What is Anesthesiology ?

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Definition of Anesthesiology

- Inducing some level of unconsciousness, amnesia, analgesia, immobility, and blunting the autonomic responses to noxious stimulation
- To the patient – “I don’t want to know what is going on or to feel any pain.”
- Rooted in physiology and pharmacology

History

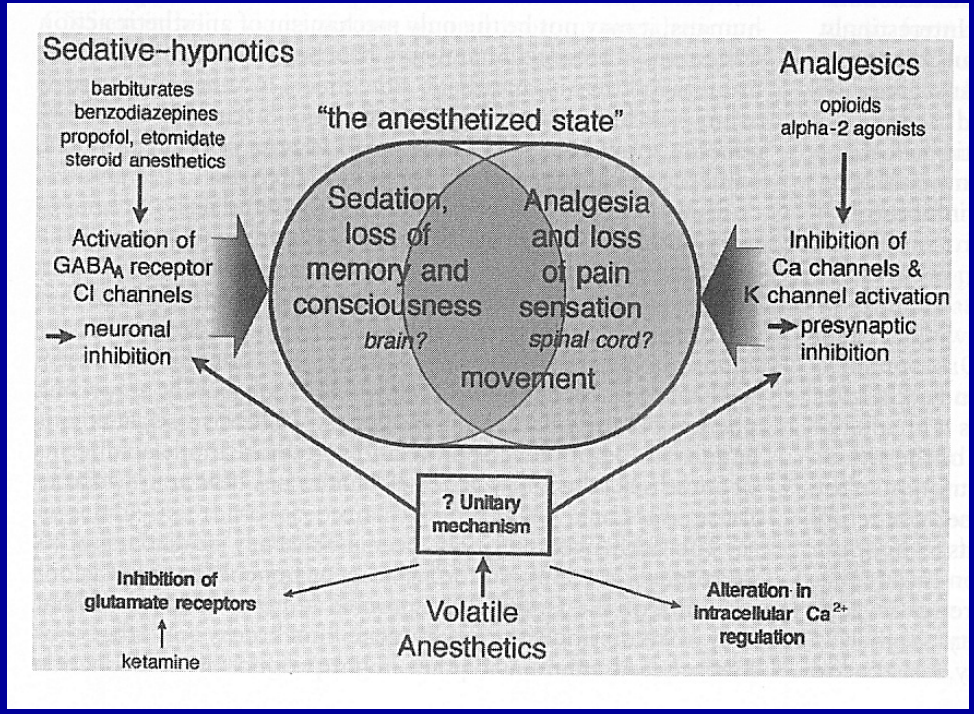
- First public demonstration of ether anesthesia in 1846
- First intubation for surgery 1878
- First spinal in 1885
- First use of curare in 1942

http://www.uihealthcare.com
/depts/medmuseum/wallexhibits/civilwar/pain.html

How Does It Work?

- We have no real idea – only theories

- Meyer-Overton Rule
- Lipid Theories
- Protein Theories



Barash, PG. Clinical Anesthesia, p 128. Philadelphia, Lippincott Williams and Wilkins, 2001.

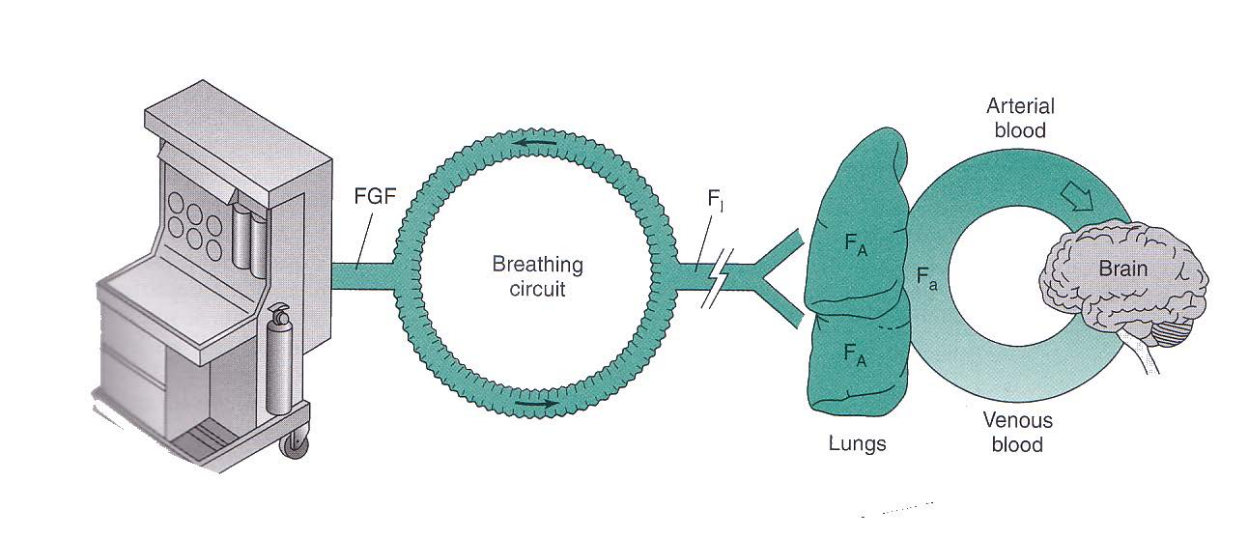
What Do We Use?

- Inhalational agents
- Muscle relaxants
- Injectable hypnotics and narcotics
- Local anesthetics
- Specialized equipment

Inhalational Agents

- Volatile agents administered through the lungs with the goal of achieving a constant concentration (partial pressure) in the CNS
- Commonly used agents include nitrous oxide, halothane, isoflurane, desflurane, and sevoflurane
- Various effects on other systems (decreased BP, increased ICP, bronchodilation)

Important Concepts in Uptake



- Concentration effect
- Second gas effect
- Ventilation effects
- Perfusion effects

Image from Morgan GE. Clinical Anesthesiology, pg 129. New York, Lange Medical Books, 2002

Potency in Inhaled Agents

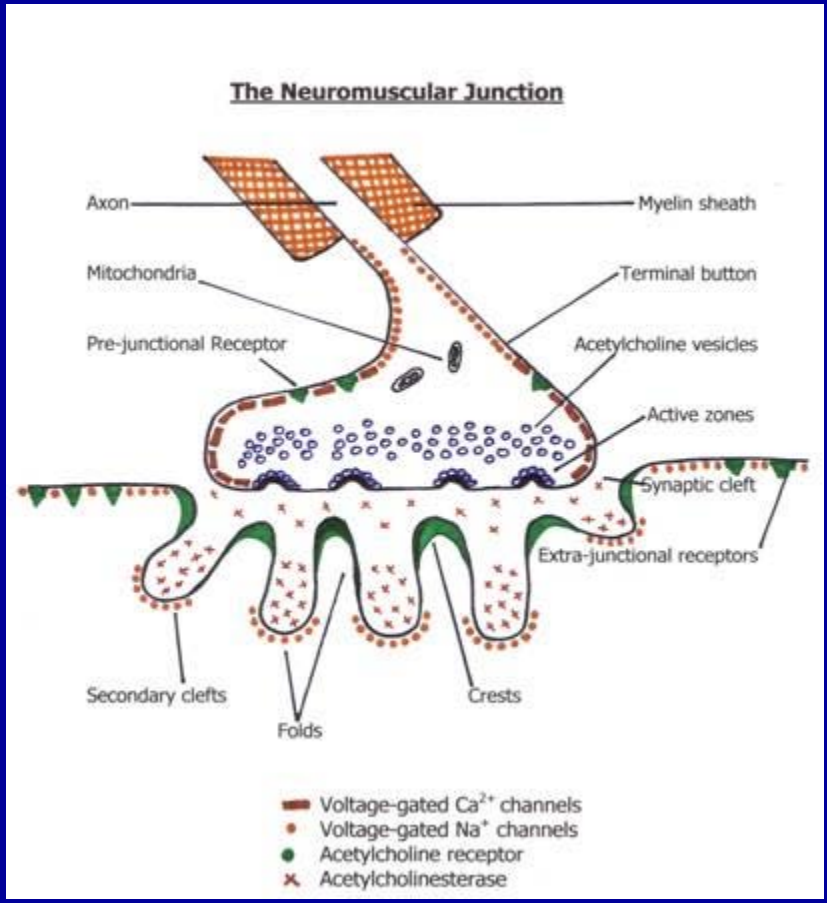
- Minimum alveolar concentration (MAC)
- Defined as partial pressure of inhaled anesthetic the prevents movement in response to surgical stimulus in 50% of patients
- Values are additive
- Different values for MAC-awake, MAC-intubation, MAC-BAR

Various Values for Agents

	MAC	B/G	Vapor Pressure
Halothane	0.75	2.3	240
Isoflurane	1.15	1.4	238
Sevoflurane	2.0	0.6	160-200
Desflurane	5.7	0.42	665
Nitrous Oxide	105	.47	xxx

Muscle Relaxants

- Two classes
  - Depolarizing
  - Non-depolarizing
- Agents works at postsynaptic receptors
- Difference is whether depolarization occurs



http://www.frca.co.uk/article.aspx?articleid=100618

Succinylcholine

- Prototypical depolarizing agent
- Very fast onset (30 sec) and short duration
- Drawbacks include
  - bradycardia in children
  - myalgias secondary to fasciculations
  - increased in closed space pressures
  - elevation of serum potassium
  - requires normal cholinesterase activity to breakdown (*more on that later)*

Abnormal Pseudocholinesterase

- Short duration of succinylcholine due to rapid metabolism by pseudocholinesterase
- Genetic traits can cause homozygous or heterozygous changes in function of enzyme
- Heterozygous leads to 20-30 minute paralysis
- Homozygous leads to 6-8 hour paralysis with one regular dose succinylcholine

Non-Depolarizing Agents

Short (7-10 min)
Mivacurium
Intermediate (10-15 min)
Atracurium
Cisatracurium
Rocuronium
Vecuronium
Long (30-40 min)
Doxacurium
Pancuronium

- Longer time to onset (2-3 min)
- Avoids drawbacks of succinylcholine
- Requires reversal with anticholinesterase medication

Peripheral Nerve Stimulation

- Used prior to intubation or monitoring blockade intraoperatively
- Most commonly used are ulnar and facial nerves
- One of several factors used to determine full recovery prior to extubation

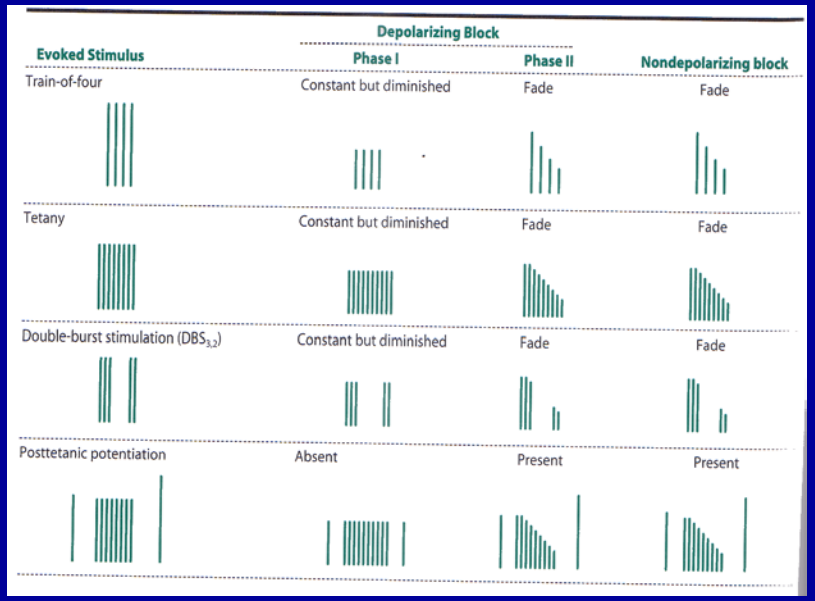


Image from Morgan GE. Clinical Anesthesiology, pg 182. New York, Lange Medical Books, 2002

IV Induction Agents

- Most agents believed to work through GABA modulation
- Most have no analgesic properties, lower ICP, depress ventilation, and lower blood pressure
- Propofol routinely used as in infusion for sedation or alternative to inhalational-based anesthetic

Unique Properties of IV Agents

- Barbiturates – routinely used for cerebroprotection in carotid surgery, controlled hypotension, and/or cardiac bypass
- Propofol (the white stuff) – significant hypotension on induction, induction agent of choice in MH susceptible patients

More Unique Properties

- Ketamine – only agent with analgesic properties, causes dissociative anesthesia, bronchodilator
  - only agent that may increase blood pressure and ICP on induction
- Etomidate – agent of choice when avoidance of hypotension a necessity
- Benzodiazepines – more frequently used for premedication than induction

Opioids

- Opioid receptors found in CNS, ANS, GI, and GU tracts
- Most commonly used intraoperatively are fentanyl, alfentanil, sufentanil
- Most commonly used post-operatively are morphine, demerol, dilaudid
- Effects of agents can be reversed with naloxone

Local Anesthetics

- Work by stopping nerve transmission through disruption of Na^{++} channels
- Used in neuraxial anesthesia, peripheral nerve blocks, intravenous blocks, field blocks, and topically

Local Anesthetic Toxicity

- Can be from systemic absorption or direct intravascular injection
- Neurological
  - (early) circumoral numbness, metallic taste in mouth, dizziness, tinnitus, blurred vision
  - (late) restlessness, agitation, then respiratory depression, seizures and coma
- Cardiovascular – bradycardia, hypotension, and eventual lethal ventricular dysrhythmias
- All locals have max doses in mg/kg

Anatomy Returns

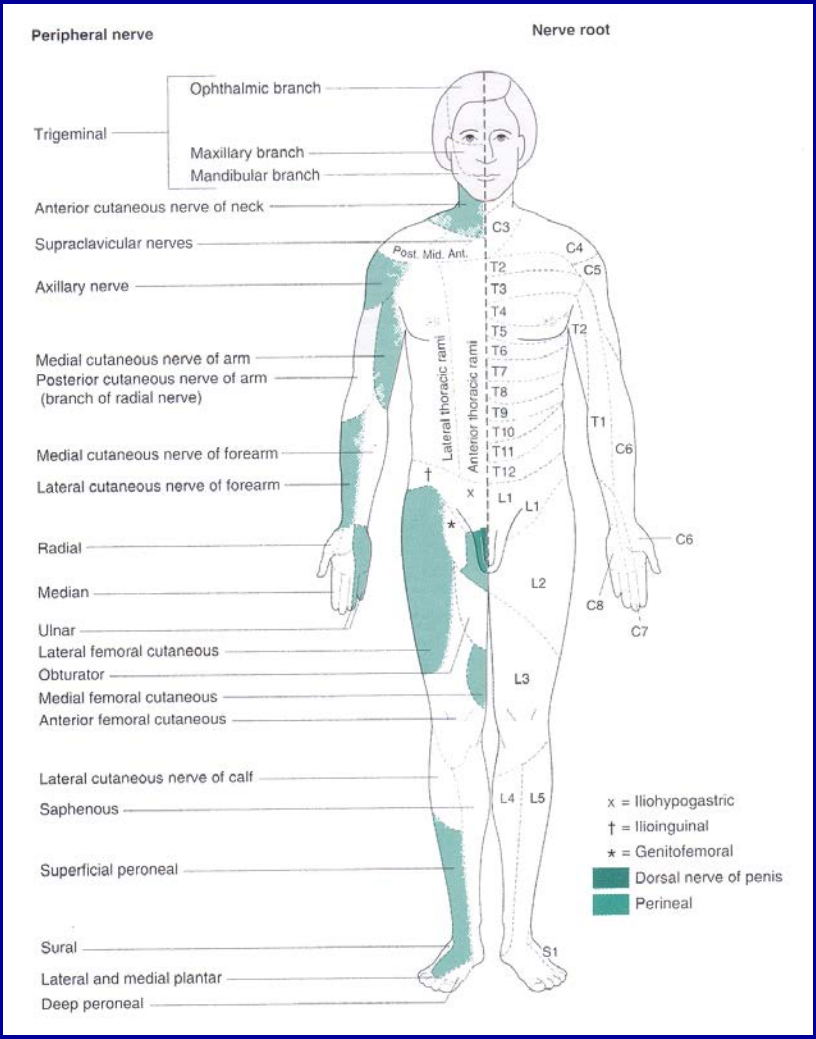


Image from Morgan GE. Clinical Anesthesiology, inside cover. New York, Lange Medical Books, 2002

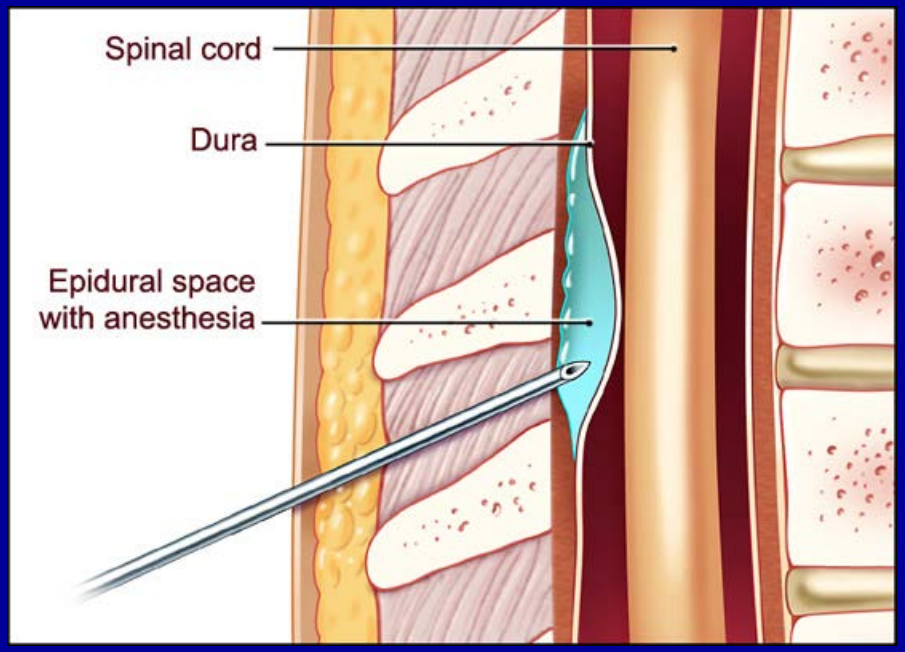
- Knowledge of dermatomes important for adequate blockade with spinals/epidurals
- Knowledge or peripheral nerve coverage important for individual nerve blockade

Neuraxial Blockade

- Spinals and epidurals blunt stress response to surgery, decrease intraoperative blood loss, and lower incidence of post-op thromboembolism
- Also used for post-op pain control
- Primary method of anesthesia in the obstetrical population
- Height of block dependent on many factors

Spinal Versus Epidural

- Difference between the two procedures is placement of medication (or catheter) into *epi*dural space versus *sub*arachnoid space
- Spinals are placed by directly inserting needle into space
- Epidurals are placed using LOR or hanging-drop technique



http://www.webmm.ahrq.gov/case.aspx?caseID=90

Complications

- Hypotension
- Backache
- Postdural puncture headache (see next slide)
- Systemic toxicity
- Total spinal
- Neurological damage
- Spinal hematoma
- Epidural abscess

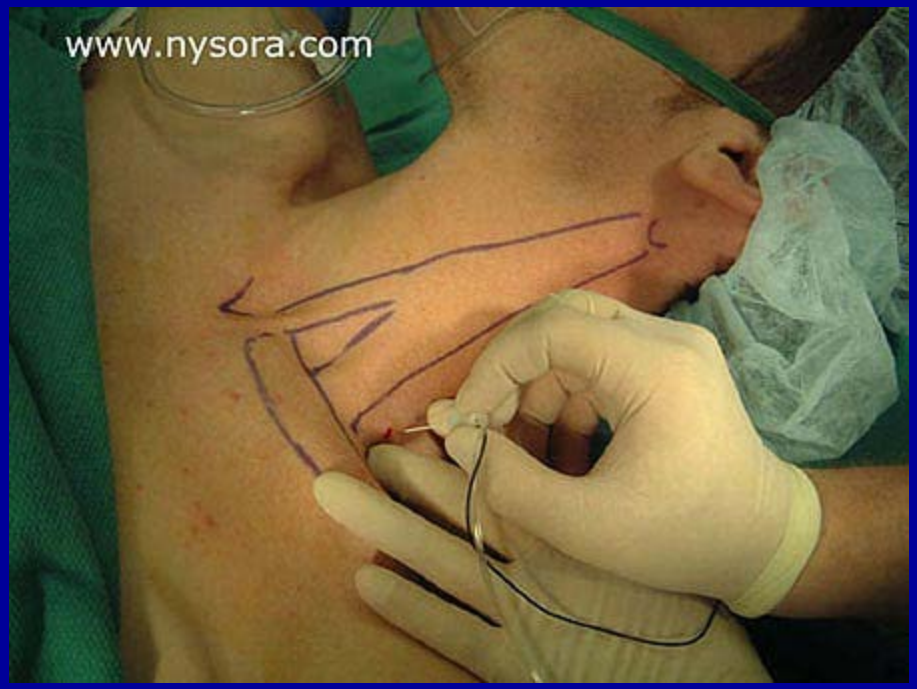
Postdural Puncture Headache

- Bilateral fronto-occipital headache that is virtually absent supine but present with head elevation
- Highest incidence in young, pregnant female using a large cutting-type needle
- Most abate in 2-3 days with conservative therapy including hydration and caffeine
- Final treatment is epidural blood patch

Peripheral Nerve Blockade

- Can be primary anesthetic, adjunct to general, for post-op pain control, or used in pain management
- Placement techniques include field block, fixed anatomic relationships, eliciting paresthesias, and use of nerve stimulators
- Can be single shot or infusion with catheter placement

Examples



Interscalene

Popliteal

Airway Instruments

More Airway Tools

Typical Routine

- Preoperative evaluation/Premedication
- Preparation
- Induction and/or block placement
- Maintenance
- Emergence
- Post-operative care

Preoperative Exam

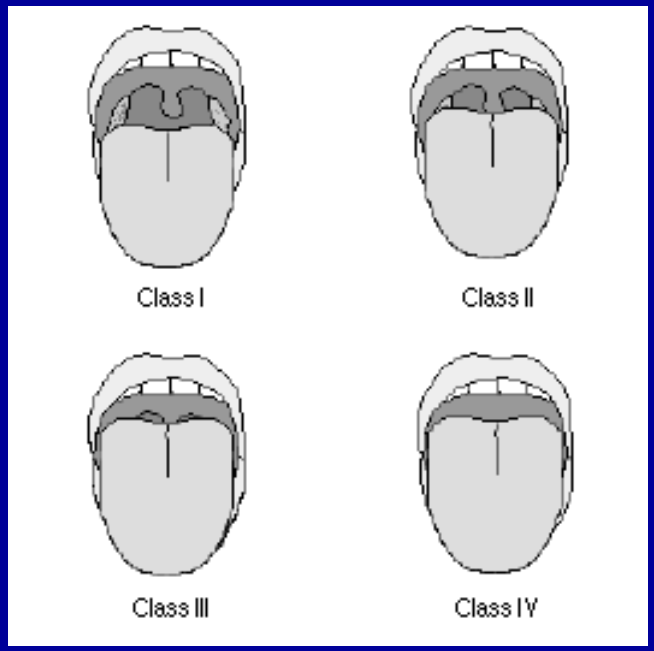
- Allergies
- Medical history
  - all medical conditions should be optimally controlled (HTN, COPD)
- Surgical history
  - any complications with previous surgeries (difficult intubations or reactions to meds)
- Medication review
  - important that the patient took cardiac meds and whether they are on any anticoagulants

Preoperative Exam

- Functional capacity
  - one of the best predictors of patient's ability to tolerate surgical procedure
- Tobacco, ETOH, drug abuse
- Laboratory and other tests
- Discussion of planned surgical procedure and planned anesthetic

Physical Exam

- Airway
  - Partials, dentures, chipped teeth
  - Mallampati classification for assistance in assessing difficulty of intubation
- Pulmonary
- Cardiac
- Inspect sites for regional (infection, rashes)



http://groups.msn.com/WELCOMETODRMAGBOULANESTHESIAHOMEPAGE/difficultintubation.msnw

Summary of Preoperative Exam

- The ASA physical status classification
  - I = healthy patient
  - II = mild to moderate systemic disease
  - III = severe systemic disease
  - IV = severe systemic disease that is constant threat to life
  - V = patient with minimal chance of survival
- An “E” designation is added on for emergency case status

Premedication

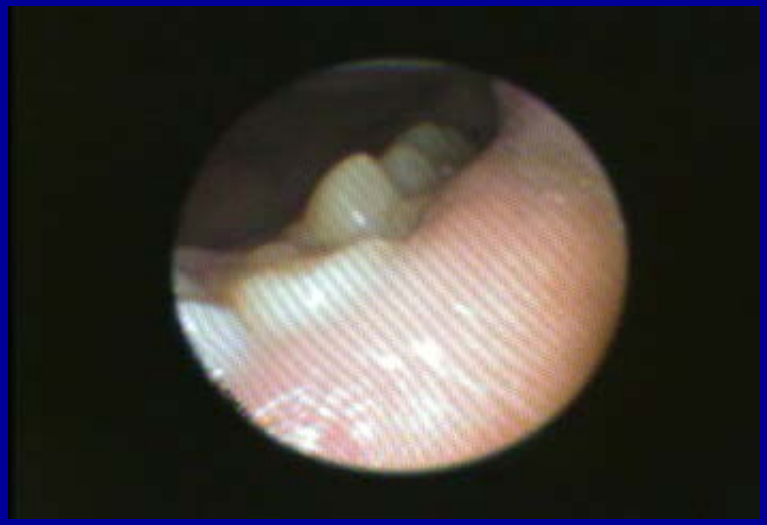
- Often oral/IV benzodiazepine administered
- H_2-receptor antagonist, metoclopramide, and/or non-particulate antacid in patients with GERD, GI motility issues, or full stomachs
- Ensure all heart medications have been administered and consider topical NTG in patients with cardiac history
- Breathing treatments and steroids in patients with lung disease

Preparation

- The most common cause of errors in anesthesia are inadequate patient preparation or insufficient planning
- Check and recheck equipment, emergency medications

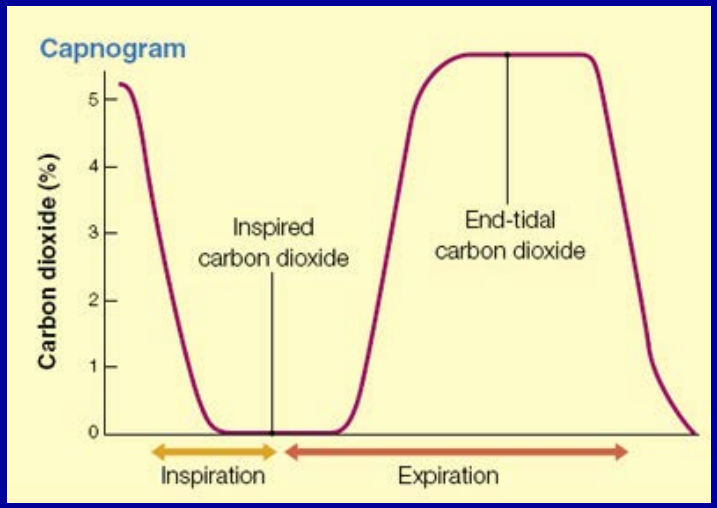
Induction

- Properly position patient
- Monitor placement
- Preoxygenation
- Administer medications



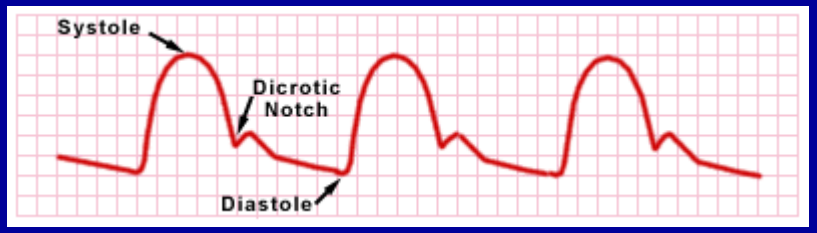
Additional Monitors

- BIS monitor
  - modified EEG that calculated the patient's depth of anesthesia and awareness
- Measurements of inhaled and exhaled gases
- Temperature
- Urine output

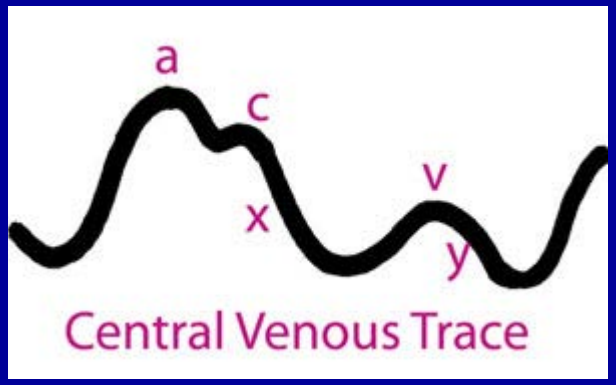


http://www.frca.co.uk/article.aspx?articleid=100389

Additional Monitors



http://classes.kumc.edu/son/nurs420/unit4/intrapresmon.html



http://www.frca.co.uk/article.aspx?articleid=100036

- Invasive blood pressure (arterial line)
- CVP
- PCWP/Cardiac output
- Evoked potentials
- TEE

Intraoperative

- Patient positioning to avoid trauma
- Fluid management
- Electrolyte and acid/base status
- Following blood loss and replacing blood and components
- Maintaining adequate paralysis, analgesia, and depth of anesthesia

Malignant Hyperthermia

- Hypermetabolic disorder caused by decreased uptake of calcium in skeletal muscle
- Triggered by succinylcholine and volatile agents
- Presents in OR with hypercarbia, tachycardia, increased temp, hypertension
- Treatment is based on cessation of offending agent and IV dantrolene

Fluid Management

- Maintenance
  - 4/2/1 rule
- Fluid deficit while NPO
  - 50% first half, remaining over next 2 hours
- Insensible losses
  - evaporative losses and fluid redistribution
- Blood loss
  - 3 cc of replacement fluid per cc blood loss

Colloids

- Alternative to crystalloids
- Half-life intravascular of 3-6 hours
- Includes albumin, dextran, hetastarch
- If given for blood replacement can replace 1cc per cc (as opposed to 3cc per 1)
- Indicated in severe intravascular fluid depletion or hypovolemia in patients with hypoalbuminemia

Recovery Room

- Hypo/hypertension
- Pain control
- Urinary retention
  - post spinal/epidural vs hypovolemia
- Hypoxia/hypercapnia
- Nausea and vomiting
- Excessive sedation

Further Training

- Operative anesthesia
  - Pediatric, cardiac, neurosurgical, transplant
- Obstetrical anesthesia
- Critical care
- Interventional Pain Medicine

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Thank You for Attending
Thank you for you interest
Thank you for your vision to become the future of Osteopathic Anesthesiology

For further information concerning available Osteopathic Anesthesiology residency training programs

Feel free to contact me:

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