Medical Emergencies for the Dental Professional

Ellen B. Grimes, RDH, MA, MPA, Ed.D
Vermont Technical College
Department of Dental Hygiene

Medical History/Vital Signs/ Kit

- Update at each visit
- Patient and operator signature
- Prevention of emergencies
- Vital signs
- Emergency kit
- Emergency plan

Medical Emergency #1

Syncope – Etiologies

- Psychic mechanisms (vasodepressor, neurocardiogenic, neurocardiac, vasovagal, neurally mediated)
  - Emotional disturbance
  - Sympathetic nervous system activated (fight or flight)
  - Blood to muscles
  - No muscular activity
  - No blood to brain
  - Loss of consciousness

Syncope – Etiologies

- Sudden decrease in O_2 to brain (50% – 70%)
- Change in quality of blood perfusing brain – caused by chemical or metabolic changes such as hyperventilation, hyperglycemia, hypoglycemia, ingestion of drgs, acute allergic reactions
- Alterations in the brain itself – epileptic seizure or CVA

Three Types of Syncope

- Cardiac – inadequate cardiac output usually from serious underlying cardiac heart disease
  - Arrhythmias or obstructive
  - Potentially fatal
- Non-Cardiac
  - Wide scope – seizures, orthostatic hypotension, metabolic diseases
- Neurocardiac – discussed earlier

Pre-Syncopal Symptoms

- Pale or gray tinge to face
- Anxious
- Dilated pupils
- Weakness, dizziness
- Nausea
- Profuse cold sweat
- Pilorection
- Yawning, sighing
- Visual changes
- Shortness of breath
- Chest pain

Syncopal Symptoms

- Weak, slow pulse less than 30 beats/min.
- Shallow breathing
- Decreased BP
- Loss of consciousness
- Possible seizures

Treatment of Syncope

- Assess consciousness
- Supine position
  - Do not put head between knees
- Check airway and breathing
- Administer O_2 - 4-6 L/min.
- Monitor vital signs
- Loosen tight collar/clothing

Treatment of Syncope

- Cold damp towel on forehead
- Reassure patient
- Position patient supine for 10 minutes after recovery
- Sit up slowly
- Contact emergency person

Medical Emergency Scenario #2

Ischemic Heart Disease

- Ischemia – decrease in blood supply to body organ or part often marked by pain or organ dysfunction – pathologic condition
- Ischemic Heart Disease – caused by a decrease in O2 to myocardium from narrowing or blocking of coronary arteries
- Possible etiologies – atherosclerosis – common arterial disorder characterized by yellowish plaques of cholesterol, lipids and cellular debris on the inner layer of the walls of large and medium sized blood vessels
- Predisposing factors – Diet, HBP, smoking, diabetes, obesity, decreased physical activity, increased stress, heredity

Angina Pectoris

- Discomfort (burning or tightness) in chest from transient & reversible myocardial oxygen deficiency
- Occurs from stress when heart needs added blood supply and it is not available
  - Physical exertion
  - Stress
  - Heavy meal
  - High altitudes
- 90% from atherosclerosis
- Attacks last 1-5 minutes
- Stable vs. unstable

Symptoms of Angina Pectoris

- Chest discomfort: pressure, burning, heaviness, squeezing
- May radiate to shoulder, neck, arms, jaw
- Pallor
- Diaphoresis
- Shallow breathing
- Anxiety/fear

Treatment of Angina Pectoris

- Sit patient upright or semisupine
- BLS
- Ask patient about symptoms
- Monitor vital signs

Treatment of Angina Pectoris

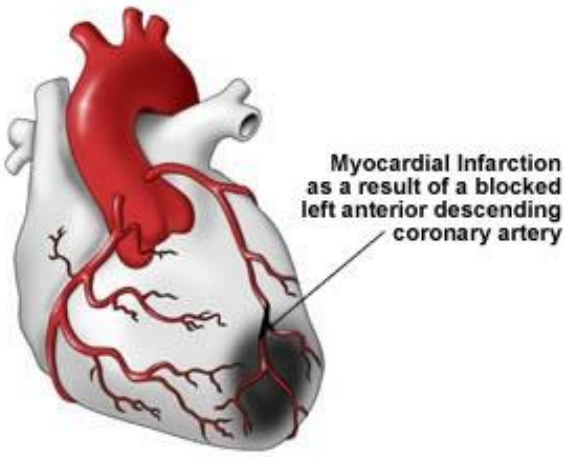
- Administer patient's nitroglycerine sublingually (tablet or spray) if not hypotensive – coronary vasodilator
  - venous dilation reduced the amount of blood returning to the heart which results in a reduction in the workload of the heart
  - this reduction in workload results in a decreased demand for oxygen
  - tablets only effective for 12 weeks once exposed to O_2

Treatment of Angina Pectoris

- Can give up to 3 doses in a 15 minute period
- If no relief call for medical assistance and treat as MI
- If more pain than usual treat as MI

Myocardial Infarction

- Extreme ischemic heart disease
- A syndrome resulting from a sudden reduction or arrest of blood flow from formation of thrombus or embolus (usually from atherosclerosis)
- Lead to myocardial necrosis
- Affects 1.5 million Americans
- #1 cause of death
- Usually in morning
- 50% no trigger



MI Symptoms

- Crushing substernal pain in chest lasting longer than 20 minutes which may radiate to left arm and jaw
- Indigestion
- Ashen gray skin
- Diaphoretic
- Nausea
- Dyspnea
- Levine sign – clutch chest
- Irregular pulse
- Eventually no pulse, respiration or BP

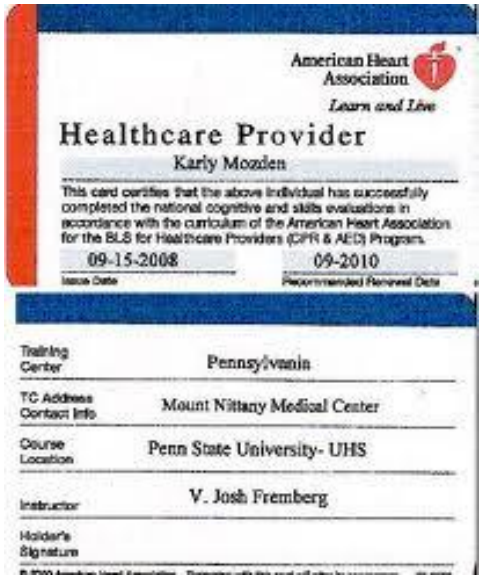
MI Symptoms

- Women have atypical discomfort (not crushing chest pain)
  - upper abdominal pain
  - shortness of breath
  - fatigue

Treatment of MI – History of Angina

CONSCIOUS

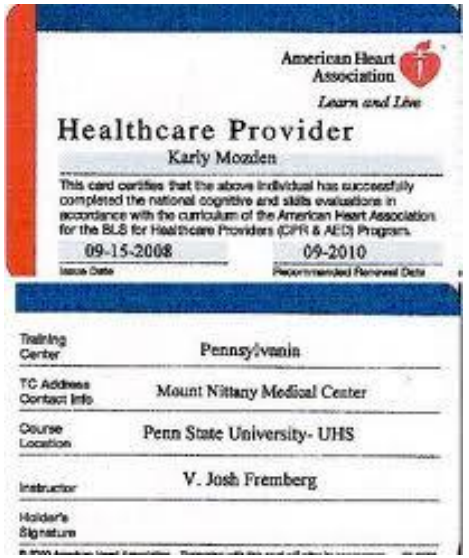
- Sit upright
- Treat for angina (reversible myocardial oxygen deficiency)
- Administer patient's nitro or translingual spray or tablests from emergency kit (coronary vasodilator)



Treatment of MI – History of Angina

CONSCIOUS

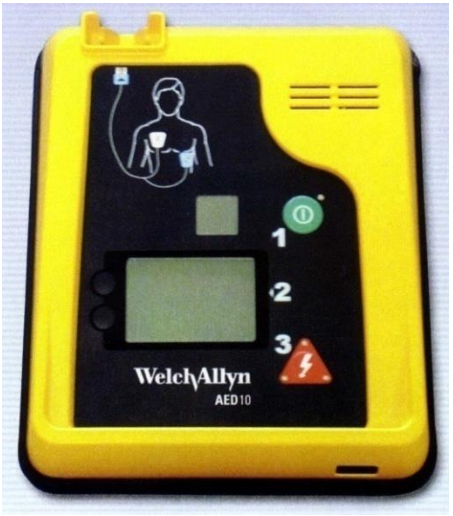
- If no relief in 2-4 minutes 2^{nd} dose
- Call EMS
- If no relief in 2-4 minutes 3^{rd} dose
- If no relief administer O_2
- Monitor vital signs
- Baby aspirin 325 mg
- Basic Life Support



Treatment of MI – History of Angina

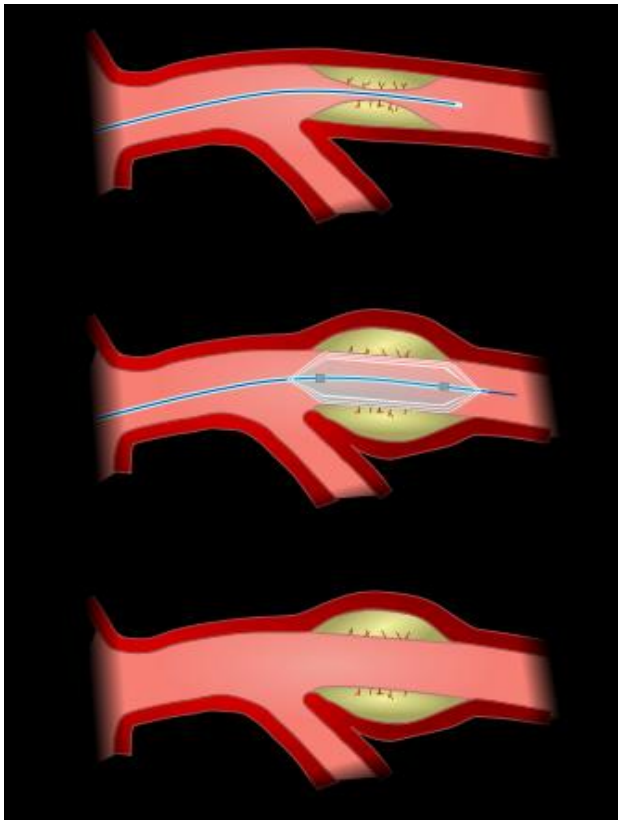
UNCONSCIOUS

- EMS
- Supine position
- CPR – force O_2 15 liters per minute
- AED
- Transport as soon as possible
- If thrombolytic agents (t-PA) administered within 12 hours of MI improved prognosis
- Now recommending angioplasty for many patients

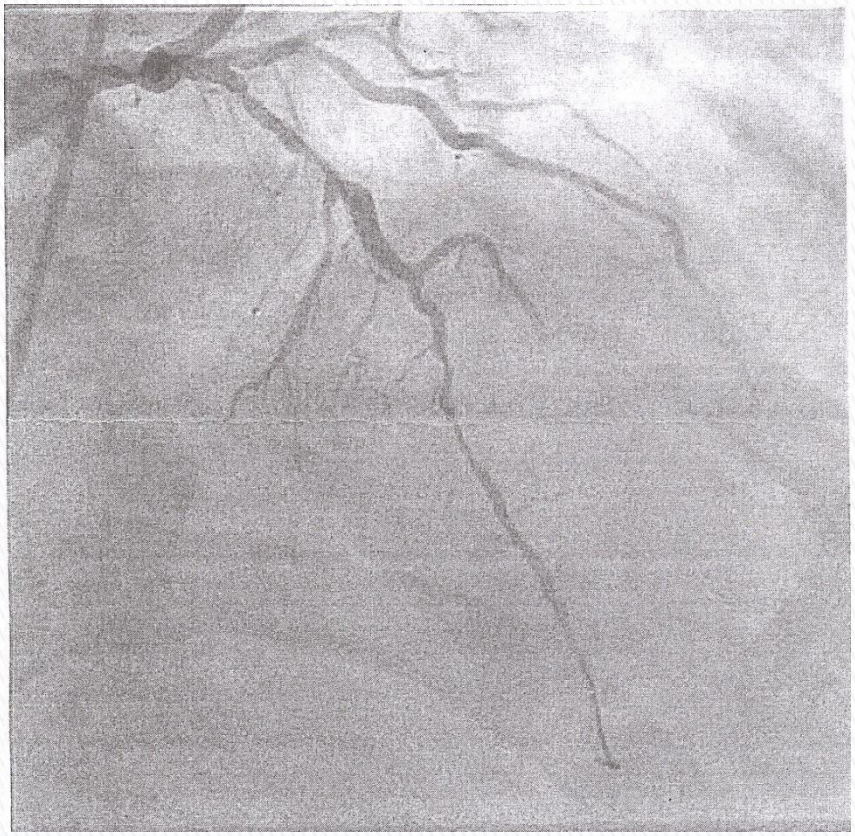


Angioplasty

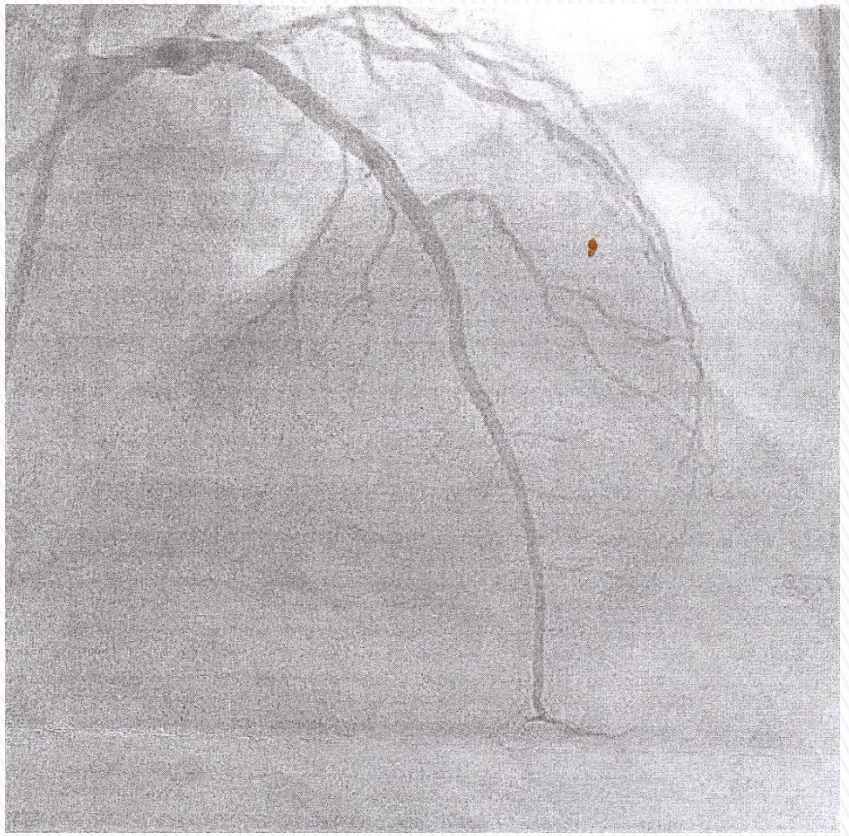
- Empty, collapsed balloon on a guide wire, balloon catheter, passed into narrowed vessel inflated using water
- Balloon forces expansion of wall
- Improved blood flow
- Balloon deflated and withdrawn
- Stent may or may not be inserted to ensure the vessel remains open



Stents



Blood Flow Pre-Stent



Blood Flow Post-Stent

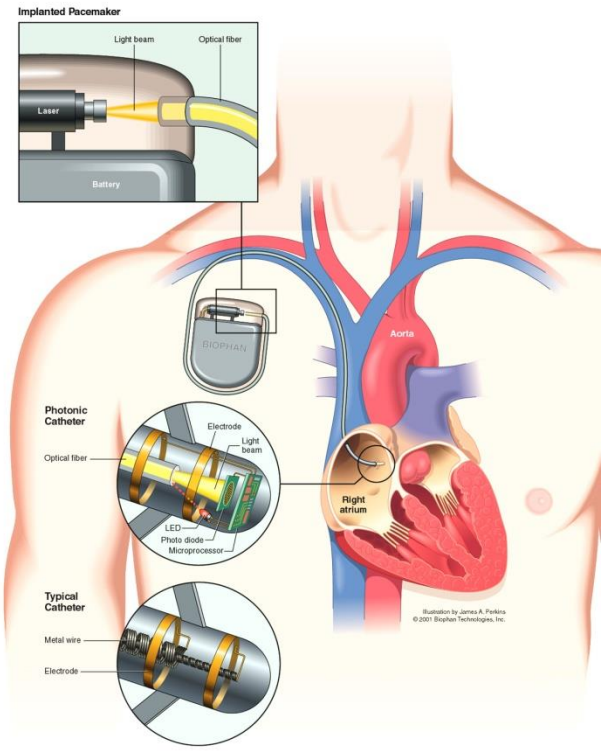
Treatment of MI

- Treatment after attack –
- Check with MD prior to treatment – old protocol was to wait 6 months
- Pay particular attention to medications – look for anticoagulants
- May have to have INR checked prior to treatment if on coumadin/warfarin
- New anticoagulants – dabigatran (Pradaxa), apixaban (Eliquis), rivaroxaban (Xarelto), and edoxaban (Lixiana), clopidogrel (Plavix)

Medical Emergency #3

Pacemaker/ICD Malfunction

- A pacemaker creates impulses to restore and regulate heart beat
- Malfunction caused by interference with these impulses
- In a dental office be careful using ultrasonic scalers or cleaners, pulp testers, electric toothbrushes, cellular phones and microwaves near patients with pacemakers
- Most pacemakers are now shielded to avoid problems

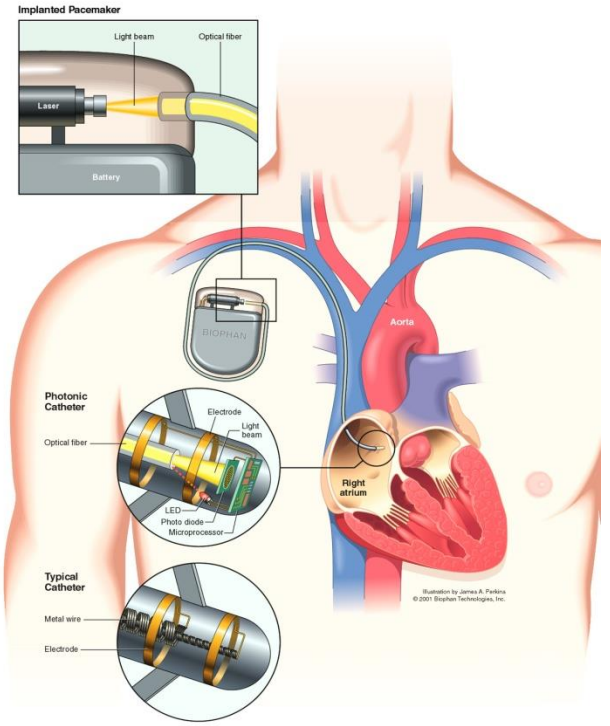


Signs and Symptoms of Pacemaker Malfunction

- Lightheadedness
- Dyspnea
- Dizziness
- Change in pulse – usually bradycardia
- Swelling of extremities
- Muscle twitching
- Chest pain
- Prolonged hiccoughing

Treatment of Pacemaker Malfunction/ICD Malfunction

- Position patient comfortably
- Turn off interference
- Check pulse rate
- If normal pulse rate does not resume summon EMS and prepare for CPR
- Monitor vital signs



Pacemaker/ICD

- Patients need to monitor have the pacemaker/ICD monitored
- Usually every 3 months
- Some wired – some wireless
- Report sent to physician

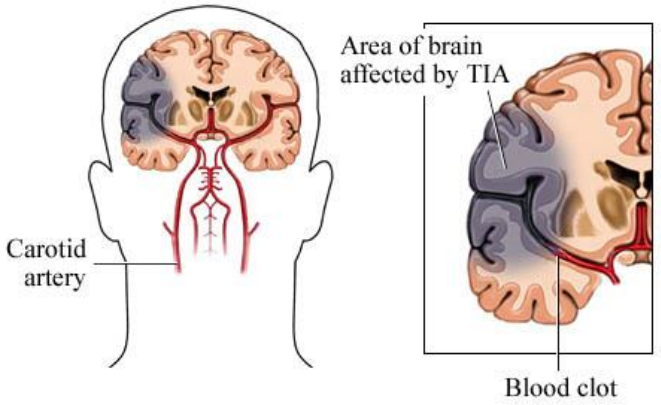
Medical Emergency #4

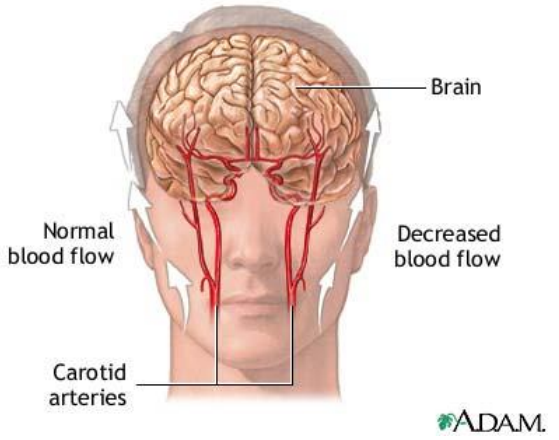
Cerebrovascular Accident

- CVA, stroke, brain attack
- Sudden loss of brain function from interference with blood supply – destruction of brain substance
- Etiologies: thrombus, embolus, ruptured blood vessel (usually following an aneurysm)
- Can cause paralysis or death
- 3rd leading cause of death
- 150,000 in US annually
- Average age 64 years

Transient Ischemic Attack

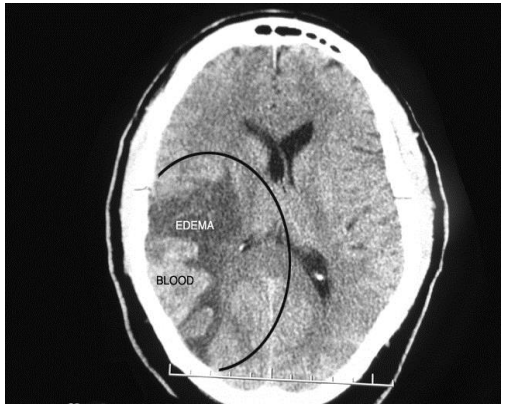
- TIA
- No permanent damage (like angina to MI)
- Usually a warning sign to CVA
- Last about 15 – 60 minutes





Types of CVA

- Hemorrhagic
- Aneurysm – 10% of CVAs
- 50-70% mortality rate
- Bleeding compresses nearby blood vessels and deprives surrounding tissue of oxygen
- Cerebral ischemia causes brain tissue to become edematous
- Most common in dental setting from stress

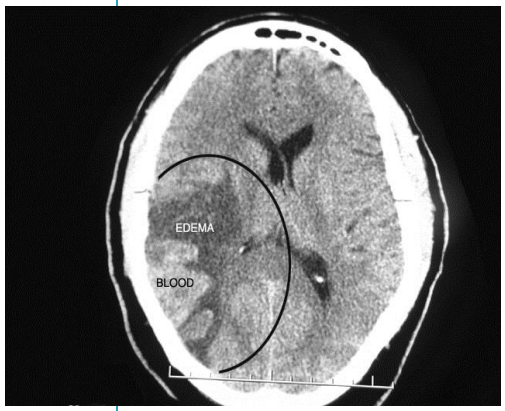


Types of CVA

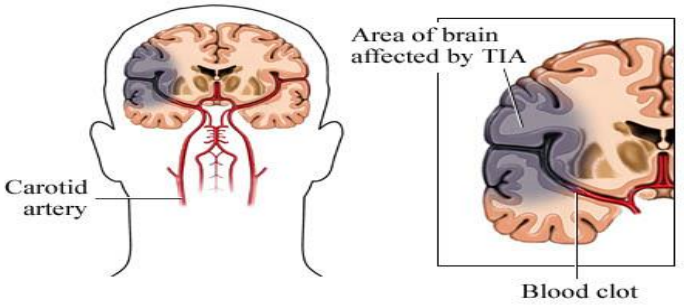
Hemorrhagic

- Abrupt onset, nausea, chills sweating, dizzy, pupils unequal, excruciating headache, consciousness impaired or lost

- Hypertension leads to degenerative changes in blood vessel walls



Types of CVA



Thrombotic

- Thrombus or embolism – occlusive
- Most common 85% – usually cerebral infarction of internal carotid artery – 7% from the heart
- Usually TIAs first
- Thrombotic – more gradual symptoms – abrupt mild headache
- Embolytic – abrupt mild heachache – hours later neurological symptoms – paralysis, dyspnea, difficulty swallowing, speech impairment, pupils unequal

Predisposing Factors

- Atherosclerosis (thrombus or embolus) 80%
  - Atherosclerosis causes clinical problems
- Hypertension
  - Weakens blood vessels
  - For every 10 mmHg of systolic BP above 160 there is a 30% greater risk of CVA
  - Degenerates the cerebral arteries
- Aneurysm
- Embolism
- Diabetes
- Contraceptives
- Smoking
- A Fib

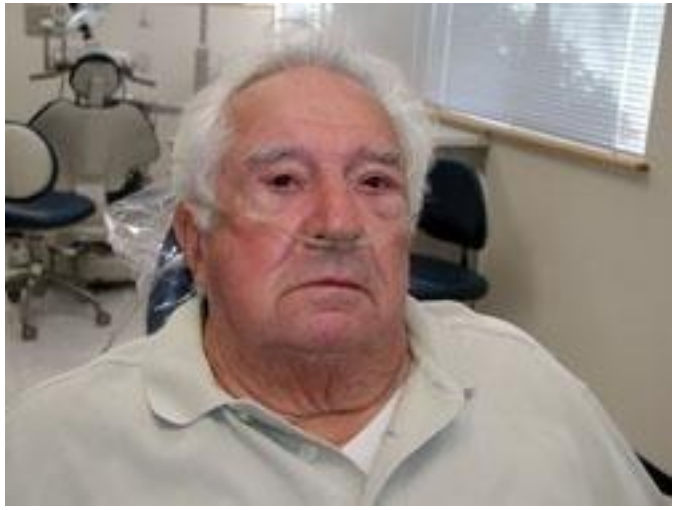
CVA Symptoms

- Numbness or weakness in face, arm or leg
- Difficulty speaking or understanding
- Difficulty swallowing
- Sudden confusion
- Severe headaches
- Dizziness or loss of balance
- Sudden blurred or decreased vision
- Sudden change of mental ability
- Nausea
- Labored slow breathing
- Unequal pupils

Treatment of CVA

CONSCIOUS

- Position patient in Semi-Fowler's position to decrease intracerebral blood flow
- EMS
- BLS
- Reassure patient
- Monitor vital signs
- Administer O_2 if needed via nasal canula – 4L/ min
- Do not give any medication – mask symptoms



Treatment of CVA

UNCONSCIOUS

70 – 100% chance of mortality

- EMS
- Supine position
- BLS
- CPR if necessary– forced O_2 15 liters per minute
- Monitor vital signs
- Transport as soon as possible
- If thrombotic stroke and thrombolytic agents (t-PA alteplase) administered within 3 hours of initial onset improved prognosis

Medical Emergency #5

Hyperventilation

- Alteration in the chemical composition of the blood causing excessive amounts of CO_2 to be eliminated
- Causes an increase in the PH of the blood – respiratory alkalosis
- Decrease in CO_2 causes increased binding of oxygen to hemoglobin causing a reduction in the amount of O_2 available to the body and brain (up to 60% reduction)
- Too much O_2 caused by patient breathing rapidly from the top of their chest
- Usually caused by emotional distress

Symptoms of Hyperventilation

- Rapid, deep respirations – 22 – 40 breaths/ minute
- Rapid pulse
- Feeling of suffocation
- Shortness of breath
- Pressure, tightness or pain across the chest
- Anxiety
- Dry mouth
- Blurred vision
- Diaphoresis

Symptoms of Hyperventilation

In extreme cases

- Tingling in face, fingers and toes
- Hand and finger spasms and pain (carpopedal spasms) –tetany from a decrease in the calcium ions in blood
- Circumoral parasthesia

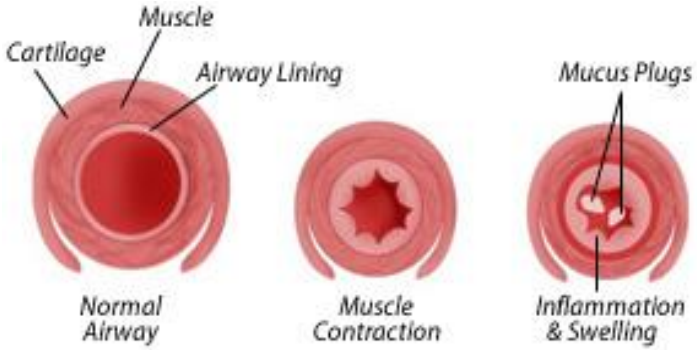
Treatment of Hyperventilation

- Upright position
- Loosen collar
- Calm patient
- Attempt to control breathing
- Do not give O_2
- May need anti-anxiety medication

Medical Emergency Scenario #6

Bronchial Asthma Attack

- Recurrent attacks of dyspnea usually with wheezing due to spasmodic constriction of bronchi



Bronchial Asthma Attack

- Allergic response
- #s in US have increased by 60% since the 1980s
- 5000 deaths per year in US
- 7-10% of all US children have asthma – leading cause of chronic disease
- Be careful with aspirin or analgesics

Triggers of Asthma Attack

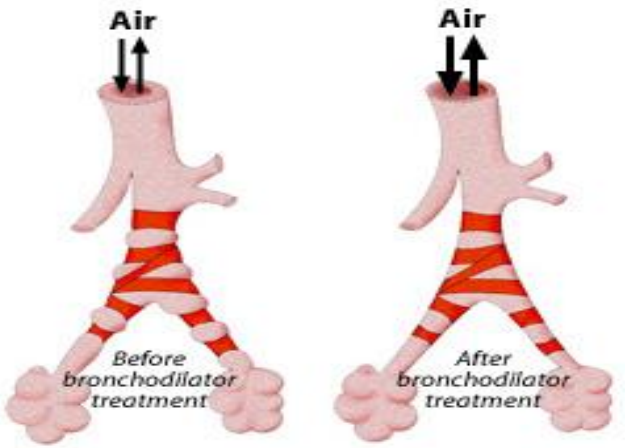
- Pollen
- Dust/smoke
- Animals
- Stress
- Temperature changes
- Laughing

Symptoms of Asthma Attack

- Dyspnea with wheezing
- Pallor of cyanosis
- Anxiety
- Coughing with or without sputum
- Chest tightness

Treatment of Asthma Attack

- Upright position with arms forward
- Bronchodilator – MDI metered dose inhaler – preferably patients or from kit – albuterol
  - Slow inhalation 5-6 seconds/hold/exhale through pursed lips
- If improvement in 15 seconds continue treatment



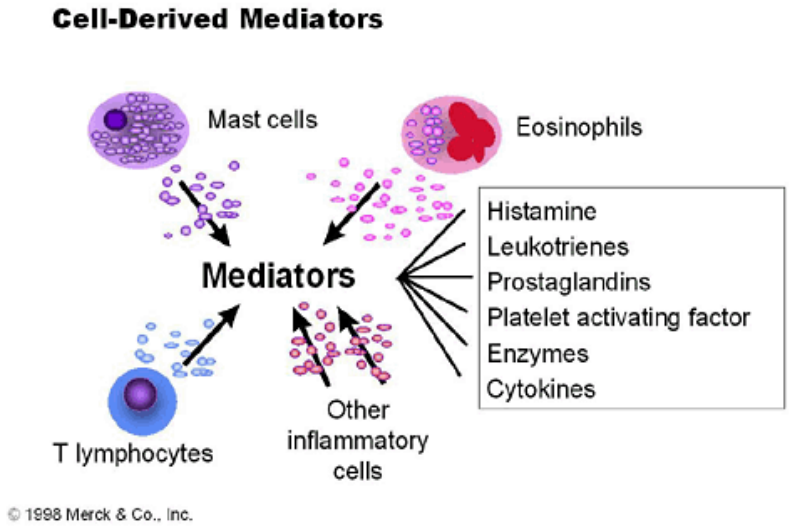
Treatment of Asthma Attack

- If no improvement administer O_2 and albulterol from emergency kit and call EMS
- If still no improvement can administer .3 mg epinephrine 1:1000 (adult) or .125 – .25 mg epinephrine (child)

Medical Emergency Scenario #7

Allergic Reaction

- State of abnormal sensitivity by being exposed to a particular allergen
- Antigen/antibody response causing IgE antibodies to become bound to the surface of mast cells
- When mast cell bound IgE combines with antigen on subsequent doses, histamine and other chemical mediators are released almost immediately which dilate blood vessels, cause edema, increased mucous secretions, pruritis, bronchospasm and urticaria



Allergic Reaction

- 15% of US population has allergic conditions severe enough to require medical management
- The quicker the onset the more severe the reaction
- If severe – death can occur
- Must be sensitized to allergen first before allergic reaction can occur
  - First dose is sensitizing dose
  - Subsequent doses are challenge doses
- Often times medications can cause allergic reactions: penicillin, cephalosporins, tetracycline, aspirin, NSAIDS, narcotics, barbituate, esters, sulfites, parabens

Symptoms of Mild Allergic Reaction

- Urticaria – capillary dilation
- Pruritus
- Rhinitis – histamine stimulates secretion of mucous glands
- Site of administration usually main area for symptoms

Symptoms of Severe Allergic Reaction

- Anaphylaxis – acute allergic reaction affecting respiratory and circulatory systems
  - Severe bronchial constriction and angioedema of the larynx
  - Allergic reactions become more severe each time exposed to allergen
  - If total collapse of circulatory and respiratory systems then referred to as anaphylactic shock

Symptoms of Severe Allergic Reaction

- Respiratory distress possibly with severe dyspnea and wheezing
- Rhinitis
- Angioedema of lips, eyes, larynx
- Decreased BP – severe hypotension leads to unconsciousness then called shock
- Tachycardia/arrhythmias
- Decreased consciousness
- Death can occur within 15 minutes

Treatment of Mild Allergic Reaction

- Position comfortably
- Oral histamine blocker
  - Chlorpheneramine
    - 10 mg 3-4 times per day
  - Benadryl
    - 25 – 50 mg 3-4 times per day

Treatment of Moderate Allergic Reaction-Systemic

- More severe symptoms, but absence of respiratory or cardiovascular difficulties
  - Position comfortably
  - BLS
  - Administer Diphenhydramine 50 mg IM
  - Administer chlorpheneramine 10 mg orally for 3 days
  - Administer O_2 as needed
  - Monitor vital signs

Treatment of Severe Allergic Reaction – Anaphylaxis

- More severe symptoms with respiratory or cardiovascular difficulties
  - Position upright
  - BLS
  - EMS
  - Administer O_2
  - Administer epinephrine IM .3 mg 1:1000
  - Administer Diphenhydramine 50 mg IM
  - Monitor vital signs

  - Usually hospitalized after reaction and given antihistamine and steroids to reduce inflammatory response

Medical Emergency Scenario #8

Local Anesthetic Overdose

- 300 million dental cartridges injected in US each year
- Often relative overdose – inadvertent intravascular injection
- Absolute – too large a total dose
- Need to be particularly wary with small individuals

Symptoms of Local Anesthetic Overdose

- Overdose is characterized by a period of excitation followed by depression
- Excitatory phase may be extremely brief or may not occur at all
- Minimal to Moderate Overdose Levels
  - Talkativeness
  - Apprehension
  - Excitability
  - Slurred speech
  - Sweating
  - Disorientation
  - Dizziness
  - Restlessness
  - Nervousness
  - Metallic taste
  - Visual and auditory disturbances

Symptoms of Local Anesthetic Overdose

- Moderate to High Overdose Levels
  - Tonic-clonic seizure activity
  - CNS depression
  - Depressed BP, heart rate and respiratory rate

Treatment of Severe Local Anesthetic Overdose

- Remove syringe
- If convulsions present, treat for seizure
- EMS
- BLS
- Optional – Administer anticonvulsant – usually not indicated – Lorazepam IM
- Transport

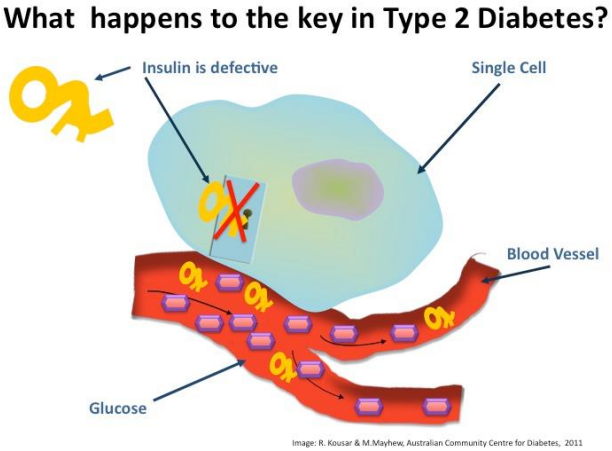
Treatment of Mild Anesthetic Overdose

- Reassure patient
- O_2
- Monitor vital signs
- Permit patient to recover
- If not improving EMS

Medical Emergency Scenario #9

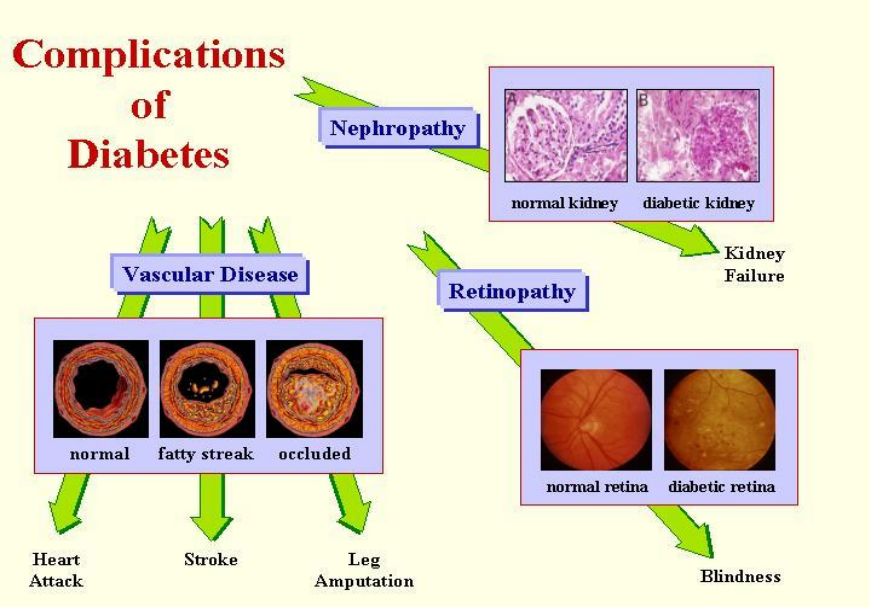
Diabetes

- Inadequate production and action of insulin from the pancreas causing the inability to utilize glucose which leads to hyperglycemia
- Effects 15.7 million people in US
- In a 2000 patient practice – 40-70 patients will have diabetes and one-third will be unaware
- Factors: genetic or destruction of islets of langerhan by inflammation, surgery or cancer



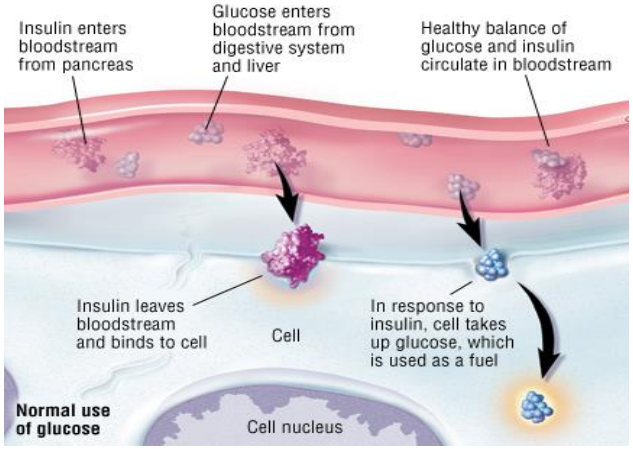
Diabetes

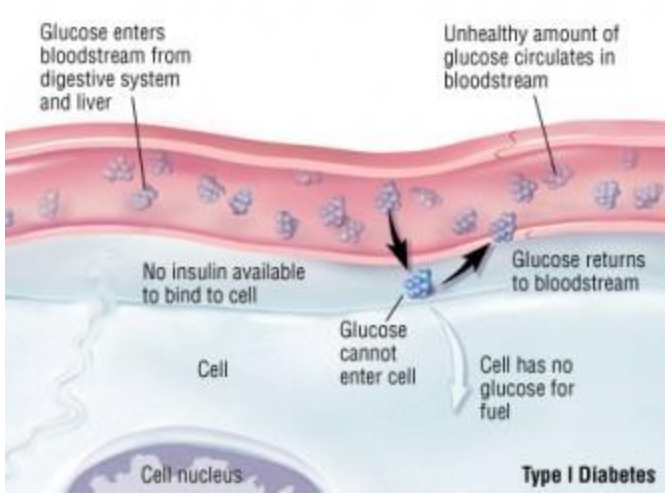
- Diabetics are 2-4X more likely to have heart disease, kidney problems or CVA
- Chronic complications
  - Large blood vessel disease
  - Small blood vessel disease
    - Microangiopathy particularly of the eyes
  - Infection
    - Gangrene or perio disease
  - Nerve Damage



Classification of Diabetes- WHO (5 Groups)

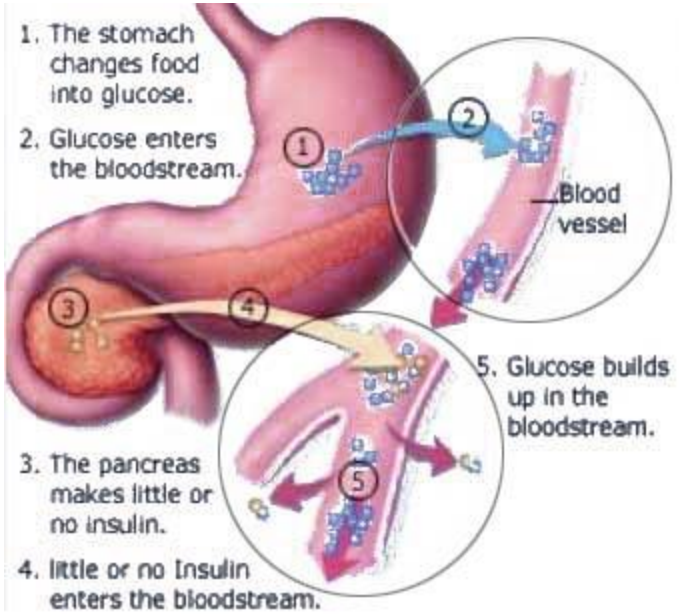
- Type 1
  - Previously IDDM
  - 5-10% affected
  - Little or no insulin secreted
- Type 2
  - Previously NIDDM, however some Type 2 diabetics require insulin
  - 90-95% of diabetics affected
  - Relative insulin deficiency
  - Ketoacidosis infrequently found





Classification of Diabetes – WHO (5 groups)

- Other specific types of diabetes
  - Genetic defects of beta cell function
  - Genetic defects of insulin action
  - Diseases of pancreas
  - Endocrinopathies
  - Drug or chemical induced
  - Infections
  - Uncommon forms of immune-mediated diabetes



Classification of Diabetes– WHO (5 Groups)

- Gestational
  - During pregnancy
  - Risk factors: obesity, family hx, previous hx of gestational diabetes
- Impaired Glucose
  - Intermediate state between normal glucose and diabetes
  - At risk individuals

Emergencies Associated with Diabetes

- HYPOGLYCEMIA
  - Most common medical emergency associated with DM
  - Diabetic patient has too much insulin and not enough glucose
  - Blood glucose levels <70 mg/dl
  - Risk factors
    - Intensive insulin therapy
    - Excessive exercise
    - Missed or delayed meals
    - Reduced meal
    - Medication error
    - illness
  - 100% of Type I diabetics experience hypoglycemia with 10-25% having severe hypoglycemia 1X/year

Symptoms of Hypoglycemia

- Symptoms begin when blood glucose is <50 mg/dl
- Rapid onset
- Diaphoresis
- Palpitations/Bounding pulse
- Dizziness
- Hunger
- Headache
- Inability to concentrate
- Behavioral disturbances – irritability, aggressive behavior or confusion – may look like drugs

Treatment of Hypoglycemia

- Conscious patient
  - Oral glucose >15 g
    - Tablets
    - Paste
    - Drink
    - Packet
  - Maintain airway
  - Monitor vital signs
  - EMS if necessary

Treatment of Hypoglycemia

- Unconscious patient
  - Supine position
  - BLS
  - EMS
  - Airway
  - Transmucosal glucose paste or 1 mg glucagon IM
  - Monitor vital signs

Symptoms of Hyperglycemia (DKA)

- Fruity odor on breath
- Slow onset
- Skin flush and dry
- Nausea, malaise
- Low BP
- Exaggerated respirations (Kussmaul's)
- Altered level of consciousness
- Eventually coma

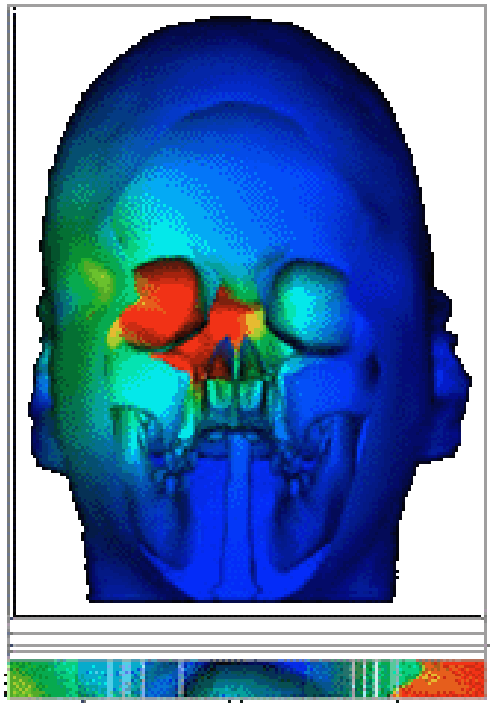
Treatment of Hyperglycemia- DKA

- Contact EMS
- Determine blood glucose level
- Monitor vital signs
- Administer O2 4-6L/min.
- If unsure give glucose

Medical Emergency Scenario #10

Seizure

- Not a disease, but a symptom of a disordered CNS characterized by recurrent attacks of convulsions
- Any disease that impairs blood flow to the brain can cause seizures
- 65% idiopathic 35% acquired
  - Congenital abnormalities
  - Perinatal injuries
    - Maternal infection, trauma, hypoxia during delivery
  - Metabolic and toxic disorders
  - Head trauma
  - Tumors
  - Vascular disease
  - Infectious diseases



Red indicates high electrical activity in brain during an epileptic seizure

Seizure

- Most common cause of seizures in a dental office are local anesthetic overdose, syncope, hypoglycemia, and epileptic patients
- 200,000 individuals in US suffer from seizures > 1X/month
- 10 million people have had at least one seizure

Generalized Seizures

- Grand Mal epilepsy
- Generalized tonic-clonic seizure (GTCS)
- Most common form of seizure disorder – 90% of epileptics
- Last about 2-3 minutes up to 5 minutes

? to ask of epileptic patient

- What type of seizure?
- How often seizures
- What triggers your seizures?
- How long do seizures last?
- When was your last seizure?
- Are you taking medication for your seizure and if so what type and did you take it today?

Seizure medications

- Used to use Dilantin (Phenytoin)
- Many side effects – drowsiness, gingival enlargement
- Many more options for medications:
  - Zarontin (ethosuximide), Lamictal (lamotrigine), Zonegran (zonisamide), Keppra (leveriracetam) for generalized or partial siezures
  - Depacon (valproate) & Topamax (topiramate) for absence seizures

Generalized Seizures – Precipitating Factors

- Arousal or anxiety
- Fear
- Frustration
- Fatigue
- Sleep
- Flickering lights or sounds

GTCS Phases: Prodromal

- Changes in emotional reactivity
- Aura – part of seizure
  - Usually same aura each time
  - Lasts a few seconds
  - May be olfactory, visual, gustatory, or auditory in nature
  - Many patients unaware of their aura due to amnesia

GTCS Phases: Pre-Ictal

- Individual loses consciousness
- Most injuries occur during this phase
- Major myoclonic jerks
- Epileptic cry/crowing
- Increased heart rate and BP

GTCS Phases: Ictal

- Tonic component
- Generalized muscle contractions
- Respiratory muscles involved so dyspnea and cyanosis may occur
- 10-20 seconds

- Clonic Component
- Alternating muscular relaxation and violent contractions
- May foam at mouth
- 2-5 minutes
- Pallor
- Perspire
- May bite tongue

Tonic Component

Clonic Component

GTCS Phases: Post-Ictal

- Total relaxation of muscles
- Headache
- Drowsiness
- Muscle Soreness
- Bladder incontinence
- Amnesic
- Possible respiratory arrest

Treatment of GTCS Seizure

- Ictal Phase
  - Supine position – floor or chair
  - EMS
  - Move objects out of reach
  - Place nothing in oral cavity
  - Gently restrain
  - Attempt to maintain open airway
  - Monitor vital signs

Treatment of GTCS Seizure

- Post-Ictal Phase
  - Let patient rest
  - Monitor vital signs
  - Administer O_2 if necessary
  - BE ALERT – PATIENT CAN GO INTO RESPIRATORY ARREST
  - CPR if necessary
  - Do not dismiss patient unaccompanied

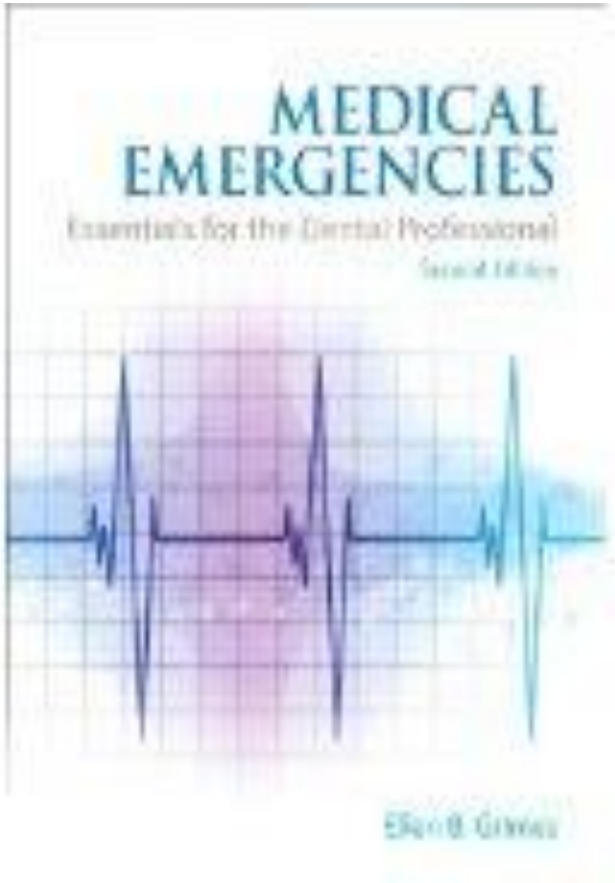
Medical Emergency Scenario #11

- You are scaling and realize that the tip of your instrument is no longer attached.

Treatment of Broken Instrument Tip

- Ask patient not to swallow
- Isolate area
- Look and carefully probe for tip
- Use perioretriever to remove
- Radiograph if cannot find
- Retrieve and record
- Show patient tip

Textbook



Webinar

- CE/Webinars
- Sonicare/DP
- Webinar Listing
- Medical Emergencies for the Dental Professional
- $30 – 2 CEUs
- 50% of proceeds to Vermont Dental Hygienists' Association

This Presentation was Supported by an Educational Grant from