-term, temporary loss of consciousness (usually 5–15 seconds), after which the patient spontaneously recovers. It is associated with a temporary decrease in oxygen supply to the brain, reduced muscle tension and an inability to remain upright.

The incidence of syncope in young subjects coming to medical attention varies from approximately 0.5 to 3 cases per 1000 (0.05–0.3%) [1, 2]. Syncope events which do not reach medical attention occur much more frequently. In fact, the recently published results of a survey of students averaging 20 years of age demonstrated that about 20% of males and 50% of females report to have experienced at least one syncope episode [3]. The most common emergency seen in the dental setting is vasovagal syncope [4].

Epilepsy is a medical condition that is manifested by recurrent disturbances of brain function in the form of various types of seizures. These seizures are often, but not exclusively, accompanied by loss of consciousness, and are caused by excessive, violent, pathological discharges of groups of neurons which occur with excessively high frequency and abnormal synchronization.

According to Shneker [5], epilepsy affects about 1–3% of the population. Prusiński [6] reports that in Poland every two-hundredth person suffers from this condition, and epileptics are often found among dental patients. Absence seizures occur in 25% of all epilepsy patients and 5% of pediatric epilepsy patients (are most common between 3–15 years of age) [7].

Although uncommon, pediatric medical emergencies can occur in the dental office. When they do happen, they happen quickly without warning and with possible dire consequences. A child's under-developed physiology coupled with small oxygen reserves requires early recognition of the problem and swift definitive treatment.

Since adults accompany the pediatric patient to the dental office there is a strong possibility, although the child is the one receiving dental treatment, it's the accompanying adult that presents the emergency. The dentist's successful management of medical emergencies requires preparation, prevention and knowledge of definitive management not just by the dentist but by all dental staff [7].

Mark Greenwood

This article counts towards one of the five core subjects introduced in 2007 by the GDC.

Medical Emergencies in Dental Practice: 2. Management of Specific Medical Emergencies

Abstract: In the second of two papers on the diagnosis and management of medical emergencies, the measures needed to manage specific medical emergencies are discussed. Each emergency requires a correct diagnosis for effective and safe management. Signs and symptoms are highlighted at the beginning of each section describing patient management. The basis of management in contemporary dental practice avoids the intravenous route of drug administration, where drugs are required.

Clinical Relevance: All dental practitioners require a knowledge of the management of specific medical emergencies.

Dent Update 2009; 36: 262–268

In the first paper, general principles of medical emergency management (the ABCDE approach) were discussed. These principles should be applied in all cases. Certain medical emergencies, however, require treatment specific to the particular situation. Emergencies can sometimes be anticipated as a result of having obtained a thorough medical history.[1]

It is important to recognize and diagnose what is happening in order to manage the particular emergency appropriately. A consideration of presenting signs and symptoms is the key to this. The administration of specific drugs, if required, varies according to the situation and these are discussed below.

Specific emergencies that can arise in dental practice are listed in Table 1.

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Their signs, symptoms and management will be discussed.

Vasovagal syncope (simple faint)

Simple faint is the most common medical emergency seen in dental practice and results in loss of consciousness due to inadequate cerebral perfusion. It is a reflex which is mediated by autonomic nerves, leading to widespread vasodilatation in the splanchnic and skeletal vessels, and bradycardia resulting in diminished cerebral perfusion. Fainting can be precipitated by pain or emotional stress, changes in posture or hypoxia. Some patients are more prone to fainting than others and it is wise to treat fainting-prone patients in the supine position.

A similar clinical picture may be seen in 'carotid sinus syndrome'. Mild pressure on the neck in such patients (usually elderly) leads to a vagal reaction producing syncope. This situation may progress to bradycardia or even cardiac arrest.

The signs and symptoms of fainting include:

- Patient feels faint/light headed/dizzy;
- Pallor, sweating;
- Pulse rate slows;
- Low blood pressure;
- Nausea and/or vomiting;
- Loss of consciousness.

Treatment for fainting involves the following:

- Lie the patient flat and raise the legs – recovery will normally be rapid;
- A patent airway must be maintained;
- If recovery is delayed, oxygen (10 litres

Vasovagal syncope (faint)
Hyperventilation/'panic attack'
Acute asthma attack
Angina/myocardial infarction
Epileptic seizures
Diabetic emergencies
Allergies/hypersensitivity reactions
Choking and aspiration
Adrenal insufficiency
Cardiac arrest (see paper 1)

Table 1. Summary of medical emergencies that may be encountered in dental practice

Clinical and Experimental Emergency Medicine

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Review Article

Syncope: a review of emergency department management and disposition

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Syncope is defined as a transient loss of consciousness due to cerebral hypoperfusion with spontaneous return to baseline function without intervention. It is a common chief complaint of patients presenting to the emergency department. The differential diagnosis for syncope is broad and the management varies significantly depending on the underlying etiology. In the emergency department, determining the cause of a syncopal episode can be difficult. However, a thorough history and certain physical exam findings can assist in evaluating for life-threatening diagnoses. Risk-stratifying patients into low, moderate and high-risk groups can assist in medical decision making and help determine the patient's disposition. Advancements in ambulatory monitoring have made it possible to obtain prolonged cardiac evaluations of patients in the outpatient setting. This review will focus on the diagnosis and management of the various types of syncope.

Keywords Syncope; Arrhythmias; Ambulatory monitoring device

Capsule Summary

What is already known

Syncope is a common chief complaint of patients presenting to the emergency department. The underlying causes are numerous and determining safe disposition can be difficult.

What is new in the current study

Certain historical and clinical features of a patient's presentation can help risk-stratify patients into low, moderate and high-risk categories that assist in determining disposition. Development of new ambulatory monitoring devices allow patients to receive prolonged cardiac monitoring in an outpatient setting and secondarily lower health care costs.

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Journal of Oral Health & Community Dentistry

SHORT COMMUNICATIONS

Management of Syncope in Dental Camps

Gururaju CR[1], Raghu KM[2], Thanuja R[3], Jayaprakash K[4]

ABSTRACT

Syncope is a transient, self-limiting, self-correcting loss of consciousness, usually leading to fall on prolonged standing. The normal circulation is restored immediately after the collapse lest the patient is suffering from any underlying diseases. Dental camps as an adjunct to public health dentistry provide awareness and treatment but lack hospital level management or emergency support system. Hence, in a dental camp, a dental practitioner should be well aware of the prevention and treatment practices to manage patients experiencing syncope with available limited resources. The present article summarizes such treatment guidelines for efficient management of syncope in dental camps till the medical emergency unit arrive thus facilitating better health care delivery.

Keywords: Syncope, management, emergency, dental camp

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INTRODUCTION

Nowadays, dental camps have be come integral part of Dental cur riculum. They provide an opportunity for the dental student to promote & practice oral health education & at the same time act as a reservoir to increase the number of out patients of the dental colleges. In lieu of this, handling medical emergencies in rural set-up really becomes a challenging task. Syncope is one such commonly occurring medical emergency during extractions in camps. Therefore this article plans to highlight the management of syncope in dental camps.

Syncope (Greek, 'syn' means 'with', 'koptein' means 'to cut' or 'to interrupt') is a symptom defined as a transient, self-limited loss of consciousness, usually leading to falling. The onset of syncope is relatively rapid, and the subsequent recovery is spontaneous, complete, and usually prompt. The underlying mechanism lies in transient global cerebral hypoperfusion. A decrease in systolic blood pressure to 60 mmHg is associated with syncope (1).

Fainting seems rather innocuous, not much of a medical emergency at all, but if cerebral ischemia is not corrected, permanent neurologic damage or death is possible.

SYMPTOMS

The symptoms can be divided under three phases:

- **Presyncope:** the period when the body experiences lack of nutrition and oxygen by inadequate cerebral circulation. Early manifestations include a pale or ashen skin color with the skin possibly cool, and/or moist ("a cold sweat"). The victim might describe a feeling of warmth in the head and neck, lightheadedness, or dizziness; and may also feel nauseated, complain of numbness or tingling in the toes and fingers etc. Some people say they feel bad, or that everything is going dark just before losing consciousness. Fainting can occur without warning.
- **Syncope:** the period when the victim actually loses consciousness. Bradycardia, hypotension, and a weak, thready pulse is common. Unconsciousness results in muscular relaxation and the possibility of an obstructed or partially obstructed airway, due to a decrease in muscle tone that may cause the tongue to fall into the oropharynx. Another

Review Article

Medical emergencies in dental clinic

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ABSTRACT

Medical emergencies are the detrimental medical episodes that may be apparent in dental settings. Diligent understanding of the emergencies is absolutely necessary for all dental surgeons and auxiliaries. Appropriate diagnosis and subsequent care play a key role in the management of medical emergencies in dental clinic. The utmost purpose of this article is to shed light on the typical medical emergencies in dental setting and their subsequent management.

Keywords: Medical emergency, Dental clinic, Management

INTRODUCTION

The clinical field of dental surgery involves indulging into a lot of subjects and patients who may have to undergo minor or major oro-facial surgeries. The dental diseases ranging from a carious tooth to a serious fatal disease like Ludwig's angina has potential to cause a medical emergency. The word emergency clearly depicts a medical condition that is in thorough need of an urgent attention and subsequent treatment. The medical emergencies, are most often, critical circumstances and must be known to all the dental practitioners in order to save the patient out of the situation.

Dr. Fast and some of his associates conducted a survey of close to 4000 dental surgeons. The survey was to indicate the clear incidence of number of medical and dental emergencies in a dental clinic. The results indicated that around 7.5-8% emergencies occur in the life of a dental surgeon in a decade [1].Since the occurrence of emergencies have increased in recent times, it is necessary to be prepared for it. A thorough medical examination, backed by the patient's detailed history could sometimes help to prevent some emergencies. In spite of all the medical back up and detailed history, it is not always possible to prevent a medical emergency and hence it gets extremely important to be adequately equipped to treat it. The first and foremost step in most of the emergencies would be to do a CPR on the patient which would include maintaining airway, examining the breathing and establishing circulation [2].

The commonly encountered medical emergencies are:
Syncope
Airway Obstruction
Anaphylaxis
Toxicity
Asthmatic Attack
Seizures
Hemorrhage

Syncope:
Syncope can be defined as a temporary collapse and loss of consciousness which could happen due to any of the underlying diseases ranging from simple stress to a variety of severe diseases like adrenal insufficiency, hypoglycaemia and epilepsy [3]. Syncope has to be found to be extremely frequent with no sex predilection [4 &5].The most common cause of syncope is vasovagal, followed by cardiac syncope. The patient experiences tachycardia followed lately by bradycardia, dilation of the pupils, perspiration and some nausea. Some patients have also have some visual interference. The basic step that could help to prevent development of the symptoms of syncope in patients is the adequate intake of food prior to any form of treatment, especially in patients with history of hypoglycemic shock. Once the symptoms of syncope are identifies, the most fundamental step is to compensate the circulation by handling the patient in a supine position.

Syncope: Evaluation and Differential Diagnosis

LLOYD A. RUNSER, MD, MPH; ROBERT L. GAUER, MD; and ALEX HOUSER, DO
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Syncope is an abrupt and transient loss of consciousness caused by cerebral hypoperfusion. It accounts for 1% to 1.5% of emergency department visits, resulting in high hospital admission rates and significant medical costs. Syncope is classified as neurally mediated, cardiac, and orthostatic hypotension. Neurally mediated syncope is the most common type and has a benign course, whereas cardiac syncope is associated with increased morbidity and mortality. Patients with presyncope have similar prognoses to those with syncope and should undergo a similar evaluation. A standardized approach to syncope evaluation reduces hospital admissions and medical costs, and increases diagnostic accuracy. The initial assessment for all patients presenting with syncope includes a detailed history, physical examination, and electrocardiography. The initial evaluation may diagnose up to 50% of patients and allows immediate short-term risk stratification. Laboratory testing and neuroimaging have a low diagnostic yield and should be ordered only if clinically indicated. Several comparable clinical decision rules can be used to assess the short-term risk of death and the need for hospital admission. Low-risk patients with a single episode of syncope can often be reassured with no further investigation. High-risk patients with cardiovascular or structural heart disease, history concerning for arrhythmia, abnormal electrocardiographic findings, or severe comorbidities should be admitted to the hospital for further evaluation. In cases of unexplained syncope, provocative testing and prolonged electrocardiographic monitoring strategies can be diagnostic. The treatment of neurally mediated and orthostatic hypotension syncope is largely supportive, although severe cases may require pharmacotherapy. Cardiac syncope may require cardiac device placement or ablation. (*Am Fam Physician*. 2017;95(5):303-312. Copyright © 2017 American Academy of Family Physicians.)

More online at http://www.aafp.org/afp.

CME This clinical content conforms to AAFP criteria for continuing medical education (CME). See CME Quiz Questions on page 288.

Author disclosure: No relevant financial affiliations.

▶ **Patient information:** A handout on this topic is available at http://www.aafp.org/afp/2017/0301/p303-s1.html.

Syncope is a sudden, brief, and transient loss of consciousness caused by cerebral hypoperfusion.[1] Other nontraumatic loss of consciousness syndromes include seizures, cataplexy, metabolic disorders, acute intoxications, vertebrobasilar insufficiency, transient ischemic attack, cerebrovascular accident, and psychogenic pseudosyncope.[2,3]

Syncope accounts for 1% to 1.5% of all emergency department visits, 250,000 annual hospital admissions, and a median hospital cost of $8,500.[4,5] Approximately 40% of the U.S. population will experience a syncopal episode in their lifetimes, and 30% to 50% will be admitted to the hospital for further evaluation.[6,7] The etiology is unexplained in up to one-third of cases.[8]

Although syncope is associated with serious risks, short-term mortality is low (i.e., 0.7% at 10 days and 1.6% at 30 days). At one year, the mortality rate is 8.4%; one-third of these are attributed to cardiovascular causes. Approximately 25% of patients with syncope will experience another event within two years.[8,9] Historically, neurally mediated and orthostatic hypotension syncope have not conferred an increased risk of death[10]; however, in a recent study, healthy adults with a diagnosis of syncope had higher rates of all-cause mortality, recurrent syncope, cardiovascular events, and pacemaker or implantable cardioverter-defibrillator placement compared with matched controls. Patients 44 to 75 years of age had the highest risk.[11,12]

Management of syncope remains a challenge, particularly in identifying patients with potentially life-threatening etiologies. Lack of physician knowledge, a desire to reassure the patient or clinician, and the fear of medicolegal ramifications result in overuse of diagnostic tests.[13] A standardized approach for evaluating patients with syncope reduces admissions, hospital costs, and number of tests performed, and increases accuracy of diagnosis.[14] Only 10% to 15% of patients will remain undiagnosed after a comprehensive evaluation using current guidelines.[15,16]

frontiers in Cardiovascular Medicine

REVIEW
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Neurohormones in the Pathophysiology of Vasovagal Syncope in Adults

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Vasovagal syncope (VVS) is the most common cause of syncope across all age groups. Nonetheless, despite its clinical importance and considerable research effort over many years, the pathophysiology of VVS remains incompletely understood. In this regard, numerous studies have been undertaken in an attempt to improve insight into the evolution of VVS episodes and many of these studies have examined neurohormonal changes that occur during the progression of VVS events primarily using the head-up tilt table testing model. In this regard, the most consistent finding is a marked increase in epinephrine (Epi) spillover into the circulation beginning at an early stage as VVS evolves. Reported alterations of circulating norepinephrine (NE), on the other hand, have been more variable. Plasma concentrations of other vasoactive agents have been reported to exhibit more variable changes during a VVS event, and for the most part change somewhat later, but in some instances the changes are quite marked. The neurohormones that have drawn the most attention include arginine vasopressin [AVP], adrenomedullin, to a lesser extent brain and atrial natriuretic peptides (BNP, ANP), opioids, endothelin-1 (ET-1) and serotonin. However, whether some or all of these diverse agents contribute directly to VVS pathophysiology or are principally a compensatory response to an evolving hemodynamic crisis is as yet uncertain. The goal of this communication is to summarize key reported neurohumoral findings in VVS, and endeavor to ascertain how they may contribute to observed hemodynamic alterations during VVS.

Keywords: vasovagal syncope, neurohormone, neuroendocrine, catecholamines, tilt-table testing

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INTRODUCTION

Vasovagal syncope (VVS) is the most frequently encountered form of reflex syncope, and is the most common cause of syncope across all age groups (1, 2). Although the clinical importance of VVS has been widely acknowledged for more than a century, and despite considerable investigational effort, its pathophysiology remains incompletely understood. In this regard, several reports have examined neurohumoral changes accompanying VVS (primarily VVS induced during head-up tilt table testing) in an attempt to gain insight into the basis of the hemodynamic alterations associated with VVS episodes. For the most part, studies have focused on changes in circulating

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Special Article

Epileptic Seizures and Epilepsy: Definitions Proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE)

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Summary: The International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE) have come to consensus definitions for the terms *epileptic seizure* and *epilepsy*. An epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain. Epilepsy is a disorder of the brain characterized by an enduring predisposition to generate epileptic seizures and by the neurobiologic, cognitive, psychological, and social consequences of this condition. The definition of epilepsy requires the occurrence of at least one epileptic seizure. **Key Words:** Epilepsy—Seizure—Definition—Classification—Epidemiology—International League Against Epilepsy.

Epilepsy is the name of a brain disorder characterized predominantly by recurrent and unpredictable interruptions of normal brain function, called epileptic seizures. Epilepsy is not a singular disease entity but a variety of disorders reflecting underlying brain dysfunction that may result from many different causes. Little common agreement exists on the definition of the terms *seizure* and *epilepsy*. Such definitions are important for communication among medical professionals and also for communication others involved in legislation, disability pensions, driving regulations, workplace safety, education, and for many other purposes. The definitions in this article are directed to a diverse group of physicians, educators, researchers, public officials, and people with epilepsy and their families.

The current proposal reflects consensus discussions held by representatives of the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy. It presents practical and operational definitions applicable both in medical and nonmedical settings.

Although the definitions have been formulated in English because of the prevalence of English in scientific communications, the intent is to express the essential features and meaning of these terms in a way applicable to translations into all languages. Preliminary definitions of *epileptic seizure* and *epilepsy* can be found in the ILAE 2001 Glossary of Descriptive Terminology for Ictal Semiology (1), and in a commonly cited epidemiologic review from 1991 (2). The current work is an expansion of the two central terms and should be considered to supersede the prior definitions.

ELEMENTS OF A DEFINITION OF *SEIZURE*

A definition (Table 1) is a useful tool for communication, diagnosis, and differential diagnosis. However, a description of the essential nature or boundaries of a condition may not lead to easily applicable rules in a practical setting. With respect to epileptic seizures, a statement concerning the electrical activity of the brain during

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Management of Epileptic Patients in Dentistry

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ABSTRACT

Epilepsy has direct negative effects on sufferers' general dental condition and oral health, both of which are further affected by inadequate oral hygiene; poor oral hygiene itself is often also caused by epilepsy-related poor health. Consequently, tooth loss, caries and periodontal disease occur increasingly often in epilepsy sufferers and they need more dental treatment. However, in fact the epileptic patients can receive fewer and simpler treatment modalities. The aim of this study was to review and synthesize recent studies on dental treatment in epilepsy patients and to mention potential triggers for seizures in dental practice.

Keywords: Epilepsy; Dental; Seizure; Prosthodontic Treatment

1. Introduction

The human brain consists of millions of neurons, their extensions, and the supportive tissues found between those neurons. All brain cells have the ability to produce electrical currents and conduct them to other cells. It is by transmitting such electrical signals that the brain functions. In other words, it is the conduction of these electrical currents that enables us to act, to speak and to feel [1,2].

Seizures can be defined as the discontinuity of normal brain functions due to sudden electrical discharges which may be either excessive or inadequate; these result in episodic convulsions (such as involuntary motion), disturbances in perception, or alterations in consciousness. The outcome of such excessive discharge during electrical conduction is called seizure [2-4].

Epilepsy is a disease that involves seizures which are characterized by an alteration of perception, behavior and mental activities, as well as by involuntary muscle contractions, temporary loss of consciousness and chronic changes in neurological functions that result from abnormal electrical activity in the brain [3,5,6]. Epileptic seizures are reversible and recur frequently [2].

For centuries epilepsy was thought to be a disease related to the supernatural. Although Hippocrates claimed that epilepsy is a naturally occurring disease, the misbelieve that the cause of epilepsy was supernatural was common until the neuropathologic origin of epilepsy was reported in the 19th century [7]. In the early part of that century, John Hughlings Jackson defined Jocksonian seizures; in the middle of the 19th century, Robert Bently Todd defined the paralyses that may develop after long-term seizures [2]. Today, the diagnosis of an epileptic patient required at least three seizure episodes [1].

The aim of this study was to review and synthesize recent studies on dental treatment in epilepsy patients and outline the special concerns that dentists should take into account when providing care to these patients.

We searched the dental literature with Medline/Pubmed with an emphasis on peer-reviewed journals and Science Citation Index Expanded. Key words used were epilepsy, dental, seizure and prosthodontic treatment. We also scrutinized common textbooks on removable and fixed proshodontics. For additional information a hand search from relevant data were searched, too.

2. Epidemiology and Prevalence

Epilepsy is a disease that is frequently encountered by oral and maxillofacial surgery practices [2]. It is thought to affect millions of people worldwide, and has a prevalence of 0.5% - 0.9% in the general population [1,2,8]. Chapman *et al.* have reported that, epileptic seizures are the second most common medical incident in dental surgeries. They have stated that statistically every dentist notice in his/her professional life 1.5 times generalized tonic-clonic seizures by the patients [9].

It has been reported that the disease occurs independent of race, age and gender [2,10]. However, epilepsy has been occur more frequently in men than in women [2,5, 10,11].

Epilepsy has been observed most frequently in children under 1 year of age and in people over the age of 75

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Seizures and Epilepsy: An Overview for Neuroscientists

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Epilepsy is one of the most common and disabling neurologic conditions, yet we have an incomplete understanding of the detailed pathophysiology and, thus, treatment rationale for much of epilepsy. This article reviews the clinical aspects of seizures and epilepsy with the goal of providing neuroscientists an introduction to aspects that might be amenable to scientific investigation. Seizures and epilepsy are defined, diagnostic methods are reviewed, various clinical syndromes are discussed, and aspects of differential diagnosis, treatment, and prognosis are considered to enable neuroscientists to formulate basic and translational research questions.

This article provides an overview of seizures and epilepsy for neuroscientists. We focus on broad concepts, rather than clinical details, and raise questions related to mechanisms, epileptogenesis, and therapeutic approaches that might generate interest among basic researchers. Further information about differential diagnosis, drug doses, and clinical management are available from numerous resources (Engel and Pedley 2008; Duchowny et al. 2012; Engel 2013).

We first define seizures and epilepsy and summarize their classification, pathophysiology, and genetics. Diagnostic methods are then considered, including the importance of an accurate historical description of an event suspected to be a seizure and the appropriate use of ancillary/confirmative tests, such as electroencephalogram (EEG), neuroimaging, and genetic studies. These modalities enable the clinician to differentiate epilepsy from numerous clinical conditions that mimic seizures, but have a nonepileptic pathophysiological basis. Examples of epilepsy syndromes are then described, selected based on their frequency in the population or because they embody scientific questions that warrant elucidation. Finally, we provide an overview of treatment options and prognosis, including a consideration of conditions that accompany epilepsy (comorbidities) and complicate the daily lives of people with epilepsy. Subsequent articles in this collection explore the scientific basis of many of the clinical concepts introduced here.

DEFINITIONS AND EPIDEMIOLOGY

A "seizure" is a paroxysmal alteration of neurologic function caused by the excessive, hyper-

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Current Classification of Seizures and Epilepsies: Scope, Limitations and Recommendations for Future Action

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Abstract

The classification of seizures and epilepsies by the International League Against Epilepsy (ILAE), 2017 is the most recent classification model which aimed to simplify terminologies that patients and their caregivers can easily understand, identify seizures that have both focal and generalized onset and incorporate missing seizures. We have exhaustively reviewed the studies, discussed its scope, outlined its limitations and gave recommendations that could help in forming subsequent reviews. We have also described the terminologies that have been replaced, redefined or removed to have a clear view of the previous and the current classification models. We have recommended the use of multidimensional classification model which incorporated the clinical semiology, disease location, etiology and associated comorbidities. The benefits of this model is for prompt diagnosis which will results into early management and then better patient outcomes. It would also have a profound effects on the kind of treatment patients might receive especially in developing countries where there are scarcity of the diagnostic techniques. Overall, in this study we have reviewed the current study on seizures and epilepsy classification model by ILAE, 2017 to clarify the descriptions and coverage, outlined some limitations and suggested recommendations.

Categories: Internal Medicine, Neurology, Preventive Medicine
Keywords: seizure, international league against epilepsy (ilae), objectives, scope, epilepsy, classification

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Introduction And Background

The most recent classification of seizures and epilepsies was the International League Against Epilepsy (ILAE), 2017, which was published in March 2017. This new classification is better organized with a clear elucidation of terminologies and list some new seizure types. Better diagnosis and management of seizures and epilepsy is achieved when classified and grouped into similar entities as different drugs are usually effective for different seizure types [1]. In this current classification by ILAE, the clinical features of epilepsy are categorized into three levels: the seizures, the epilepsies, and the epilepsy syndromes. Emphases have been made to consider etiology and comorbidities at each level [2]. Also, epilepsy is declared a curable disease rather than a disorder. It is said to be resolved after ten years of the seizure-free period with the last five years spent without medications, or the patient is no longer at risk for age-related epilepsy syndrome [3].

Seizures are defined as transient symptoms and signs due to abnormal excessive or simultaneous neuronal activity of a population of neuronal cells in the brain. While epilepsy is defined as a chronic disorder of the brain characterized by an enduring disposition towards recurrent unprovoked seizures and by the neurobiological, cognitive, psychological, and social consequences of this condition. The diagnosis of epilepsy requires at least two unprovoked seizures occurring greater than twenty-four hours apart. A syndrome is defined as a characteristic seizure associated with abnormal investigations that occur together in a recognizable pattern. It usually includes more than one type of epilepsy [4]. The possibility of having a recurrent seizure can be suspected when the patient's electroencephalogram (EEG) shows an epileptiform activity or when epileptogenic abnormality on brain imaging was detected [5]. Several factors are considered during the classification of epilepsy, and these include mode and age of onset, seizure pattern, family history, EEG, and MRI findings [6].

However, these definitions have some drawbacks as a person may be at a very high risk of having second seizure even after the first one and, therefore, should be considered to have epilepsy. Also, some benign epilepsy syndromes like benign Rolandic epilepsy may be identified after one seizure with EEG as centrotemporal spikes. It is interesting to know that all seizures are not unprovoked, some occurs after provocation as in some reflex seizures like photosensitive epilepsy. Therefore, the definition of epilepsy has been revised and expanded from having two or more unprovoked seizures more than twenty-four hours apart to including those with one seizure and a high likelihood (more than 60%) of having another [3]. More than 60% was taken because it is the lower limit of the confidence interval for the individual with two unprovoked seizures having another seizure [5]. Many health professionals other than neurologists or those with

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Treatment of Angina: Where Are We?

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Keywords
Angina · Beta-blockers · Calcium channel blockers · Ivabradine · Myocardial ischaemia · Nicorandil nitrates · Ranolazine · Trimetazidine

Abstract
Ischaemic heart disease is a major cause of death and disability worldwide, while angina represents its most common symptom. It is estimated that approximately 9 million patients in the USA suffer from angina and its treatment is challenging, thus the strategy to improve the management of chronic stable angina is a priority. Angina might be the result of different pathologies, ranging from the "classical" obstruction of a large coronary artery to alteration of the microcirculation or coronary artery spasm. Current clinical guidelines recommend antianginal therapy to control symptoms, before considering coronary artery revascularization. In the current guidelines, drugs are classified as being first-choice (beta-blockers, calcium channel blockers, and short-acting nitrates) or second-choice (ivabradine, nicorandil, ranolazine, trimetazidine) treatment, with the recommendation to reserve second-line modifications for patients who have contraindications to first-choice agents, do not tolerate them, or remain symptomatic. However, such a categorical approach is currently questioned. In addition, current guidelines provide few suggestions to guide the choice of drugs more suitable according to the underlying pathology or the patient comorbidities. Several other questions have recently emerged, such as: is there evidence-based data between first- and second-line treatments in terms of prognosis or symptom relief? Actually, it seems that newer antianginal drugs, which are classified as second choice, have more evidence-based clinical data that are more contemporary to support their use than what is available for the first-choice drugs. It follows that actual guidelines are based more on tradition than on evidence and there is a need for new algorithms that are more individualized to patients, their comorbidities, and pathophysiological mechanism of chronic stable angina.

Introduction

Ischaemic heart disease continues to be the major cause of death and disability among Western countries and angina pectoris is the most prevalent symptomatic manifestation. Strategies to improve management of chronic stable angina remain a priority. Almost a third of patients have suboptimal treatment, both in terms of advice regarding lifestyle modification, as well as the appro-

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Basic management of medical emergencies

Recognizing a patient's distress

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ABSTRACT

Background and Overview. Medical emergencies can happen in the dental office, possibly threatening a patient's life and hindering the delivery of dental care. Early recognition of medical emergencies begins at the first sign of symptoms. The basic algorithm for management of all medical emergencies is this: position (P), airway (A), breathing (B), circulation (C) and definitive treatment, differential diagnosis, drugs, defibrillation (D). The dentist places an unconscious patient in a supine position and comfortably positions a conscious patient. The dentist then assesses airway, breathing and circulation and, when necessary, supports the patient's vital functions. Drug therapy always is secondary to basic life support (that is, PABCD).

Conclusions and Clinical Implications. Prompt recognition and efficient management of medical emergencies by a well-prepared dental team can increase the likelihood of a satisfactory outcome. The basic algorithm for managing medical emergencies is designed to ensure that the patient's brain receives a constant supply of blood containing oxygen.

Key Words. Medical emergencies; basic life support; seizures; hypoglycemia; chest pain; angina pectoris; acute myocardial infarction; bronchospasm; syncope; allergy.

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Early recognition of medical emergencies begins at the first sign or symptom.[1] Familiarity with the patient's medical profile aids immensely in recognition; knowing what to expect and what to look for promotes a faster response. The dentist needs to focus on what is happening with a patient minute by minute because distractions slow response time.

By performing a simple visual inspection of the patient, the dentist can determine if he or she has various diseases such as obesity, a history of cerebrovascular accident (CVA) (stroke), Parkinson disease, jaundice, exophthalmos, breathing difficulties and heart failure (orthopnea).

When treatment is indicated, the dentist should proceed without hesitation. Often, management of medical emergencies in the dental office is limited to supporting patients' vital functions until emergency medical services (EMS) arrives. This is especially true in the case of major morbidity such as myocardial infarction or CVA. Treatment should consist minimally of basic life support and monitoring of vital signs.[2] The dentist never should administer poorly understood medications.

An emergency management plan, as described by Haas[3] in this supplement and by Peskin and Siegelman,[4] is of paramount importance. The dental team's ultimate goal

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EDITORIAL

Acute and stable coronary heart disease: different risk factors

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This editorial refers to 'Contribution of novel biomarkers to incident stable angina and acute coronary syndrome: the PRIME Study'[†] by J.-P. Empana *et al.*, on page 1966

Coronary heart disease (CHD) continues to be a worldwide leading cause of death for both men and women. When coronary atherosclerosis progresses, there is deposition of plaque external to the lumen of the artery, thus the plaque may extend eccentrically and outward without compromising the lumen initially. As atherosclerosis worsens the plaque mass may later on bulge into the lumen and may therefore result in a haemodynamic obstruction and angina pectoris symptoms. Typically, angina pectoris develops when an atherosclerotic plaque obstructs at least 70% of the arterial lumen. Thus, stable angina pectoris is a condition in which there is regional myocardial ischaemia caused by inadequate coronary perfusion and is usually induced by increases in myocardial oxygen requirements. Chest pain that can be characterized as chronic stable angina typically is produced with physical exertion and relieved by rest and/or nitroglycerin. In contrast, chest pain that occurs at rest usually is indicative of unstable disease, such as acute coronary syndrome (ACS) that usually is caused by a coronary plaque rupture and subsequent intracoronary thrombosis formation.

Same disease or two different diseases?

Prognosis of patients with stable angina is in general very good, with an incidence of death or non-fatal myocardial infarction not exceeding 2% per year.[1] On the other hand, patients with an ACS without ST elevation [non-ST-segment elevation myocardial infarction (NSTEMI)] have a much worse prognosis since 10–15% experience death or non-fatal myocardial infarction within 1 year after admission.[2]

Despite a similar anatomical background, there are differences between stable angina pectoris and ACS. Thus, vulnerable plaques are typically defined by a large lipid pool, and a high percentage of inflammatory cells, as well as a thin fibrous cap separating the lipid core from the blood pool. In contrast to collagen-rich hard plaques, which may progress in severity and result in stable angina pectoris, the vulnerable soft plaque is more prone to acute rupture and exposure of the potently thrombogenic core to the blood pool, with resultant intracoronary thrombosis and an ACS.[3] Furthermore, when studying coronary angiograms, it has been shown that patients with ACS generally have fewer diseased vessels, fewer stenoses and occlusions, and a lower atherosclerosis extent index than those with stable angina pectoris.[4] These differences in plaque vulnerability and extent of atherosclerosis between patients with stable angina pectoris and ACS may suggest that the two presentations of CHD, at least in part, may develop in different ways and the vulnerability of the plaque rather than the extent of coronary atherosclerosis is likely to be the determinant of ACS. The rate of progression of atherosclerotic lesions is variable and hard to predict. Angiographically, small coronary lesions may be associated with acute progression to severe stenosis or total occlusion, and may eventually account for the majority of the patients who develop unstable angina or other ACS.[5] However, there is no plaque rupture in all patients with ACS, but rather a superficial erosion of a plaque.

What makes the atherosclerotic disease progress to either a stable angina pectoris or an unstable coronary disease?

Classical cardiovascular risk factors

It is possible that stable angina pectoris and ACS do not share the same cardiovascular risk factor profile. There are some data suggesting that, however the results are heterogeneous.[6–7]

Inflammation

Inflammation is known to have an important role in the progression of atherosclerotic disease and is considered to be a promoter of the disease. Elevated levels of high-sensitivity C-reactive protein (hs-CRP) have prognostic value with respect to cardiovascular events in patients from several different populations.[8–10] In

The opinions expressed in this article are not necessarily those of the Editors of the *European Heart Journal* or of the European Society of Cardiology.

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CLINICAL REPORT

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Chest pain in the dental surgery: A brief review and practical points in diagnosis and management

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Abstract

If a dental patient develops chest pain it must always be managed promptly and properly, i.e., the practitioner immediately stops the procedure and, being aware of the patient's medical history, questions the patient regarding the nature of the pain to help determine the likely diagnosis. It will most likely be a manifestation of coronary artery disease (synonymous with ischaemic heart disease), i.e., angina pectoris or acute myocardial infarction, most usually the former. Angina will usually resolve with proper intervention whereas up to about one-half of myocardial infarction cases will develop cardiac arrest, mostly in the first few hours, and this will be fatal in up to two-thirds of cases. As health care professionals, dental practitioners have an inherent duty of care to be able to initiate appropriate care if such a medical emergency occurs.

Key words: Chest pain, dental patient.

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INTRODUCTION

The occurrence of chest pain in a dental patient is uncommon. A recent estimate from an Australian survey of medical emergencies in the dental office is that a practitioner would experience one case of angina in a career of 40 years whereas the incidence of acute myocardial infarction (AMI) was about one-in-ten dentists, also in a 40 year career.[1] These and other results are recorded in Table 1 and compared to the results of two similar surveys.[2,3]

Responding immediately to a patient with chest pain is critical to a successful outcome. This will be outlined in the following section.

DISCUSSION

The basis of safe practice is a complete and up-to-date medical history for all patients, plus, especially for patients with coronary artery disease (CAD), liaison with the patient's medical practitioner where indicated, plus provision of adequate local anaesthesia and stress minimization. Cardiac arrest patients should also be identified, e.g., history of moderate or severe hypertension, heart failure, insulin dependant diabetes, hyperlipidaemia, etc.[4,5] Medical advice may need to be sought and in some cases this may involve referral to a specialist, i.e., physician or cardiologist.[4,5]

Accepted practices[4-11]

The practitioner should refamiliarize himself/herself regarding the medical history and current medication of all cardiac risk patients at the start of an appointment.

The practitioner should recall that ischaemic cardiac pain is usually located in the centre of the front of the chest, i.e., retrosternal, is of variable intensity, often described as a feeling of tightness or heaviness of the chest and can radiate to the left shoulder and arm and, less commonly, to the left side of the neck and mandible. Anginal pain tends to be similar for each individual each time it occurs whereas the pain of AMI is generally of greater intensity than that of angina and is often described as crushing in nature. Also the AMI patient may be cyanotic while nausea and vomiting are also common – these features are rarely seen in angina.

For the patient with a history of angina, administer a prophylactic dose of glyceryl trinitrate (GTN) a few minutes before commencing the appointment. (GTN presentations: tablet dose – 0.6mg; spray dose – 0.4mg.) It is generally recommended that GTN be kept as an emergency drug and GTN spray is the preferred presentation because of its longer shelf-life. If they experience their typical anginal chest pain later in the appointment, sublingual GTN should be administered in the recommended fashion, i.e., one dose about every five minutes, up to a maximum of three doses until the pain is relieved and administer supplemental oxygen. However, because GTN may cause hypotension with reflex tachycardia, the practitioner, who is monitoring basic signs (consciousness, colour, pulse and blood pressure (BP)), will check the systolic BP before subsequent doses – if this is <100mmHg, withhold subsequent doses of GTN as otherwise myocardial

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CHAPTER 37: PATHOLOGY OF MYOCARDIAL INFARCTION AND SUDDEN DEATH

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Summary

This chapter discusses the pathology of myocardial infarction (MI) and sudden death. Severe loss of myocardial contractility occurs within 60 seconds of the onset of ischemia; loss of viability (irreversible injury) takes at least 20-40 minutes after total occlusion of blood flow. MI has traditionally been viewed as a manifestation of necrotic cell death, but other forms of cardiomyocyte death have also been observed in reperfused MI; the extent to which the processes considered to comprise the spectrum of cell death—necrosis, apoptosis, autophagy, and necroptosis—each contribute to infarct size is currently unclear. Collateral circulation, preconditioning, and reperfusion can influence infarct size. If ischemic myocardium is reperfused early, the degree of myocardial salvage greatly exceeds the damage associated with reperfusion injury. Myocardium may adapt to chronic ischemia by decreasing its contractility but preserving viability; this reversibly, dysfunctional tissue is commonly referred to as hibernating myocardium. Left ventricular remodeling begins within the first few hours after an MI and continues to progress, and the infarcted myocardium undergoes rapid turnover during the first 1-2 weeks after MI. MI also generates a systemic inflammatory response. Histologic evaluation (see accompanying Hurst's Central Illustration) has been classically considered the gold standard for the evaluation of myocardial tissue, but cardiac magnetic resonance has become the in vivo gold standard for quantifying myocardial salvage.

eFig 37-01

Hurst's Central Illustration: Histologic Findings After Myocardial Infarction.

Timelines of histologic findings after myocardial infarction in nonreperfused and reperfused* infarctions. Myocardial salvage occurs if reperfusion takes place within 4-6 hours after onset of chest pain or electrocardiographic changes, and the infarct is likely to be subendocardial without transmural extension. *Reperfused within 4-6 hours after onset of chest pain or electrocardiographic changes.

Review Article

Medical emergencies in Dentistry: Practical tips in Implementation

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KEYWORDS

Medical emergencies; Dentistry; Dental clinic; Management

ABSTRACT

In a rapidly aging society, many patients will have multiple medical co-morbidities and on polypharmacy. Dental patients rarely have medical emergencies during their treatment and it is because of this rarity, that the odd emergency that presents can overwhelm the dentist's ability to cope despite their theoretical knowledge. The authors discuss how to adapt the clinic facilities for managing an emergency and provide an overview of management of common emergencies that dentists may encounter.

INTRODUCTION

It is not uncommon to see a dentist practising in a solo or small group dental office. Many of these offices are not within the vicinity of a hospital. In the event of an unexpected medical emergency, the dental practitioner will be the first line of care of the patient. These emergencies are not common, and it may be precisely why it can be problematic.

In a survey of Australian Dentists, it is estimated that 1 in 7 dentists will experience a patient collapse requiring resuscitation in their practice lifetime [1]. In the Great Britain, an emergency event was reported, on average, for every 4.5 practice years in England and Wales, and 3.6 years in Scotland [2]. Similarly, it was reported by New Zealand's dentists that only 2 medical emergencies occurred per 10,000 patients treated under local anaesthesia [3].

A review of present literature suggests that there is a wide range of medical emergencies which may occur in a dental clinic setting (Table 1). While broadly described as medical emergencies, some conditions require prompt pharmacologic intervention, resuscitation or activation of emergency services as compared to others.

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Vasovagal syncope is the most common medical emergency described in many cross-sectional studies. However, it is typically not life threatening and usually does not have negative sequalae. The management is mostly supportive in nature. In comparison, other emergencies such as acute myocardial infarction, anaphylaxis or foreign body ingestion require intervention as soon as possible to ensure the survival of the patient.

The low frequency of the emergency events in a dental office may result in dental schools putting less focus of it in their syllabus and also means that dental practitioners may not be well-prepared and current with management of emergencies. More than half the respondents in a New Zealand survey expressed dissatisfaction with the training they had received for medical emergencies as undergraduate students, and 14.1% continued to feel inadequately prepared for an emergency in practice [3]. While 75% of the respondents in the survey conducted in the Great Britain received relevant training as undergraduates, only 30% considered themselves 'well' or 'fairly well' prepared to manage emergencies. This is also reflected in surveys conducted in India, Nigeria, Saudi Arabia and Poland [10-13].

Theoretical knowledge derived from lectures, tutorials and exams may not adequately prepare the dental practitioner. Simulation training with hands on involvement may better facilitate memory

Open Access

Original Article

Chest Pain as a presenting complaint in patients with acute myocardial infarction (AMI)

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ABSTRACT

Objective: To study various characteristics of chest pain in acute myocardial infarction patients.

Methodology: A total of 331 patients of AMI admitted at Cardiology unit Nishtar Hospital Multan and Chaudhry Pervez Elahi Institute of Cardiology Multan, irrespective of the age and gender, were included in this study. The study duration was one year starting from June 2011 to June 2012. Non-probability purposive sampling technique was used in this descriptive study. Informed consent to participate in this study was taken. Data were entered and analyzed using SPSS-11.

Results: A total number of 331 patients with AMI were included in the study. Mean age was 54.99±11.25 years with minimum age 20 years and maximum age 90 years. It included 264(79.8%) male and 67(20.2%) female patients with male to female ratio of 3.9:1. Out of these 331 patients 308 (93.1%) patients reported chest pain as the presenting complaint. Remaining 23(6.9%) presented with clinical features other than chest pain. There were 127(38.4%) patients with pre-cordial chest pain, 115(34.7%) had retrosternal chest pain, 58(17.5%) were having epigastric pain. Severe chest pain was seen in 281(84.9%) patients while 26(7.9%) had only mild chest discomfort. Radiation of the pain to shoulder, neck and jaw was seen in 75 (22.7%) patients. In 42(12.7%) patients, pain radiated to both sides of chest. Another 55(16.6%) patients had pain radiation to chest, shoulder, upper arm and ulnar side of left forearm. Chest pain radiation to interscapular region along with both sides of chest was present in 10(3.0%) patients. In 11(3.3%) patients' pain radiated only to left side of chest. Pain persisting for >20 minutes was reported by 298 (90%) patients while only 10(3.1%) had pain persisting for <20 minutes.

Conclusion: There is considerable overlap in chest pain of cardiac as well as non cardiac causes. However, vigilant evaluation of characteristics of chest pain in history taking may help to overcome this dilemma. Severe and prolonged precordial chest pain in a male patient between the age of 41-70 years, with pain radiation to left shoulder, neck and jaw is highly suggestive of AMI.

KEY WORDS: Chest pain, acute myocardial infarction, Precordial chest pain.

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INTRODUCTION

Acute myocardial infarction (AMI) is a cardiac emergency. The clinical diagnosis of AMI requires an integrated assessment of the history especially with reference to chest pain along with some combination of indirect evidences of myocardial infarction using biochemical, electrocardiographic, and imaging modalities. In the United States, nearly one million patients suffer from AMI per year[1]. Even in Pakistan 46 % of the deaths are due to myocardial infarction and 27% are due to other subsets of Ischemic heart disease[2].

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Review Article

Dental Management of the Cardiovascular Compromised Patient: A Clinical Approach

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ABSTRACT

Cardiovascular disease trends, complications, and associated therapeutics, impact the dental health and treatment. Such patients require special consideration with regard to when and which dental treatment is appropriate and what precautions are required. A clinical approach is provided for the dental management of patients with Arterial hypertension, Heart failure, and Ischemic Heart disease, Cardiac Arrhythmias, Infective Endocarditis, Stroke and Cardiac Pacemaker. A Medline-PubMed search was conducted of the literature over the last 20 years using the keywords: "cardiovascular diseases", "dental management", "arterial hypertension", "heart failure", "ischemic heart disease", "cardiac arrhythmias", "infective endocarditis", "stroke" and "cardiac pacemaker". A total of 46 articles were reviewed, of which 32 were literature reviews, 3 were expert committee guides and updates and 11 original research papers. The appropriate management of dental patients with cardiovascular disease is contingent on appropriate assessment and evaluation. This article aims to allay many of these uncertainties by describing the commoner cardiac conditions, the risk they pose during dental practice and how they may affect dental treatment. It outlines prophylactic and remediable measures that may be taken to enable safe delivery of dental care.

Key words: Cardiovascular disease, Dental management, Arterial hypertension, Heart failure, Ischemic heart disease, Cardiac arrhythmias, Infective endocarditis, Stroke and cardiac pacemaker.

Key message: This review aims to allay many of these fears and focuses on common Cardiovascular compromised conditions and risk they pose during dental practice that necessitate extra awareness and caution to prevent potential complications causing otherwise unnecessary morbidity and mortality.

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INTRODUCTION

Cardiovascular disease is the leading global cause of death, accounting for more than 17.3 million deaths per year.[1] Nearly half of all African-American adults have some form of cardiovascular disease. Compared with western countries, most Asian countries have higher age related mortality from cardiovascular disease.[2] Along with the associated morbidity, such disorders are important because many patients are associated with treatment. So, patient with cardiovascular disease constitute risk cases in dental practice. The dental management of these medically compromised patients can be problematic in terms of oral complications, dental therapy, and emergency care. The present study consists of a literature review dental management of patients suffering from various cardiovascular diseases.

MATERIALS AND METHODS

A Medline-PubMed search was conducted of the literature over the last 37 years using the keywords: "cardiovascular diseases", "dental management", "arterial hypertension", "heart failure", "ischemic heart disease", "cardiac arrhythmias", "infective endocarditis", "stroke" and "cardiac pacemaker". A total of 46 articles were reviewed, of which 32 were literature reviews, 3 were expert committee guides and updates and 11 original research papers.

Cardiovascular diseases and their dental management

1. ***Hypertension:*** Hypertension is high blood pressure. Hypertension is defined as values >140 mmHg systolic pressure and/or >90 mmHg diastolic pressure.[3,4]

Dental management:

1. A well-controlled hypertensive patients does not pose a risk in clinical practice.
2. The patient is to be instructed to take his or her medication as usual on the day of dental treatment. Prior to such treatment, the patient blood pressure should be recorded.[5,6]
3. It is preferable for the visits to be brief and in the morning. The prescription of anxiolytic agents may prove necessary in particularly anxious patients (5-10 mg of diazepam the night before and 1-2 hours before the appointment) before dental treatment, or alternatively sedation with nitrous oxide may be considered.
4. In the case of emergency dental visits, treatment should be conservative, with the use of analgesics and antibiotics. NSAIDs should not be prescribed for longer than this five-day period.[7,8]
5. Patients with cardiovascular disease are at a greater risk of massive endogenous adrenalin release secondary to deficient local anesthesia than of reaction to the small amount of vasoconstrictor used in local anesthetics.[9,10,11,12] Nevertheless, vasoconstrictor use should be limited, taking care not to exceed 0.04 mg of adrenaline.[1]

ANALYTIC REVIEW

Jenna Brinks, MS, Amy Fowler, BS,
Barry A. Franklin, PhD, and Jassu Dulai, PharmD

Lifestyle Modification in Secondary Prevention: Beyond Pharmacotherapy

Abstract: *Despite significant advances in medical technology and pharmacology, cardiovascular disease (CVD) remains a major contributor to health care expenses and the leading cause of death in the United States. Patients with established CVD and their health care providers are challenged with achieving cardiovascular risk reduction to decrease the likelihood of recurrent cardiovascular events. This "secondary prevention" can be achieved, in part, through adherence to prescribed pharmacotherapies that favorably modify major coronary risk factors (ie, hypertension, hypercholesterolemia, diabetes, and obesity). However, lifestyle modification can also be helpful in this regard, providing independent and additive benefits to the associated reductions in cardiovascular morbidity and mortality. Accordingly, physicians and other health care providers should routinely counsel their coronary patients to engage in structured exercise and increased lifestyle physical activity, consume a heart-healthy diet, quit smoking and avoid secondhand smoke, and purposefully address psychosocial stressors that may elevate cardiovascular risk. These lifestyle interventions, either as an adjunct to medication therapy or independently in those patients where medications may be poorly tolerated, cost prohibitive, or ineffective, can significantly decrease cardiovascular mortality and the risk of recurrent cardiac events.*

Keywords: secondary prevention; risk factor reduction; cardiovascular mortality; lifestyle modification

Despite a 31% decline in cardiovascular disease (CVD) death rates from 2000 to 2010,[1] heart disease remains the leading cause of death in the United States, followed by cancer, respiratory disease, accidents, and stroke.[2] In 2010, US$193.4 billion was spent on direct medical costs associated with stroke and heart disease, excluding associated nursing home care expenses.[1] For those experiencing nonfatal cardiovascular events, coronary revascularization procedures and/or new cardiac diagnoses, patients and their health care providers are challenged with

> "... adjunctive lifestyle modification in the setting of established CVD is arguably of equal importance in reducing the risk of recurrent cardiovascular events."

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Chapter 299: Cardiovascular Collapse, Cardiac Arrest, and Sudden Cardiac Death

Christine M. Albert; William G. Stevenson

OVERVIEW AND DEFINITIONS

Cardiovascular collapse is severe hypotension from acute dysfunction of the heart or peripheral vasculature causing hypotension with resulting cerebral hypoperfusion and loss of consciousness that can be the result of a cardiac arrhythmia, severe myocardial or valvular dysfunction, loss of vascular tone, and/or acute disruption of venous return **(see Table 299-1)**. When an effective circulation is restored spontaneously, patients present with syncope **(see Chap. 18)**. If spontaneous resolution does not occur, then cardiac arrest occurs, ultimately resulting in death if resuscitation attempts are unsuccessful or not initiated. Underlying etiologies for cardiovascular collapse include benign conditions such as vasovagal syncope, but also life-threatening conditions, including: ventricular tachyarrhythmias, severe bradycardia, severely depressed myocardial contractility, as with massive acute myocardial infarction (MI) or pulmonary embolus, and other catastrophic events interfering with cardiac function such as myocardial rupture with cardiac tamponade or papillary muscle rupture with torrential mitral regurgitation.

Table 299-1

Distinction between Cardiovascular Collapse, Cardiac Arrest, and Death

Term	Definition	Qualifiers	Mechanisms
Cardiovascular collapse	Sudden loss of effective circulation due to cardiac and/or peripheral vascular factors that may reverse spontaneously (e.g., neurocardiogenic syncope, vasovagal syncope) or require interventions (e.g., cardiac arrest).	Broad term that includes cardiac arrest and transient events that characteristically revert spontaneously presenting as syncope.	Same as “Cardiac Arrest,” plus vasodepressor syncope or other causes of transient loss of blood flow.
Cardiac arrest	Abrupt cessation of cardiac function resulting in loss of effective circulation which may be reversible by prompt emergency medical intervention, but will lead to death in its absence.	Rare spontaneous reversions; likelihood of successful intervention relates to mechanism of arrest, clinical setting, availability of emergency medical services, and prompt return of circulation.	Ventricular fibrillation, ventricular tachycardia, asystole, bradycardia, pulseless electrical activity, noncardiac mechanical factors (e.g., pulmonary embolism).
Sudden cardiac death	Sudden unexpected death attributed to cardiac arrest, which if witnessed occurs within one hour of symptom onset.	In unwitnessed cases, the definition is often expanded to include unexpected deaths where the subject was documented to be well within the preceding 24 h.	Same as Cardiac Arrest.

Source: Modified from RJ Myerburg, A Castellanos: Cardiovascular collapse, cardiac arrest, and sudden cardiac death, in *Harrison’s Principles of Internal Medicine*, 19th ed, DL Kasper et al (eds). New York, McGraw-Hill Education, 2015, pp 1764–1771, Table 327-1.

Sudden cardiac arrest (SCA) refers to an *abrupt* loss of cardiac function resulting in complete cardiovascular collapse due either to an acute life-threatening cardiac arrhythmia or abrupt loss of myocardial pump function that requires emergency medical intervention for restoration of effective circulation. Most SCAs occur outside the hospital, and fewer than 10% of these victims survive to be discharged from the hospital despite undergoing attempted resuscitation by emergency medical services (EMS). For those that die prior to hospital admission, a cardiovascular cause for the arrest is

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Cardiac Arrest: Resuscitation and Reperfusion

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Abstract

The modern treatment of cardiac arrest is an increasingly complex medical procedure with a rapidly changing array of therapeutic approaches designed to restore life to victims of sudden death. The two primary goals of providing artificial circulation and defibrillation to halt ventricular fibrillation continue to evolve since they were established 60 years ago. The evolution of artificial circulation includes efforts to optimize manual CPR, external mechanical CPR devices designed to augment circulation, and may soon advance further into the rapid deployment of specially designed internal emergency cardiopulmonary bypass devices. The development of defibrillation technologies has progressed from bulky internal defibrillators paddles applied directly to the heart, to manually controlled external defibrillators, to automatic external defibrillators that can now be obtained over-the- counter for widespread use in the community or home. But the modern treatment of cardiac arrest now involves more than merely providing circulation and defibrillation. As suggested by a three phase model of treatment, newer approaches targeting patients who have suffered a more prolonged cardiac arrest include treatment of the metabolic phase of cardiac arrest with therapeutic hypothermia, agents to treat or prevent reperfusion injury, new strategies specifically focused on pulseless electrical activity, which is the presenting rhythm in at least one-third of cardiac arrests, and aggressive post resuscitation care. There are discoveries at the cellular and molecular level regarding ischemia and reperfusion pathobiology that may be translated into future new therapies. On the near horizon is the combination of advanced cardiopulmonary bypass plus a “cocktail” of multiple agents targeted at restoration of normal metabolism and prevention of reperfusion injury, as this holds the promise of restoring life to many patients for whom our current therapies fail.

Keywords

Cardiac arrest; resuscitation; reperfusion

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Nonstandard Abbreviations and Acronyms: None

Disclosures: none

COVER STORY

The dental patient with asthma

An update and oral health considerations

DEREK M. STEINBACHER, D.M.D.; MICHAEL GLICK, D.M.D.

ABSTRACT

Overview. Asthma is a serious global health problem that has steadily increased in prevalence during the past two decades. New classification and treatment guidelines have been published, and dental providers need to be aware of these changes.

Literature Reviewed. The authors searched textbooks and MEDLINE, looking for the most updated medical information on asthma, as well as for previous publications on treatment of asthmatic patients in a dental setting.

Results. More than 9,000 articles on asthma were published in English between 1997 and 2000. From 1960 until 2000, approximately 40 articles specifically addressed asthma and dental care. The authors reviewed more than 300 articles from the medical literature and all articles after 1980 that directly focused on oral health issues for importance and relevance.

Conclusions. Recent information regarding the etiology, pathogenesis and treatment of asthma had not been adequately addressed in the dental literature. Dental care of asthmatic patients may necessitate considerations beyond what has previously been published in the dental literature.

Clinical Implications. In the treatment of asthma, as with treatment of most medical conditions, oral health care providers play a role that is important in terms of both the patient's overall health and the systemic condition's effect on oral health. This article provides dentists with a timely update on asthma and the relationship between asthma and oral health, and it offers suggestions for safe and appropriate dental care.

Asthma is a serious global health problem, affecting more than 100 million people worldwide. The prevalence of asthma in the United States has increased steadily for the past two decades with no end in sight.[1] It is estimated that more than 17 million Americans are affected, with a projected increase to as many as 22 million cases by 2010 and 29 million cases by 2020.

In the treatment of asthma, oral health care providers play a role that is important in terms of both the patient's overall health and the systemic condition's effect on oral health.

Although asthma is viewed by many as a fairly benign disorder, the mortality rate for this disease has almost tripled in the past 20 years, reaching a peak of more than 5,000 annual deaths.[2] This somber number is projected to double within the next two decades.

Children, young adults and racial and ethnic minorities living in urban areas compose the group of people at highest risk. This is not surprising, as health disparities play a significant role in putting people at risk of developing this disease. However, other, less understood factors also contribute to the noted increased prevalence.[3-6] Poverty-stricken inhabitants of the inner city have a greater chance of developing the disease, and their disease often has a more severe progression. Many different factors have been put forth as explanations of this phenomenon—crowded living conditions with poor ventilation, lack of access to quality health care, reduced long-term adherence to and maintenance of therapeutic regimens, family dysfunction, weak social supports and paucity of education.[7-9]

Asthma care represents a significant economic and social burden, accounting for numerous hospitalization stays and missed days of school and work.

With increasing numbers of affected patients, oral health care workers need to be adept at recognizing the signs and symptoms of asthma. Modifications to dental treatment may be indicated, and practitioners need to be capable of handling acute exacerbations. To that end,

The patient with asthma: Implications for dental practice

Article *in* Compendium of continuing education in dentistry (Jamesburg, N.J.: 1995) · June 2009

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ESSENTIAL DENTAL KNOWLEDGE

Diagnosis, Management, and Dental Considerations for the Diabetic Patient

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Abstract

Current epidemiological data suggest that the prevalence of diabetes in Canada is increasing. Patients with poor glycemic control are more prone to oral manifestations of diabetes, including periodontal disease, salivary gland dysfunction, halitosis, burning mouth sensation, delayed wound healing and increased susceptibility to infections. Diabetic patients are also at risk of experiencing an intraoperative diabetic emergency in the dental office. Therefore, dentists must appreciate and implement important dental management considerations while providing care to diabetic patients.

The diabetic patient and dental treatment: an update

L. Wray[1]

VERIFIABLE CPD PAPER

IN BRIEF

- Provides an update on the current management of Type 1 and Type 2 diabetes.
- Outlines the oral health implications of having diabetes.
- Advises on the safe dental treatment of the diabetic patient including under sedation.
- Discusses the possible effects of dental treatment on diabetic control.

PRACTICE

This paper has been written to both refresh and update clinicians' knowledge of diabetes. Treatment for patients with diabetes continues to develop with the majority of Type 1 diabetics now using multiple daily injections and an increasing minority using insulin pumps. Blood glucose monitoring and patient education programmes have resulted in more patient involvement in controlling this condition. Type 2 diabetics have had improvement in care provision through the development of shorter acting sulphonylureas and the potential for GLP1 injections. The impact of diabetes on both oral health and quality of life is discussed. Practical suggestions are made regarding the dental treatment of diabetic patients using both local anaesthetic and under sedation. Diabetes continues to be a fickle master for those affected by this condition. The paper is written from the perspective of the 'expert patient'. It is hoped that a greater understanding of this chronic condition will improve both access to, and safety of, dental care for those patients with diabetes.

INTRODUCTION

As Martin Silink, past-president of the International Diabetes Foundation (2003-2006), expressed, 'diabetes is understood by few and ignored by many'.[1] With the current global epidemic of this condition it is important that clinicians should have background knowledge of diabetes and its implications for dental care so that barriers to treatment can be avoided.

WHAT IS DIABETES?

Diabetes is a condition where the body either fails to produce insulin (Type 1 diabetes) or the insulin that is produced is no longer as effective (Type 2 diabetes). A recent study in the United Kingdom reported that diabetes affects 4.3% of the UK population.[2] However, using recently introduced WHO criteria, there has been a drastic elevation in the prevalence of diabetes among the older British population (age range 60-79 years): approximately 8% of British men and 6% of British women are now known to have diabetes.[3] Of the remainder, approximately 6% of men and 5% of women are classified as having undiagnosed diabetes.

Insulin is a hormone produced in the beta cells of the Islets of Langerhans within the pancreas. Insulin is released directly into the bloodstream and is therefore part of the endocrine system. Insulin acts like a key which allows blood glucose to enter the cells around the body for use as an energy supply. Glucose is essential for the body to function properly. The brain is particularly affected by any reduction in blood glucose supply due to its lack of capacity for glucose storage.

There are two main types of diabetes:

Type 1 diabetes

Type 1 diabetes accounts for approximately 15% of all diabetics in the UK: it is usually juvenile onset, but can occur at any age. In Type 1 diabetes the beta cells in the pancreas undergo a chronic autoimmune destruction process which results in a long-term lack of endogenous insulin. Scientists and researchers remain unsure as to the exact cause of Type 1 diabetes but it is thought that a viral or other infection may trigger the autoimmune destruction.[4] The resultant lack of insulin must be replaced via injection, or via an insulin pump. This should be combined with knowledge of dietary carbohydrate (CHO) values such that injected insulin can be adjusted to carbohydrate consumed to avoid large fluctuations in blood glucose levels.

There are many other factors (apart from insulin and CHO) which can affect blood glucose levels. These are less easy to control or monitor and include: anti-insulin hormones, eg, adrenaline, growth hormone, cortisol and glycogen; exercise; and anxiety.

The above factors alter from day to day and even hour to hour thus making good blood glucose control a far from simple goal.

Type 2 diabetes

With Type 2 diabetes there are usually adequate levels (and sometimes even increased levels) of insulin but it is no longer as effective at the cellular level. Using the key analogy, it is as if the key is a bit rusty and it struggles to unlock the cell door to allow the blood glucose to enter. Blood sugar therefore becomes raised but as there is still some effective insulin the levels are not usually as high as with the Type 1 diabetes situation. Hence the undiagnosed Type 2 diabetic may misinterpret or even ignore their symptoms

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Diabetes mellitus
Considerations for dentistry

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ABSTRACT

Background. The connection between oral health and systemic health is bidirectional; systemic illnesses, especially metabolic disorders, affect oral health, and it appears that oral health may affect systemic health.

Methods. In this review, the authors outline the basic principles behind diabetes mellitus (DM) and provide some tips to help dentists manage the care of patients with DM better in general practice.

Results. DM negatively affects all microvasculature beds, and the soft tissues and bones supporting the teeth are susceptible. There is also strong evidence that the presence of periodontal disease is associated with increased cardiovascular morbidity in patients with DM.

Conclusions. DM is a chronic, systemic metabolic disorder in which the orosystemic connection is becoming more understood.

Clinical Implications. DM is a relatively common condition and, thus, is one that practicing dentists may encounter frequently.

Key Words. Diabetes; insulin; hypoglycemia; periodontal disease.

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Diabetes mellitus (DM) is a metabolic disorder characterized by impaired action, secretion of insulin or both, resulting in hyperglycemia. An estimated 20.8 million people in the United States (7 percent) have DM, and 1.5 million new cases were diagnosed in 2005.[1] Although the definition, the pathophysiological basis and much of management of DM is glucocentric, it is a true metabolic disorder, and a number of metabolic disturbances have been characterized.[2,3] In addition to experiencing well-known complications associated with DM such as premature cardiovascular disease, renal disease, retinopathy and neuropathy, about one-third of people with DM have severe periodontal disease. Attenuated immunity, which occurs as a result of hyperglycemia, and a variety of host factors associated with DM may be the pathophysiological basis for the increased prevalence and severity of periodontal disease.[4] In addition to altering the course of periodontal disease, the diabetic state influences treatment decisions. Osteoporosis increasingly is being associated with DM, which may affect the treatment of periodontal disease because of the involvement of mandib-

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