Can Placental Thickness Predict Fetal Weight?

Thesis

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By

Maysoon Hossam Ismail
M.B.Ch.B
Mustansirya University

Under Supervision of

Prof. Dr. Mohammed Ahmed El-Kady
Professor of Obstetrics and Gynecology
Faculty of Medicine - Ain Shams University

Dr. Ahmed Mohammed Essam El-Din Mansour
Lecturer of Obstetrics and Gynecology
Faculty of Medicine - Ain Shams University

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
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Maysoon Hossam Ismail

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List of Abbreviations

Abbr.	Full-term

AC ..... *Abdominal circumference*

BPD ..... *Biparietal diameter*

CT ..... *Computed tomography*

DM ..... *Diabetes mellitus*

dNK ..... *Decidual natural killer cells*

EFBW ..... *Estimated fetal body weight*

EFW ..... *Estimation of fetal weight*

fFN ..... *Fetal-specific fibronectin*

FL ..... *Femur length*

FVWs ..... *Flow velocity waveforms*

FW ..... *Fetal weight*

HC ..... *Head circumference*

hCG ..... *Human chorionic gonadotropin*

IL ..... *Interleukin*

IQ ..... *Intellectual quotient*

IUGR ..... *Intrauterine growth restriction*

MMPs ..... *matrix metalloproteinases*

MR *.....Magnetic resonance*

NICU *.....Neonatal intensive care unit*

PlGF *..... placental growth factor*

SD *.....Standard deviation*

US *.....Ultrasonography*

VEGF *..... Vascular endothelial growth factor*

2D *.....Two-dimensional*

3D *.....Three-dimensional*

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Abstract

Background: The placenta is the principal influence on fetal birth weight, and it is thought that abnormalities of placental growth may precede abnormalities in fetal growth. Because the placenta may be the first organ to manifest changes of disease in pregnancy, placental features may have a role in screening for pregnancy complications. **Aim of the Work:** The aim this study is to assess the accuracy of placental thickness (estimated by ultrasonography) in predicting fetal weight. **Patients and Methods:** This prospective observational study was conducted at Ain Shams University Maternity Hospital November, 15th, 2016 to November, 1st, 2017. 100 Normal antenatal pregnant women at 24-28 weeks of pregnancy who attended antenatal clinic at the department of obstetrics and gynecology, Ain Shams University Maternity Hospital were recruited, after fulfilling the inclusion and exclusion criteria. **Results:** The predictive rule could estimate actual birth weight with an accuracy of ± 0.450 kg (SEest = 0.450 kg). In visits 1 and 2; ± 0.448 kg (SEest = 0.448 kg) in visit 3. **Conclusion:** The actual birth weight was regressed on the placental thickness using simple linear regression to obtain a predictive rule. There is very weak correlation between the actual neonatal weight and placental thickness. The current study deduced a new formula for correction of EFW using placental thickness which has a promising role to offer in the prediction of birth weight.

Key words: placental thickness, fetal weight, ultrasound

Introduction

The in utero environment and its impact on neonatal health are of increasing interest in relation to adult health outcomes ***(Salafia et al., 2007).*** There is a growing body of evidence that birth weight and placental insufficiency are important risk factors for later development of the so-called metabolic syndrome: hypertension, diabetes, and coronary heart disease ***(Lee et al., 2012).***

The placenta is the principal influence on fetal birth weight, and it is thought that abnormalities of placental growth may precede abnormalities in fetal growth. Because the placenta may be the first organ to manifest changes of disease in pregnancy, placental features may have a role in screening for pregnancy complications ***(Thame et al., 2001).***

Placental thickness is the easiest placental dimension to measure, yet little is known about the "normal" placental thickness as measured by second-trimester sonography. Historically, a placenta of greater than 4 cm in thickness has been regarded as abnormal and associated with various poor outcomes ***(Mathai et al., 2013).***

However, that idea was based on a study that was performed since 1979, and there are no current data to support this cutoff value or specifically addressing placental

thickness in the second trimester. In fact, there is evidence that placental thickness may vary with the implantation site and that anterior placentas tend to be thinner than posterior placentas, casting further doubt on the relevance of a categorical 4-cm cutoff ***(Durnwald and Mercer, 2004).***

Reliable information on gestational age is important for assessment of fetal size and fetal growth. Early detection of fetal growth restriction or macrosomia may help to reduce associated morbidity and mortality ***(Boulet et al., 2004; Fang, 2005).*** Accurate information on gestational age is also important to avoid unnecessary obstetric interventions at the time of delivery ***(Verburg et al., 2008).***

Gestational age is historically derived on the basis of the first day of the last menstrual period (LMP) ***(Naegele, 2005).***

Fetal size and fetal growth trajectories are important indicators of fetal health. Fetal growth is heavily modulated by placental function, with the placenta serving the critical respiratory, hepatic and renal functions of the fetus ***(Barr and Pecci, 2004).***

In the first trimester, placental growth is more rapid than that of the fetus. But by approximately 17 postmenstrual weeks, placental and fetal weights are approximately equal.

By term, placental weight is approximately one sixth of fetal weight ***(Verburg et al., 2008).***

Large placentas are associated with hemolytic disease of newborn, maternal diabetes mellitus (DM), severe anemia and intrauterine fetal infections ***(Negrato et al., 2012).***

Small placentas are associated with preeclampsia, chromosomal abnormalities, sever maternal DM, chronic fetal infections and intrauterine growth restriction (IUGR) ***(Sadler et al., 2004).***

Ultrasonography (US) enables the evaluation of the placenta and the detection of placental abnormalities using different parameters such as (2D) placental thickness especial techniques like three-dimensional (3D) power Doppler ***(Chen et al., 2006; Hafner et al., 2003; Elchalal et al., 2000).***

Previous studies focused on 3D measurement of placenta to predict the adverse pregnancy outcome; however, this technique is relatively new, needs complex clinical setting and gives conflicting results regarding its reproducibility in evaluating placenta ***(Suri et al., 2013).***

Ultrasound measurement of placental thickness is a relative simple, reproducible and clinical useful way, which

had been used for more than two decades ***(Elchalal et al., 2000; Chen et al., 2006; Hafner et al., 2003).***

Although most of the placental growth occurs in the third trimester, other researchers like ***Goldenberg et al. (1997)*** stated that birth size was only predicted in the third trimester by fetal ultrasound measurements ***(Parker et al., 2012).***

The placental thickness was measured trans-abdominally by placing the ultrasound transducer perpendicularly to the plane of the placenta, in the area of the cord insertion at third trimester.

At term the placenta is approximately 3cm thick at the cord insertion ***(Sadler, 2004).***

Studies have shown that diminished placental size precedes fetal growth retardation ***(Bamfo and Odibo, 2011).***

Aim of the Work

The aim this study is to assess the accuracy of placental thickness (estimated by ultrasonography) in predicting fetal weight.