Local Anesthesia & Patient Assessment

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NYS Required Learning Objectives:

Medical History & Assessment for Safe Delivery of Local Aesthesia

Understand the difference between relative & absolute Contraindications for Local Anesthesia

Definitions & descriptions of physiological & psychological aspects of anxiety and pain

Indications & contraindications for use of local anesthesia.

As per the Dental literature:

"Evaluating the Physical and Psychological Status of your patient can prevent up to **90%** of the medical emergencies which can occur in a dental office."

SO……

We do **not** want you to be fearful about providing dental injections to your patients

But to be mindful that you are injecting a drug which has the potential to have unintended systemic side affects if not administered with safe correct technique.

Systemic Reactions during administration of Local Anesthesia occur more often with Block Anesthesia techniques than infiltration techniques

Ask yourself these questions…..

- Is the patient capable both physiologically & psychologically of undergoing the dental procedure & receiving local anesthesia?
- Does this patient represent a greater risk of morbidity/mortality then the average healthy person during the dental treatment?
- If patient is an ASA II; III; What treatment modifications need to be made to safely deliver dental treatment?
- Based upon the assessment of this patient, Is this patient better managed in a hospital based dental clinic?

Difference between Relative & Absolute Contraindications

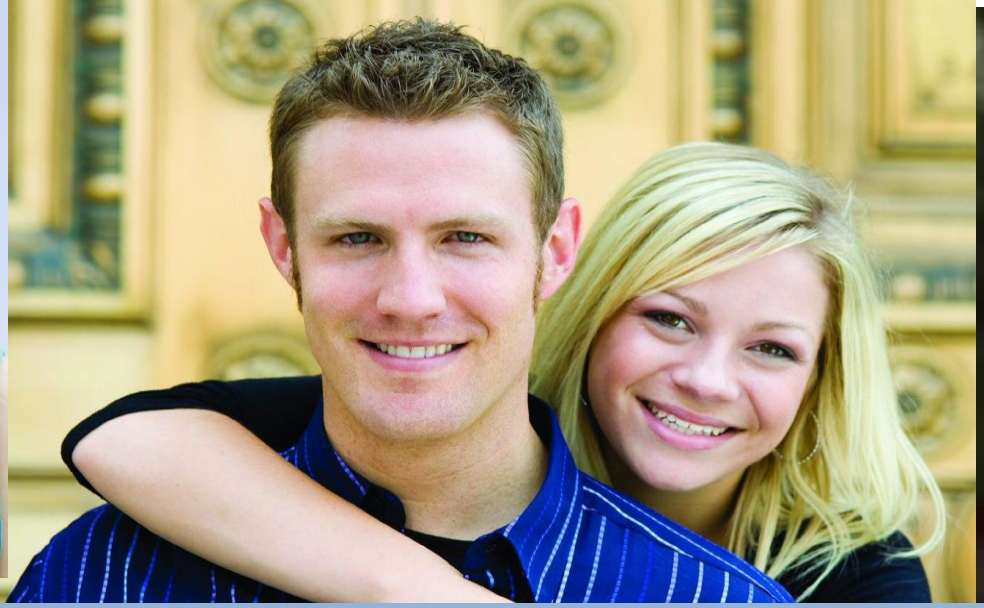
Absolute contraindication:

- The administration of the offending drug increases the possibility of a life-threatening situation and should not be administered to the individual under any circumstances.

Relative contraindication:

- The administration of the offending drug is preferably avoided because of the increased possibility of an adverse reaction to the drug.

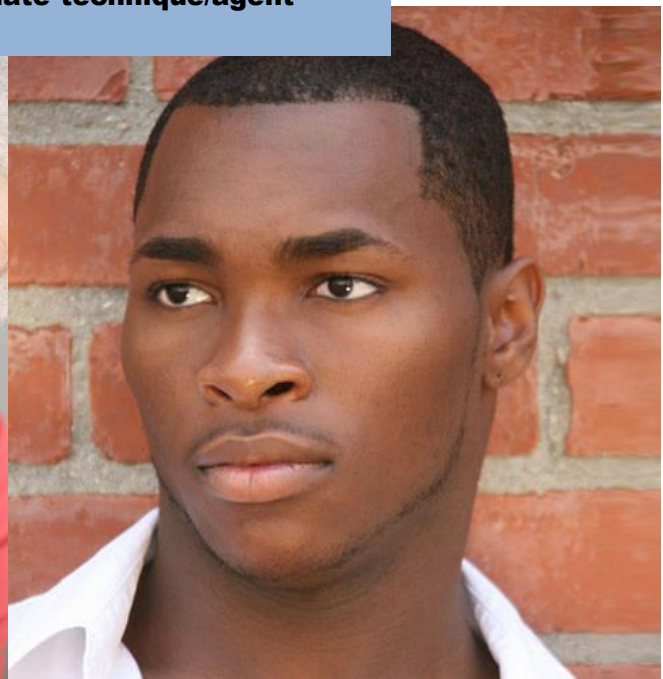
Patient Assessment



When we assess the patient:

Prevents or minimizes anesthetic complications/medical emergencies

Assists the healthcare provider in choosing appropriate technique/agent selection/dosage of anesthetic



Getting To Know The Patient

A comprehensive assessment includes:

- Comprehensive medical history review
- Review of past dental experiences *Why?*
- Observation of:
  - Physical evaluation
  - Psychological demeanor
- Assigning an ASA classification
- Consultation with other Healthcare Professional if your clinical judgement warrants it

Comprehensive Medical Review

The written medical history form should always be reviewed & a dialogue established with the patient to obtain a clear understanding of the information which has been provided on the form

Important information we need to know:

1. Diagnosed medical conditions
2. Prescription medication to manage the medical condition
3. OTC products including dietary & herbal supplements (look them up!)
4. Allergies to anything!
5. Concomitant medications

Concomitant medications

is defined as drugs that are in a patient's system when local anesthetics are administered which:

- May influence the choice of anesthetic and the quantity administered
- Ability to affect the efficacy, metabolism and elimination of the anesthesia

It is always important to:

Record the following information about Prescription and OTC products patients are taking:

- » Drug name –trade and generic
- » Drug classification
- » Purpose for taking the drug
- » Prescribed dose and schedule
- » Side effects and adverse reactions
- » Precautions w/dental care
- » Drug interactions

An Example of a concomitant interaction:

- Tagamet (Cimetidine) is an H_2 receptor blocker and therefore competes with Lidocaine (amide) for binding sites in the liver.
- This interaction will increase the half-life of the local anesthetic agent, lidocaine.

Common Concomitant Drug Therapy & Local anesthesia

Review Table 7-11 in your textbook

Physical Evaluation

> skin tone (pale; sweating; normal)

> symmetry of head & neck structures/posture

> observation of respiratory exchange

> speech pattern

> evaluation of the eye pupil

> vital signs
(pulse; blood pressure; respiration)

> weight

Evaluation of the pupils

Physical Evaluation of the Patient

Heart Rate/Pulse

- Location: Brachial or radial pulse most often used
- *Normal Adolescent & Adult resting heart rate between*

  60 to 110 beats per minute
- Pulse rate:

  below 60(bradycardia) &

  above 110 bpm (tachycardia) require further evaluation
- Delay dental treatment until cardiac system evaluated

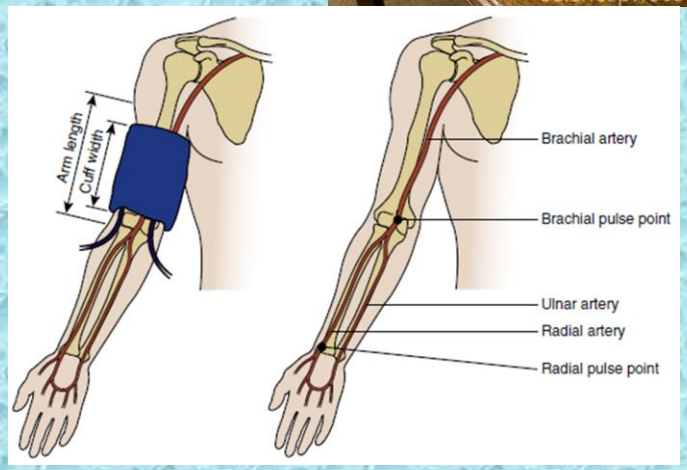
Blood Pressure

Administration of Local Anesthesia:

- Can affect cardiac & vascular structures
- Stress from local anesthesia administration can cause an ↑ blood pressure, pulse & possibly respiration

Vital signs serve as baseline data in the event of adverse effects.

- ***must be documented in the patient chart***
- ***dental record is a legal document, if you do not document it was not done***



From Darby M, Walsh M: Dental hygiene theory and practice, ed 4, St Louis, 2015, Saunders, Elsevier.

Guidelines for Local Anesthesia Management in Hypertension

Blood Pressure Values	Treatment and Referral Actions
≥ 120/80 but < 160/100 →	No contraindications for treatment, suggest medical referral
≥ 160/100 →	Treatment may be initiated with monitoring, prompt medical referral
> 180/110 →	Defer treatment, immediate medical referral

Treatment Considerations for Hypertensive Patients

- take BP at every visit
- Patients' noncompliance with antihypertensive drug regimens is epidemic
- Patients should be reminded to take their potentially life-saving medications

Illegal Drug Use

- Patient's are not always forthcoming about illegal drug use
- If you suspect person is using recreational drugs then postpone the dental appointment
- Remember there is no emergency "Dental Cleaning"

Local Anesthesia & Illegal Drug Use

DRUG	Local Anesthesia Considerations	Vasoconstrictor Considerations	Dental Considerations
Methamphetamine	N/A	**Caution**: Administration of Vasoconstrictor can result in Hypertensive crisis and Stroke or MI	**DO NOT** administer Local anesthesia with vasoconstrictor within **24 hours** of meth use
Cocaine	Cocaine is a strong CNS depressant and Local anesthesia will compound this effect	Caution: Administration of Vasoconstrictor can result in Hypertensive crisis and Stroke or MI	DO NOT administer Local anesthesia with vasoconstrictor within **6 hours** of cocaine use
Oxycodone	abusers were compared to non-abusers in their response to lidocaine.	The abusers were found to require a longer amount of time for the lidocaine to work. And in addition, a greater amount of lidocaine was required.	
Alcohol	Decreases the effectiveness of Local anesthetic	N/A	

Respiration and Local Anesthesia

TABLE 7-5 Acceptable Ranges of Respiratory Rate According to Age

Age	Rate (Breaths per Minute)
Toddler (2 years)	25–32
Child	20–30
Adolescent	16–20
Adult	12–20

As a clinician, the patients will normal respiration will tolerate Local Anesthesia well

National Boards always ask about normal Vital Signs' Ranges

Weight

- Weight is used to determine the Maximum Recommended Dose (MRD)
- For delivery of Adult Local Anesthesia this does not impact clinical decision
- Children patients weight can impact how much local anesthesia one delivers
  - ****Lower the MRD for children with excess weight.**

Review of Past Dental Experiences

- Dental phobia? Or Dental Anxiety
- Past dental experiences: Good, bad, indifferent
- Life stresses: Divorce, death in family, trauma, work, school
- Medical stresses impact on psychological response
  - Angina, asthma, hyperventilation, seizures
- Physical symptoms:
  - Anxiety can Increase in vital signs
  - Observations:
    - Movements, skin color, sweats, posture, trembling, verbal communication

Dental History Review

Anxiety and fear can produce both psychological and physiological changes in the body that can impact the ability to administer local anesthesia and the effectiveness of the local anesthetic

Dental Fears Questionnaire

- Designed to assess the patients level of anxiety and fear.
- Corah's Dental Anxiety Scale (**DAS**)- patient's select the response that most closely matches their reaction to hypothetical situations.
- Each response is assigned a value
- Higher values indicate higher anxiety

Questions -Corah's Dental Anxiety Scale (developed 1969) are:

1. If you had to go to the dentist tomorrow for a check-up, how would you feel about it?
2. When you are waiting in the dentist's office for your turn in the chair, how do you feel?
3. When you are in the dentist's chair waiting while the dentist gets the drill ready to begin working on your teeth, how do you feel?
4. Imagine you are in the dentist's chair to have your teeth cleaned. While you are waiting and the dentist or hygienist is getting out the instruments which will be used to scrape your teeth around the gums, how do you feel?
5. Are your afraid to get dental local anesthesia? (question #5 added in 1990's and calleda the Modified Dental Anxiety Scale)

Not often used in Dentistry therefore we will not test you on this

From the Assessment information

We can then assign an ASA

ASA Classification

- What is it?
  - » A classification system created by the American Society of Anesthesiologists
  - » Used in hospitals routinely to predict preoperative adverse outcomes in patients receiving general anesthesia
  - » Classifies patients into a risk category based upon their systemic or physiological health
  - » For Medicine, PS1 to PS6 categories are used
  - » Adapted for dentistry by Malamed & McMarthy includes PS1 to PS5 categories

Assigning an ASA Classification

Modified from Little JW, Falace DA, Miller CS, Rhodus NL: Dental management of the medically compromised patient, ed 8, St Louis, 2013, Mosby.

In Dentistry in a private practice setting, we treat ASA I to III with clinical judgement

In General
Patients who are ASA III *May* need to be treated in a Hospital dental clinic
ASA IV- should be treated in a hospital dental clinic

TABLE 7-6 American Society of Anesthesiologists Physical Classification System

Classification	Description of Classification
American Society of Anesthesiologists (ASA) I	A normal, healthy patient
ASA II	A patient with a mild systemic disease but this does not interfere with daily activity (e.g., a healthy patient with considerable anxiety; a healthy pregnant patient; a patient who has well-controlled type 2 diabetes, controlled epileptic, and/or well-controlled asthma)
ASA III	A patient with moderate to severe systemic disease that limits activity but is not incapacitating, but may affect daily activity (e.g., stable angina, exercise-induced asthma, postmyocardial infarction or cerebrovascular accident more that 6 months before treatment, poorly controlled hypertension)
ASA IV	A patient with an incapacitating systemic disease that is a constant threat to life (e.g., myocardial infarction within past 6 months, or cerebrovascular accident within 6 months, uncontrolled epilepsy or uncontrolled diabetes, blood pressure greater than 180/110)
ASA V	A moribund patient not expected to survive 24 hours with or without an operation
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes.

Commonly Encountered Medical Emergencies in the Dental office

Medical Emergencies reported by 2,704 Dentist in North America		
Syncope	30%	
Allergic RXN(mild)	18.7%	
Postural Hypotension	17.9%	
Hyperventilation	9.6%	
Insulin Shock (hypoglycemia)	5.1%	
Angina pectoris	4.6%	
Seizures	4.6%	
Asthmatic Attack	2.8%	
Local Anesthetic overdose	1.5%	
Allergic RXN (severe) Anaphylactic RXN	1.4%	
Myocardial infarction Cardiac Arrest	1.4% 1.2%	

So.....

Local Anesthesia in Dentistry is very safe when the patient is assessed, and proper injection technique is followed

Before we review how different organ systems may be affected by Local Dental Anesthesia

We must first discuss an ingredient in Local anesthesia called the vasoconstrictor

Local Anesthesia can be formulated with or without an agent called a Vasoconstrictor

If the local anesthetic contains a vasoconstrictor it is either Epinephrine or Levonordefrin

Why are Vasoconstrictors in LA Important?

- Functions to:
  - » Slows the rate of absorption into the blood stream
  - » Delays cresting of blood peak levels
  - » Prolongs the duration anesthesia
  - » Produces a better depth of anesthesia
  - » Reduces the risk of systemic reaction to the local anesthetic solution.

Choosing a Dental Local Anesthesia with or without a vasoconstrictor will depend on the health of different body systems

Body System	Absolute Contraindications to the use of a vasoconstrictor	
Heart		
within 6 months of dental appt	Myocardial Infarction or Coronary Bypass Surgery (CABG)	↑cardiac arrest
	Uncontrolled High Blood Pressure (BP > 180/110	Medical consult required
	Uncontrolled Angina or Arrhythmias	↑cardiac event
Recreational Drug Use	Cocaine or Methamphetamine abusers	Vasoconstrictor+ concomitant drug= ↑cardiac arrest
Endocrine		
Diabetes	Poorly controlled diabetes	Vasoconstrictor competes with insulin for binding sites in liver; ↑ hyperglycemia
Thyroid	Uncontrolled Hyperthyroidism	Thyroid crisis/storm
Adrenal Gland Malfunction	tumors of the adrenal gland	
Allergies	Sulfite Allergies-Sulfite derivatives only added to Local Anesthesia with vasoconstrictor	

Body Systems & Dental Local Anesthesia Considerations

Cardiovascular system

Respiratory system

Nervous system

Coagulation/blood disorders

Excretion (Liver & Kidney)

Metabolic disorders

Biotransformation of Dental Local Anesthetic Agents

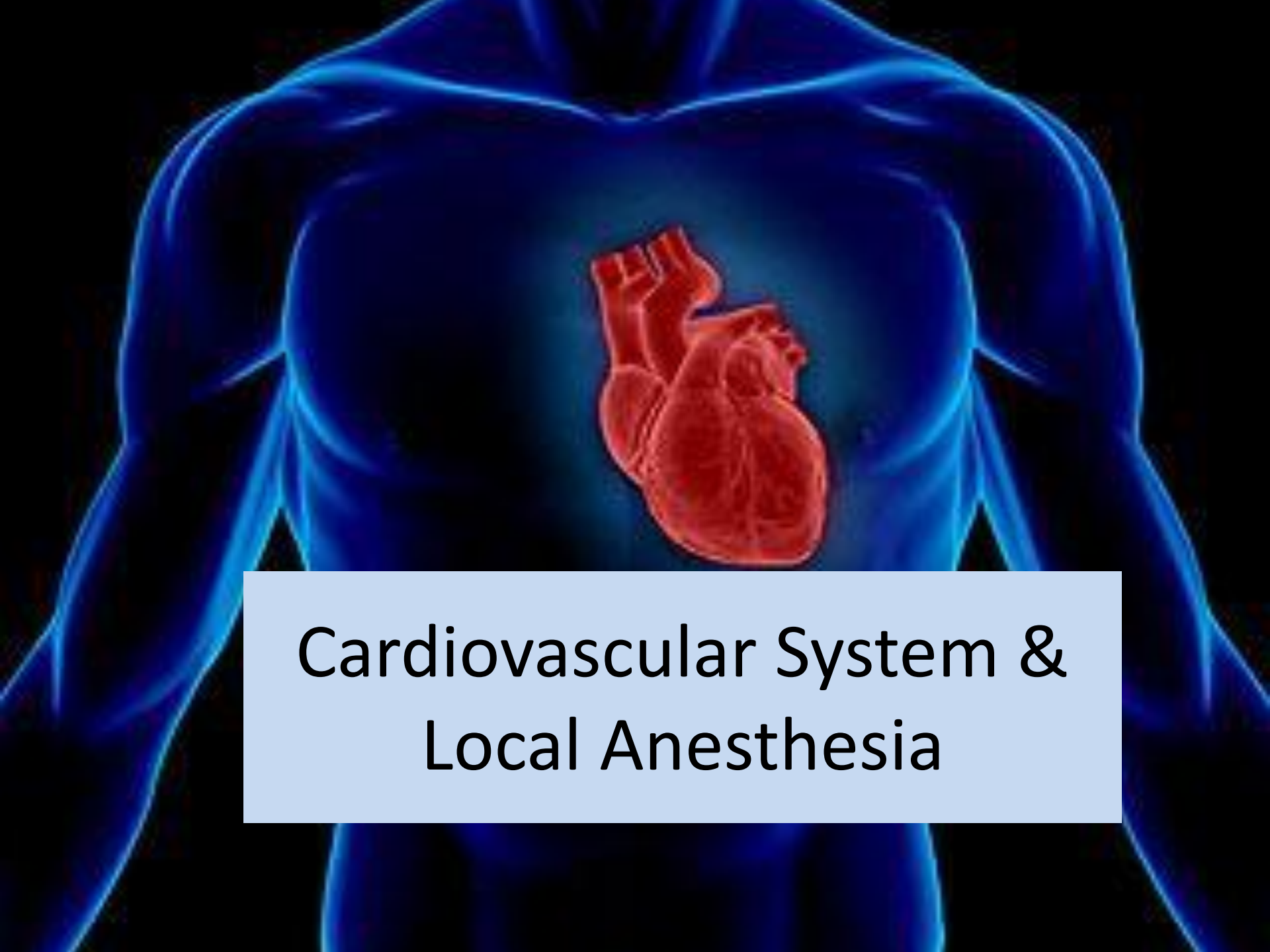
The Biotransformation of all Dental Local Anesthetics is:

Liver for the Amide based Local Anesthetics

Blood Plasma for the Ester based Local Anesthetic

(in US Dental Local Anesthetics that are an Ester (Novacaine) are no longer manufactured for use in dentistry)

Therefore, if there is liver disease or an enzyme deficiency (plasma pseudocholinesterase) in the blood the Amid and Ester Dental Local Anesthesia will have an altered biotransformation leading to a toxicity to occur



Cardiovascular System & Local Anesthesia

Effect on Cardiovascular System

Local anesthesia with vasoconstrictor has the potential to cause arrhythmias

Cardiovascular System Diseases & Local Anesthesia Considerations

1.Myocardial infarction

2. Angina Pectoris

3. Congestive Heart Failure

4. Implanted Cardiac Devices (Pacemaker/ Defibrillator)

Cardiovascular Conditions of Concern

Myocardial infarction-administration of LA presents an increased risk to patients with recent(<6 months) **or** history of multiple myocardial infarction

- — No elective dental care within 6 months of MI
- — Post MI patients**(>6 months**) are treatable(ASA-3) Vasoconstrictor at "cardiac dose " is allowed based upon clinical judgement.

Angina Pectoris-is defined as a transient (reversible)chest pain caused by myocardial ischemia, relieved by rest or administration of a vasodilator

- — Stable angina represents an ASA-3 risk
- — Unstable angina represents an ASA-4 risk & dental tx is recommended in hospital based dental clinic; no vasoconstrictor in LA.

Cardiovascular Conditions of Concern

Congestive Heart Failure-impairs lung function, particularly in the pulmonary vessels where blood accumulates(congestion in the lungs)

CHF:

-leads to pulmonary hypotension(Edema)

-compromises both the heart and lung function

-necessitates modifications for local anesthesia

-cannot be supine, leads to pulmonary edema

Implanted Cardiac Devices

Heart **Pacemakers**

- Significant rhythm disturbances of the heart may necessitate the insertion of a pacemaker
- Current pacemaker are of the demand type (function only when needed)
- Do not require antibiotic prophylaxis
- **Safe to use local anesthesia with vasoconstrictors; limit to "Cardiac Dose" dose**

- Implanted Cardioverter/defibrillator
- (**ICD**) Indicated for persons with significant atrial and ventricular cardiac dysrhythmias
- sense the onset of potentially life-threatening irregularities in the heart's rhythm and deliver either a synchronized shock(cardioversion) or a shock to defibrillate the heart

ICD

- Size of a deck of playing cards
- Now are dual function and Currently replacing “former “ pacemakers
- Implanted under the skin on the left side of the chest
- Leads are place into the heart to monitor its rhythm and deliver a shock, if needed.
- Antibiotic prophylaxis not required
- Consultation with patients cardiologist is suggested prior to dental treatment

Vasoconstrictor & Cardiac disease

It is recommended after assessment and clinical judgement to give a local anesthetic with vasoconstrictor to cardiac patients with:

1. Patients with Heart disease and ASA II/III

-stable angina patient

- history of MI greater than 6 months

- controlled Hypertension

- ICD

Quantity of vasoconstrictor is to be <u>limited</u>.

"Cardiac Dose"= 0.04mg= 2.2 carpules of 1:100,000 dilution of epi (National Board Question)

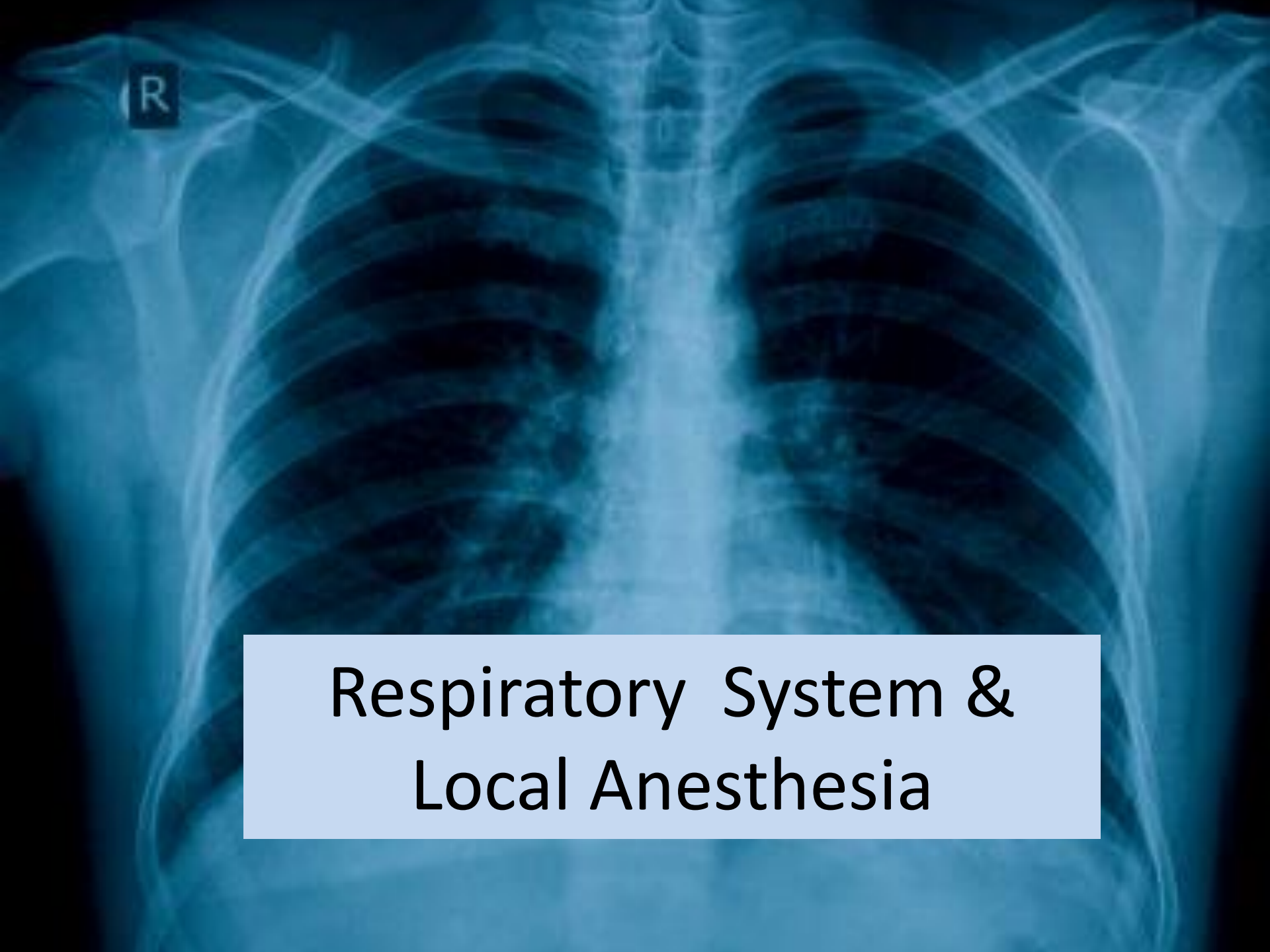
Vasoconstrictor & Healthy Patients

Maximum amount of vasoconstrictor is:

0.2 mg= ~13 cartridges of lidocaine

1:100,000 dilution

Word of caution: I cannot think of any complex dental restorative case that would require 13 cartridges of Anesthesia.



Respiratory System & Local Anesthesia

Respiratory System

- Systemic effects of local anesthesia on the respiratory system are typically minimal
- Epinephrine acts on the smooth muscles of bronchial circulation to dilate the vessels

Respiratory System Diseases & Local Anesthesia Considerations

Asthma-is a disorder that causes the airways of the lungs to swell and narrow leading to chest tightening and coughing ,wheezing, shortness of breath.

- **Children- anxiety may provoke asthmatic episode**
- **Adults- manifest as hyperventilation**
- **Triggers:**
  - Allergies
  - Sulfite sensitivity
  - Physiological and psychological stress related to anticipation of LA

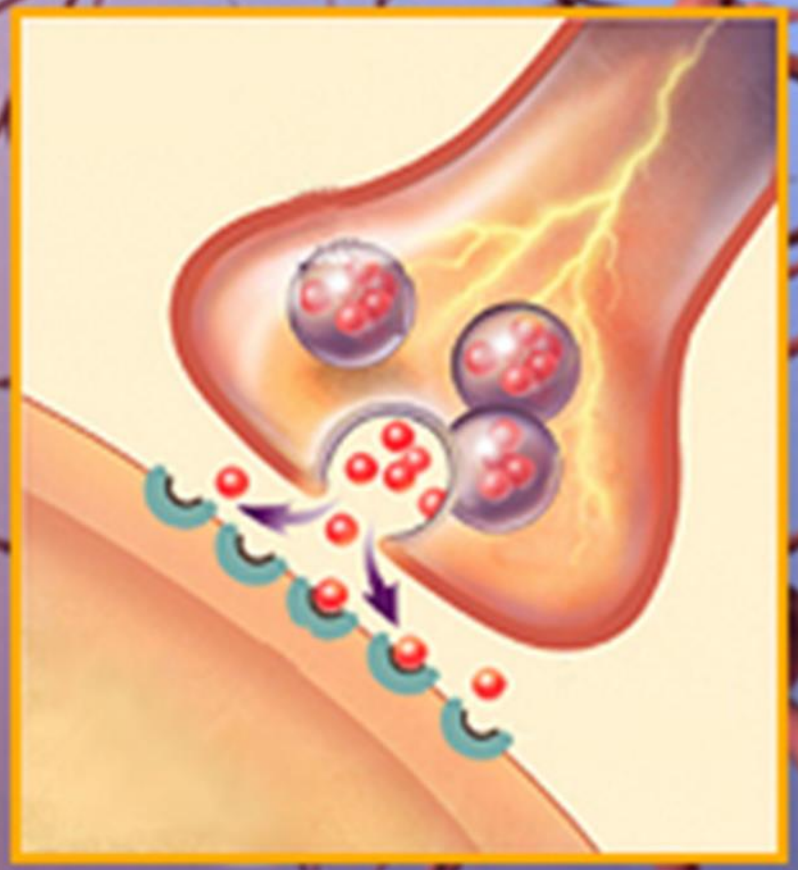
COPD - 2 main types- Chronic bronchitis and emphysema Nitrous Oxide contra-indicated; concerns regarding concomitant drug interactions with Local Anesthesia

Respiratory System Diseases & Local Anesthesia Considerations

Asthma

- Chronic inflammation & bronchospasm disease of the airways
- Up to 10% of the asthmatic population are allergic to bisulfates.
- Asthmatic patients who receive a local anesthetic with vasoconstrictor should be observed for signs and symptoms of an asthma attack.

*** Always make sure patients Inhaler is in the operatory ***



Nervous System & Local Anesthesia

Nervous System Conditions of Concern

- Alzheimer's Disease-related to inability to cooperate
- Anxiety – concern regarding psychogenic induce physiological response- faint; hyperventilation
- Depression disorders- concerns regarding concomitant drug interactions
- Epilepsy -concerns regarding concomitant drug interactions
- Stroke- use "cardiac limit" of local anesthesia & avoid accidental intravascular injection of vasoconstrictor

Tricyclic Antidepressants

TCA's:

- Used to manage major depression
- This drug enhances the cardiovascular response to exogenously administered vasopressor.

TCAs increase the effects of the Vasoconstrictor

- **For Norepinephrine & Levonordefrin the enhanced activity is**

  5 to 10 fold!
- For epinephrine it is 2 fold.

- TCA & Local Anesthesia with Vasoconstrictor have the potential to lead to a hypertensive crisis & Arrhythmias

Nervous System & Local Anesthesia

Concomitant Drug-Drug Interactions:

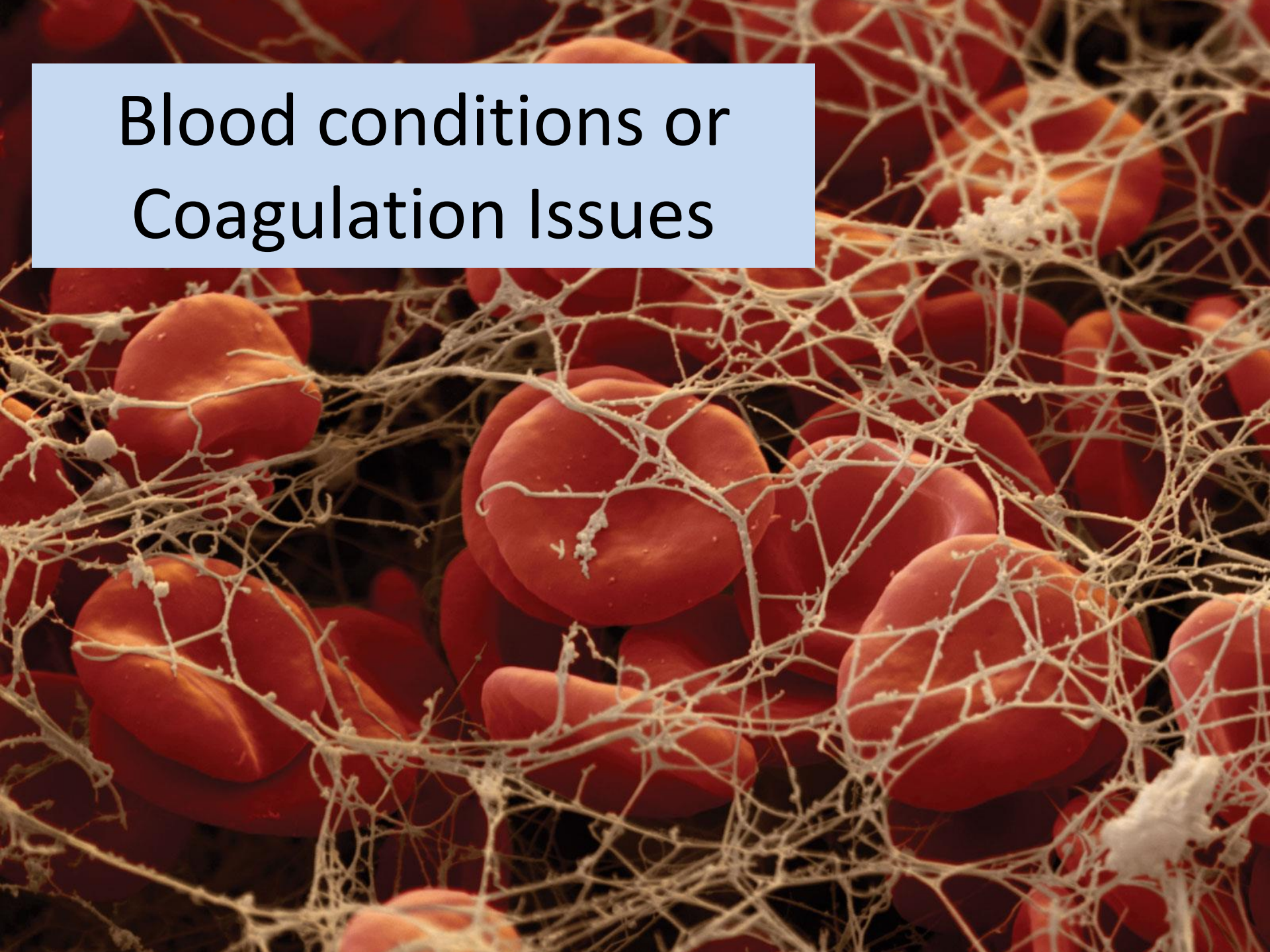
BOX 7-7 Commonly Prescribed Tricyclic Antidepressants

- Amitriptyline (Elavil)
- Amoxapine (Asendin)
- Clomipramine (Anafranil)
- Desipramine (Norpramin, Pertofrane)
- Doxepin (Sinequan, Adapin)
- Nortriptyline (Aventyl, Pamelor)
- Imipramine (Tofranil)
- Protriptyline (Vivactil)
- Trimipramine (Surmontil)

This is a relative contraindication for epinephrine

If clinically necessary a small amount of local anesthesia with epinephrine may be used similar to Cardiac Dose

Blood conditions or Coagulation Issues



Blood Conditions & Local Anesthesia

1. Atypical Plasma Cholinesterase
2. Methemoglobinemia (very rare condition)
3. Coagulation Diseases- possible factor replacement prior to administering Local Anesthesia
4. Sickle Cell Anemia

Blood Conditions & Local Anesthesia

Atypical Plasma Cholinestrerase

- Inherited autosomal recessive trait
- Affects 1 out of 2820 people
- Defect in their plasma pseudocholinesterase enzyme
- Plasma Pseudocholinesterase enzyme is produced in the plasma and functions in the blood to breakdown “ester” type products.
- Normal Therapeutic dose of an “ester” type would cause local anesthetic toxicity in these patients
- Can tolerate most “amide” local anesthetics except articaine

National Board Questions about Articaine

Methemoglobinemia

Congenital or Acquired Methemoglobinemia

-rare condition

- Cyanosis develops in absence of cardiac or respiratory factors because the blood has difficulty binding oxygen
- Clinically person has respiration depression

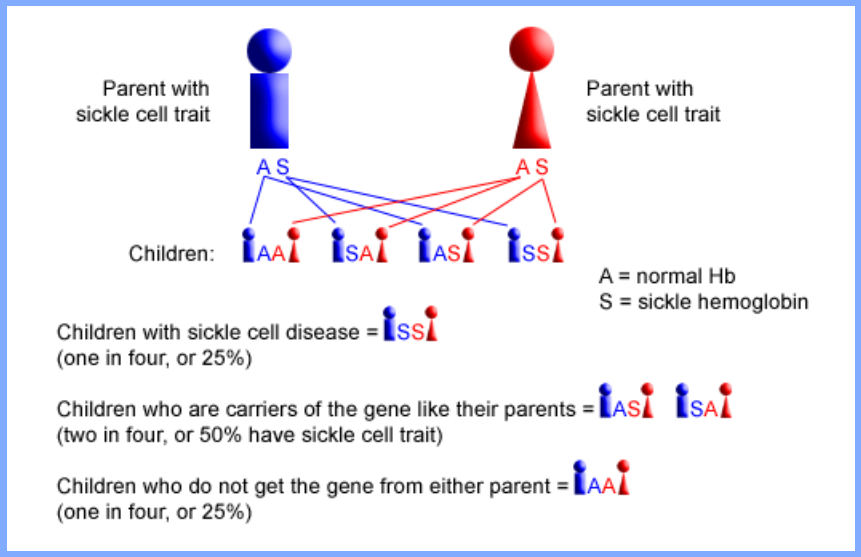
• Administration of the amide local anesthetic Prilocaine or topical benzocaine will cause a life-threatening medical emergency

• Prilocaine is metabolized to ortho-toluidine (reread your textbook page 58)

National Board Questions

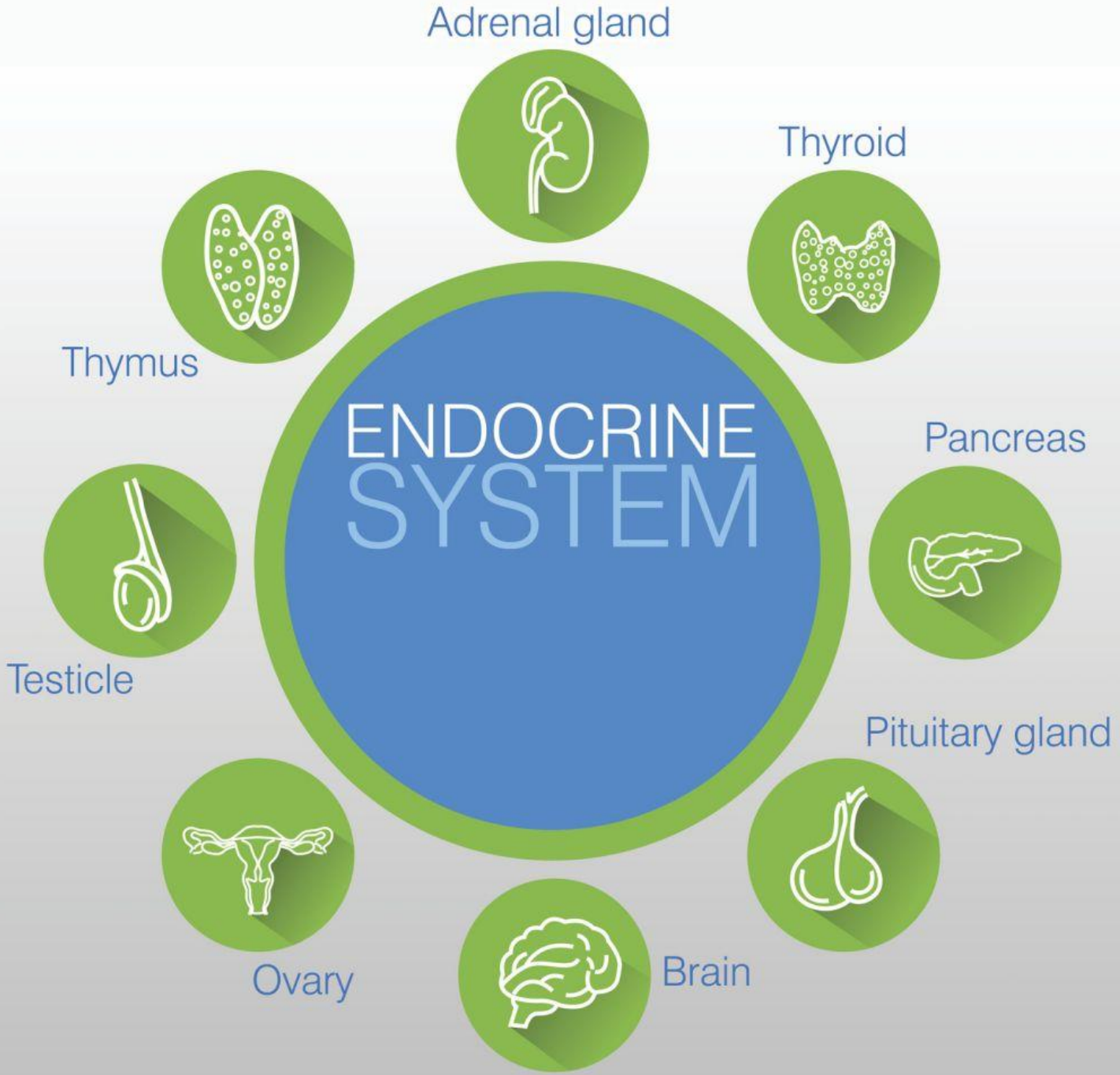
Sickle Cell Anemia

Inherited Recessive trait blood disorder characterized by an abnormality to the oxygen-carrying hemoglobin molecule in red blood cells



For routine dental care, appointments should be short.

- No dental treatment or local anesthesia should be administered during a crisis.
- Use of local anesthesia is acceptable and tolerated
  - Inclusion of vasoconstrictor in the local anesthetic is suggested to be a limited dose similar to the cardiac dose. “Relative” contraindication.


Adrenal gland
Thyroid
Thymus
ENDOCRINE
SYSTEM
Pancreas
Testicle
Pituitary gland
Ovary
Brain

Endocrine System & Local Anesthesia

Controlled vs not well controlled

- Diabetes
- Thyroid Disease

see slide 41

Controlled Diabetes – will tolerate LA with vasoconstrictor

Controlled Thyroid – Hyperthyroidism- **Relative contraindication**- limit LA with vasoconstrictor to “Cardiac Dose”

Conditions Requiring Medical Consultation

- Cardiac conditions
- Recent surgeries
- Uncontrolled high blood pressure
- Some psychological conditions
- Compromised liver or kidney function
- Immune system compromise
- Any condition that raises concerns

One Last Thought?

Can Patients be “allergic” to Dental Local Anesthesia?

- when the ester Novocain was used _YES

- amides-true allergic reactions to amide local anesthetics are ***extremely rare*** but have been documented. These patients may be treated under general anesthesia.

Many patients confuse an allergic reaction with a response from a vasoconstrictor:

-confused by rapid adrenergic symptoms; palpations

- or may have experienced an “overdose” toxicity reaction

So in Summary…

The Dental Hygienist should:

1. Understand that for healthy patients, the choice of dental anesthetic is based upon the length of the dental procedure.
2. Evaluate the patient's physical ability to tolerate the administration of local anesthesia with or without a vasoconstrictor – through a comprehensive medical history & physical assessment!
3. Realize that Dental Local Anesthetic is well tolerated, the vasoconstrictor in local anesthetics causes one to evaluate the absolute or relative contraindication based upon the systemic health of the patient.
4. Understand a patient's attitudes and fears before giving LA (psychological assessment).
5. Take pre-anesthetic vital signs.
6. It is a rare occurrence to be "allergic" to Local anesthetics.


The End