

بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



Evaluation of Fetal Kidney Length in Relation to Femur Length as an Accurate Method of Estimation of Gestational Age in Third Trimester

Thesis

*Submitted for Partial Fulfillment of the Master
Degree in Obstetrics and Gynecology*

By

Mina Tharwat Nassif Makram

M.B.B.Ch.

Faculty of Medicine- Alexandria University (2014)

Under Supervision of

Prof. Dr. Mohammad Abd ElHameed

Mohammad Nasr AdDeen

*Professor of Obstetrics and Gynecology
Faculty of Medicine - Ain Shams University*

**Dr. Hosam Mohammad Mohammad
Hemeda**

*Assistant Professor of Obstetrics and Gynecology
Faculty of Medicine - Ain Shams University*

**Faculty of Medicine
Ain Shams University
2021**



Acknowledgement

*First and foremost, Thanks are due to **ALLAH** the most merciful and the mightiest to whom I relate my success in achieving any work in my life.*

*I would like to express my sincere gratitude and deepest appreciation to **Prof. Dr. Mohammad Abd ElHameed Mohammad Nasr AdDeen**, Professor of Obstetrics and Gynecology, Ain Shams University, for his kindness, precious advice, continuous encouragement and guidance throughout the preparation of this work.*

*I am deeply grateful to **Dr. Hosam Mohammad Mohammad Hameda**, Assistant Professor of Obstetrics and Gynecology, for his guidance and help in this work.*

*I would like to express my sincere gratitude and deep thanks to Ultrasound Unit in Ain Shams University Hospital for giving me the chance to perform my study and deep thanks to **Dr. Sheriff Ahmed Hassan Alkadi**, for his valuable instructions, and for his experienced guidance and helpful suggestions that make the completion of this work possible.*

*Finally no words can express the warmth of my feelings to **my family**, to whom I am forever indebted for their patience, support and help.*

Mina Tharwat

Contents

Subject	Page No.
List of Abbreviations	I
List of Tables	IV
List of Figures	VI
Introduction	1
Aim of the Work	3
Review of Literature	4
Patients and Methods	61
Results	68
Discussion	91
Conclusion	96
Recommendations	97
Summary	98
References	100
Arabic Summary	١

List of Abbreviations

Abb.	Full term
2DUS	Two-dimensional ultrasound
AC	Abdominal circumference
BPD	Biparietal diameter
CI	Cephalic index
CRL	Crown-rump length
DM	Diabetes Mellitus
EDD	Estimated date of delivery
EFW	Estimated fetal weight
FKL	Fetal Kidney Length
FL	Femur length
GA	Gestational age
GDM	Gestational diabetes mellitus
HC	Head circumference
hCG	Human chorionic gonadotropin
IUGR	Intrauterine growth retardation
IUP	Intrauterine pregnancy
LMP	Last menstrual period
MRI	Magnetic resonance imaging
MSD	Mean sac diameter
OFD	Occipitofrontal diameter
SE	Standard error
TAUS	Transabdominal ultrasound
TVUS	Transvaginal ultrasound

List of Tables

<i>Table</i>	<i>Title</i>	<i>Page</i>
Table 1	Demographic and sonographic characteristics of the study population	69
Table 2	Gestational age of the studied cases (CRL)	71
Table 3	Fetal femur length (mm) among the studied cases	72
Table 4	Kidney lengths among the studied cases	73
Table 5	Linear regression model for prediction of gestational age from femur length	74
Table 6	Linear regression model for prediction of Gestational age from right fetal kidney length	77
Table 7	Linear regression model for prediction of gestational age from left fetal kidney length	80
Table 8	Linear regression model for prediction of gestational age from average fetal kidney length	83
Table 9	Comparison between right or left fetal kidney length	88

<i>Table</i>	<i>Title</i>	<i>Page</i>
Table 10	Comparison of the standard error of estimate for predicted gestational age using femur length or average fetal kidney length	89

List of Figures

<i>Figure</i>	<i>Title</i>	<i>Page</i>
Fig. 1	Crown rump length	13
Fig. 2	Measurement of embryo in gestational sac	14
Fig. 3	Early IUP with double decidual sac sign	17
Fig. 4	Yolk sac	21
Fig. 5	Measurement of fetal biparital diameter	27
Fig. 6	Cavum septum pellucidum	30
Fig. 7	Fetal femur length	32
Fig. 8	Image of abdominal circumference	34
Fig. 9	Measurement of abdominal circumference	35
Fig. 10	Transverse cerebellar diameter on fetal ultrasound	36
Fig. 11	Role of placental thickness in assessment of gestational age	38
Fig. 12	Role of transcellebellar diameter in assessment of gestational age	39
Fig. 13	Kidney length at 31 weeks of gestation	50
Fig. 14	Kidney length	55

<i>Figure</i>	<i>Title</i>	<i>Page</i>
Fig. 15	Kidneys are identified, moving the probe caudally in transverse section just below the level for abdominal circumference measurement	57
Fig. 16	Fetal kidney length measured from outer to outer margin was 33.2mm and Hadlock based average gestational age was 32 weeks and 4 days	58
Fig. 17	Sonogram of fetal kidney lengths measurement at 35 weeks of gestation	59
Fig. 18	Flow chart of cases enrollment in the study	68
Fig. 19	Scatter plot showing line of best fit for regressing gestational age on femur length	75
Fig. 20	Histogram showing frequency distribution of residuals of gestational age predicted from femur length	76
Fig. 21	Scatter plot showing line of best fit for regressing gestational age on right fetal kidney length	78
Fig. 22	Histogram showing frequency distribution of residuals of gestational age predicted from right fetal kidney length	79

<i>Figure</i>	<i>Title</i>	<i>Page</i>
Fig. 23	Scatter plot showing line of best fit for regressing gestational age on left fetal kidney length	81
Fig. 24	Histogram showing frequency distribution of residuals of gestational age predicted from left fetal kidney length	82
Fig. 25	Scatter plot showing line of best fit for regressing gestational age on average fetal kidney length	84
Fig. 26	Histogram showing frequency distribution of residuals of gestational age predicted from average fetal kidney length	85
Fig. 27	Bland-Altman plot for agreement between right and left fetal kidney length for estimation of gestational age	86
Fig. 28	Bland-Altman plot for agreement between femur length and average fetal kidney length for estimation of gestational age	87
Fig. 29	Residual gestational age for femur length or average fetal kidney length	90

Introduction

An accurate gestational age (GA) is vital to the diagnosis of fetal growth disorders and the timing of elective delivery, failure of which could either result in iatrogenic prematurity or postmaturity, with their attendant perinatal morbidity and mortality. In developing countries, a significant number of pregnant women tend to seek antenatal care late in pregnancy, a number of who are unable to recall their precise last menstrual period (LMP) (*Lees et al., 2020*).

Compared with the traditional methods of dating pregnancy using LMP and clinical measurement, ultrasonographic dating has been recognized as the most parameters used include gestational sac volume, gestational sac diameter, and crown-rump length (CRL) measurements, which are most commonly used in 1st-trimester pregnancy dating.

By the end of the 1st trimester, measurements of biparietal diameter (BPD) become more accurate than the CRL, which by that time reflects errors associated with fetal flexion and extension. BPD and femur length (FL) are commonly used for 2nd-trimester pregnancy dating. To a lesser degree, biometric indices such as transcerebellar

diameter, foot length, and clavicular length have also been used. The sonographic parameters used in the 3rd trimester are BPD, FL, abdominal circumference (AC), and head circumference (HC). Between the 12th and 28th weeks of gestation, BPD has been shown to be able to predict GA within 6–11 days, but after 26 weeks, the accuracy of FL measurement progressively decreases, with a standard error (SE) of ± 3 weeks near term (*Edevbie and Akhigbe, 2018*).

This study has been done through measurement of femur length of the selected cases and compare it with the new parameter which is Mean fetal Kidney length to get the most accurate single parameter for estimation of gestational age in third trimester.

Das et al concluded that the most accurate method for evaluation of gestational age was the Fetal Kidney Length (FKL) followed by Abdominal Circumference (AC) and Biparietal Diameter (BPD) (*Das et al., 2018*). While **kumar et al** found that the best linear regression model for estimating of gestational age is Femur Length (FL), Fetal Kidney Length (FKL) and Biparietal Diameter (BPD) in that order (*Kumar et al., 2013*).

Aim of the Work

The aim of the study is to compare the accuracy of fetal kidney length in relation to FL regarding to estimation of gestational age in third trimester.

Research question:

Is the measurement of the fetal kidney length more accurate in prediction of gestational age in third trimester than the measurement of femur length?

Research hypothesis:

Measurement fetal kidney length is more accurate in prediction of gestational age in third trimester than measurement of femur length.