

Anesthesia and Analgesia in Emergency Settings



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Anesthesia and Emergency

⌘ In the Emergency Department

- ☒ good equipped
- ☒ best performed by anesthesiologist

⌘ Pre-hospital

- ☒ field work
- ☒ experience needed in optimal settings
- ☒ no good monitoring

☒ quid if failed ?

- ☒ situation worsened
- ☒ possible dead

Trauma induces ...

⌘ Acute phase

- ☒ increase in
 - ☒ Cardiac output
 - ☒ brain metabolism
 - ☒ catecholamines release
- ☒ hyperglycemia
- ☒ Catabolic

⌘ All these changes occur in response to stress ...

and ...

are not only happening in trauma patients

The stress response is ...

- ⌘ hyperdynamic
- ⌘ hypermetabolic
- ⌘ protective in survival

Is any attempt to modify this response beneficial ?

Care priorities

- ⌘ Rapid overview
- ⌘ Airway, breathing and circulation
- ⌘ Disabilities and minor injuries
- ⌘ **Pain management**
is not the main goal in trauma care

Goals of pain management

- ⌘ Analgesia
- ⌘ Anxiolysis
- ⌘ Relief of agitation
- ⌘ Sedation

- ⌘ Modification of stress response



Common pitfalls

- ⌘ pain is extremely common
- ⌘ Evaluation is very difficult
- ⌘ *Pain relief can alter physiology of vital organs*



Methods of pain relief

- ⌘ Non-specific:
 - ☒ rewarming
 - ☒ splinting
 - ☒ communication
- ⌘ Minor drugs:
 - ☒ paracetamol
 - ☒ NSAID
- ⌘ Entonox
- ⌘ Narcotics:
 - ☒ morphine
 - ☒ fentanyl, sufentanyl, alfentanyl,
- ⌘ Regional nerve block
- ⌘ Locoregional analgesia

Pre-hospital analgesia and anesthesia

- ⌘ Difficult and controversial
- ⌘ Studies:
 - ☒ uncommon
 - ☒ not standardized
- ⌘ pain:
 - ☒ useful in diagnosis
 - ☒ stress response initiator
- ⌘ First:
 - ☒ stabilization, ABC
 - ☒ preliminary diagnosis
 - ☒ cervical spine, splints, ...
 - ☒ ICU - monitoring
 - ☒ (anamnesis)

Pre-hospital analgesia and anesthesia

⌘ Advantage:

- ☑ pain relief
- ☑ memory loss

⌘ Pre-hospital analgesia and anesthesia should only be performed after specific training.

⌘ Disadvantage:

- ☑ diagnostic mistakes

Indications for Pre-hospital anesthesia

- ⌘ trapped victims
- ⌘ airway management
- ⌘ painful extrication procedures
- ⌘ painful medical procedures

Common pitfalls

- ⌘ Inadequate time and conditions for airway management
- ⌘ Full stomach
- ⌘ Preexisting diseases
- ⌘ Maxillofacial injuries



Common pitfalls

- ⌘ Facial burn injuries
- ⌘ Cervical spine injury
- ⌘ Injuries to the respiratory tract
- ⌘ Haemodynamic compromises

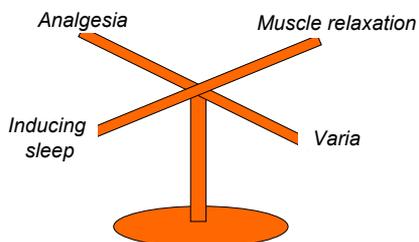


General anesthesia is ...

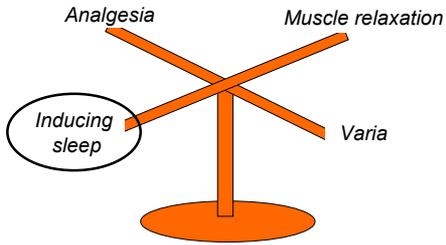
- ⌘ Induction of sleep
- ⌘ Pain relief
- ⌘ Muscle relaxation
- ⌘ Varia

'Balanced' anesthesia

Balanced anesthesia



Balanced anesthesia



Induction Agents

⌘ Barbiturates

- ☒ rapid
- ☒ myocardial depression (compensatory VC and increase in HR)
- ☒ Pearl Harbor syndrome (hypovolemia)
- ☒ paravenous injection

- ☒ dose: 4 -5 mg/kg



Induction Agents

⌘ Propofol

- ☒ well being
- ☒ cardiac depression, LV impairment
- ☒ injection pain

- ☒ dose: 2 mg/kg



Induction Agents

⌘ Ketamine

- mild respiratory depression
- cardiovascular stimulation
- increase of ICP, IOP
- IV as IM possible
- some pain relief

⊠ dose: 2 mg/kg IV
5 à 10 mg/kg IM

⊠ use: hypovolemic and cardiogenic shock
children when no IV-line
burns



Induction Agents

⌘ Etomidate

- Hypnotic drug, no analgesia
- Minimal HD alteration

⊠ dose: 0.2 mg/kg IV

⊠ use: haemodynamic compromised patients
trauma - hypovoleamia
myocardial injury
cardiogenic shock



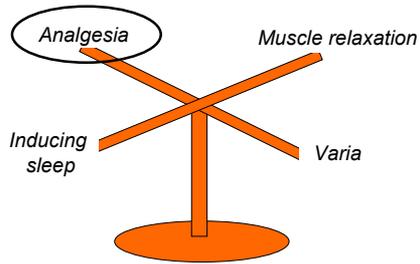
Benzodiazepines

- ⌘ Anxiety relief
- ⌘ Seizure control
- ⌘ Sedation
- ⌘ Ante- and retrograde amnesia
- ⌘ Muscle relaxation

⌘ Not:

- ⊠ inducing anaesthetic level of sleep.

Balanced anesthesia



Narcotics

⌘ Analgesia, relief of agitation, sedation

⌘ Safe

⌘ Receptor mediated effect

- ⊠ Mu-receptor: analgesia, euphoria, miosis, respiratory depression
- ⊠ Kappa-recept: analgesia, sedation
- ⊠ Sigma-recept: dysphoria, no analgesia, hallucinations, mydriasis
- ⊠ Delta-recept: potentialisation of Mu-recept.



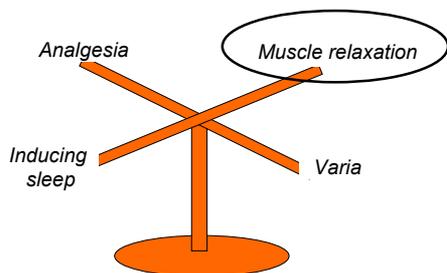
Narcotics

	<i>morphin</i>	<i>fenta</i>	<i>sufenta</i>	<i>alfenta</i>
<u>potency ratio</u>	1	292	4531	73
<u>onset min</u>	5-10	5	5	1
<u>duration min</u>	240	30	30	10
<u>dose IV mg/kg</u>	0.2	0.0015	0.15	7-15
		mg/kg	ga/kg	ga/kg

Narcotics



Balanced anesthesia



Muscle relaxants

⌘ Depolarization agents

- ⌘ suxamethonium (=Myoplegine®)

⌘ Non depolarization agents

- ⌘ cis-atracurium
- ⌘ mivacurium
- ⌘ rocuronium

⌘ drug of choice for emergency **intubation**

⌘ older:

- atracurium
- vecuronium
- pancuronium

Suxamethonium alternatives

⌘ Rocuronium

☒ Esmeron®

☒ "acceptable" conditions for intubation



dose (mg/kg)	onset (sec)	time of duration (min)
0,45	90	25 - 30
0,6	60	30 - 40
0,9	< 60	50 -60

Choice of the muscle relaxant for rapid-sequence induction.

(Eur J Anaesthesiol Suppl 2001;23:71-6)

- ⌘ ... among all the muscle relaxants available, succinylcholine is the only one with a fast onset and a fast recovery. Therefore it is still the most frequently used muscle relaxant for rapid-sequence induction despite its well-known side-effects.
- ⌘ The short duration of action of succinylcholine is, however, no substitute for aggressive airway management in the case of an unexpectedly difficult intubation in order to prevent life-threatening hypoxia. A preoperative assessment of the airway is mandatory in any patient.
- ⌘ ... doses of rocuronium (> or = 1.0 mg kg⁻¹) under relatively light anaesthesia, may even be potentially harmful.

Once the patient sleeps, he must be intubated to protect the free airway and to take over respiration.

Trauma and emergency anesthesia is always at high risk.

Difficult intubation

⌘ 30% of all anesthesia accidents due to difficult airway

☒ 70% die or have permanent brain damage

⌘ Incidence difficult intubation:

☒ 0,05 to 20 %

⌘ Subordinate to

- ☒ training.
- ☒ type of surgery.
- ☒ in-hospital vs. out-of-hospital.



The intubation is optimal once successful after one attempt.

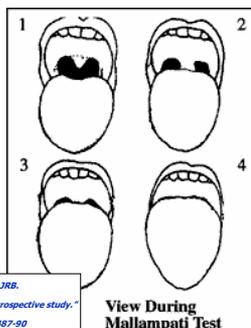
- ⌘ Experienced anesthesiologist
- ⌘ No significant muscle tone
- ⌘ Optimal position of the head (sniffing)
- ⌘ Optimal external laryngeal manipulation
- ⌘ Change length of blade
- ⌘ Change type of blade.

Benumof JL. Can J Anaes 1994; 41: 361.

Airway management

⌘ Mallampatti test

☒ Mallampati SR et. al.
Can Anaesth Soc J
1985; 32: 429.



Samsoon GLT, Young JRB.
"Difficult tracheal intubation: a retrospective study."
Anaesthesia 1987;42:487-90

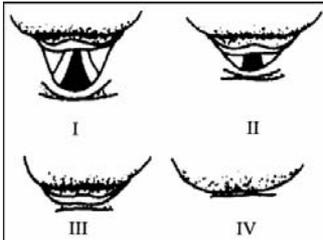
**View During
Mallampati Test**

Airway management

⌘ Incidence:
+/- 3 %

⌘ Cormack, Lehane

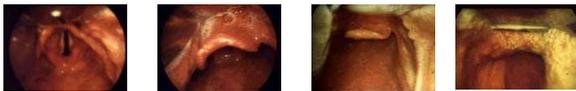
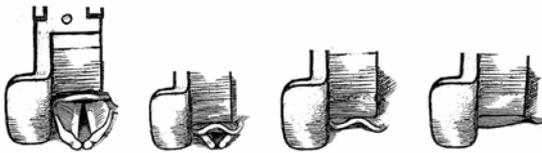
	%
graad I	95
graad II	3
graad III	1,95
graad IV	0,05



Classification of Laryngoscopy Views

Cormack RS, Lehane J.
"Difficult intubation in obstetrics."
Anaesthesia 1984;39:1105-11

Cormack & Lehane



Problems in airway management



⌘ Regurgitation

⌘ Aspiration

⌘ Aspiration
pneumonitis

Trauma predisposes to *regurgitation*

- ⌘ increased intragastric pressure
 - intraperitoneal blood
 - intestinal distention
 - MAST-suit
- ⌘ intragastric material
- ⌘ decreased LOS
 - injuries: CNS, diaphragm rupture, ...
 - preexisting diseases: CNS, hernia diafragmatica
 - intoxication
 - anesthesia

Trauma predisposes to *aspiration*

- ⌘ Copious oropharyngeal material
 - blood, vomitus
- ⌘ Laryngeal incompetence
 - CNS depression
 - laryngeal injury
 - anesthesia and analgesia
- ⌘ Diminished or absent cough
 - CNS injury
 - chest and/or upper abdominal injury
 - anesthesia

Objectives

- ⌘ pre-induction pharmacological measures
 - antacids
 - H-2 blocking drugs
- ☒ no advantage in major trauma
- ⌘ pre-induction evacuation of the stomach
 - ☒ most effective
 - ☒ nasogastric tube needs not to be removed prior to intubation
- ⌘ Rapid sequence induction

Rapid sequence induction

original description An. Analg. 1976

⌘ Pre-oxygenation

- ☑ 100% oxygen, 3-4 minutes
- ☑ 4 deep breath (not in acute trauma patients)

⌘ Sellick's manoeuvre

- ☑ cricoid pressure

⌘ Pre-curarisation

- ☑ low dose non depolarization relaxant (1/10 to 1/5 of dose)
- ☑ attenuates suxamethonium increase in ICP, IOP and fasciculation

Sellick's manoeuvre

original description 1961

- ⌘ 30° head-up tilt
- ⌘ nasogastric tube
- ⌘ preoxygenation
- ⌘ IV inducing agent
- ⌘ application of cricoid pressure
- ⌘ IV suxamethonium
- ⌘ maintaining apnoea and intubation after fasciculation's
- ⌘ inflation of the endotracheal tube cuff

Sellick's manoeuvre

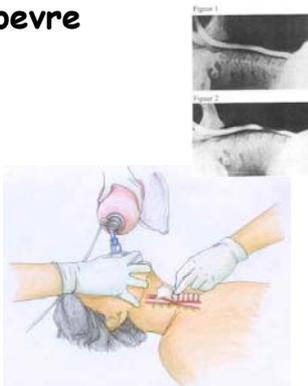
cricoid pressure

⌘ prevents:

- ☑ entry
- ☑ gastric inflation

⌘ force:

- ☑ +/- 4.5 kg



Sellick's manoeuvre

cricoid pressure

⌘ prevents:

- ☒ entry
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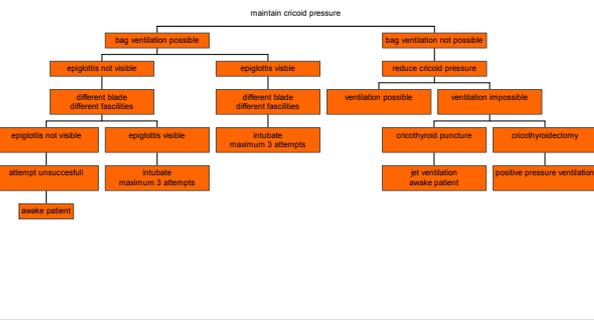
⌘ force:

- ☒ +/- 4.5 kg

⌘ contra-indications

- ☒ cervical spine lesions:
 - #
 - dislocations
- ☒ larynx and/or cricoid injuries
- ☒ awake intubation

Failed Intubation



Failed intubation

- ⌘ Leaders into the ETT
- ⌘ Blades of different size
- ⌘ Blades of different forms (Belhouse, Bullard)
- ⌘ ETT of different sizes
- ⌘ No indication for laryngeal mask in emergency situations

Conclusions

- ⌘ Pain relief comes after stabilization and primary diagnosis.
- ⌘ Anesthesia is hazardous in inexperienced hands.
- ⌘ General anesthesia is mandatory in emergency situations.

Conclusions



⌘ Drugs of choice are systemic

- ⊗ Induction agent: etomidate
ketamine
- ⊗ Muscle relaxation: suxamethonium

⌘ Critically injured patients have unpredictable pharmacokinetics

⌘ JUST ENOUGH TO DO THE JOB
