



WHAT IS THE RELATIONSHIP BETWEEN A GYNECOLOGIST/OBSTETRICIAN AND THE AIRWAY?

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SUMMARY – Physiological changes in pregnancy as part of biohumoral and morphological changes (hyperemia, edema, hypersecretion) influence the possible problems in obstetric anesthesia. These changes by themselves, and particularly aggravated by acute or chronic gestational or non-gestational comorbidity, increase the risk of aspiration of gastric contents, failed intubation, esophageal intubation, inadequate ventilation, and respiratory failure. The types of premedication, anesthesia and techniques of anesthesia are evident from medical historiography. Almost obligatory promethazine and atropine was given intravenously either in the delivery room or on the operating table immediately before the induction of anesthesia in a dose of 0.5 mg in parturients of average body weight. Atropine has been a favorite premedicant for decades, given its pharmacological properties, especially its antisialogenic effect and absence of a depressant effect on the fetoplacental unit, but today it is rarely used. Nasal decongestants before surgery are not recommended but in cases of severe rhinitis, atropine, promethazine, or topical decongestants may be used.

Key words: *Airway; Obstetrics; Obstetric anesthesiology; High-risk parturient; Pregnancy*

Introduction

Today's obstetrics and obstetric anesthesia are associated with many risk factors that did not exist twenty or more years ago, such as older females, pregnancies following medically assisted fertilization, significant pregestational and gestational comorbidities with major obstetric syndromes, obesity pandemics, etc. The occurrence of the previously mentioned risk factors was accompanied by a disproportionate expansion of new obstetric and non-obstetric indications for cesarean section (CS). Obstetric anesthesia has been

used for decades for emergencies such as emergency CS and obstetric emergencies in delivery rooms (e.g., internal rotation, extraction of the child). Nowadays, we are witnessing a reversal in everyday practice with an extreme increase in the ratio of elective to emergency CS (80%:20%); other obstetric emergencies are extremely rare, with postpartum hemorrhage being a sole exception to the rule. In perinatal centers, elective CS and epidural analgesia account for 80%-90% of the total workload, making obstetric anesthesiology today paradoxical compared to its historical role¹⁻⁵. Still, however, mothers with expected and especially unexpected emergencies belong to a high-risk group of patients with possible anesthetic complications regarding the airway. Airway management is the basis of anesthesia-resuscitation procedures, so it is no wonder that some authors call it a nightmare in pregnancy⁶.

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Physiological changes in pregnancy as part of biohumoral and morphological changes (hyperemia, edema, hypersecretion) impact possible problems in obstetric anesthesia. Progesterone causes mucosal hypervascularization and secretion, while estrogens cause mucosal angioedema, especially in the oropharynx and nasopharynx, larynx and trachea, with consequent nasal obstruction, possible epistaxis with impaired nasal breathing, and hypersecretion, altogether leading to increased tissue friability and changes in the voice due to edema of uvula and vocal cords. Nasal mucosal fibroblasts under the influence of progesterone affect the extracellular matrix and disrupt mucociliary clearance causing nasal congestion and leading to a condition called pregnancy rhinitis, which occurs from the beginning of pregnancy with progression in the third trimester and preeclamptic patients⁷⁻¹¹. Also, progesterone causes relaxation of the highly positioned gastroesophageal sphincter, which is compressed by the stomach. This leads to gastroesophageal reflux and allows regurgitation of gastric contents into the esophagus and oropharynx with the risk of aspiration and chemical pneumonitis. The increase in breast adipose tissue in obese pregnant women and the lack of sufficient atlanto-occipital extension significantly complicates intubation and ventilation, thus also maternal-fetal oxygenation^{1,6,10}. Secondarily increased

minute ventilation, tidal volume, inspiratory capacity, and alveolar ventilation in healthy pregnant women are conditioned by biohumoral changes and a decrease in functional residual capacity, total pulmonary capacity, and residual volume by compression of the elevated diaphragm.

These physiological changes cause mechanical disorders in the upper and lower respiratory tract, compensatory hyperventilation, hypersalivation, narrowing of the airway, and hypoxemia, which increases maternal morbidity and mortality. These changes by themselves, and particularly aggravated by acute or chronic gestational or non-gestational comorbidity, increase the risk of aspiration of gastric contents, intubation problems (failed intubation), esophageal intubation, inadequate ventilation, and respiratory failure^{8,9,11,12}. Global (medical) and obstetric risk factors for obstetric complications are shown in Table 1.

In this paper, the circumstances and risk factors of obstetric anesthesia today are discussed from the obstetric point of view.

Historical Review

The types of premedication, anesthesia and techniques of anesthesia are evident from medical historiography and insight into anesthesiology reports of

Table 1. General (medical) and obstetric risk factors for obstetric anesthesia complications

General (medical) factor	Obstetric factor
Obesity and morbid obesity (high body mass index)	Cephalad displacement of the diaphragm (high diaphragm position)
Excessive weight gain	Breast enlargement with 'short thorax'
Age	Often full stomach
Malampatti score >1	Decreased functional residual capacity
Chronic pulmonary diseases with chronic obstructive pulmonary disease	Narrowing of an airway
Severe anemia	Upper airway edema
Acute respiratory infections	Increased oxygen consumption
Distorted anatomy of head and neck secondary to previous trauma or surgery	Hypersalivation
Chronic smoking	Obstetric emergencies
Pregestational cardiovascular comorbidity	Increased risk of aspiration
	Severe preeclampsia with hydrops gravidarum
	Great obstetric syndromes

obstetric surgeries (at that time, primarily emergency CS). General Hospital in Bjelovar serves as a half-a-century-old example of anesthesiology development. The profession was held in the hands of anesthetic nurses who were exclusively using endotracheal technique in a semi-closed breathing system². Premedication was dual (atropine or promethazine). Almost obligatory atropine was administered intravenously either in the delivery room or on the operating table immediately before the induction of anesthesia. Induction was performed with thiobarbiturate (Pentothal[®], Kemithal[®], Nesdonal[®]) or propanidide (Epontol[®]) with a mixture of nitrous oxide and oxygen following rapid intubation during inhalation (without succinylcholine) by the Sellick maneuver and further assisted ventilation with a mixture of nitrous oxide and oxygen. Upon extraction of the child, myorelaxation with succinylcholine volatile anesthetic diethylether was included (until 1970), after that, halothane and very rarely neuroleptanesthesia. Orotracheal intubation was first performed with a flat spatula and Rusch[®] small uncuffed rubber tubes with oropharyngeal gauze tamponade, then, in the mid-1960s, using a laryngoscope with a curved blade and a tube with a small cuff to decrease mucosal damage caused by mucosal edema and increased mucosal secretion². However, it should be mentioned that spinal anesthesia (rachianesthesia) with tropacocaine or percaïne has been used in obstetric and gynecologic procedures for almost half a century. It was then suppressed from clinical use by the development of endotracheal anesthesia.

Atropine sulfate was administered preoperatively intravenously at a dose of 0.5 mg in pregnant women of average body weight. Its parasympatholytic (anticholinergic) antisialogenic action inhibits secretion of the salivary, bronchial and sweat glands and relaxes bronchial musculature. Due to the inhibitory effect on hypersalivation, it was used for decades before the induction of anesthesia, especially in an open breathing system (in the first half of the 20th century) and later with the semi-closed breathing system in endotracheal anesthesia. Scopolamine with morphine was previously used in premedication, but due to its lower efficacy than atropine, it was used less often because no analgesics needed to be added to atropine, and the amnestic effect of scopolamine occurred in only 20 minutes, so this effect was not clinically justified in emergencies. Thus, atropine has been a favorite premedicant for de-

cadec, given its pharmacological properties, especially its antisialogenic effect and absence of a depressant effect on the fetoplacental unit. Promethazine (Phenergan[®]), an excellent drug with antiemetic, antihistamine and sedative properties, has been used less frequently in premedication of obstetric patients. However, it has been used in various analgesic 'cocktails' for peripartum analgesia (e.g., with petantine). Promethazine, followed by the neurolept fixed combination (Thalamonal[®]) of fentanyl and droperidol, had a strong antiemetic effect, so it was given before anesthesia to provide an excellent postoperative antiemetic effect^{2,13}.

Discussion

In 1946, Curtis Lester Mendelson described chemical pneumonitis with aspiration and development of acute respiratory distress syndrome in 66 obstetric patients and two death cases under general anesthesia during CS. Regional anesthesia, which then was the state of the art, was suggested. However, the introduction of revolutionary endotracheal anesthesia at that time suppressed decades of spinal anesthesia from clinical anesthesiology, which is now a repeated state of the art in obstetric anesthesiology^{2,14,15}. Nowadays, teamwork of anesthesiologists and obstetricians is a necessary prerequisite for the safety of pregnant women and mothers, so antepartum and peripartum reduction of risk factors, if they can be acted upon, is the basis for reducing global clinical risk¹. Thus, it has been proven that weight gain during pregnancy directly affects Mallampati scores, so preconception and antepartum surveillance is necessary, especially regarding current and apparently unstoppable pandemics of gestational diabetes and obesity^{6,9}. Preeclampsia with hydropic changes of the head and neck (*facies leontina*) complicates direct laryngoscopy, elevating the risk of mucosal lesions and oropharyngeal bleeding. Morbid adiposity with superimposed preeclampsia disrupts the oropharyngeal anatomy and disables adequate laryngoscopic visualization and sufficient oxygenation^{10,12}, thus complications are more common in obese (32%) than in non-obese parturients (7%)¹⁶.

Inadequate oxygenation, i.e., airway management in anesthesia (e.g., esophageal intubation or difficult endotracheal intubation with injuries), is the cause of litigation processes in 76% of cases, and the incidence of fatal failed intubation is 13 times higher in obstet-

ric patients^{7,17}. D'Angelo's group has reported 157 anesthetic complications in 307,495 births, averaging 1:1,959 births. Of the 211,368 vaginal births under regional anesthesia (68.7% of all deliveries) and 96,127 cesarean sections (31.3% of all deliveries), 30 maternal deaths unrelated to the primary respiratory cause occurred. Ten failed intubation (1:533) cases are reported with no aspiration cases⁷, while Quinn *et al.* report a complication rate of 1:224 anesthesia in the obstetric population¹⁸. Jadon reports a high incidence of difficult obstetric intubation of 1:30¹⁷, while our group recorded sudden maternal and fetal death in the third trimester due to massive aspiration of gastric contents (Mendelson's syndrome) found at autopsy¹⁹. German authors presented solutions to the problem of airway obstruction in their institutions, including different shaped laryngoscope blades (74.9% of departments), laryngeal masks (91.0%), fiberoptic bronchoscope (85.9%), and transtracheal puncture devices (59.9%)²⁰. Irish authors, based on their experience in cases of airway obstruction in obstetrics in inexperienced anesthesiologists, suggest the use of a laryngeal mask²¹, as suggested by British anesthesiologists in emergency CS²².

Head-up and sniffing positions using Sellick's cricoid pressure maneuver (posterior oropharyngeal pressure and gastric regurgitation prevention) are recommended for easier intubation in obstetric patients combined with preoperative use of prokinetics, antacids and anticholinergics. Metoclopramide, a dopaminergic antagonist, promotes gastric emptying (at a dose of 10 mg IM or IV 1 hour before SC). Combined with H₂ blockers, it increases gastric pH by 2.5 and decreases volume by 25%. Sodium citrate and sodium bicarbonate are prescribed as successful antacids, as well as proton pump inhibitors, such as omeprazole^{17,19}. Nasal decongestants before surgery are not recommended but in cases of severe rhinitis, atropine, promethazine, or topical decongestants may be used, while estrogen receptor antagonists are not recommended²³.

Today's extremely liberal approach to CS brings many obstetric short-term and long-term complications, especially placenta previa and invasive placentation, and significant risks for any type of anesthesia. This is undoubtedly a professional, i.e., deontological and medicolegal problem, which we have repeatedly reported on³⁻⁵. It is generally known that low-risk midwife-led births carry a lower incidence of all obstetric and thus anesthetic complications, including

CS. Furthermore, peripartum pain management with intravenous opioid analgesia, nitrous oxide inhalation, and complementary analgesic methods provides satisfactory results and excellent compliance in midwifery. However, in Croatia, where midwifery is not yet recognized as an independent profession, this way of thinking will have to be considered some other time. From the description of Mendelson's syndrome, *nihil per os* during childbirth, became an authoritative fact that was clinically unquestionable. It led to dehydrated mothers in ketoacidotic state during labor, so today, in low-risk deliveries, consumption of energy bars, honey or sweetened tea, water, and isotonic energy solutions is suggested. Obstetric-midwifery support is of immense importance.

The approach described above is essential when healthy pregnant women become patients (e.g., pre-eclampsia, diabetes) with high background risk. Therefore, spontaneous or programmed vaginal delivery should be favored to reduce obstetric and anesthetic complications. This philosophy is also consistent with the undeniable biological evidence of peripartum health programming through life. Everyday life shows a different practice than described, and the complications of obstetric anesthesia from our operating theaters and maternity wards seem to be gone because they are not reported in scientific papers. This professional paradox makes comparing with other centers and learning on one's own professionalism impossible.

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Sažetak

ŠTO POVEZUJE GINEKOLOGA/OPSTETRIČARA S DIŠNIM PUTOM?

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Fiziološke promjene u trudnoći u sklopu biohumoralnih i morfoloških promjena (hiperemija, edem, hipersekrecija) utječu na možebitne probleme u opstetričkoj anesteziji. Fiziološke promjene same po sebi, a osobito pogoršane akutnim ili kroničnim gestacijskim ili negestacijskim komorbiditetom, čimbenici su rizika za nastanak gastrične aspiracije, teške intubacije, ezofagusne intubacije, neadekvatne ventilacije i respiracijskih poremećaja. Vrste premedikacije, anestezija i tehnika anestezije razvidna su iz povijesti medicine. Tako su se prometazin i atropin obligatno rabili intravenski u rađaonici ili operacijskoj dvorani neposredno prije uvoda u anesteziju u dozi od 0,5 mg atropina kod roditelja prosječne težine. Atropin je desetljećima bio omiljen monopremedikant s obzirom na njegova farmakološka svojstva, napose antisijalogenog učinka i manjak medikamentne depresije na fetoplacentarnu jedinicu, no danas se rijetko rabi. Nazalni dekongestivi prije operacije se ne preporučuju, no u slučajevima teških oblika rinitisa, atropin, prometazin ili topikalni dekongestivi mogu se primijeniti.

Ključne riječi: *Dišni put; Porodništvo; Porodnička anestezijologija; Visokorizična roditelja; Trudnoća*