ANESTHETIC MANAGEMENT OF FETAL SURGERIES

Essay

Submitted for Partial Fulfillment of
Master Degree **in Anesthesia**

Presented by

Hatem Abd Al-Wahed Desoki
M.B.B.Ch.
Faculty of Medicine - Cairo University

Under Supervision of

Prof. Dr. Mahmoud Abd Al-Aziz Ghallab
Professor of Anesthesia and Intensive Care
Faculty of Medicine - Ain Shams University

Prof. Dr. Mohammed Anwar Al-Shafie
Assistant Professor of Anesthesia and Intensive Care
Faculty of Medicine - Ain Shams University

Dr. Hend Youssef Mohammed Ali
Lecturer of Anesthesia and Intensive Care
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
2011

إستراتيجيات التخدير في جراحات الأجنة

رسالة

توطئة للحصول على درجة الماجستير في التخدير

مقدمة من

الطبيب/ حاتم عبد الواحد دسوقي

بكالوريوس الطب و الجراحة

جامعة القاهرة

تحت إشراف

الأستاذ الدكتور / محمود عبد العزيز غلاب

أستاذ التخدير والرعاية المركزة

كلية الطب- جامعة عين شمس

الأستاذ الدكتور / محمد أنور الشافعي

أستاذ مساعد التخدير والرعاية المركزة

كلية الطب- جامعة عين شمس

الدكتورة / هند يوسف محمد علي

مدرس التخدير والرعاية المركزة

كلية الطب- جامعة عين شمس

كلية الطب

جامعة عين شمس٢٠١١

Introduction

Surgery to the fetus while it is still in utero is used to treat an increasing number of lethal and non-lethal conditions.

The problems of preterm labour and premature rupture of membrane associated with open surgery have led to the development of minimal access surgical techniques. Although fetal surgery is a new and fast moving frontier of medicine, it is not one that all obstetric anesthetists will encounter ***(Jeffrey L et al., 2008)***

The most frequently occurring condition operated on relatively commonly in the UK is twin-to-twin transfusion syndrome ***(Laura B. Myers et al., 2002).***

Life-threatening conditions that have had in utero intervention to lessen the severity of pathology include congenital diaphragmatic hernia, obstructive uropathy, and sacrococcygeal teratoma ***(Ritu Gupta et al.,2008).***

Types of fetal surgeries could be : open fetal, exutero intrapartum or fetoscopic.

The broad challenges present anesthesiologist are: Those related to any anesthetic in a pregnant woman , techniques used to prevent preterm labour,

maintenance of maternal homeostasis in the face of tocolytic techniques, maintenance of fetal homeostasis and provision of fetal analgesia during surgery ***(Marc van de velde .,2010).***

ACKNOWLEDGEMENT

First, thanks are all due to ***Allah*** *for blessing this work until it has reached its end, as a part of his generous help through out my life.*

I would like to direct special thanks to ***Prof. Dr. Mahmoud Abd Al-Aziz Ghallab*** *, Professor of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, for his great support and encouragement he gave me throughout the whole work. It is a great honor to work under his guidance and supervision.*

I would like to express my sincere gratitude to ***Prof. Dr. Mohammed Anwar Al-Shafie,*** *Assistant Professor of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University for his close supervision, continuous help, and the tremendous effort he has done in the meticulous revision of the whole work.*

Also, I am greatly honored to express to my utmost thanks to ***Dr. Hend Youssef Mohammed Ali*** *Lecturer of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, from whom I received faithful supervision, valuable suggestions, and continuos guidance throughout this work.*

Hatem Desoki

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الملخص العربي

إن الجمع بين العيوب و التشوهات الخلقية التي قد تهدد الحياة تضع الجنين غالبا في خطر كبير.

إن تعرض الجنين للجراحة و التخدير يؤدي إلى مخاطر كبيرة من الإصابة بالأمراض أو موت الجنين.

تتكيف وظائف الأم الحامل مع التغيرات الفسيولوجية و التشريحية للحمل لذلك من المهم على طبيب التخدير أن يشترك في عناية المرأة الحامل حتى يفهم هذه التغيرات مما يوفر التخدير الآمن للأم و المرتبط بالتالي بالولادة الآمنة.

الدورة الدموية الطبيعية في المشيمة و الرحم مهمة للحفاظ على نمو الجنين بصحة جيدة و استمرارية هذه الدورة تعتمد على تدفق الدم للرحم و عمل المشيمة بصورة طبيعية.

الدورة الدموية للجنين تتميز بارتفاع مقاومة الأوعية الدموية الرئوية و انخفاض مقاومة الأوعية الدموية للجسم وتتميز أيضا بتحويل مسار الدم في القلب من اليمين إلى اليسار عن طريق الثقب البيضاوي.

يمكن تقسيم جراحة الأجنة إلى ثلاث مجموعات متميزة :

- جراحة الأجنة المفتوحة
- جراحة الأجنة خارج الرحم أثناء الولادة
- جراحة الأجنة بالمنظار

تستخدم جراحات المنظار كثيرا في تقييم و علاج متلازمة نقل الدم من التوأم إلى التوأم و حالات الانسداد البولي.

إن جراحة الأجنة خارج الرحم هي عمليات غير شائعة تتم في حالات انسداد المجرى الهوائي للجنين بعد الولادة مما يعرض حياته للخطر.

فتح الرحم يكون مطلوبا للوصول إلى الجنين الذي يتم إعادته لاحقا إلى الرحم بعد الإنتهاء من العملية الجراحية لإكمال بقية فترة الحمل و يتم إجراء جراحة الجنين عن طريق شق جراحي في البطن منخفض و بالعرض.

حالات جراحات الأجنة تتطلب العمل الجماعي حيث تشمل تخصصات الجراحة العامة للأطفال,النساء و الولادة وتخصص تخدير الأطفال و تخدير الولادة و أمراض القلب و الأشعة و حديثي الولادة وتمريض حديثي الولادة و تمريض غرفة العمليات.

Abbreviations

°C	: Degree Celsius
B-2	: Beta 2
BP	: Blood pressure
CCAM	: Congenital cystic adenomatoid malformation
CDH	: Congenital diaphragmatic hernia
CHAOS	: Congenital high airway obstruction syndrome obstruction syndrome (CHAOS).
CSF	: Cerebral spinal fluid
CNS	: Central nervous system
CO_2	: Carbon dioxide
CVR	: CCAM volume ratio
DNA	: Deoxy ribonucleic acid
ECG	: Electro-cardiograph
EX	: Example
EXIT	: The ex utero intrapartum treatment
FETENDO	: Fetal endoscopy
FETO	: Fetoscopic Endoluminal Tracheal Occlusion
Fig	: Figure
FRC	: Functional residual capacity
GA	: Gestational age
GA	: General anesthesia
IM	: Intramuscular
IQ	: Intelligence quotient
IUFD	: Intrauterine fetal demise
IV	: Intravenous
Kg	: Kilogram
LHR	: Lung to head ratio
MAC	: Minimum alveolar concentration

Abbreviations (Cont.)

Mg	: Milligram
MMC	: Myelomeningocele
mmHg	: Millimeter mercury
MRI	: Magnetic resonance imaging
N20	: Nitrous oxide
Nd: YAG	: Neodymium YAG laser fiber
NPO	: Nothing per oral
NSAIDs	: Non steroidal anti-inflammatory agents
OOPS	: Operations on placental support
OR	: Operation room
PO	: Per oral
PPROM	: Preterm premature rupture of the membranes
PROM	: Premature rupture of membranes
SCT	: Sacrococcygeal teratoma
SIDS	: Sudden infant death syndrome
TRAP	: Twin reversed arterial perfusion
TTTS	: Twin-twin transfusion syndrome
UBF	: Uterine blood flow
US	: Ultrasound
UK	: United kingdom
Vs	: Versus

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Aim of essay

This essay discuss the anesthetic precautions and management for both the fetus and the mother during fetal surgery

The combination of underdeveloped organ function and usually life-threatening congenital malformation in addition to type of surgery and anesthetic technique places the fetus at a considerable risk that can result in fetal death and morbidity. For example, altered coagulation factors predispose the fetus to bleeding and cause difficulty in achieving surgical homeostasis during fetal surgery. This problem is compounded by the small blood volume of the fetus that makes it fetal to the fetus. Fetal surgery can result in premature labor and birth due to such complications. Also, surgeries were only performed in cases of impending fetal death, with the advancements in anesthetic and surgical techniques, the risks have decreased and the indications broadened ***(Kirti N Saxena.,2009).***

Fetal surgery also leads to enhanced surgical and anesthetic risk for the mother including hemorrhage, infection, airway difficulties and amniotic fluid embolism. Only ASA class I and II mothers with very sick fetuses are taken up for fetal surgery. For example fetal saccrococcygeal tumor leads to the 'maternal mirror syndrome', where in the mother experiences progressive symptoms of preeclampsia due to release of toxins from the placenta. This syndrome is terminated by delivery of the fetus and placenta but not by the excision of the tumor ***(Kirti N Saxena.,2009).***

So maternal and fetal physiological aspect should be considered and respected in order to pass a successful surgery.

(I)Maternal physiological and anesthetic consideration:

Normal pregnancy involves major physiological and anatomical adaptation by maternal organs. It is important that anesthetists involved in the care of the pregnant woman to understand these changes, to provide safe maternal anesthetic care which is compatible with safe delivery of the baby ***(Duvekot et al., 2009).***

Pregnancy affects virtually every organ system. Many of these physiological changes appear to be adaptive and useful to the mother in tolerating the stresses of pregnancy, labor and delivery ***(Morgan et al., 2006).***

Regional anesthesia is usually the technique of choice for obstetric anesthetic practice. But, because the uterine relaxation required for hysterotomy based fetal surgery is best provided by high concentration potent volatile agents, general anesthesia is the technique of choice for fetal surgery and this a still point of debate till now ***(Duvekot et al., 2009).***

The maternal physiologic changes during pregnancy contribute to increased anesthetic risk for both the mother and fetus.

1) Cardiovascular changes:

Pregnancy is a hyperdynadmic state in which cardiac output increases 30 % to 50% from 4 L to 6 L/min, particularly during the first two trimesters ***(Yeomans and Gilstrap, 2008).***

This increase is primarily a result of a 20% to 50% increase in stroke volume. Estrogen-mediated increases in myocardial alpha-receptors results in an increase in heart rate of 10 to 20 beats/min Cardiac output begins to rise gradually at 8 to 10 weeks' gestation and peaks