Histopathological comparative study of the placenta in normal and preeclamptic pregnancy

Thesis Submitted for fulfillment of Master degree in

Pathology

Presented by

Noha Nazeeh Mahmoud

M.B, B.Ch, Cairo University
Specialist of Pathology
National Research Center

Supervised by

Prof. Dr. Wafaa Alsayed AbdeL Aal

Professor of Pathology
National Research Center

Prof. Dr. Gamal Abdel Sameea Ibrahim

Professor of Obstetrics and Gynecology
Faculty of Medicine
Cairo University

Dr. Hala Mahmoud Naguib Hosni

Lecturer of Pathology
Faculty of Medicine
Cairo University

Faculty of Medicine
Cairo University
2008

ACKNOWLEDGEMENT

First of all, thanks to ALLAH

I would like to express my deepest gratitude to ***Professor Dr. Wafaa Alsayed AbdeL Aal****,* ***Prof. of Pathology, National Research Center****, for her continuous support, great help and valuable instructions throughout the work.*

I am very thankful to ***Dr. Gamal Abdel Sameea Ibrahim, Prof. of Obstetrics and Gynecology****, Faculty of Medicine, Cairo University, for his sincere help, patience and valuable advices.*

My sincere appreciation goes to ***Dr. Hala Mahmoud Naguib Hosni, Lecturer of Pathology****, Faculty of Medicine, Cairo University, for supplying me by sizable portion of the material of the study, her meticulous advices, expert guidance and valuable instructions.*

I would like to thank also ***Dr. Nermeen M. Elshafiee Researcher of histology****, NRC, Pathology department for her fruitful help.*

I would like to thank also ***Dr.Fatma Adli Prof. of histochemistry*** *,NRC Pathology department for her guidance.*

I wish to extend my thanks to all my stuff, at pathology department in the National Research Center and Faculty of Medicine, Cairo University, for their cooperation and encouragement.

Contents

List of abbreviation

AGT: Angiotensingen gene

ACOG: American College of Obstetricians and Gynecologists

α-actin : Alpha – actin

CAM: Cell adhesion molecule .

CD10: CALLA; Common acute Leukemia antigen

eNOS: Endothelial nitric oxide synthase

FRO: Free radical of oxygen

HCG: Human chorionic gonadotrophin

HELLP:Haemolysis, elevated liver enzymes & low platelet count

H&E: Hematoxylin and eosin stain

IUGR: Intra-uterine growth restriction

I.M: Image analysis

Ki67: Protein in cell cycle

LDL: Low density lipoproteins

mRNA: Messenger ribosomal nucleotide adenosine

PAS: Periodic acid-schiff stain

PET: Preeclamptic toxemia

PIH: Pregnancy induced hypertension

Rb: Retinoblastoma gene

SOD: Super oxide dismutase

SPSS:Statistical Package for the Social Science

TNF: Tumor necrotizing factor

USA: United states of America

VCAM: vascular cell adhesion molecule

VLDL: Very low density lipoprotein

WHO: World health organization

List of figures

List Of Graphs

List of tables

List Of Result Figures

Page 117'

Abstract

Objectives: Evaluation of placental lesions found in women with preeclampsia compared with normotensive control patient and to determine whether the presence of these lesions are related to gestational age at delivery .

Study design: The study included 60 females, 30 of them were normotensives and the other 30 had preeclampsia either mild or severe according to the criteria of diagnosis. Cases were recruited from the Obstetrics & Gynecology Department Cairo University and pathologically analyzed at the Pathology Department Cairo University and imaging analysis was done at the National Research Center at Pathology Department.

Results: A significant difference in mean values of placental morphological parameters including placental weight,surface area and infarcted areas were found between the control and the preeclampsia group, The rates of abruptio placentae and chorioamnionitis were not different between the two groups. Within the preeclamptic group, the rates of decidual arteriolopathy (P<.0001), infarction (P <.0001), and thrombi in fetal circulation (P<.0001) were higher the earlier the gestational age at delivery.

Conclusion: This study contributed to the placental morphological and morphometric characterization of the clinical hypertensive syndromes, allowing for a greater agreement between findings from the anatomic and pathological examination of placentae and the clinical status presented by the patients. Placentae in women with preeclampsia have increased amounts of disease.

Key words: Preeclampsia ,Placenta, Histopathological changes,Image analysis.

Introduction

Pregnancy-induced hypertension is one of the leading crucial causes of maternal and fetal morbidity and mortality . The pathophysiology of pregnancy-induced hypertension is still not completely understood but is thought to be related intimately to changes in the microcirculation (*Foong et al.,2000*).

The main hemodynamic characteristic of pre-eclampsia is vascular dysfunction with the consequence of altered vascular reactivity, proteinuria and, in advanced disease, marked increase in peripheral vascular resistance (*Vedernikov et al., 2001).*

Altered vascular reactivity in pre-eclampsia and underlying maternal vascular diseases were found to be due to endothelial dysfunction with an imbalance of vasodilating and vasoconstricting factors, genetic factors may confer susceptibility *(Levine et al., 2004).*

Central nervous influences, such as enhanced sympathetic activity, are reported in pre-eclampsia and may cause or enhance vasoconstriction *(Tsatsaris et al., 2003).*

Although it remains uncertain as to what extent vascular dysfunction in pre-eclampsia is a result of endothelial dysfunction,

central nervous influences, local neuronal defects, myogenic impairments, or microangiopathy *(Beinder and Schlembach 2001*). Pregnancy complications like hypertension or gestational diabetes are reflected in the placenta in a significant way (both macroscopically and microscopically), it has been recorded that the maternal utero-placental blood flow is decreased in pre-eclampsia (*Redman and Sargent 2005*).

Maternal vasospasm, reduction of maternal utero-placental blood flow leading indirectly to constriction of fetal stem arteries has been associated with the changes seen in the placentae of pre-eclamptic women , maternal vasospasm leads to fetal hypoxia (*Beinder and Schlembach 2001).*

According to *Thomson et al., (2002),* fetal hypoxia is not uncommon near term and accordingly it may lead to fetal distress and fetal death. *Naeye and Friedman (1999),* calculated that 70% of the excess fetal deaths in women with hypertension are due to large placental infarcts and markedly small placental size.

Histopathological changes related to confined placental mosaicism may be associated with inadequate placentation and hence with retroplacental ischemia (*Fox et al., 2001*).

Aim of the work

The purpose of this study is to:-

1- Evaluate of placental lesions found in women with preeclampsia compared with normotensive control patients.

2- Determine whether the presence of these lesions is related to gestational age , blood pressure , placental weight & area and number of cotyledons .

Placentae will be examined macroscopically and microscopically including the histopathological changes and morphometric changes in the placental blood vessels (size, thickness & others)

Development of the Placenta

Implantation or Imbedding of the Ovum:

Fertilization of the ovum occurs in the lateral or ampullary end of the uterine tube and is immediately followed by segmentation. On reaching the cavity of the uterus the segmented ovum adheres like a parasite to the uterine mucous membrane, destroys the epithelium over the area of contact, and excavates for itself a cavity in the mucous membrane in which it becomes imbedded (*Peters et al., 1998).*

In the ovum described by (*Bryce and Teacher et al., 1908*), the point of entrance was visible as a small gap closed by a mass of fibrin and leucocytes.

In the ovum described by *(Peters et al., 1998*) the opening was covered by a mushroom-shaped mass of fibrin and blood-clot. The narrow stalk of which plugged the aperture in the mucous membrane. Then all trace of the opening is lost and the ovum is then completely surrounded by the uterine mucous membrane.

The trophoblast proliferates rapidly and forms a network of branching processes which cover the entire ovum and invade and destroy the maternal tissues and open into the maternal blood vessels,

with the result that the spaces in the trophoblastic network are filled with maternal blood; these spaces communicate freely with one another and become greatly distended and form the intervillous space (*Peters et al., 1998).*

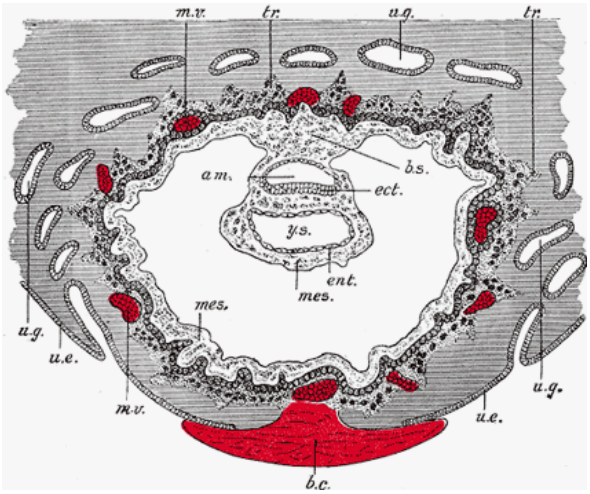

Figure (1):** Section through ovum imbedded in the uterine decidua. (Peters, 1998)* **am.** *Amniotic cavity,* **b.c.** *Blood-clot*, **b.s.** *Body-stalk,* **ect.** *Embryonic ectoderm,* **ent.Entoderm,* **mes.***Mesoderm,* **m.v.***Maternal vessels,* **tr.** *Trophoblast,* **u.e.** *Uterine epithelium,* **u.g.** *Uterine glands.* **y.s.** *Yolk-sac.*

The Decidua:

Before the fertilized ovum reaches the uterus, the mucous membrane of the uterine body undergoes important changes and is then known as the decidua: