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.

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.

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...
Hypertension
Smoking
Diabetes Mellitus
Cardiac and peripheral vascular disease
Atrial fibrillation
Previous Transient Ischaemic Attack (TIA) – focal CNS disturbances caused by vascular events such as microemboli and occlusion leading to ischaemia. By definition, symptoms last for less than 24 hours
Obesity
Hyperlipidaemia
Excess alcohol intake

Table 7. Risk factors for stroke.

to have a prophylactic increase in steroid dose.

The guidance for patients with Addison’s Disease is to double the patient’s steroid dose before significant dental treatment under local anaesthesia and continue this for 24 hours.

The treatment of adrenal crisis includes the following:
- Lay the patient flat and raise his/her legs;
- Ensure a clear airway and administer oxygen;
- Call an ambulance.

Stroke

Stroke may be either haemorrhagic or embolic in aetiology but clinically the effects are essentially the same. Risk factors for stroke are summarized in Table 7. Signs and symptoms vary according to the site of brain damage. There may be loss of consciousness and weakness of limbs on one side of the body. One side of the face may become weak. As stroke causes an upper motor neurone lesion, the forehead muscles of facial expression will be unaffected. Speech may become slurred.

Initial management of a stroke includes the following:
- The airway should be maintained and an ambulance called;
- High flow oxygen (10 litres per minute) should be given;
- The patient should be carefully monitored for any further deterioration.

Local anaesthetic emergencies

Allergy to local anaesthetic is rare but should be managed like any other case of anaphylaxis. When taken in the context of the number of local anaesthetics administered, complication rates are low. The signs and symptoms in allergy are those of anaphylaxis. Fainting in association with the injection of local anaesthetic is more common and can usually be avoided by administering the local anaesthetic while the patient is supine.

Conclusions

After correct diagnosis, prompt appropriate management will deal with medical emergencies effectively. It is important that each member of the dental team knows what his/her role should be in the event of a medical emergency. Training should be updated regularly and at least on an annual basis.

References

return the situation to normal.

Asthma
Asthma is a potentially life-threatening condition and should always be taken seriously. An attack may be precipitated by exertion, anxiety, infection or exposure to an allergen. It is important in the patient's history to gain some idea of the severity of attacks. Clues include the precipitating factors, effectiveness of medication, hospital admissions as a result of asthma and the use of systemic steroids.

It is important that asthmatic patients bring their usual inhaler(s) with them – if the inhaler has not been brought it must be in the emergency kit or treatment should be deferred. If the asthma is in a particularly severe phase, elective treatment may be best postponed. Drugs which may be prescribed by dental practitioners, particularly non-steroidal anti-inflammatory drugs (NSAIDs), may worsen asthma and are therefore best avoided.

The signs and symptoms of asthma include:
- Breathlessness (rapid respiration – more than 25 breaths per minute);
- Expiratory wheezing;
- Use of accessory muscles of respiration;
- Tachycardia.

The signs and symptoms of life-threatening asthma include:
- Cyanosis or slow respiratory rate (less than 8 breaths per minute);
- Bradycardia;
- Decreased level of consciousness/confusion;

Treatment for asthma involves the following:
- Most attacks will respond to the patient's own inhaler, e.g. salbutamol (may need to repeat after 2–3 minutes);
- If no rapid response, or features of severe asthma, call an ambulance;
- A medical assessment should be arranged for patients who require additional doses of bronchodilator to end an attack;
- A spacer device may need to be used if the patient has difficulty using the inhaler;
- If the patient is distressed or shows any of the signs of life-threatening asthma, urgent transport to hospital should be arranged;
- 10 litres per minute of oxygen should be given whilst awaiting transfer – 4–6 actuations from the salbutamol inhaler via a spacer device should be used and repeated every 10 minutes. In the British National Formulary, a technique is described for a ‘home-made’ space device. A hole can be cut out of the base of a paper or plastic cup. The mouthpiece of the inhaler is pushed through this. The open end of the cup can then be applied to the mouth when the inhaler is activated.
- If asthma is part of a more generalized anaphylactic reaction, or in extremis, an intramuscular injection of adrenaline should be given (see section on anaphylaxis).

All patients, including those who have chronic obstructive pulmonary disease, should be given high flow oxygen as, even if these patients are dependent on ‘hypoxic drive’ to stimulate their respiration, they will come to no harm in the short term.

Chest pain of cardiac origin
Most patients who suffer chest pain from a cardiac origin in the dental surgery are likely to have a previous history of cardiac disease. The history is clearly important and, if a patient uses medication to control known angina, he/she should have brought this with them, or it should be readily to hand in the emergency kit. Similarly, it is important that the patient has taken his/her normal medication on the day of the appointment.

Classically, the pain of angina is described as a crushing or band-like tightness of the chest which may radiate to the left arm or mandible. There are many variations, however. The pain of myocardial infarction (MI) will often be similar to that of angina but more severe and, unlike angina, will not be relieved by GTN (glyceryl trinitrate). In cases of angina, the patient should use his/her GTN spray, which will usually remove the symptoms. Dental treatment may be best left until another day if there is an attack, according to the practitioner’s discretion. More severe chest pain always warrants postponement of treatment and an ambulance should be called.

Features which make chest pain unlikely to be cardiac in origin are: pains which last less than 30 seconds, however severe; stabbing pains; well-localized left submammary pain and pains which continually vary in location. Chest pain
Medical emergencies

- Angina
- MI
- Pleuritic eg pulmonary embolism
- Musculoskeletal
- Oesophageal reflux
- Hyperventilation
- Gall bladder and pancreatic disease

Table 2. Possible causes of chest pain.

- Status epilepticus
- High risk of recurrence of fits
- First fit
- Difficulty in monitoring the patient’s condition

Table 3. NICE Guidelines for sending a patient with epilepsy to hospital after a fit.

which improves on stopping exertion is more likely to be cardiac in origin than one that is not related. Pleuritic pain is sharp in character, well localized and worse on inspiration.

Oesophagitis can produce a retrosternal pain which worsens on bending or lying down. A complicating factor in differentiation from cardiac chest pain is that GTN, caused by action on the muscle of the oesophagus, may ease the pain.

Musculoskeletal pain will often be accompanied by tenderness to palpation in the affected region. As mentioned earlier, hyperventilation may produce chest pain. A list of possible causes of chest pain is given in Table 2.

It is clearly important to exclude angina and myocardial infarction in the patient complaining of chest pain.1 If in doubt, treat as cardiac pain until proven otherwise.

The signs and symptoms of myocardial infarction include:
- Severe, crushing chest pain which may radiate to the shoulders and down the arms (particularly the left arm) and into the mandible;
- The skin becomes pale and clammy;
- Shortness of breath;
- Pulse becomes weak and patient may become hypotensive;
- Often there will be nausea and vomiting;
- Not all patients fit this ‘classic’ picture – may exhibit only some of the signs and symptoms above.

Treatment for myocardial infarction involves the following:
- The practitioner should remain calm and be a reassuring presence;
- Call 999 immediately;
- Most patients will be best managed in the sitting position;
- Patients who feel faint should be laid flat;
- Give high flow oxygen (10 litres per minute);
- Give sublingual GTN spray;
- Give 300 mg aspirin orally to be chewed (if no allergy) – ensure that, when handing over to the receiving ambulance crew, they are made aware of this as thrombolytic therapy is given by some ambulance crews;
- A patient who has had surgical dental treatment should be highlighted to the ambulance crew, as any significant risk of haemorrhage may affect the decision to use thrombolytic therapy;
- If the patient becomes unresponsive, the practitioner should check for ‘signs of life’ (breathing and circulation) and start CPR.

Epileptic seizures

The history will usually reveal the fact that a patient has epilepsy.1 A history should include information with regard to the nature of any seizures, their frequency and degree of control. The type and efficacy of medication should be determined. Signs and symptoms vary considerably.

The signs and symptoms of epilepsy include:
- The patient may have an ‘aura’ or premonition that a seizure is about to occur;
- Tonic phase – loss of consciousness – patient becomes rigid and falls and becomes cyanosed;
- Clonic phase – jerking movements of the limbs, tongue may be bitten;
- Frothing at the mouth, urinary incontinence;
- Pulse becomes weak and patient may become hypotensive;
- Often there will be nausea and vomiting;
- Not all patients fit this ‘classic’ picture – may exhibit only some of the signs and symptoms above.

In patients with a marked bradycardia (less than 40 beats per minute) the blood pressure may drop to such an extent that it causes transient cerebral hypoxia leading to a brief fit. This is not a true fit and represents a vasovagal episode.

Treatment of an epileptic fit includes the following:
- The decision to give medication should be made if seizures are prolonged (with active convulsions for 5 minutes or more (status epilepticus) or seizures are occurring in quick succession). If possible, high flow oxygen should be administered. The possibility of the patient’s airway becoming occluded should constantly be remembered and the airway must therefore be protected.
- As far as possible, ensure safety of the patient and practitioner (do not attempt to restrain);
- Midazolam given via the buccal or intranasal route (10 mg for adults). The buccal preparation is marketed as Epistatus (10 mg/ml). For children:
  - 1–5 years 5 mg;
  - 5–10 years 7.5 mg;
  - over 10 years 10 mg.
- The parents of some children with poorly controlled epilepsy will carry rectal diazepam. As part of pre-treatment preparation, it is wise to arrange with the parent for them to be on hand to administer this should a fit arise;
- In the absence of rapid response to treatment, call an ambulance.

Criteria for sending a patient with epilepsy, who has had a seizure, to hospital have been developed by the National Institute for Health and Clinical Excellence and are summarized in Table 3.

Diabetic emergencies

The history should be used to assess the degree of diabetic control achieved by the patient. A history of recurrent hypoglycaemic episodes and markedly varying blood glucose levels (from the patient’s measurements) suggest that a patient attending for dental treatment is more likely to develop hypoglycaemia. It is wise to treat diabetic patients first on any list and ensure that they have had their normal medication and something to eat prior to attending.

A dentist in general practice is much more likely to encounter hypoglycaemia than hyperglycaemia since the latter has a much slower onset. It should
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be remembered that diabetic control may be adversely affected by oral sepsis, leading to an increased risk of complications.8

The signs and symptoms of hypoglycaemia include:

- Trembling;
- Hunger;
- Headache;
- Sweating;
- Slurring of speech;
- ‘Pins and needles’ in lips and tongue;
- Aggression and/or confusion;
- Seizures;
- Unconsciousness.

Treatment for hypoglycaemia includes the following:

- If the patient is conscious, give oral glucose (3 lumps of sugar or 2–4 teaspoons of sugar) or GlucoGel®;
- Lay the patient flat (remember A,B,C);
- If the patient is unconscious, give 1 mg glucagon intramuscularly (or subcutaneously);
- Get medical help.

Patients who do not respond to glucagon (a rarity), or those who have exhausted their supplies of liver glycogen, will require 20 ml of intravenous glucose solution (20–50%) and should be managed under medical supervision or by the attending ambulance team. It can take glucagon 5–10 minutes to be effective and the patient’s airway must be protected at all times.

Once the patient regains consciousness and has an intact gag reflex, he/she should be given glucose orally and a high carbohydrate food. If full recovery is achieved and the patient is accompanied, he/she may be allowed home but should not be allowed to drive. The general medical practitioner should be informed of the event.

The principle of treatment of hyperglycaemia is through intravenous rehydration. This should be carried out under medical supervision and is beyond the scope of this discussion.

### Allergies/hypersensitivity reactions

#### Anaphylaxis

Anaphylaxis is a Type 1 hypersensitivity reaction involving IgE to which free antigen binds leading to the release of vasoactive peptides and histamine. Penicillin and latex are the most likely causes in dentistry. Local anaesthetics are rarely responsible.7

The signs and symptoms of anaphylaxis include:

- Itchy rash/erythema;
- Facial flushing or pallor;
- Upper airway (laryngeal) oedema and bronchospasm, leading to stridor, wheezing and, possibly, hoarseness;
- A respiratory arrest may occur, leading to cardiac arrest;
- Vasodilatation, leading to low blood pressure and collapse which may progress to cardiac arrest.

Initial treatment for anaphylaxis includes the following:

- The ABCDE approach should be employed while the diagnosis is being made;
- Airway and breathing should be managed by administering 10 litres per minute of oxygen;
- Blood pressure should be restored by lying the patient flat and raising the legs.

In life-threatening anaphylaxis (hoarseness, stridor, cyanosis, dyspnoea, drowsiness, confusion or coma), adrenaline should be administered in the following way:

- Administer 0.5 ml of 1 in 1000 adrenaline (epinephrine) IM and repeat at 5 minute intervals if no improvement;
- The optimum site for injection is the anterolateral mid-third of the thigh.

Chlorphenamine (antihistamine) and hydrocortisone (steroid) need not be given by non-medical ‘first responders’.9

As a result, the only drug required to be administered by dental practitioners is adrenaline. The other drugs will be administered by ambulance personnel, if necessary.

Many patients with a history of anaphylactic reactions will carry an ‘Epipen’, which contains 300 micrograms of epinephrine. This may be used if such a patient has an anaphylactic reaction in the dental surgery (Figure 2). Variation in the doses of adrenaline which may be given to different age groups are summarized in Table 4.

#### Angioedema

Angioedema is triggered when mast cells release histamine and other chemicals into the blood producing rapid swelling, which may be life-threatening if the airway is involved. It may be precipitated by substances such as latex and penicillin. There is an hereditary component. The signs and symptoms are summarized in Table 5.

Hereditary angioedema (HANE) is caused by complement activation resulting from a deficiency of the inhibitor of the enzyme C1 esterase. It is usually inherited as autosomal dominant and may not present until adulthood. C1 esterase inhibitor concentrates are available to supplement the deficiency. Such supplements should be administered prior to dental treatment if treatment has previously triggered the onset of angioedema.

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**Figure 2.** An ‘Epipen’ for use in anaphylactic reactions. It contains 300 microgram of adrenaline.
Choking and aspiration

The nature of dental treatment puts patients at increased risk of choking and aspiration. Prevention is important by the use of rubber dam, instrument chains, mouth sponges, etc. Careful suction of the oral cavity and close observation minimize risk.

If a patient is suspected of having aspirated a foreign body, he/she should be allowed to cough vigorously in an attempt to clear the airway and ‘cough up’ the object. A foreign body may lead to either mild or severe airway obstruction. The signs and symptoms that aid in differentiation of the degree of airway obstruction are shown in Table 6. In a conscious victim it is useful to ask the question ‘Are you choking?’ An algorithm for the management of a choking patient has been published by the Resuscitation Council (UK) and is given in Figure 3.

The back blows and abdominal thrusts mentioned in the algorithm are delivered by standing to the side of the victim and slightly behind. The chest should be supported with one hand and the victim leant well forwards so that when the obstruction is dislodged it is expelled from the mouth rather than passing further down the airway. Up to five sharp blows should be given between the shoulder blades with the heel of the other hand. After each back blow a check should be made to see if the obstruction has been relieved.

If back blows fail, up to five abdominal thrusts should be given:
- Stand behind the victim and put both arms around the upper part of their abdomen and lean them forwards.
- The rescuer’s fist should be clenched and placed between the umbilicus and lower end of the sternum.
- The clenched fist should be grasped with the other hand and pulled sharply inwards and upwards.
- This should be repeated up to 5 times.
- The back blows and abdominal thrusts should be continued in a cyclical fashion.

If it is suspected that a foreign body has been inhaled, the patient must be referred for chest radiography. Radiographs will be taken in two planes (postero-anterior and lateral). The foreign body is most likely to be seen in the right lung or right main bronchus, as the latter is more vertical than the left. Bronchoscopy, or even thoracotomy, may be required to retrieve it.

Adrenal insufficiency

Adrenal crisis may result from adrenocortical hypofunction leading to hypotension, shock and death. It may be precipitated by stress induced by trauma, surgery or infection. It is rare that this would happen as a result of dental treatment and, if a patient collapses, other causes are much more likely and should be considered first.

The signs and symptoms of adrenal crisis include:
- The patient loses consciousness;
- The patient has a rapid, weak or impalpable pulse;
- The blood pressure falls rapidly.

It is important in the history to ascertain whether the patient has recently used or is currently using corticosteroids. Some patients carry a ‘steroid warning card’. Acute adrenal insufficiency can often be prevented by the administration of a steroid boost prior to treatment. Recent studies have suggested that dental surgery may not require supplementation. More invasive procedures, however, such as oral surgical procedures or the treatment of very apprehensive patients, may still require cover. Patients who are systemically unwell (for example patients with a significant dental abscess) are also recommended.

Table 6. Management of a choking victim (adapted from Resuscitation Guidelines 2005 Resuscitation Council (UK)) – signs and symptoms.

<table>
<thead>
<tr>
<th>Unconscious</th>
<th>Conscious</th>
<th>Encourage Cough</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start CPR</td>
<td>5 back blows</td>
<td>Continue to check for deterioration to ineffective cough or relief of obstruction</td>
</tr>
<tr>
<td></td>
<td>5 abdominal thrusts</td>
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Figure 3. Algorithm for management of the choking patient (Resuscitation Council (UK) 2005).