

Anesthesia and Pain Management



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<https://is.muni.cz/auth/el/1411/zima2011/VSAL091/>

My goal:

- understand basic concepts of general and regional anesthesia
 - learn basic skills of airway management
 - anatomy of regional anesthesia (SA, EPI)
 - anesthesia of children
- .. and if you would like, more ...
-
-

How to get credit??

Lectures

Literature : Larsen, Miller, Barash
Anesthesia

Short test

Simulation (Airway management drill)

OR – voluntary intership

Oral Exam

Anesthesia&Pain Management; pondělí 13:30 (knihovna ARK)

3	Mon 1 Oct 12	Introduction, investigation, premedication	Dadák
4	Mon 8 Oct 12	Anesthesia Machine, Monitoring	Dadák
5	Mon 15 Oct 12	Pharmacology of Anaesthetic	Zadražilová
6	Mon 22 Oct 12	Airway Management	Dadák
7	Mon 29 Oct 12	Regional Anesthesia	Zadražilová
8	Mon 5 Nov 12	Acute and chronic pain	Hakl
9	Mon 12 Nov 12	Children and anesthesia	doc.Fedora
10	Mon 19 Nov 12	Break	
11	Mon 26 Nov 12	Simulation	Dadák
12	Mon 3 Dec 12	Simulation	Dadák
13	Mon 10 Dec 12	Simulation	Zadražilová
14	Mon 17 Dec 12	Simulation	Zadražilová
15	Mon 7 Jan 13	Simulation	Zadražilová

Topics for oral exam

- Anatomy of airways + physiology of breathing
 - Physiology of circulation (cardiac output)
 - Monitoring
 - Pharmacology
 - ASA I patient and GA, premedication;
 - Airway management
 - Rapid sequence of induction = technique, indications
 - Difficult ventilation / intubation
 - Malignant hyperthermia
 - Acute, chronic pain
 - Anatomy of spinal column – SA, EPI
-
-

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[The Society For Airway Management](#)

History

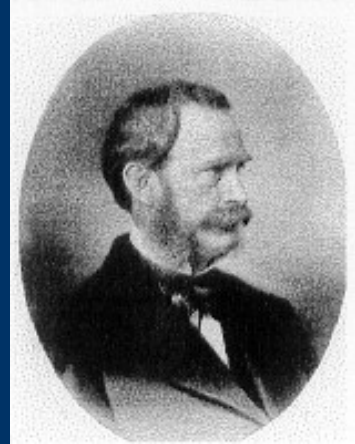
- 📄 Opium (Egypt, Syria)
 - Hippokrates 400 BC ease pain
 - 📄 1555 Andreas Vesalius - arteficial ventilation through tube between vocal cords, ventricular fibrilation (animals)
 - 📄 1546 Valerius Cordus - ether – oleum vitreolum dulce
 - 📄 1547 Paracelsus - analgetic effect of ether
 - 📄 1646 Severino - cryoanaesthesia – Napoleon's wars - Larey
 - 📄 1773 N₂O Joseph Priestley (1733-1804)
 - 📄 1774 oxygen
 - 📄 1779 Humphry Davy - anaesthetic effect of N₂O
-
-

Surgery before modern Anesthesia

Surgical procedures were carried out prior to the introduction of anesthetics.

The key to success was the **speed** of the procedure, with successful amputations lasting 30 seconds. Strong assistants and restraints were frequently required. Alternatively, decreased cerebral perfusion via bilateral carotid compression was used to decrease sensation during the procedure. Importantly, surgical procedures were associated with significant risk of death and, at a minimum, severe pain. The development of anesthesia was heralded as one of the great advances of modern medicine, in that it allowed surgery to advance.

Beginning of GA



- ☞ October 16th 1846 ether general anaesthesia Boston dentist William Thomas Green Morton to Gilbert Abbott (tumor of mandibule)
- ☞ February 6th 1847 Prague - first Czech ether anaesthesia - Celestýn Opitz
- ☞ 1895 direct laryngoscopy Alfred Kirstein in Berlin.
 - 1920 direct laryngoscopy to clinical praxis Magill and Rowbotham

Ether



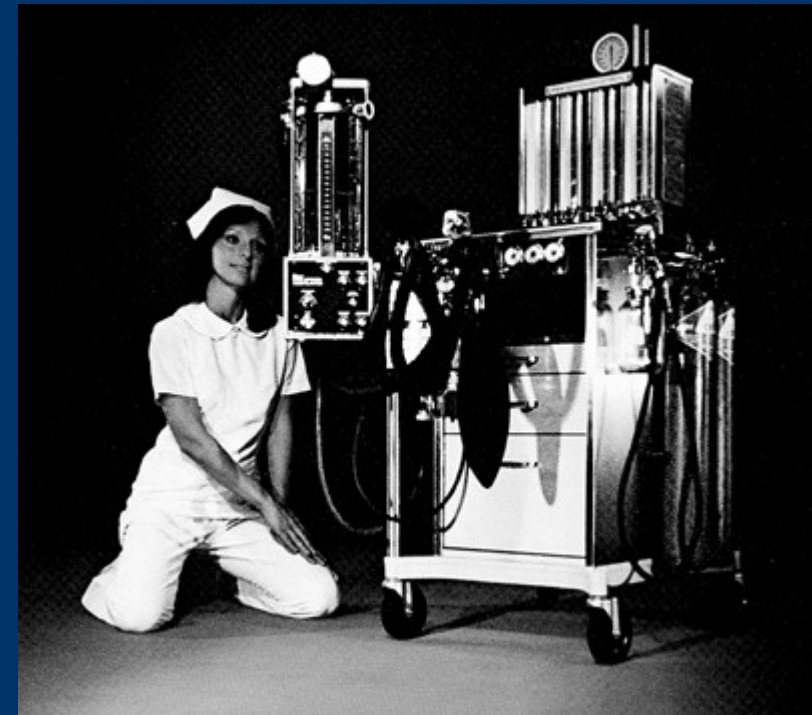
DR. H. J. BIGELOW DR. A. A. GOULD DR. J. C. WARREN DR. W. T. C. MORTON DR. SAMUEL PARKMAN DR. GEORGE HAYWARD
DR. J. MASON WARREN DR. S. D. TOWNSEND

*The First Public Demonstration of Surgical Anaesthesia
Boston, October 16, 1846*

After ether

- 1847 – chloroform – obstetrics anesth.
- 1884 – cocaine – eye, .. mucosa
- 1885-99 – cocaine “spinaly”

- 1950's – halothan
- 1960's – enflurane, isoflurane
- 1994 – sevoflurane



Ideal anesthetic

- temporary disable function of neurons
- no influence on breathing, circulation
- safe, cheap, non-toxic,...

- Does not exist.



Anesthesiology

is a young discipline (160y) dealing with

- The preoperative, **intraoperative** and **postoperative** evaluation and treatment of patients who are rendered unconscious and/or insensible to pain and emotional stress during surgical, obstetrical, therapeutic and diagnostic medical procedures;
 - The protection of life functions and vital organs (brain, heart, lungs, kidneys, liver, endocrine, skin integrity, nerve) under the stress of surgical and other medical procedures;
-
-

Anesthesiology

- Monitoring and maintenance of normal physiology during the perioperative period;
- Diagnosis and treatment of acute, chronic and cancer-related pain;
- Clinical management of CPR;
- Evaluation of respiratory function and application of respiratory therapy;
- Management of critically ill patients;
- Conduct of clinical research;
- Teaching personnel involved in perioperative care

General Anesthesia - Definition

☞ artificial intoxication, controlled coma

☞ reversible

☞ drug-induced loss of consciousness, feeling, pain.
„No reaction“ to stimuli

☞ allow therapy (surgery, electroshock)

☞ allow diagnostic method (CT, MRI)



Patient + GA

 preoperative anaest. visit, **informed consent**

 premedication

 venous line

 monitoring

 induction

 (airway protection)

 maintenance

 (extubation)

 treatment of postoperative pain

record of GA

ASA Physical Status = risk

I Healthy patient	0,06%
II Mild systemic disease, no functional limitations hypertension, smoker, mild asthma	0,47%
III Severe systemic disease- definite functional limitation coronary disease, COPD, DM, CHF, renal failure	4,39%
IV Severe systemic disease that is a constant threat to life unstable angina, burn with septic shock 23,48%	
V Moribund patient not expected to survive 24 hours with or without operation patient with extensive bowel infarction, polytrauma	50,8%

Preoperative tests

as a component of the preanesthesia evaluation, may be indicated to:

- 1) discovery a disease or disorder which may affect perioperative anesthetic care,
- 2) verification of an already known disease, disorder, medical or alternative therapy which may affect perioperative anesthetic care,
- 3) formulation of specific anesth. plans

Will I change something if the resust is ...?

Preoperative examination

- ☞ history (GA, RA, complications)
 - ☞ physical examination (neck, back)
 - ☞ laboratory: blood cells, ions, urea, creatinin, glucose, AST, ALT, GMT, bilirubin, AB0.
 - ☞ ECG (older 45).
 - ☞ Xray of chest (older 60 let).
 - ☞ function exam
 - cardiological, lung, nephro, hemato
-
-

Why to do PreOP exam?

- decrease RISKS
 - what is the benefit of surgery
 - Airway exam
 - GA // regional?
 - premedication
-
-

History of Airway Management

- History

- any difficulty, teeth?
- TS scar [narrower trachea]?

!!! Tell the truth about troubles in anesthesia !!!

- Examination:

- Mouth Opening(3 fingers)
 - free teeth
 - gotic palatum
 - big tongue, small mouth
 - hypoplastic mandibula
 - anteposition of larynx = mandibula-os hyoideum <3 fing.
 - flection, extension of head
 - Mallanpati
-
-

Difficul airway

- * Obesity - body weight $> 110\text{kg}$
- * Mouth opening - inter-incisor distance $< 4\text{cm}$ in an adult
- * Ability to prognath - a large overbite, or the inability to shift the lower incisors in front of the upper incisors
- * Thyromental distance - The distance from the thyroid cartilage to the mentum (tip of the chin) should be $> 6.5\text{-}7\text{ cm}$.
- * Mentum-Hyoid distance - Similar to thyromental distance, and should be at least 3-4 finger-breadths.

- ***Mouth opening***

Should be adequate (3 cm or more) to easily

- allow a laryngoscope plus endotracheal tube (ETT).
- Patients with temporomandibular joint (TMJ) disease or trismus may not be able to open widely, and may require fiberoptic intubation by the nasal route





Teeth



Edentulous patients are always **easier to intubate**, but are often **more difficult to ventilate** with a face mask.

Patients with teeth in poor condition or with very prominent teeth may be more difficult to intubate.



Thyromental distance

Distance from the mentum of the **mandible to the thyroid**, with neck fully extended.

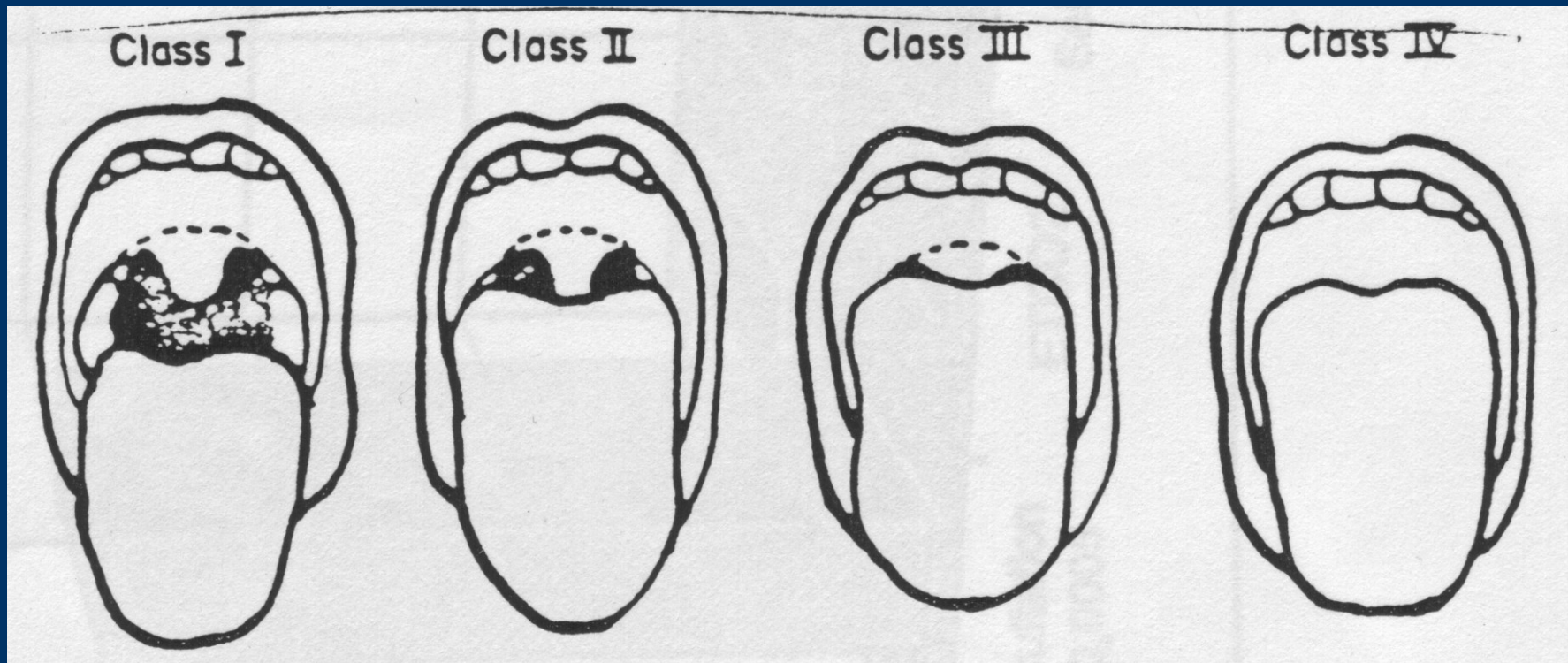
If distance is less than 6 cm there is less space for the tongue to be displaced with laryngoscopy



Mallanpati

OTI easy 95%

OTI difficult 50%



Your easy patient?



<http://starwars.wikia.com>

Predicted difficult airway

- epiglottitis
 - abscess (submandibular, retropharyngeal)
 - tetanus
 - trauma of the neck, mouth
 - tumor of the larynx, faryngx
 - temporomandibular joint disease
 - obesity
-
-

Respiratory risk

- spirometry, Blood gases
- COPD
- Astma
- chronic bronchitis
- acute inflammation of lunx



Cardiovaskular risks

- ECG (load)
 - ECHO, (coronarography)

 - hypertension (cardiac work, failure)
 - ischemia (AP, IM, rhythm)
 - Cor pulmonale
 - Valvular abnormalities (Ao stenosis)
- Prophylaxis:
- Beta blockers, ? antihypertenzive drugs
-
-

... other risks

- Diabetes mellitus
 - Hepatic
 - porphyry
 - failure
 - Renal
 - CNS
 - epilepsy
 - mm. (Myastenia gr.,)
-
-

Conversation before GA or RA

☞ empty stomach - last food, fluid

☞ tooth (artificial, free)

☞ weight

☞ allergy

☞ complication of CA in his/family history

☞ check-up questionnaire

☞ agreement with anaesthesia

PreOP starving

- 24 h no smoking
- 6-8 h no eating
4h breast milk
- 2 h last clear liquid



Premedication

usually p.os - evening + morning

☞ sedation/anxiolysis (Benzodiazepines)

☞ analgesia only if pain (opioids)

☞ reduce airway secretions + heart rate control + hemodynamic stability

☞ prevent bronchospasm

☞ prevent and/or minimize the impact of **aspiration**

☞ decrease post-op nausea/vomiting

Premedication

goal: cooperating patient

anxiolysis

- easier induction of A.
- lower consumption of drugs



Risk of Aspiration

- Severe obesity
 - Symptoms of gastroesophageal reflux
 - Advanced pregnancy
 - Severe ascites
 - Opioid administration or other condition resulting in delayed gastric emptying
 - History of gastroparesis or other motility disorder
 - Bowel ileus or bowel obstruction
- ((Metoclopramid, sodium citrate with citric acid))
→ RSI Rapid Sequence of Induction
-
-

Induction of Anesthesia

1 – 3 drugs i.v. =

- lethal dose
- the most effective way

=> no self-control, unable call for help, suppress of vital autoregulating mechanisms

- unmask compensated disturbances (hypovolemia, relative respiratory insuf, ...)



Induction

- 30 - 60s from fully conscious to vitally dependent on anaesthetist
- Moment with big influence on the rest of the life.

P.S. Did you ever sign “Informed Consent”

Airways

Indication for intubation:

- ☰ need of relaxation or artificial ventilation
- ☰ full stomach (Rapid Sequence of Induction)

- ☰ Laryngeal mask
 - ☰ Face mask
 - ☰ Orotracheal intubation, nasotracheal intubation with direct laryngoscopy
 - ☰ Tracheotomy
 - ☰ Cricothyrotomy
-
-

In the End of Anesthesia

☞ Stable ABCD: extubation, pain, temperature control, PostAnest.CareUnit

☞ Unstable: analgo-sedation + artificial ventilation - transport to ICU



Extubation

- pay now or pay later - if in doubt, leave it in.
- always awake if - difficult mask airway or intubation, full stomach, surgical considerations, sux contraindicated
- awake means awake - if in doubt, leave it in



Postoperative care

- ICU or standard department
 - monitoring according to the type of OP + health
 - control laboratory
 - treatment of acute pain
 - infusion therapy, blood loss
-
-



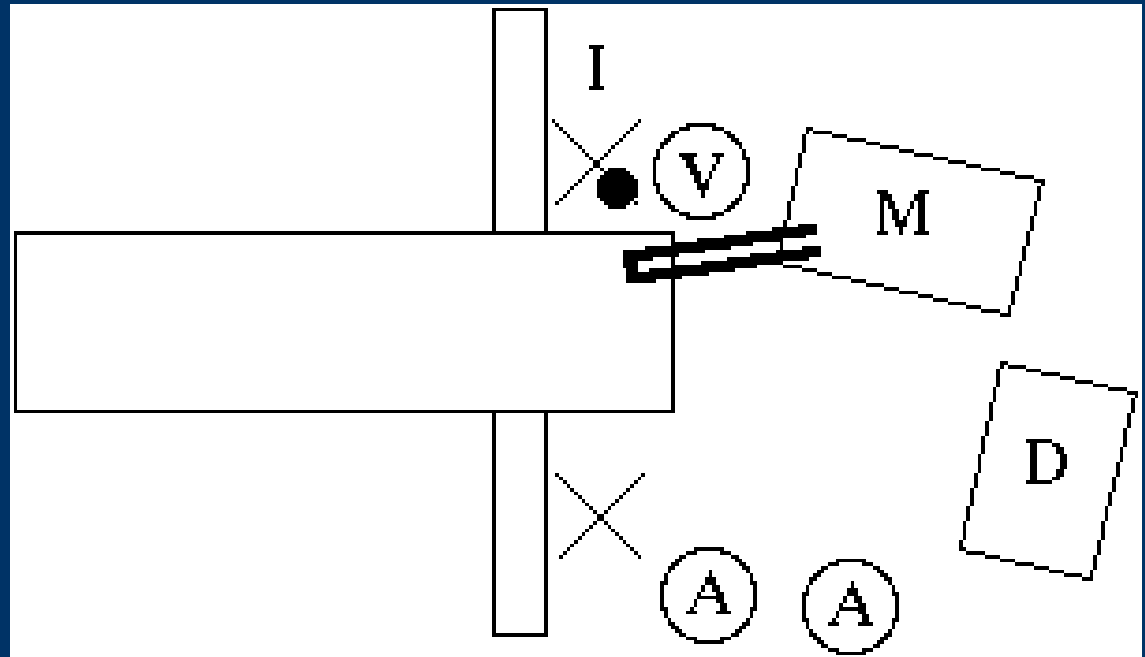
OR checklist

- Test A.Machine = does it inflate O2
[before anesthesia]
 - Identity
 - Procedure, side
 - Allergy
 - Documentation (fill in, Informed Consent)
 - i.v. access
 - Monitoring
-
-

Optimal anesthesia – cardiovascular stability

- f 50..90/min
 - STK max 115% of starting
 - DTK > 60 mmHg
 - PAOP < 12 mmHg
 - correct anemia
-
-

ORoom



- „Dobry den“
 - fellowship anestetist ~ A.nurse
- confidence, respect
- hygiene – wash your hands before every case, use gloves
-
-

Mortality of anaesthesia (ASA I)

☞ 0,008-0,009% primary connected with A

☞ 0,01-0,02% partially connected with A

☞ 0,6% 6 day mortality after operation

☞ 3 times danger than flying [1: 775 000]



Complications of GA

!!! No risk = no anaesthesia !!!

☞ difficult intubation, ventilation ... asfyxia

☞ aspiration of stomach fluid ... pneumonia

☞ overdose anaesthetic ... cardiovascular, respiratory colaps

☞ malfunction of monitor, machines

☞ organ failure (AIM, dekomensation COPD, hepatitis, ...)

☞ malignant hyperthermia

☞ anaphylactic reaction / shock

Risk of anesthesia - mortality

- Trend to improve safety => low tolerance to complications of anesthesia

Mortality and Anesthesia:

- 1952 1 : 2 000 (Beecher, 1954)
 - 1982 1 : 10 000 (NCEPOD 1987)
 - 2001 1 : 50 000 – 220 000 (Brown, 2002)
-
- Risk of death in aviation 1: 755 000 (1997)
-
-

☰ *Death and Anesthesia*

- hypoxemia / UPV /
intubation of oesophagus
- aspiration / regurgitation of gastric fluid to lung
- circulatory instability (ischaemia)
- over dose
- anaphylaxis, interaction of drugs

!!! Death was preventable (30-60%) !!!

Phraseology

- analgesia = elimination of pain
 - sedation = elimination of stress, impatience, fear
 - Minimal Sedation (Anxiolysis) is a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and physical coordination may be impaired, airway reflexes, and ventilatory and cardiovascular functions are unaffected.
 - Moderate Sedation/Analgesia (“Conscious Sedation”) is a drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation.
-
-

Phraseology

- Deep Sedation/Analgesia is a drug-induced depression of consciousness during which patients cannot be easily aroused but respond following repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate.
- General Anesthesia is ... loss of consciousness during which patients are not arousable, even by painful stimulation.
 - inability to maintain ventilatory function = often require assistance in maintaining a patent airway, and positive pressure ventilation may be required.

Continuum of depth of sedation

	<i>Minimal Sedation/Anxiolysis</i>	<i>Moderate Sedation/Analgesia</i> <i>("Conscious Sedation")</i>	<i>Deep Sedation/Analgesia</i>	<i>General Anesthesia</i>
<i>Responsiveness</i>	Normal response to verbal stimulation	Purposeful** response to verbal or tactile stimulation	Purposeful** response following repeated or painful stimulation	Unarousable even with painful stimulus
<i>Airway</i>	Unaffected	No intervention required	Intervention may be required	Intervention often required
<i>Spontaneous Ventilation</i>	Unaffected	Adequate	May be inadequate	Frequently inadequate
<i>Cardiovascular Function</i>	Unaffected	Usually maintained	Usually maintained	May be impaired

ASA 2004/2009

Anesthesia

- General
 - inhal.,
 - TIVA
- Regional
 - central block (SA, EPI)
 - periferal blocks (brachial, nervous)
 - local anesthesia (eye – cornea + conjunctiva, infiltration)

Combined = GA + EPI-line

Useful web

<http://www.virtual-anaesthesia-textbook.com/>

www.asahq.org

www.akutne.cz

www.cobatrice.org

<http://airwaymicrotext.homestead.com>

Virtual Anesthesia Machine:

- <http://www.anest.ufl.edu/vam/>
- www.simanest.org



Preoperative evaluation and premedication

- Risk of A
- PreOp evaluation
- Premedication
- Safety in OR

Next week:

- Anesthesia Machine
 - Monitoring
-
-