Anesthetic Management Of High Risk Obstetric Cases

Essay Submitted For Partial Fulfillment Of The Master Degree Of Anesthesia

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بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ
مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ
الْحَكِيمُ

صدق الله العظيم

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El-Said Abd El-Monaem Ali Megahed

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List of Abbreviations

%	Percentage
AFE	Amniotic Fluid Embolism
AFOI	Awake Fiberoptic Intubation
ALI	Acute Lung Injury
ARDS	Adult Respiratory Distress Syndrome
ARF	Acute Renal Failure
AS	Aortic Stenosis
ASA	Acetyl Salicylic Acid
BMI	Body Mass Index
BUN	Blood Urea Nitrogen
CHD	Congenital Heart Diseases
CLMA	Classic Laryngeal Mask Airway
CNS	Central Nervous System
Co_2	Carbon Dioxide
COP	Cardiac Output
CPB	Cardiopulmonary Bypass
CS	Cesarean Section
CSE	Combined Spinal Epidural
CSF	Cerebrospinal Fluid
CVCI	Cannot be Ventilated Cannot be Intubated
CVP	Central Venous Pressure
DIC	Disseminated Intravascular Coagulapathy
DM	Diabetes Mellitus
EBL	Estimated Blood Loss
ERV	Expiratroy Reserve Volume

List of Abbreviations (cont.)

$ETCO_2$	Endtidal Co_2
ETT	Endo Tracheal Tube
FFP	Fresh Frozen Plasma
FHR	Fetal Heart Rate
FRC	Functional Residual Capacity
GA	General Anesthesia
GDM	Gestational Diabetes Mellitus
HUS	Hemolytic-Uremic Syndrome
ICU	Intensive Care Unit
IDDM	Insulin Dependent Diabetes Mellitue
ILMA	Intubating Laryngeal Mask Airway
IM	Intramuscular
IV	Intravenous
LDH	Lactic Dehydrogenase
LMWH	Low Molecular Weight Heparin
MAC	Minimal Alveolar Concentration
MG	Myasthenia Gravis
MRI	Magnetic Resonance Image
MS	Mitral Stenosis
NIDDM	Non Insulin Dependent DM
NIG	Nitroglycerine
NO	Nitric Oxide
NSAIDS	Non Steroidal Anti-inflammatory Drugs
NYHA	New York Heart Association
PACU	Post Anesthesia Care Unit

List of Abbreviations (cont.)

PAP	Pulmonary Artery Pressure
PCEA	Patient Controlled Epideral Analgesia
PDA	Patent Ductus Arteriosus
PDPH	Post Dural Puncture Headache
PEEP	Positive End Expiratory Pressure
PIH	Pregnancy Induced Hypertension
PLMA	Proseal Laryngeal Mask Airway
PT	Prothrombin Time
PTE	Pulmonary Thromboembolism
PTT	Partiel Thromboplastin Time
PVR	Peripheral Vascular Resistance
RA	Regional Anesthesia
SVR	Systemic Vascular Resistance
TBG	Thyroid Binding Glabulin
TTP	Thrombotic Thrombocytopenic Purpura
UFH	Unfractionated Heparin
VSD	Ventricular Septal Defect
VTE	Venous Thromboembolism

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Anesthetic care of the pregnant parturient is unique in that two patients are cared for simultaneously: the parturient and the fetus. Failure to take these facts into consideration can have disastrous consequences**.** Important issues when anesthetizing the pregnant woman for labor, vaginal delivery, or Cesarean delivery include the physiologic changes of pregnancy, the direct and indirect effects of anesthetics on the fetus and neonate, and the benefits and risks of various anesthetic techniques to the mother. In choosing appropriate anesthetic techniques, the anesthetist must consider any medical or obstetric complications, obstetric requirements, the patient's wishes, and the anesthesiologist's judgment,**(Glosten,2000).**

Regional analgesic techniques are the most effective means of providing analgesia for labor and vaginal delivery, as it provides pain relief while allowing the parturient to be awake and able to participate in the delivery process with less incidence of drug induced depression in the fetus or mother. The most common regional anesthetic techniques are lumbar epidural, caudal, and spinal blocks. Maternal request represents sufficient justification for pain relief, but the selected analgesia technique depends on the medical status of the patient, the progress of the labor, and the resources of the facility. Epidural analgesia has been shown to reduce levels of catecholamines in the maternal circulation that may be beneficial to the fetus. The primary goal is to provide adequate maternal analgesia with as little motor block as possible which can be achieved by the administration of local anesthetic at low concentrations with the addition of narcotics, **(Hawkins et al., 1998).**

The choice of anesthesia for Cesarean Section (CS) depends on the reason for the operation, the degree of urgency, and the desires of the patient. Survey data from 1992 from the United States reveal that more than 84 % of Cesarean deliveries are performed with regional anesthesia (spinal, 40 %; epidural, 44 %; general; 17 %). Regional anesthesia has become the preferred technique as it decreases the maternal mortality rate associated with general anesthesia, (1.7/1000 000 VS 32/1000 000). Death associated with general anesthesia is mainly related to airway problem, such as inability to intubate, inability to ventilate, or aspiration pneumonitis, while death associated with regional anesthesia are generally related to excessive high block, or local anesthetic toxicity,**(Morgan, 2002[a]).**

Risk is usually defined as a hazard of loss, or alternatively as the probability of occurring a bad consequence, while hazard is a situation that could lead to harm. High risk level is 1:100, while very high risk level is 1:10,**(Adams&Smith,2001)**.

Hemorrhage, infection, obstructed labor and eclampsia dominant as causes of maternal mortality in developing countries, while the indirect causes are prevalent in the UK today,**(Bergs,2004)**.

A voluntary registry for high risk obstetric patients was started in late 1996. Initially confined to cardiorespiratory disease, the registry has expanded and now includes neurological disease, hematological disease, and other conditions,**(Lewis et al.,2003)**.

Physiological Considerations of Normal Pregnancy:

During pregnancy, there are major alterations in nearly every maternal organ system; *(see table 1)*, initiated by hormones secreted by the corpus luteum and placenta, and completed by the mechanical effects of the enlarging uterus in the second and third trimesters. An understanding of the normal adaptive mechanisms in pregnancy is vital to enable accurate diagnosis, and to allow appropriate management of the critically ill obstetric patient, **(Alan et al., 2001).**

Hormonal Changes:

Hormonal changes are the bases for all changes that occurring during pregnancy. Pregnancy is accompanied by extensive hormonal and physiologic readjustment by the mother. Almost every endocrine tissue and system participates in adaptive changes that maintain metabolic hemostasis during normal pregnancy. The placenta, anterior pituitary, and adrenal cortex all perform key functions in the endocrine adaptation to pregnancy, **(Langer, 2000)**.

There are marked changes in estrogen and progesterone levels during pregnancy. Progesterone level rises to 900 % higher by term. Estrogen levels also rise throughout pregnancy to 100 times more estradiol and 1000 times more estriol at term. Progesterone levels decrease sharply immediately before delivery, increasing uterine contractility, **(Gluck, 2004).**

Table (1): Summary of Physiologic Changes of Pregnancy**.**

Variable	Change	Variable	Change
CVS & CNS **(Clark et al., 1989)**		***Lung mechanics*** **(Russel et al.,1981)**	
Cardiac output (L/min)	+ 43%	Minute ventilation	+50%
Heart rate (beats/min)	+17%	Alveolar ventilation	+70%
Stroke volume (mL)	+18%	Tidal volume	+40%
Systemic vascular resistance	- 21%	Respiratory rate	+15%
Pulmonary vascular resistance	- 34%	Dead space	No change
Colloid oncotic pressure	- 14%	Airway resistance	–36%
Total blood volume	+ 25–40%	Total pulmonary resistance	–50%
Plasma volume	+ 40–50%	Total compliance	–30%
Fibrinogen	+ 50%	Lung compliance (alone)	No change
Serum cholinesterase activity	- 20–30%	Chest-wall compliance (alone)	–45%
Minimum alveolar concentration	- 32–40%	FEV_1	No change
Lung volumes & capacities **(Holdcraft et al., 1977)**		*Diffusing capacity*	*- 5 %*
Total lung capacity	0 to –5%	***Arterial blood gases*** **(Prowse et al., 1965)**	
Inspiratory lung capacity	+5%	Arterial PCO_2	–10 mm Hg
Functional residual capacity	–20%	Serum bicarbonate	–4 mEq/L
Expiratory reserve volume	–20%	Arterial pH	No change
Residual volume	–20%	Arterial PO_2	+10 mm Hg
Vital capacity	No change	Oxygen consumption	+20%

It has not been shown that progesterone has a similar effect on the pulmonary smooth muscle. However, the lowest rates of symptoms in asthmatics occur in the last 4 weeks of pregnancy with reduced wheezing, sleep interference. There is an increase in free cortisol starting early in pregnancy and reaching 2.5 times nonpregnant levels by the third trimester. Similar amounts of free cortisol in nonpregnant volunteers have been shown to decrease circulating monocytes and T cells, **(Gluck, 2004).**

Pregnancy is a *diabetogenic state*. Insulin production rises during pregnancy but is accompanied by increased resistance. Therefore, any carbohydrate load will cause a greater than normal increase in plasma glucose concentrations. This facilitates placental glucose transfer. As insulin does not cross the placenta, the fetus relies on its own production of insulin. Poorly controlled maternal diabetes is associated with fetal macrosomia. Maternal hyperglycemia causes increases in fetal insulin and this can result in neonatal hypoglycemia as the carbohydrate load falls immediately after birth, **(Bernhard & McClure, 2003)**.

The thyroid gland enlarges by 50 % to 70 %, largely due to hyperplasia of lactotrophs, which are responsible for prolactin secretion. Pregnancy and hyperthyroidism share some features: increased heart rate, dyspnea, fatigue, and diaphoresis. The best test for thyroid dysfunction is thyroid stimulating hormone level (TSH), **(Elizabeth, 2002)**.