Anesthesiology of dog and cat
General surgery and anesthesiology
4th study year FVM

Fundamentals of „safe“ anesthesia
• Venous access
• Endotracheal intubation
• Oxygenation
• Artificial lung ventilation
• Knowledge and possibility of CPR

Anesthesia of DOG
• Monoanesthesia
  – Propofol i.v.
  – Inhalation anesthesia (Isoflurane, Sevoflurane)

• Examination
• Painless procedures only

Anesthesia of DOG
• Sedation and premedication
  – Medetomidine (+ opioids) i.m., i.v.
  – Midazolam (Diazepam) + opioids i.v.
  – Acepromazine + opioids i.m., i.v.
  – Droperidol + Fentanyl i.m., i.v.

Anesthesia of DOG
• Anesthesia induction
  – Intravenously
    • Propofol
    • Ketamine
  – Intramuscularly
    • Ketamine, Tiletamine/Zolezapem
  – Inhalation (by mask, chamber)
    • Isoflurane, Sevoflurane

Anesthesia of DOG
• Maintenance
  – Boluses reapplication, CRI
    • Propofol i.v.
    • Ketamine i.m., i.v.
  – Inhalation
    • O₂ + (N₂O, Air) + Isoflurane, Sevoflurane

Anesthesia of CAT
• Monoanesthesia
  – Ketamine, Zolazepam/Tiletamine i.m.

• Examination
• Painless procedures only

Anesthesia of CAT
• Sedation and premedication
  – Medetomidine (+ opioids) i.m., i.v.
  – Midazolam (Diazepam) + opioids i.m., i.v.
  – Zolazepam/Tiletamine i.m.
  – (Acepromazine + opioids i.v.)

Anesthesia of CAT
• Anesthesia induction
  – Intravenously
    • Propofol
    • Ketamine
  – Intramuscularly
    • Ketamine, Tiletamine/Zolezapem
  – Inhalation (by mask, chamber)
    • Isoflurane, Sevoflurane

Anesthesia of CAT
• Maintenance
  – Bolus reapplication, CRI
    • Propofol i.v.
    • Ketamine i.m., i.v.
  – Inhalation
    • O₂ + (N₂O, Air) + Isoflurane, Sevoflurane

Patient with cardiovascular disease
General surgery and anesthesiology
4th study year FVM

Cardiovascular disease
• Reduction of drug distribution and metabolism
• Decreased circulation and C.O.
• Reduction of perfusion of
  – Kidneys and liver
  – Periphery
• Impairment of ventilation/perfusion
  – Venous admixture

Patient with cardiovascular disease
• Preanesthetic stabilization
• Preoxygenation
• Positioning
- Ventilation mode
- Sufficient fluid therapy

**Mitral valve incompetence**
- Low C.O., restricted contractility
- Complication – lung edema, atrial fibrillation
- Stabilization
- Anesthesia
  - Avoid increasing of SVR
  - Mild tachycardia
  - Acepromazine + Isoflurane

**Mitral valve stenosis**
- Bradycardia, hypotension, lung edema
- Correct fluid therapy
- Anesthesia
  - Maintain C.O.
  - Maintain SVR
  - Mild tachycardia
  - Carefully IPPV

**Dilated cardiomyopathy**
- Ca – deficit of LV
- Fe – deficit of RV
- Arrhythmias, lung edema
- Anesthesia
  - Maintain C.O.
  - Reduce myocardial hypoxia

**Cor pulmonale**
- Pathology of lungs and RV
- Anesthesia
  - Maintain or decrease lungs VR
  - N₂O increase, Iso, Sevo decrease lungs VR
  - Low PIP při IPPV

**Hypertrophic cardiomyopathy**
- Frequently with subaortic stenosis
- Reduction of emptying of LV
- Anesthesia
  - Avoid tachycardia
  - Avoid increasing of myocardial contractility
  - Increase of SVR

**PDA**
- L-R PDA – decreasing of C.O. – hypotension – hypertrophy of LV, RV
- R-L PDA – venous admixture – cyanosis
- Anesthesia
  - Maintain C.O.
  - Avoid decrease of SVR, increase of lung VR
  - Oxygenation

**Pulmonic stenosis**
- Tricuspid valve incompetence – RA hypertrophy – RV hypertrophy
- Anesthesia
  - Maintain, mild reduction of HR
  - RV preload
  - Reduce PIP při IPPV

**Aortic stenosis**
- Reduction of LV output – hypertrophy
- Decrease of DAP – decrease of coronary perfusion
- Anesthesia
  - Normotension, avoid hypertension
  - Maintain HR
  - Oxygenation

**Anesthesia of patient with cardiomyopathy**
- Premedication
  - Midazolam (Diazepam), Acepromazine + opioids
- Induction
  - Etomidate, Propofol, Ketamine
- Maintenance
  - Isoflurane, Sevoflurane
  - TIVA (Midazolam/Fentanyl)

**Respiratory abnormalities**
- Hypoxia, hypercapnia – cardiovascular abnormalities – multiorgan effects
- Anesthesia – impairment of
  - Mucociliary function (Atropin)
  - Formation of atelectases
  - Impairment of ventilation/perfusion – AV shunts
  - Respiratory depression

**Bronchial effects**
- Bronchodilatation
  - Atropin
- Bronchoconstriction
— Thiopental, Ketamine
• Antitussic effect
  — Butorphanol

Anesthetic technique
• Preoxygenation
• Induction
  — Fast – i/v + ETR
  — Benzodiazepines + opioids + Propofol
• TIVA
• IPPV + PEEP

Patient with hepatic disease
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Blood plasma protein binding
• High (> 80%)
  — Propofol, Diazepam
• Medium (50-80%)
  — Thiopental
• Low (< 50 %)
  — Ketamine, Morphine

• Change of anesthetic effectiveness

Hepatic disease I.
• Drugs with minimal liver metabolization
  — Opioids – Fentanyl derivates
  — Inhalation anesthetics – Isoflurane, Sevoflurane
  — Short acting anesthetics – Propofol, Etomidate
  — Atracurium, Remifentanil (Hofmanns degradation)
  — Ester L.A. – Procaine

Hepatic disease II.
• Unsuitable
  — Morphine (↑ of tone of sphincter of Oddi)
  — Neuroleptics, alpha-2 agonists
  — Ketamine, Thiopental
  — Amid L.A.

Hepatic disease III.
• Liver biopsy
  — Premedication with vitamine K
• PSS
  — Risk of hepatopencephalopathy
  — Increased sensitivity of anesthetics

— Closing of PSS – changes of ABP
— Glucose supplementation

Anesthesia of patients with hepatopathy
• Premedication
  — Opioids (Pethidine)
• Induction
  — By mask – Isoflurane, Sevoflurane
  — Short acting anesthetics – Propofol, Etomidate
• Maintenance
  — Isoflurane, Sevoflurane

Patient with urologic disease
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Urologic patient
• Influence of anesthetic on renal functions
• Influence of renal abnormalities on drug metabolization
• Regulation of fluid and electrolyte balance
• Excretion of N-metabolites, anesthetics
• Uremic patient
  — Hyperkalemia, hypovolemia, dehydration, metabolic acidosis

Patophysiology
• Sympaticus – renal vasoconstriction
  — Insufficient anesthesia, analgesia, hypoxia, hypercapnia
• ADH
  ↑ secretion – stress, anesthetics
    • Barbiturates, opioids, inhalation anesthetics
  ↓ secretion
    • Phenothiazines (+ vasodilatation) – diluted urine

Influence of anesthetics
Patient with neurologic disease
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Patophysiology
• ICP = 0-10 mmHg
  CPP = MAP – ICP
• MAP = 70-80 mmHg
Normotension and normocapnia

Regulation of ICP
- Patient positioning
- Stabilization of MAP, CVP
- Normocapnia (IPPV), oxygenation
- Sedation
- Lidocaine
- Furosemide
- Mannitol

Influence of anesthetics on ICP
  Ketamine
  N₂O

  Acepromazine
  Opioids

  Medetomidine
  Benzodiazepines
  Isoflurane, Sevoflurane
  Propofol, Thiopental

Anesthesia
- Sedation and premedication
  - Opioids (Morphine?)
  - Alpha-2 agonists (Xylazine?), Benzodiazepines
- Induction and maintenance
  - Propofol (CRI, TIVA)
  - Isoflurane, Sevoflurane
  - Induction by mask – unsuitable (excitation)

Neurologic analgesia
- Opioids
- Alpha-2 agonists
- NSAIDs, steroids
- Ketamine – low doses, CRI
- Lidocaine – CRI
- Gabapentin (anticonvulsant)
- Amitriptiline (tricyclic antidepressives)

Patient with epilepsy
- Acepromazine?
- Opioids
- Low doses of alpha-2 agonists
- Benzodiazepines (in combination)
- Propofol, Thiopental
- Ketamine unsuitable

Patient with gastrointestinal disease
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Gastrointestinal abnormalities
- Abnormalities
  - Electrolyte, acid-base
  - Dehydratation, hypovolemia
  - Malabsorption, hypoproteinemia
- Emergency cases
  - Volvulus, perforation, ...
- Pancreas
  - Changes of glucose metabolism

Influence of anesthetics

Abnormalities of esophagus I.
- Obstruction
  - KI drugs inducing vomiting
  - Opioids + Propofol, Thiopental, Ketamine, Etomidate + ETR (cuff)
  - Ca – striated muscles – PMNBA + UPV
  - ? thoracic surgery?

Abnormalities of esophagus II.
- Megaesophagus
  - Risk of aspiration pneumonia
  - Vascular ring anomaly
- Esophagitis
  - Complication of GOR
    - (17% of patients undergoing G.A.)
    - Sucralfate, H-2 blockers, metoclopramide
    - Atropine – relaxation of esophageal sphincter

Abnormalities of stomach
- GDV
  - Shock
  - Benzodiazepines + opioids + Propofol, Etomidate, (Ketamine) + Isoflurane, Sevoflurane
  - Cardiac arrhythmias – Lidocaine
- Gastroduodenoscopy
  - Opioids – ↑ tone of pyloric sphincter
Visceral analgesia
• Opioids + NSAID
  – Buprenorphine + Carprofen, Meloxicam
• CRI
  – Lidocaine
  – Ketamine
  – Medetomidine
  – Morphine

Patient for Cesarean section
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Pregnancy
• Decrease of lung capacity, increase consumption of O₂
  – Risk of atelectases, hypoxia
• Increase of alveolar ventilation
  – Risk of inhalation anesthetics overdose
• Sedative effects of progesterone
  – Risk of anesthetic overdose
• Distension of abdominal cavity
  – Hypoventilation, hypotension

Cesarean section
• Influence of female and fetal health status
• Influence of character of Cesarean section
• Increased fetal mortality
  – Alpha-2 agonists
  – Long-acting anesthetics
• Minimal negative effects
  – Isoflurane, Propofol

Anesthesia for CS
• Short-acting anesthetics
• Anesthetics with antagonists
• L.A.
  – Oxygen supplementation
• ETR
• Fluid therapy
• ABP monitoring

Anesthetics for CS I.
• Mu-opioids
  – Respiratory depression, bradycardia
  – Antagonisation
• Phenothiazines
  – Prolonged metabolization
  – Vasodilatation
• Benzodiazepines
  – Crossing placental barrier
  – Depression of neurological functions

Anesthetics for CS II.
• Alpha-2 agonists
  – Reduction of perfusion of uterus
• Propofol
  – Placental barrier crossing restricted
• Barbiturates
  – Reduction of newborns vitality
• Ketamine
  – Respiratory depression in newborns

Anesthetics for CS III.
• Alphaxalone
  – CS in cats
  – Fast clearance
• Local anesthetic
  – Lidocaine

Anesthesia for CS
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Intraocular pressure

INCREASE
• Increasing og ABP
  – Coughing, vomiting
• Hypercapnia, hypoxia
• Pressure on eye globe

DECIDE
• Decreasing of ABP
• Hypocapnia

• Most of anesthetics
• Osmotic diuretics
• Carboanhydrase inhibitors

Anesthesia for ophthalmology I.

• Okulocardial reflex

• Central eye globe position
  – Eye globe surgery
  – PNMB
  – Dissociatives
  – Retrobulbal block

Anesthesia for ophthalmology II.

• Lid and conjunctival surgery
  – Without limitation
  – According health status

• Eye globe surgery
  – Without dissociatives
  – Muscle relaxation + artificial lung ventilation