OBSTETRIC ANESTHESIA

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Normal pregnancy lasts for 40 weeks (40 hbd.)

Labour between 38th – 42nd week – labour on time
Labour between 22nd and 37th week - premature labour
Labour before 32nd week – big risk for the fetus and adverse effects of prematurity
Pregnancy, labour and puerperium

- Adaptative changes occurring in the body of a pregnant woman take place in virtually every organ and system and are a sign of adaptation to the changing needs of the fetus developing in the uterus and of preparation for labour.
Changes in the cardiovascular system

- Increase in the use of oxygen by c.a. 20%
- Increase in minute heart volume - 40%
- Increase in heart rate - 15%
- Decrease in systolic pressure by 5 mmHg
- Decrease in diastolic pressure by 10-20 mmHg
- Decrease in total peripheral resistance by c.a. 15%
Changes in the cardiovascular system

- Increase in the volume of circulating blood by 35%
- Bigger increase in the volume of plasma than of red blood cells
- Increase in blood flow through the uterus (20-40 times)
- Blood flow through the uterus towards the end of the pregnancy equals c.a. 20% of the minute heart volume of the mother
- Decrease in uterine vascular resistance
Changes in the respiratory system

- Edema of the upper airways, fragile (delicate) mucus
- Lifting of the diaphragm by the developing uterus
- Increase in the anteroposterior diameter of the chest
- Widening of the costal angle
Changes in the respiratory system

- Increase in alveolar ventilation by 70%
- Acceleration of breathing by 15%
- Increase in tidal volume by 40%
- Increase in minute ventilation by 50%
- Decrease in FRC (functional residual capacity) by 20%
- Respiratory alkalosis (pH: 7.38-7.42; PaCO₂: 28-32 mmHg; torr)
Changes in the alimentary system

- Impairment in the absorption of nourishment
- Deceleration of stomach emptying, voiding
- Decrease in tension of the lower esophageal sphincter (LOS)
- Weakening of the peristaltic movements of the stomach, increase in the acidity of the gastric contents (placental gastrin)
- Decrease in the gastroesophageal angle
Changes in the coagulation system

- Increase in the number of blood platelets
- Increase in the concentration of coagulation factors I (fibrinogen), VII, X, XII - by over 100%
- Weakening of the fibrinolytical activity of the plasma
- So called „hypercoagulability”
Changes in the central nervous system

- Emotional instability
- Endogenous endorphines and progesteron decrease the minimal alveolar concentration (MAC) of all inhalatory anesthetics
- Increase of pain threshold (by weakening of the enzymatic distribution of opioids)
CLINICAL IMPLICATIONS OF THE ADAPTATIVE CHANGES DURING PREGNANCY

1. Aorto-caval compression
2. Decompensation of circulatory system, in women with heart diseases (especially with congenital heart diseases) mainly between weeks 28 and 34 of the pregnancy
3. Difficult intubation, easy wounding of the mucus leading to bleeding
Aorto-caval compression
CLINICAL IMPLICATIONS OF THE ADAPTATIVE CHANGES DURING PREGNANCY

4. Rapid occurrence of hypoxemia in apnea; easiness of denitrogenation in passive oxygenation

5. Hypercoagulability as preparation for excessive blood loss during labour
CLINICAL IMPLICATIONS OF THE ADAPTATIVE CHANGES DURING PREGNANCY

- 6. So called anemia of the pregnant (Htc 35%)
- 7. The pregnant woman is always treated like a patient with a full stomach
- 8. Decreased need for local anaesthetics during epidural analgesia; technical problems
CHANGES DURING LABOUR

- Intensification of the changes occurring during the pregnancy
  - 1. Duplication of minute heart volume
  - 2. Increase in the volume of circulating blood - “autotransfusion” from the shrinking uterus
  - 3. Hyperventilation and hypocapnia
  - 4. Double increase in the concentration of adrenaline, noradrenaline and cortisol
  - 5. Metabolic acidosis as compensation of respiratory alkalosis and as a result of accumulation of lactates and pyrogonians
CHANGES DURING PUERPERIUM

1. Changes in the respiratory system recede in 2-3 weeks
2. Changes in the alimentary system recede the fastest on - 2-3 days, except the retarded stomach voiding
3. Minute heart volume is normalized after 2-4 weeks
4. End of the puerperium period - 6 weeks after labour
1. **20%** of the minute heart volume of the mother, i.e. **500- 700 ml/min** goes to the feto-placento-maternal entity, 80% of it goes to the intervillous space and 20% to the myometrium.
2. Utero-placental flow depends on:
- mean mother pressure (MMP)
- uteral venous pressure
- uteral peripheral resistance
Factors affecting the utero-placental flow:

- 1. Mother’s position: supine position – decrease in the flow
- 2. Hypotension: under 100 mmHg - decrease in the flow; sympathetic blockade in central block may cause hypotension!!!
Factors affecting the utero-placental flow:

- 3. Changes in myometrial tone: tetanic contraction suppresses the flow, ketamine in a dose of >1.5mg/kg reduces the flow; oxytocine increases the myometrial tone and reduces the flow.

- 4. Hypoxia reduces the flow.
Factors affecting the utero-placental flow:

- 5. Hypocapnia and hypercapnia reduce the flow

- 6. Katecholamines: reduce the flow; **ephe drine** is the only that maintains a good utero-placental perfusion
Methods of delivery:

1. Natural delivery - physiological, through natural passages, spontaneous; forceps delivery

2. Abdominal delivery - delivery by caesarean section
ANESTHESIA FOR CESAREAN SECTION

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CESAREAN SECTION

- Percentage of cesarean sections:
  - Great Britain - 25%
  - USA - 25%
  - France - 20%
  - Poland – 30-50%
Anesthesia for cesarean section

1. Every pregnant woman is ALWAYS treated as a patient with a full stomach !!!!
2. The type of anesthesia depends on the indications
Anesthesia for cesarean section

3. Until the extraction of the fetus no glucose solutions are administered to the patient
Anesthesia for cesarean section

4. The patient in cesarean section ALWAYS lies on her left side
Anesthesia for cesarean section

5. Until the extraction of the fetus no opioids are administered to the patient (if yes-the neonatologist must be informed!)
Anesthesia for cesarean section

6. After the extraction of the fetus uteral astringents (methergine, oxitocine) are administered intravenously to the patient.
Anesthesia for cesarean section

7. Local anesthesia is more recommendable
Anesthesia for cesarean section

1. Local anesthesia
   - spinal anesthesia
   - epidural anesthesia
   - continuous epidural anesthesia
   - Combined Spinal-Epidural Anesthesia (CSE)

2. Endotracheal general anesthesia
Anesthesia for cesarean section

**IDI** – time from the introduction to anesthesia to the extraction of the fetus, preferably < 8 minutes

**UDI** - time from the hysterotomy to the extraction of the fetus, preferably < 3 minutes
Endotracheal general anesthesia for cesarean section

1. Prophylactics of the Mendelson syndrome
2. Placing the patient on her left side
3. Monitoring: EKG, NIBP, SpO_2, ETCO_2,
4. Preoxigenation: breathing 3-5 minutes or 3 deep breaths with 100% oxygen
Endotracheal general anesthesia for cesarean section

5. Intravenous infusion of 0.9% NaCl 500-1000 ml

6. Rapid induction of anesthesia after the preparation of the operative field:
   - tiopental 3-4 mg/kg
   - ketamine 1-1.5 mg/kg
   - etomidate 0.2-0.3 mg/kg
   - propofol 2.5 mg/kg
Endotracheal general anesthesia
for cesarean section

-intubation with the Sellick manoeuvre after
relaxation with chlorsuccilene 1-1.5 mg/kg
without active oxygenation
Endotracheal general anesthesia for cesarean section

7. Maintenance of the anesthesia:
   - 50% nitrous oxide + 50% oxygen
   - halotan 0.5vol% or isofluran 0.75vol%
   - no opioids or neuroleptic agents before the extraction of the fetus
Endotracheal general anesthesia for cesarean section

8. After the extraction of the fetus:
   - uteral astringents (methergine, oxitocine)
   - deepening of the anesthesia (opioids, neuroleptic agents, 70% nitrous oxide)
Endotracheal general anesthesia
for cesarean section

9. Extubation of the conscious patient
Indications for general anesthesia for cesarean section

1. Active bleeding or hemodynamic instability
2. Coagulopathy
3. Severe menace for the fetus (e.g. slipped umbilical cord)
4. Sepsis
5. Neurological diseases
6. Lack of mother’s consent for local anesthesia
7. Failed local anesthesia
Risks connected with general anesthesia for cesarean section

1. Risk of aspiration
2. Risk of difficult or failed intubation
3. Possibility of the patient regaining consciousness during light anesthesia
4. Respiratory depression of the newborn
Local anesthesia
for cesarean section

1. Compulsory prehydration for 15-20 min. before the anesthesia (prevention of pressure falls, transfusion of 1000 ml isotonic salt solution)

2. Reduction of the dose of the local anesthetic by c.a. 1/3
## Comparison of epidural and spinal anesthesia for cesarean section

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Advantages of local anesthesia for cesarean section

- minimized risk of aspiration
- smaller risk of hypoxia connected with difficult intubation
- less hemodynamic disturbances connected with intubation
- less effect on utero-placental flow
- less effect on the fetus
- possibility of conscious participation of the mother in the birth of the child
Spinal and epidural anesthesia

1. Prehydratation: 1000 ml crystaloids
2. Prophylactics of the Mendelson syndrome
3. Monitoring: ECG, NIBP, SpO2
4. Passive oxygenation 4-10 l/min
5. Lateral or sitting position during the injection
Spinal anesthesia

               - 27 G Quincke - sharp

7. Local anesthetics:
   - 5% lidocaine  60-80 mg
   - 0.5% bupivacaine 10-15 mg
Epidural anesthesia

6. Identification of the epidural space by lack of resistance method

7. Test dose -3-5 ml (5-10 ml)

8. After 1-3 min, insertion of 2-5 cm catheter and administration of the local anesthetic every 2-3 minutes
Epidural anesthesia

9. Local anesthetic with adrenaline
   - 2% lidocaine 18 - 30 ml
   - 0.5% bupivacaine 18 - 25 ml

10. Opioids (sic!)
    - fentanyl 50-100 μg
    - sufentanyl 20-30 μg
    - morphine 3-5 mg
Spinal and epidural anesthesia

8. After placing on the operating table, immediate sinistroversion of the uterus

9. In case of hypotension: ephedrine in fractioned doses of 5-10 mg, rapid infusions of fluids
CSE
- Combined Spinal-Epidural Anesthesia
  - Better blockade of sacral segments
  - Touhy needle 16 G
  - 26 G spinal needle
1. Cimetidine 200 mg iv
2. Metoclopramide 10 mg iv
3. 0.3 M sodium citrate p.o. 30 ml
Mendelson syndrome

Adrenaline 1: 100000 – 1: 200000
Ropivacaine 0.2%
”Walking anaesthesia”
Epidural anesthesia for labor and vaginal delivery

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- a reversible conduction block in sensory (especially A delta and C), motor and autonomic nerve fibres

- Analgesia occurs after the injection of local analgetics into the epidural space through epidural catheter; several doses of analgetics may be administered during labor
Effects of analgesia in labor:

- appeasing the fear and anxiety of the parturient
- ensuring the comfort of the parturient
- decreasing the secretion of CATECHOLAMINES
- decrease of tachycardia
- improvement of peripheral circulation
- improvement of vascular perfusion!!!
- decrease of hyperventillation
- compensation of metabolic acidosis
Effects of epidural block (especially sympathetic block):

- mother bradycardia
- decrease in arterial blood pressure
- tremor
- increase in uteroplacental flow
Advantages of continuous epidural analgesia during labor:

- possibility of participating in a painless labor
- stabilization of mother arterial blood pressure
- increase in uteroplacental flow
- minimizing the risk of fetus hypoxia and acidosis!!!
- possibility of rapid surgical anesthesia for obstetric surgeries, especially cesarean section
- postpartum analgesia
Indications for continuous epidural analgesia during labor:

- mother stress and hypersensitivity
- twins
- pelvic lie
- hypotrophy of the fetus
- prematurity
- possibility of forceps delivery
- pregnancy induced hypertension
- mother’s heart diseases or diabetes
- patient’s wish
Contraindications for continuous epidural analgesia during labor:

- Lack of consent and cooperation of the parturient
- Certain neurological and mental disorders
- Disturbances in coagulation system and treatment with anticoagulants
- Dermal infection in the site of injection
- Shock, hypovolemia
Conditions, which need to be fulfilled during continuous epidural analgesia during labor:

1. Starting the analgesia during regular uterine contractions, with dilatation of 5 - 6 cm in primiparas, 4 - 5 cm in multiparas
2. Intravenous access
3. Monitoring: HR, RR, KTG
4. Specially trained obstetric and anesthesiologic teams