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REGIONAL ANESTHESIA IN PREECLAMPSIA

Essay

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In Anesthesia

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Dedication

To my dear father and mother;
for their constant encouragement.

To my lovely wife;
for her patience and wisdom.

To my little Joiriah

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*First and foremost thanks to **ALLAH**, the most beneficent and merciful.*

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Abbreviations

ACE: angiotensin converting enzyme
ACOG: The American College of Obstetricians and Gynecologists
ALT: Alanine transaminase
APTT: Activated partial thromboplastin time
AST: Aspartate transaminase
B.HCl: local anesthetics hydrochloride salts
B: the unionized base
BT: Bleeding Time
BUN: Blood Urea Nitrogen
CNS: central nervous system
CSEA: Combined spinal-epidural anesthesia
CSF: Cerebrospinal fluid
CT: Clotting Time
CT: computerized topography
CVP: central venous pressure
DIC: Disseminated Intravascular Coagulopathy
EBP: epidural blood patch
ERV: Expiratory reserve volume
FRC: Functional residual capacity
GETA: general endotracheal anesthesia
GFR: glomerular filtration rate
GGT: gamma glutamyl transpeptidase
HCG: human chorionic gonadotrophin
HELLP syndrome: (hemolysis, elevated liver enzymes, and a low platelet count)
IC: Inspiratory capacity
IRV: Inspiratory reserve volume
ITM: Intrathecal morphine
KDR: kinase insert domain receptor
KPa: kilo pascal
LA: Local anesthetic
LDH: lactate dehydrogenase
LP: lumbar puncture
MAC: minimum alveolar concentration

ME: membrane expansion
MRI: magnetic resonant imaging
NICE*:* National Institute for Health and Clinical Excellence
NK: Natural killer cells
NO: nitric oxide
P50: The partial pressure of O2 in the blood at which hemoglobin is 50% saturated)
PABA: Para Amino Butyric Acid
PaCO2: (partial pressure of CO2)
PCEA: patient controlled epidural analgesia
PDPH: Postdural puncture headache
PIH: pregnancy induced hypertension
PlGF: placental growth factor
PRES: posterior reversible encephalopathy syndrome
PT: Prothrombin time
RCOG: Royal College of Obstetricians and Gynaecologists
RPLS: reversible posterior leukoencephalopathy
RV: Residual volume
sEng: soluble endoglin
sFlt1: soluble fm like tyrosin-1
TAP: transversus abdominis plane
TEG: thromboelastograph
TGF: Transforming growth factor
Th2: helper T lymphocytes type-2
TLC: Total lung capacity
TRH: Thyroid releasing hormone
TV: Tidal volume
UK: United Kingdom
VC: Vital capacity
VEGF: vascular endothelial growth factor

Introduction

Hypertensive disorders of pregnancy are a multisystem disorder with heterogeneous presentation and ill-defined etiology. Preeclampsia is one of the leading causes of maternal morbidity and mortality and occurs in 3–5% of all pregnancies worldwide. It is associated with hypertension (≥140/90mmHg) and proteinuria (>300 mg/24 h) and may be accompanied by hepatic, renal and clotting disorders. (**Bombrys et al., 2008)**

The mortalities in pregnant patients with hypertensive disorders are due to intracranial hemorrhage and cerebral infarction, acute pulmonary edema, respiratory failure and hepatic failure or rupture. Severe maternal complications include antepartum hemorrhage due to placental abruption, eclampsia, cerebrovascular accidents, organ failure and disseminated intravascular coagulation. Pre-eclampsia is the leading cause of fetal growth restriction, intrauterine fetal demise and preterm birth**.** **(Lewis, 2007)**

Obstetric management of pre-eclampsia relies on a high index of suspicion, careful observation, and early intervention. The method of intervention is logically a function of the severity of the disease, but ultimately the only definitive treatment is delivery of the fetus and placenta**. (ACOG, 2002)**

Currently, the definitive treatment of preeclampsia is delivery. If the pregnancy is remote from term in the presence of severe preeclampsia, a determination must be made whether to deliver or expectantly manage. This requires repeated evaluation of the mother and fetus. It is critical for the anesthesia provider on labor and delivery to be aware of these

patients and their clinical course, as they can rapidly deteriorate and require urgent or emergent delivery.

(Miller, 2011)

The optimal anesthetic method for Cesarean section for women with pre-eclampsia remains unsettled. However, several studies have demonstrated the safety of subarachnoid block (spinal), epidural and combined subarachnoid block-epidural anesthesia for Cesarean section in women with pre-eclampsia. **(Visalyaputra et al., 2005)**

Normally, invasive monitoring is not required and central venous lines may increase risk without known benefit. However, in certain cases of severe preeclampsia and HELLP syndrome (hemolysis, elevated liver enzymes, and a low platelet count) an invasive pressure line or central venous catheter may be beneficial. These clinical situations might include the need for:

(1) Management of labile hypertension,
(2) Frequent blood gas/laboratory studies (severe pulmonary edema).
(3) Rapid central acting vasoactive medications, or
(4) Estimation of intravascular volume status (oliguria).

The use of judicious volume expansion is generally supported before initiation of neuraxial blockade.

(Miller, 2011)

The American College of Obstetricians and Gynecologists (ACOG) considers neuraxial analgesia the preferred analgesic method for labor in preeclamptics, but careful titration of the local anesthetic is needed to prevent the reduction in uteroplacental perfusion pressure**. (ACOG, 2002)**

Aim of the work

The purpose of this essay is to focus on pysiological changes during pregnancy and regional anesthetic management of preeclamptic patients in an attempt to decrease peri operative morbidity and mortality.

Chapter 1

Applied anatomy

Anatomy of vertebral column &spinal cord:

The spine is composed of the vertebral bones and intervertebral disks. There are 7 cervical (C), 12 thoracic (T) and 5 lumbar (L) vertebrae. The sacrum is a fusion of 5 sacral (S) vertebrae and there are small rudimentary coccygeal vertebrae. The spine as a whole provides structural support for the body and protection for the spinal cord and nerves and allows a degree of mobility in several spatial planes. At each vertebral level, paired spinal nerves exit the central nervous system. ***(Ellis et al., 2006)***

Vertebrae differ in shape and size at the various levels. The first cervical vertebra, the atlas, lacks a body and has unique articulations with the base of the skull and the second vertebra. The second vertebra, called the axis, consequently has atypical articulating surfaces. All 12 thoracic vertebrae articulate with their corresponding ribs. ***(Apfel et al., 2010)***

Lumbar vertebrae have a large anterior cylindrical vertebral body. A hollow ring is defined anteriorly by the vertebral body, laterally by the pedicles and transverse processes and posteriorly by the lamina and spinous processes. The laminae extend between the transverse processes and the spinous processes and the pedicle extends between the vertebral body and the transverse processes. When stacked vertically, the hollow rings become the spinal canal in which the spinal cord and its coverings sit . ***(Arzola et al., 2007)***

The individual vertebral bodies are connected by the intervertebral disks. There are four small synovial joints at each vertebra, two articulating with the vertebra above it and two with the vertebra below. These are the facet joints which are adjacent to the transverse processes. The pedicles are notched superiorly and inferiorly, these notches forming the intervertebral foramina from which the spinal nerves exit. Sacral vertebrae normally fuse into one large bone, the sacrum, but each one retains discrete anterior and posterior intervertebral foramina. The laminae of S5 and all or part of S4 normally do not fuse, leaving a caudal opening to the spinal canal, the sacral hiatus (Fig. 2). ***(Horlocker et al., 2010)***

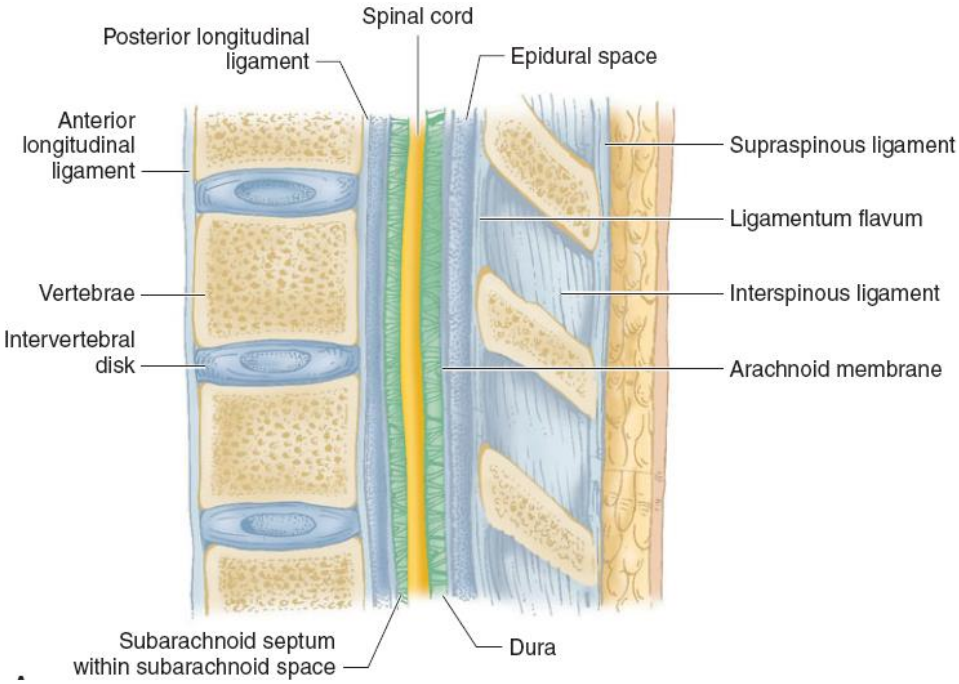

Figure 1: Sagittal section through lumbar vertebrae ***(Morgan et.al, 2013)***