ANESTHESIA AND ANALGESIA IN OBSTETRICS

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Introduction

Solicitations of anesthetic doctors in obstetrics

- Analgesia for normal delivery
- Anesthesia before and after delivery for obstetrical maneuver: C/S, forceps, AD
- Anesthesia and analgesia for high risk pregnancy (maternal diabetes, prematurity, preeclampsia, maternal cardiovascular disease)
- Anesthesia for perioperative complications (severe bleeding, amniotic embolism...)

Other indications: surgery in utero for fetal congenital malformations correction; surgery in pregnant women for non obstetrical problems; anesthesia for medically assisted procreation

Epidemiology:
INSERM (France, 1982): 110 maternal deaths due to complications of pregnancy, delivery, and postpartum (1.37 per 10000 births)
Introduction 3

Evolution in human idea and behavior
⇒ acceptation and request for analgesia in obstetrics

Necessity of an optimal security
Maternal information many weeks before delivery
⇒ anesthetic consultation+++
Physiological modifications of pregnancy

Physical status ➔ important modifications of vital functions

Mechanical modifications / gravid uterus, hormonal, ↑maternal metabolism and consumption of $O_2$

➢ Respiratory modifications:

Hypervascularisation of superior airway mucous membrane ➔ congestion, edema

Frequency of nasal obstruction and risk of bleeding (NGT, TI)

Edema in laryngeal and pharyngeal mucous membrane, cephalic edema, breast hypertrophy ➔ difficulty of tracheal intubation

Preeclampsia ➔ aggravation of edema
## Respiratory modifications

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Type of variation</th>
<th>Mean variation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minute ventilation</td>
<td>↑</td>
<td>50</td>
</tr>
<tr>
<td>Alveolar ventilation</td>
<td>↑</td>
<td>70</td>
</tr>
<tr>
<td>Tidal volume</td>
<td>↑</td>
<td>40</td>
</tr>
<tr>
<td>Respiratory frequency</td>
<td>↑</td>
<td>15</td>
</tr>
<tr>
<td>Vital capacity</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>FRC</td>
<td>↓</td>
<td>20</td>
</tr>
<tr>
<td>Thoraco-pulmonary compliance</td>
<td>↓</td>
<td>45</td>
</tr>
<tr>
<td>Consumption of O2</td>
<td>↑</td>
<td>20</td>
</tr>
</tbody>
</table>

↓ reserves of oxygen ⇒ ↓ PaO2 during induction
↑ ventilation/minute ⇒ rapid induction
Cardiovascular modifications

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Type of variation</th>
<th>Mean variation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac output</td>
<td>↑</td>
<td>40</td>
</tr>
<tr>
<td>Pulse</td>
<td>↑</td>
<td>15</td>
</tr>
<tr>
<td>Systolic ejection</td>
<td>↑</td>
<td>30</td>
</tr>
<tr>
<td>SBP</td>
<td>↓</td>
<td>0-5 mm Hg</td>
</tr>
<tr>
<td>DBP</td>
<td>↓</td>
<td>10-20 mm Hg</td>
</tr>
<tr>
<td>Plasmatic volume</td>
<td>↑</td>
<td>45</td>
</tr>
<tr>
<td>Globular volume</td>
<td>↑</td>
<td>20</td>
</tr>
<tr>
<td>Total blood volume</td>
<td>↑</td>
<td>35</td>
</tr>
<tr>
<td>CVP</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>SAR</td>
<td>↑</td>
<td>15</td>
</tr>
<tr>
<td>Blood loss</td>
<td>↑</td>
<td>400ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>750 C/S</td>
</tr>
</tbody>
</table>
# Coagulation factors

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Normal value</th>
<th>End of pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (fibrinogen)</td>
<td>2-4,5 g/l</td>
<td>4-6,5 g/l</td>
</tr>
<tr>
<td>II (prothrombin)</td>
<td>75-125%</td>
<td>100-125%</td>
</tr>
<tr>
<td>V</td>
<td>75-125%</td>
<td>100-150%</td>
</tr>
<tr>
<td>VII</td>
<td>75-125%</td>
<td>150-250%</td>
</tr>
<tr>
<td>VIII</td>
<td>75-150%</td>
<td>200-500%</td>
</tr>
<tr>
<td>IX</td>
<td>75-125%</td>
<td>100-150%</td>
</tr>
<tr>
<td>X</td>
<td>75-125%</td>
<td>150-250%</td>
</tr>
<tr>
<td>XI</td>
<td>75-125%</td>
<td>50-100%</td>
</tr>
<tr>
<td>XII</td>
<td>75-125%</td>
<td>100-200%</td>
</tr>
<tr>
<td>XIII</td>
<td>75-125%</td>
<td>35-75%</td>
</tr>
<tr>
<td>Antithrombin III</td>
<td>85-110%</td>
<td>75-100%</td>
</tr>
<tr>
<td>Anti-Xa</td>
<td>85-110%</td>
<td>75-100%</td>
</tr>
<tr>
<td>Platelets</td>
<td>-</td>
<td>↑moderate</td>
</tr>
</tbody>
</table>
| Fibrin                | -              | ↓moderate
Cardiovascular modifications

Syndrome of compression of big vessels: (DD)

- Hypotension, CF↑ or ↓
- Malaise, dizziness, nausea
- Pallor, sweating

Others: hypoproteinemia (↓ total protein 10% and albumin 20%)

⇒ RISK OF OVERDOSE
Digestives modifications

Anatomical and hormonal modifications ⇒ Esophageal regurgitations and inhalation of gastric contents
Gravid uterus: ↑ intragastric tension, modification of normal angle of gastro-esophageal junction; ↓ tonus of lower esophageal sphincter, ↑ of gastric acid secretions
Progesterone: inhibition of gastric motility, alimentary transit → difficulty to empty the stomach ⇒ FULL STOMACH
↑ Liver enzymes (SGOT, LDH, PAL)
↓ plasmatic pseudocholinesterases (28%) → risk of prolonged neuromuscular block
CNS and kidney function modifications

Progesterone: $\uparrow$ renal blood flow, glomerular filtration $\uparrow$ 50% ⇒ $\downarrow$ urea, uric acid, creatinin
Dilatation of urinary tract + compression of urethra / gravid uterus ⇒ frequency cystitis and pyelonephritis during pregnancy
$\uparrow$ Progesterone and endorphin ⇒ $\downarrow$ MAC of anesthetic gas (25% halothane, 40% isoflurane)
Engorgement vx $\downarrow$ vol. peridural and subarachnoidal space
Nervous fibers are very sensitive, rapid diffusion of LA
$\uparrow$ Free fraction of LA ⇒ RISK OF OVERDOSE
Common characteristics of anesthetic techniques

- Risk of inhalation of gastric content
- Hemodynamic stability
- Maintain/reinforcement of uterine contractility
- Medical premedication
- Anti-thrombotic prophylaxis
- Reduction of infection risk
- Management of pain
General anesthesia

**Advantages**
- Rapid Induction (emergency)
- Reliability
- Adaptability
- Control of ventilation and hemodynamics
- Sleeping and amnesia
- Good surgical conditions

**Disadvantages**
- Risk of bronchial inhalation
- Difficulty of intubation
- Hemodynamic disadvantages of rapid induction
- Neonatal depression, acidosis, fetal hypoxemia
- Bleeding + stress-induced endocrine changes
General anesthesia

**Indications**
- CI of LRA, refusal of LRA, stenosing cardiopathy
- Coagulopathy
- Hemodynamic instability, severe bleeding
- Infectious status
- Progressive neuropathy
- Extreme emergency

Others: 1\textsuperscript{er} episode of genital herpes

**Contraindications**
- Patient refusal
- Past history of malignant hyperthermia
- Allergy
Spinal anesthesia

**Advantages**
- Simplicity of technique
- Efficacy
- Low rate of failure
- Rapid installation
- Good surgical conditions
- Prevention of thrombosis
- Relatively low cost

**Disadvantages**
- Hypotension
- Postoperative headache
Spinal anesthesia

**Indications**
- C/S (extreme emergency)
- Obstetrical maneuvers (episiotomy, forceps)

**Contraindications**
- Hemodynamic instability
- Infection at the punction site
- Coagulopathy
- Patient refusal
- Eclampsia
- Neurological problems
Complications of spinal anesthesia

- Hypotension
- Total spinal anesthesia
- Failure
- Intra-vascular injection
- Headache