Early prediction of preeclampsia and intra uterine growth retardation using first trimesteric uterine artery Doppler & maternal serum Beta-Human Chronic Gonadotrophin

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By
Suzy Abdel Aziz Abdel Hamid
Assistant lecturer of Obstetrics & Gynecology
Kasr El Aini Hospital

Supervised by

Prof. Dr. **Asmaa Farid**
Professor of Obstetrics & Gynecology
Faculty of Medicine, Cairo University

Prof. Dr. **Mohamed Hani Shehata**
Professor of Obstetrics & Gynecology
Faculty of Medicine, Cairo University

Dr. **Eman Ali Hussein**
Lecturer of Obstetrics & Gynecology
Faculty of Medicine, Cairo University

Faculty of Medicine
Cairo University
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Abstract

Hypertensive disorders during pregnancy constitute a serious health problem and are associated with increased risk of maternal-perinatal adverse outcome. One main goal of prenatal care is to improve the outcome of pregnancy in terms of perinatal morbidity and mortality by identifying women at risk of complications of uteroplacental insufficiency; preeclampsia and IUGR.

Doppler ultrasound has been demonstrated to be a reliable, non-invasive method of examining uteroplacental perfiision. Scientific interest is now focused on early pregnancy.

Recent studies have documented that detection rates may be increased by a combination of uterine artery Doppler with first-trimester maternal serum markers as human chorionic gonadotrophin (HCG).

Key Words:

Preeclampsia and IUGR, Uterine Artery Doppler, Human Chorionic Gonadotrophin

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List of Abbreviation

AES	• **Androgen Excess Society**
AIs	• **Aromatase Inhibitors**
ASRM	• **American Society of Reproductive Medicine**
ATD	• **1,4,6-androstatrien-3,17-dione**
CC	• **Clomiphene citrate**
dB	• **decibele**
DHEAS	• **Dehydroepiandrosterone sulfate**
E2	• **Estradiol**
ER	• **Estrogen receptor**
ESHRE	• **European Society for Human Reproduction & Embryology**
FSH	• **Follicular stimulating hormone**
FDA	• **Food drug administration**
GnRH	• **Gonadotropin releasing hormone**
hCG	• **Human chorionic gonadotropin**
HMG	• **Human menopausal gonadotropin**
Hz	• **Hertz**
IGF-I	• **Insulin growth factor one**
IUGR	• **Intrauterine growth retardation**
IVF	• **In vitro fetilization**
KHz	• **Kilohertz**
LH	• **Lutenizing hormone**
MHz	• **Megahertz**
mRNA	• **Messenger ribonucleacic acid**
NIH	• **National Institutes of Health**
OHSS	• **Ovarian hyperstimulation syndrome**
PI	• **Pulsatile index**
P	• **Progestrone**
PCOS	• **Polycystic ovarian syndrome**
PIF	• **Fourier pulsatile index**
PPI	• **Peak to peak pulsatility index**
RI	• **Resistance index**
S/D	• **Systolic/diastolic ratio**
TAMV	• **Time averaged maximum velocity**
TGF-α	• **Transforming growth factor alpha**
RecFSH	• **Recombinant follicular stimulaing hormone**
IUI	• **Intrauterine insemenemation**

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Introduction

Knowledge of the weight of the fetus in-utero is important for the obstetrician to decide the mode of delivery **(Bhandary et al ;2004)**. Suspected macrosomia may, for example, be an indication for Cesarean delivery in women with gestational diabetes or breech presentation **(Conway et al, 2002, Goffinet et al; 2006).** On the other hand, small for gestational age fetuses must be identified in utero if obstetricians are to provide close monitoring and plan their delivery to reduce perinatal risks **(Williams et al; 1982, Resnik et al; 2002).**

The traditional techniques for antenatal estimation of fetal weight (EFW) is by using a number of parameters (bi-parietal diameter , femur length and abdominal circumference).this antenatal estimation of fetal weight is used in detecting any growth abnormalities, thus help in choosing the mode of delivery **(Hadlock et al; 1985).**

Ultrasound derived fetal weight estimates alone are not sufficient grounds for deciding the route of delivery. To determine the mode of delivery, the clinical fetal weight estimate and clinical assessment of pelvic capacity should be added to the sonographic fetal weight estimate, with consideration of the risk factors for macrosomia **(Ben-Haroush et al; 2004).**

A number of researchers have attempted to use sonographically measured soft tissue thickness to predict fetal weight. Studies showed that measurements the subcutaneous tissue thickness at the mid-calf, mid-thigh, and abdominal levels can predict fetal weight **(Hill et al; 1992).**

Subcutaneous fat, which can be evaluated by means of skin fold thickness, can be easily seen antenatally with ultrasound. On a transverse section of the fetal abdomen, it appears as a well-delineated echogenic line **(Petrikovsky et al; 1999).**

Aim Of The Work

Aim of the Work

This study was done to assess the relation between fetal abdominal subcutaneous tissue thickness and birth weight.

Review of literature

FETAL GROWTH

Definition : Prenatal or antenatal development is the process in which an embryo or fetus gestates during pregnancy, from fertilization until birth. Often, the terms fetal development, or embryology are used in a similar sense **(Wagner et al; 2004).**

After fertilization the embryogenesis starts. When embryogenesis finishes by the end of the 10^{th} week of gestation the precursors of all the major organs of the body have been created. Therefore, the following period, the fetal period, is described both topically on one hand, i.e. by organ, and strictly chronologically on the other, by a list of major occurrences by weeks of gestational age **(Mazza et al; 2000).**

The term embryo is used to describe the developing offspring during the first 8 weeks following conception, and the term fetus is used from about 2 months of development until birth **(Mazza et al; 2000).**

Pregnancy is considered "at term" when gestation attains 37 complete weeks but is less than 42 (between 259 and 294 days since LMP). Events before completion of 37 weeks (259 days) are considered preterm. From week 42 (294 days) events are considered postterm when pregnancy exceeds 42 weeks (294 days), the risk of complications for woman and fetus increases significantly. As such,

obstetricians usually prefer to induce labour, in an uncomplicated pregnancy, at some stage between 41 and 42 weeks **(Lama et al; 2006).**

Deviations from normal fetal growth and weight contribute to morbidity and mortality in the perinatal period **(Edouard et al; 1980).**

Many researchers have been devoted to the diagnosis and management of growth disturbances. The infants with growth disturbances have both short-term and long-term sequelae reported as an increase adult risk of insulin resistance, hypertension, type II diabetes and cardiovascular disease in growth-restricted fetuses **(Barker et al*; 1998)***.

One of the unique characteristics of human development includes the growth of a very large brain and the deposition of a very large amount of fat tissue **(Hofman et al; 1993).**As fat supplies over half of the calories required by the fetus from 27 to 40 weeks' gestation and approximately 90% of the caloric requirement in the last few weeks of pregnancy **(Sparks et al; 1980).**

In earlier gestation (e.g. 26–30 weeks) there are few fat deposits present even in normally grown preterm infants. This makes recognition of intra uterine growth retardation (IUGR) by fat assessment more difficult **(Ogata et al; 1989)**. Utilizing serial

ultrasound measurements of fetal abdominal circumference in diabetic pregnancies which brought out the fact that a clear-cut deviation from normal growth was not apparent until >30 weeks gestation. For diabetic pregnancies whether gestational diabetics or not, macrosomia is the most frequent problem encountered and these large infants have significantly increased fat stores compared to other large for gestational age (LGA) babies **(Bernstein et al; 2000).**

In the fetus, adipose tissue comprises both brown and white adipocytes for which brown fat is characterized as possessing the unique uncoupling protein1 (UCP1) **(Mühlhäusler et al; 2003).** Mitochondrial UCP1 gives the cell's mitochondria an ability to uncouple oxidative phosphorylation and utilize substrates to generate heat rather than ATP **(Cypess et al; 2009).**

Brown fat is richly vascularized and has numerous unmyelinated nerves which provide sympathetic stimulation to the adipocytes **(Vanmarken et al; 2009).** It is of particular importance in neonates, small mammals in cold environments, because it has the ability to dissipate stored energy as heat.

The characteristics of fetal fat reflect its critical role at birth in providing lipid that is mobilized rapidly following activation of UCP1 upon cold exposure to the extrauterine environment **(Mühlhäusler et al; 2003).**