PLACENTAL ULTRASONOGRAPHIC GRADING AND PLACENTAL ULTRASTRUCTURAL CHANGES IN PREGNANCY COMPLICATED WITH DIABETES MELLITUS

THESIS

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By

HISHAM MOHAMED FATTHY

M.B.B. Ch., M.S.

UNDER SUPERVISION OF

Prof.Dr. AHMED ROSHDY AMMAR
Prof. of Obstetrics & Gynaecology

Prof.Dr.ALY ELYAN KHALAF ALLAH
Prof. of Obstetrics & Gynaecology

Assistant Prof.Dr.EZZ ELDIEN HELIL
Assistant Prof. of Anatomy

FACULTY OF MEDICINE
AIN SHAMS UNIVERSITY
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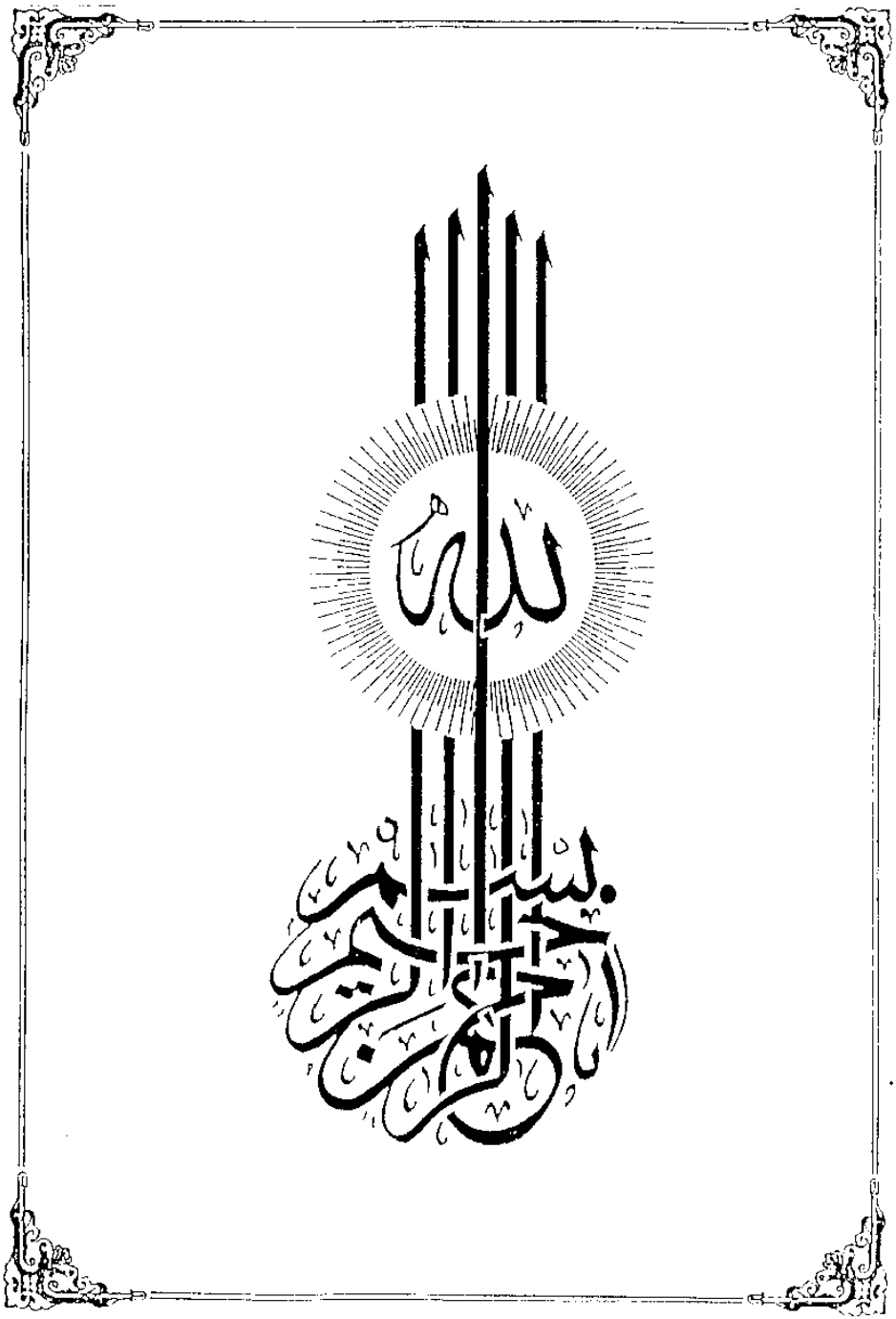
بسم الله الرحمن الرحيم

" قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم "

صدق الله العظيم



TO MY FAMILY
THIS WORK IS
DEDICATED

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INTRODUCTION AND AIM OF THE WORK

INTRODUCTION

Pregnancy complicated by carbohydrate intolerance is the most common risk factor for women in all reproductive age group. The fusion of basic research, technological advances and interdisciplinary interaction that underlies modern treatment has resulted in more spectacular improvement in diabetes in pregnancy. It has highlighted the key role that maternal fuel metabolism may play in intrauterine development.

The occurance of pregnancy in a diabetic woman has always had a fascination for the obstetrician because of the obvious effect which the maternal disease has on both the course of pregnancy and fetal outcome. Beside this, diabetes mellitus produces placental changes, whether macroscopically (Horger, 1975 & Nummi, 1972) or microscopically, that may affect intrauterine development of fetus leading to intrauterine fetal death (Fox, 1969; 1978 & Jacome, 1976).

Diabetic patients have unusual amounts of glycosylated hemoglobin in their red cells due to slow and constant modification of Hb A by the binding of glucose in a stable ketomine linkage in the N-terminal valine of the hemoglobin -chain (Bunn et al., 1979). Hb A^{1b} and Hb A^{1c}. Hb A^{1c} can be used as a measure of the level of glycosylated hemoglobin. Changes in the level of glycosylated hemoglobin present in

the blood normally takes several weeks so that it may be used as an indicator of blood glucose levels during the preceding one-to-three months i.e. it reflects the overall blood glucose concentration independently of day-to-day fluctuation.

The primary goal in the management of diabetic pregnancies is a good outcome with minimal morbidity and no mortality for the mother, fetus and infant. To achieve this goal, the best course for the diabetic woman and her physician to follow requires: (A) Good diabetic control before conception and during pregnancy, the peripartum and the postpartum periods. (B) Prevention of complication by good prenatal care at frequent intervals. (C) Early detection and prompt treatment of minor and major medical problems.

AIM OF THE WORK

The aim of this study is to try to establish a relationship between the degree of control of diabetes during pregnancy, the extent of changes in the placenta microscopically and ultrasonographically with fetal outcome.

REVIEW OF LITERATURE

THE HUMAN PLACENTA

* HISTORICAL:

The term placenta is believed to have been introduced by Realdus Columbus in 1559 when he used the latin word for a circular cake. In 1937, Mossman defined placenta as that portion of the fetal membranes that was in apposition with or fused to the uterine mucosa. Historically, however, as pointed out by Boyd and Hamilton (1970), man's knowledge of the 'after birth' can be traced far into human history. In the old Testament, placenta was considered as the External Soul and and was sometimes described as being tied up in the so - called 'Bundle of life' that probably included the umbilical cord. It is believed that Aristotle (384-322 B.C) was the first to use the word chorion. It was not, however, until the early 16th century, a time of renaissance of anatomy, that opinions, concerning the function of the placenta were given. But even then Leonardo da Vinci (1452-1519) and Vesalius (1514-1564) illustrated the human placenta incorrectly. To his credit, however, Vesalius, in 1555, corrected his error in the second edition of his outstanding book.

The concept of circulation of blood in the placenta apparently was introduced by Harvey in 1628, but it was John Mayow who more adequately described the nature of the fetal

circulation. It can be appreciated that the endocrine function of the placenta was not recognized until much later because the function of hormones in general must necessarily have preceded such an elucidation. It was not until 1564 that Arantius, by was of careful placental dissections, discounted the concept that there was continuity between maternal and fetal vascular systems. Harvey, in 1651, set forth clearly that there was a fetal arterial and venous circulation to the placenta, but it was Malpighi, in 1660, who set forth the concept of a capillary network as the anatomic basis for the regional circulation. By way of findings of many celebrated anatomists, there was, by the end of the 17th century, a remarkably accurate concept of the structure and functional significance of the human placenta. The basic idea that there was a "placental barrier" clearly already was formulated in the late 17th or early 18th century.

William Hunter, in 1774, is credited with the first accurate description of the decidua and, even then, he distinguished a parietal lining (decidua vera) from a capsular one. Later, John Hunter (1821) described the decidua basalis. It was probably Williams and John Hunter, although each claimed credit separately, who accurately described what we now know as the intervillious spaces. It was not until the middle of the 19th century that the true

nature of the chorionic villi were appreciated; by 1880, however the basic knowledge of the nature of blood circulation in the intervillous space was established. In 1882, a notable contribution was made by Langhano, who demonstrated clearly that the villi were covered by two layers of cells. It was in 1889 that the term "trophoblast" was introduced by Hubrecht to distinguish the portion of the blastocyst that does not contribute to the cellular portion of the embryo. The superficial layer of the chorionic villi was eventually demonstrated to be syncytial in nature and is now generally referred to as the syncytiotrophoblast (Pritchard et al., 1985).

Development of the Human Placenta

* Decidua:

Implantation and subsequent development of the human placenta depend on certain changes in the endometrium that culminate in the formation of the decidua. In the human being, complete conversion of the endometrium to decidua does not occur until several days after ntgation, first appearing locally around blood vessels, and later spreading throughout the uterus. During development of the decidual reaction, the endometrial stromal elements enlarge to form polygonal or rounded decidual cells, the nuclei become round and vesicular while the cytoplasm becomes clear slightly basophilic and surrounded by a translucent membrane. The decidua directly beneath the site of implantation forms the decidua basalis; that portion that overlies the developing ovum and separates it from the rest of the uterine cavity is the decidua capsularis. The remainder of the uterus is lined by decidua vera or decidua parietalis.

During the early months of pregnancy, there is a space between the decidua capsularis and the decidua vera since the gestational sac does not fill the entire uterine cavity. By the fourth month, the enlarging sac fills the uterine cavity; and with fusion of the decidua capsularis and vera, the uterine cavity is obliterated. The capsularis is most