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Anaesthesia and Pain Management

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aVLAL091

Goal

- understand basic concepts of general and regional anaesthesia
- learn basic skills of airway management

- learn anatomy of regional anaesthesia (SA, EPI)
- Anaesthesia of children

.. and if you would like, more …

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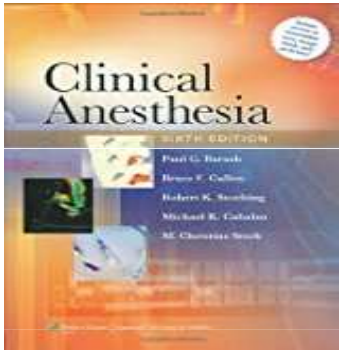
How to get credit??

- Lectures
- Literature : Larsen, Miller, Barash



- Simulation (Airway management drill)
- OR – voluntary intership – (COVID era not possible)
- Oral Exam (December 2022 – February 2023)

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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

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 Anaesthesia

Surgical procedures were carried out prior to the introduction of Anaesthetics. 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 Anaesthesia was heralded as one of the great advances of modern medicine, in that it allowed surgery to advance.

Beginning of GA

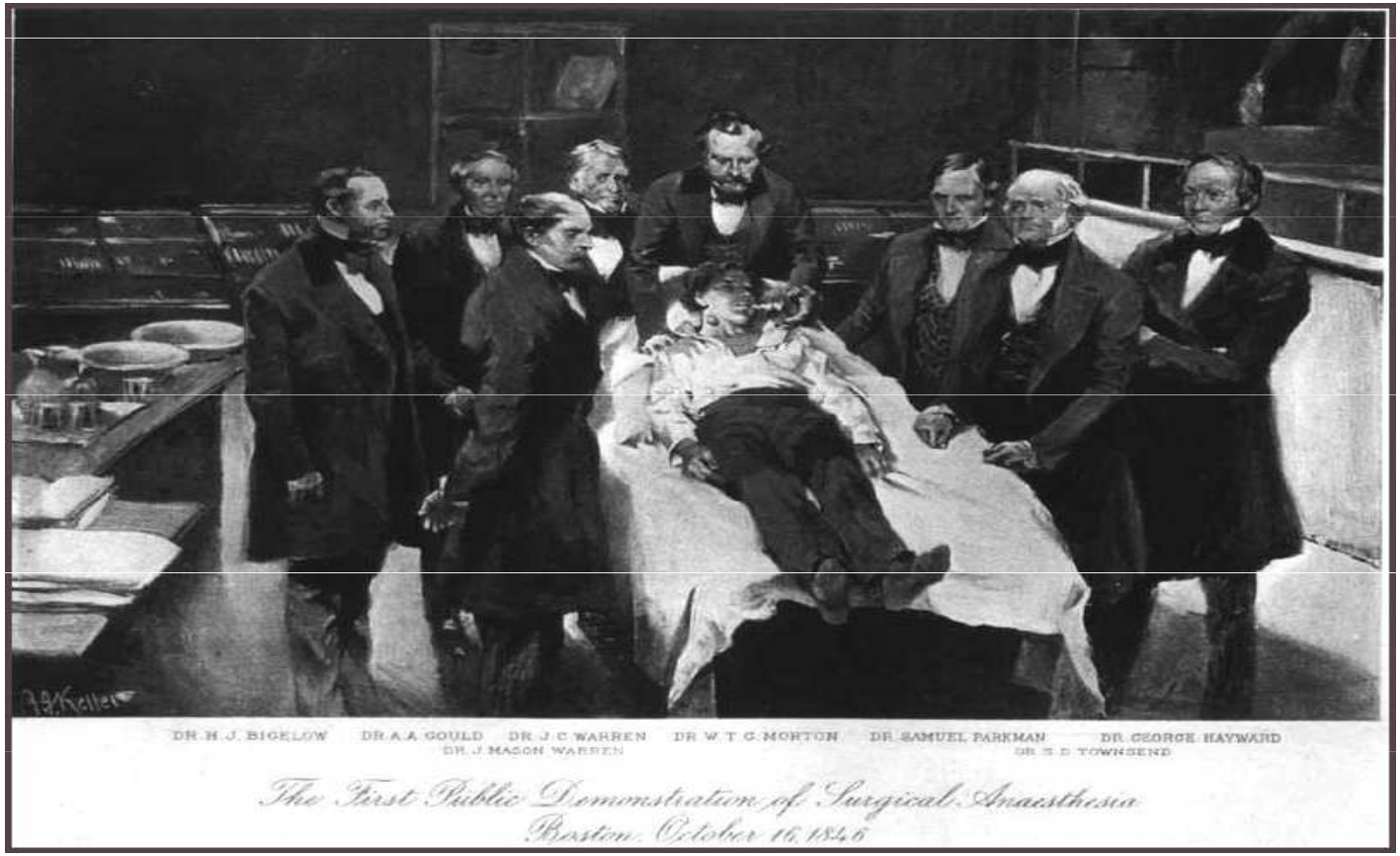
- October 16th 1846 ether general Anaesthesia

  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 laryngoskopy to clinical praxis Magill and Rowbotham

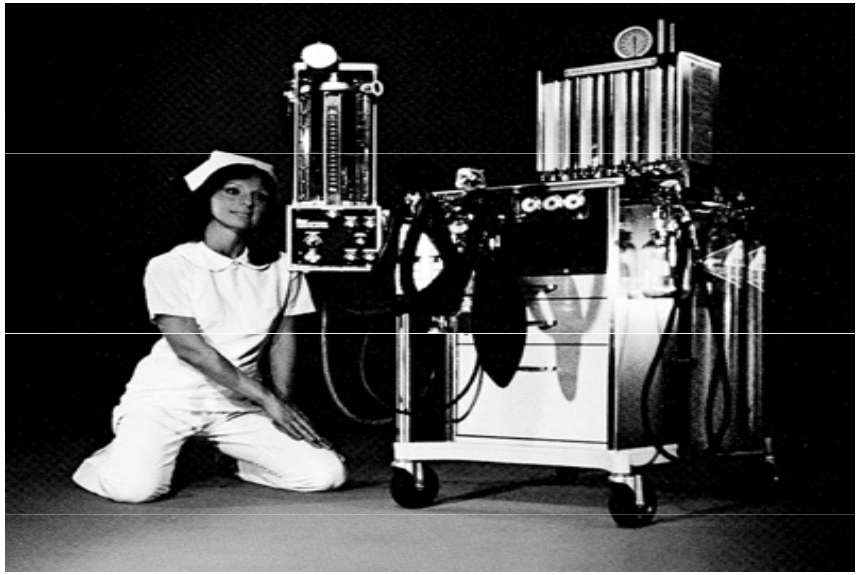
Ether


DR. H. J. BIGELOW
DR. A. A. GOULD
DR. J. C. WARREN
DR. W. T. G. 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 Anaesthesia
1884 – cocaine – eye, mucosa
1885-99 – cocaine “spinaly”

1950's – halothan
1960's – enflurane, isoflurane
1994 – sevoflurane
2006 – sugammadex



Ideal Anaesthetic Drug

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

- Does not exist.

Anaesthesiology

is a jung discipline (176y) 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;

Anaesthesiology

- 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

GUIDELINES FOR PATIENT CARE IN AnaesthESIOLOGY, ASA 1967

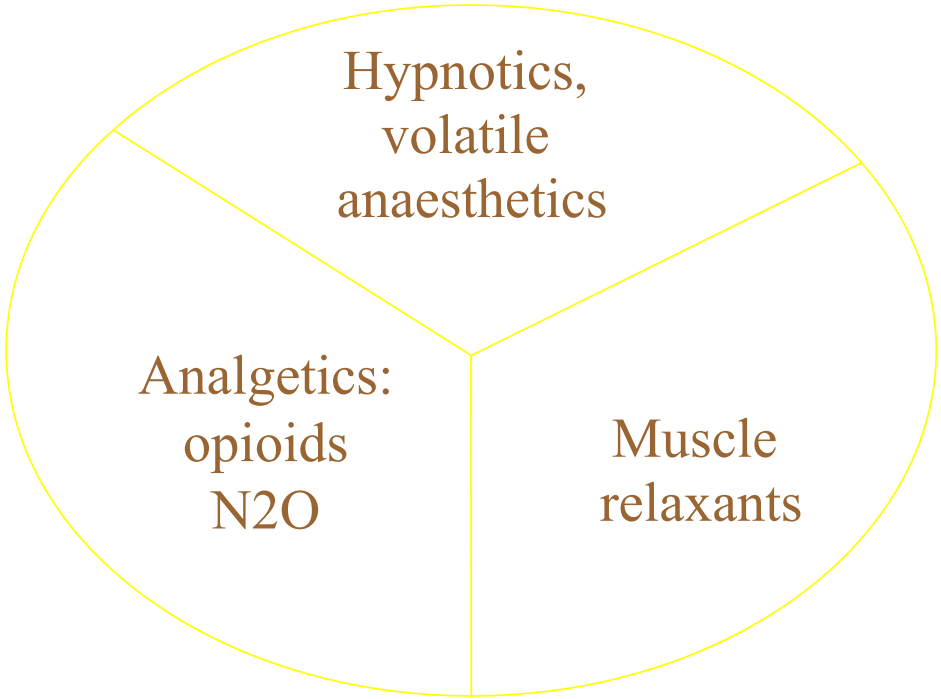
General Anaesthesia - Definition

- arteficial reversible intoxication,
  controled coma
- drug-induced loss of consciousness, felling, pain
- „No reaction" to stimuli

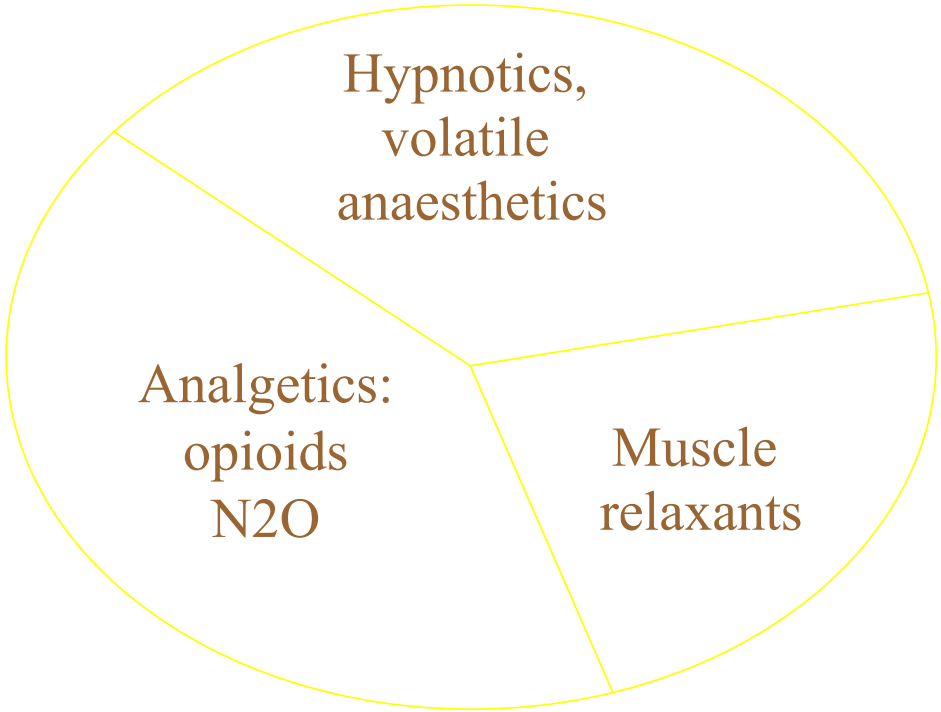
- allow therapy (surgery, electroshock)
- allow diagnostic method (CT, MRI)

General Anaesthesia

No memory
No pain
No force

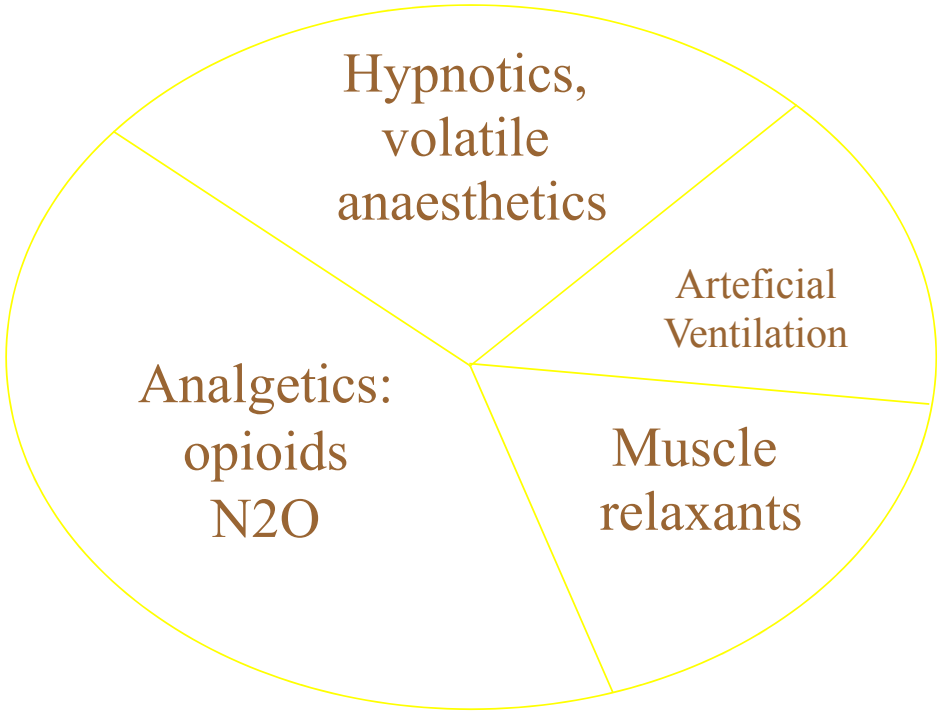


General Anaesthesia



General Anaesthesia

No memory
No pain
No force
No respiratory drive



Patient and Course of Anaesthesia

- preoperative anaesth. visit, informed consent, optimalization
- premedication (evening/morning)

OR:

- monitoring
- venous line

- induction (+ airway protection)
- maintenance
- recovery (extubation)

- treatment of postoperative pain

- record of GA

Preoperative examination

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

Why to do PreOP exam?

- decrease RISKs
- what is the benefit of surgery
- Airway examimation
- GA / regional?
- premedication

Preoperative tests

as a component of the preanesthesia evaluation, may be indicated to:
1) discovery a disease / disorder
   which may affect perioperative Anaesthetic care,
2) verification of an already known disease, disorder, medical or alternative
   therapy which may affect perioperative Anaesthetic care,
3) formulation of specific Anaesth. plans

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

Airway

History of Airway Management

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

!!! Tell the truth about troubles in Anaesthesia !!!

Airway

Examination:

- mouth opening(3 fingers)
- free teeth, carious teeth
- gotic palatum
- Mallanpati
  (big tongue, small mouth)
- hypoplastic mandibula
- anteposition of larynx = mandibula-os hyoideum <3 fing.
- fletion, extension of head = neck motion

Difficul airway

- Obesity - body weight > 110kg
- Mouth opening - inter-incisor distance < 4cm 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 > 6.5-7 cm.
- Mentum-Hyoid distance - Similar to thyromental distance, and should be at least 3-4 finger-breadths.

Inter Incisors Distance

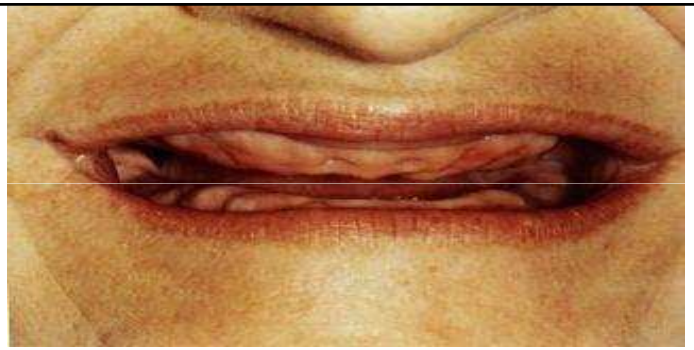
3 fingers = cm

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.

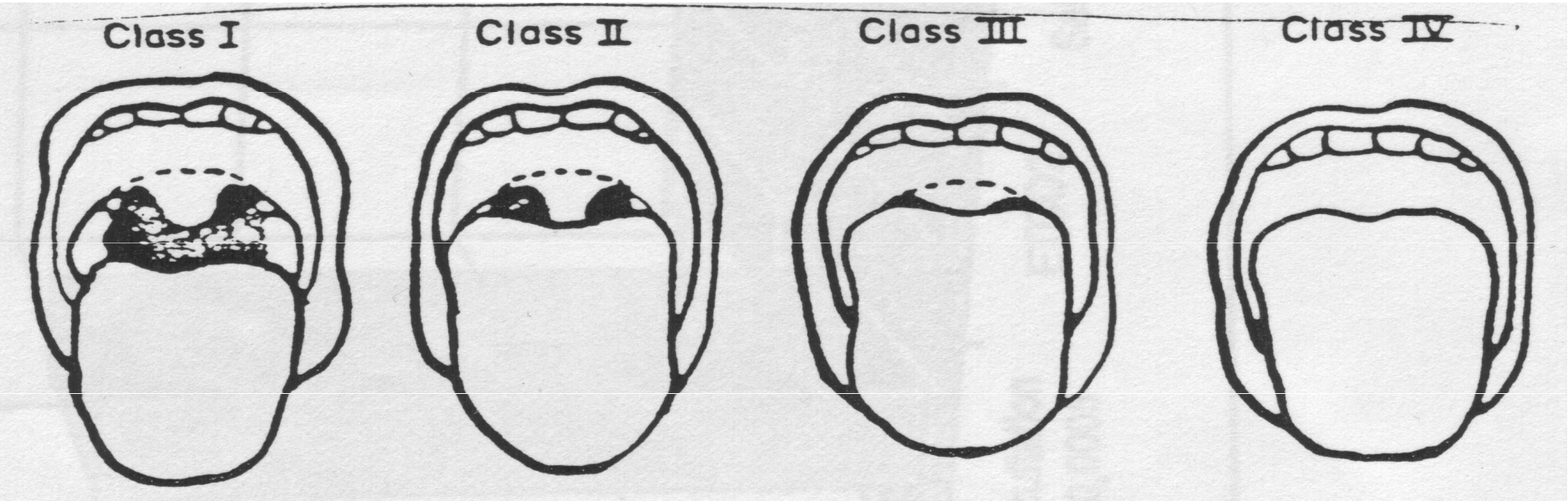
Patients with teeth in poor condition or with very prominent teeth may be more difficult to intubate.

The Upper Lip Bite test

Mallampati

OTI easy 95%

OTI difficult 50%



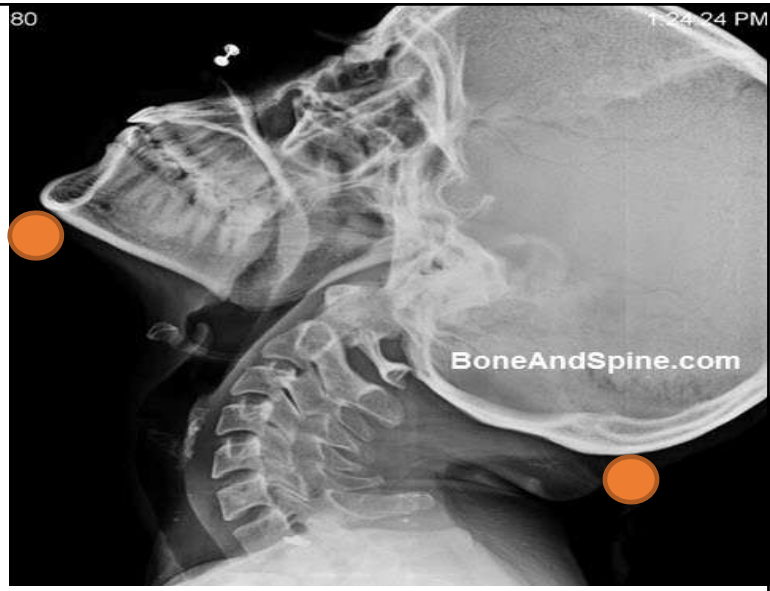
Cervical mobility

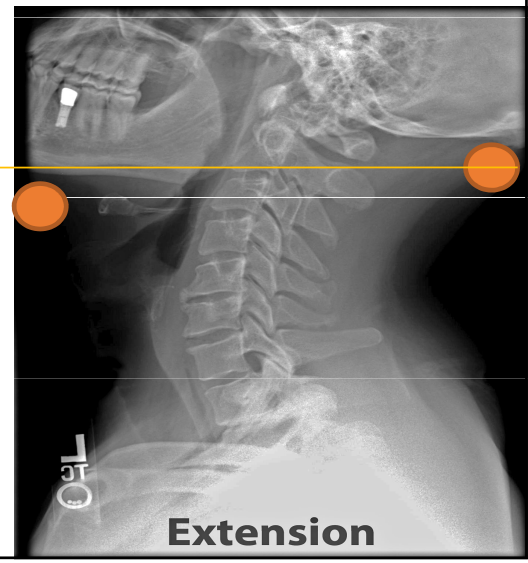
Head in neutral position.

- Use index 2 index fingers:
  on chin and nape
- Extension of neck
- Read the position of fingers

Result:

- Normal bend
- slightly limited = fingers horizontal
- significantly reduced bend



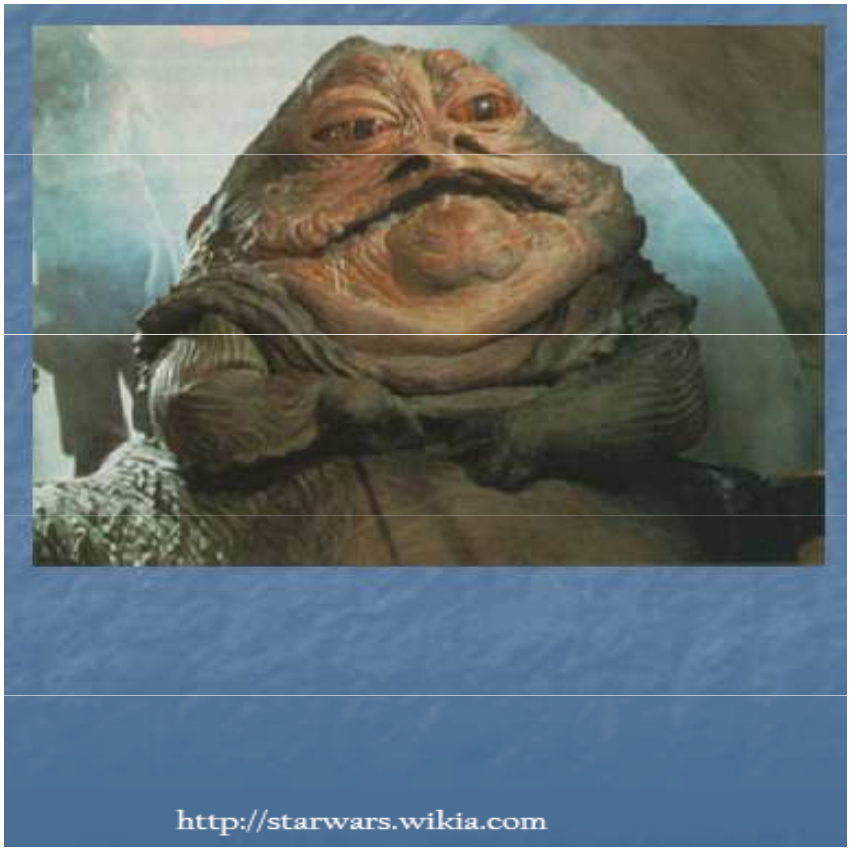


Thyromental distance

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

Easy patient?



No prediction is accurate.
MP I, normal C spine movements, 3-3-2 ... DAM

Predicted difficult airway

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

Respiratory risk

- X-ray
- spirometry
- blood gases

- COPD
- Astma
- chronic bronchitis

- acute inflamation of lunx

(pneumonia 3 weeks postponement)

Cardiovaskular risks

- ECG (load)
- ECHO, (coronarography)

- hypertension (cardiac work, failure)
- ischemia (AP, IM, rhythm)
- cor pulmonale
- valvular abnormalities (Ao stenosis)

Prophylaxis:

- Beta blockers, ? antihypertensive drugs

… other risks

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

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%

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]

Risk of Anaesthesia - mortality

Trend to improve safety => low tolerance to complications of Anaesthesia

Mortality and Anaesthesia:

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 Anaesthesia

- hypoxia /
  intubation of oesophagus
- aspiration / regurgitation of gastric fluid to lung
- circulatory instability (ischaemia)
- overdose
- anaphylaxy, interaction of drugs

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

Complications of GA

!!! No risk = no Anaesthesia !!!

- difficult intubation, ventilation ... asfyxia
- aspiration of stomach fluid ... pneumonia
- overdose Anaesthetic ... cardiovascular, respiratory colaps
- malfunction of the monitor, ventilator
- organ failure (MI, COPD, hepatitis, ...)
- malignant hyperthermia
- allergic reaction / shock

Premedication

goal: cooperating patient

anxiolysis

- easer induction of A.
- lower consumption of drugs
- easer recovery

Premedication

usually p.os - evening + morning

- sedation/anxiolysis (benzodiazepines)
- analgesia only if pain (paracetamol, 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 of adults

Evening:

alprazolam 0.5 mg p.os 22 h
(or diazepam 10 mg p.os)

Morning:
alprazolam 0.5 mg p.os 6 h

paracetamol 1g p.os

PreOP starving

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

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

Operating Room

Conversation before GA or RA

- identity and procedure site
- tooth (artificial, free)
- empty stomach - last food, fluid
- weight
- allergy
- complication of CA in his/family history

- check-up questionnaire
- agreement with Anaesthesia

Induction of Anaesthesia

1 – 3 drugs i.v. =

- lethal dose
- the most effective way

=> no self-controle, 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 Consend"

Airways

Indication for intubation:

- full stomach (Rapid Sequence of Induction)
- artificial ventilation after procedure

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

In the End of Anaesthesia

No bleeding, no revision, end of procedure:

- Stable ABCD: extubation, pain, temperature control, PostAnest.CareUnit
- Unstable: analgosedation + arteficial 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

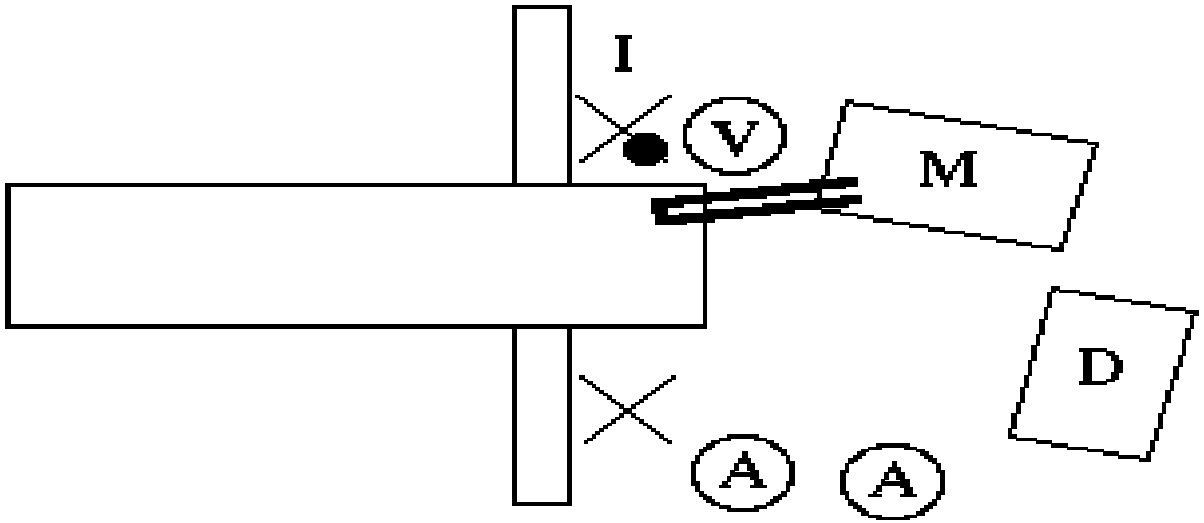
OR checklist

- Test A.Machine = does it inflate O2

[before Anaesthesia]

- Identity
- Procedure, side
- Allergy
- Documentation (fill in, Informed Consend)
- i.v. access
- Monitoring

ORoom



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

Continuum of depth of sedation

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

ASA 2004/2009

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 Anaesthesia 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.

Anaesthesia

General

- inhalation
- TIVA

Regional

- central block (subarachnoid, epidural)
- periferal blocks (brachial, nervous)

- local Anaesthesia (eye – cornea + conjunctiva, infiltration)

Combined = GA + EPI-line

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