



Position of Intrauterine Contraceptive Device (IUCD) in 3D Ultrasound Coronal Plane of the Uterus in Women with Menorrhagia

Thesis

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

By

Mahmoud Muhammed Ahmed Salama

*M.B.B.CH., Faculty of Medicine, Ain Shams University
Visitor Resident in Fetal Care Unit – Ain Shams University Maternity Hospital*

Under Supervision of

Prof. Hassan Awwad Bayoumy

*Professor and Head of Obstetrics and Gynecology Department
Faculty of Medicine, Ain Shams University*

Dr. Ghada Mahmoud Mansour

*Consultant – Professor Degree – of Obstetrics and Gynecology
in Department of Obstetrics and Gynecology
Ain Shams University Hospitals*

Dr. Rania Hassan Mostafa

*Lecturer of Obstetrics and Gynecology
Faculty of Medicine, Ain Shams University*

Faculty of Medicine - Ain Shams University

2020

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

لسبحناك يا معلم لنا
إلّا ما علمتنا إنك أنت
العليم الكبير

صدّق الله العظيم

سورة البقرة الآية: ٣٢

*First and foremost, I feel always indebted
to **Allah** the Most Beneficent
and Merciful.*



Acknowledgments

*My deepest gratitude to my supervisor, **Prof. Hassan Awwad Bayoumy**, Professor of Obstetrics and Gynecology, Faculty of Medicine, Ain Shams University, for his valuable guidance and expert supervision, in addition to his great deal of support and encouragement. I really have the honor to complete this work under his supervision.*

*I would like to express my great and deep appreciation and thanks to **Dr. Ghada Mahmoud Mansour**, Consultant, Professor degree of Obstetrics and Gynecology, Ain Shams University Hospitals, for her meticulous supervision, and her patience in reviewing and correcting this work.*

*I can't forget to thank with all appreciation **Dr. Rania Hassan Mostafa**, Lecturer of Obstetrics and Gynecology, Faculty of Medicine, Ain Shams University, for the time and efforts she has devoted to accomplish this work.*

Dedication

*I would like to dedicate this work to my
Parents, my brothers, my **Wife** and all my **Family**
members for their continuous encouragement, enduring
me and standing by me.*

List of Contents

Title	Page No.
List of Tables.....	i
List of Figures	ii
List of Abbreviations.....	v
Protocol.....	
Introduction	- 1 -
Aim of the Work	3
Review of Literature	
▪ Intrauterine Contraception	4
▪ Abnormal Uterine Bleeding.....	17
▪ Cross-Sectional Imaging of the Uterus	26
Subjects and Methods.....	39
Results.....	43
Discussion	66
Summary.....	77
Conclusion	80
Recommendations	81
References	82
Arabic Summary	—

List of Tables

Table No.	Title	Page No.
Table 1:	Suggested Normal limits for menstrual parameters	18
Table 2:	Descriptive statistics	44
Table 3:	Univariate analysis	59
Table 4:	Multivariate analysis	59
Table 5:	Endometrial cavity width.....	60
Table 6:	Cut off values of different indices	62

List of Figures

Fig. No.	Title	Page No.
Figure 1:	The revised FIGO-AUB System.	19
Figure 2:	(The FIGO classification system (PALM-COEIN))	22
Figure 3:	FIGO leiomyoma subclassification system.	24
Figure 4:	Comparison between the three groups according to the mean value of uterine PI.	45
Figure 5:	Comparison between the three groups according to the mean value of uterine RI.	46
Figure 6:	Comparison between the three groups according to the mean value of Subendometrial PI.	47
Figure 7:	Comparison between the three groups according to the mean value of Subendometrial RI.	48
Figure 8:	Comparison between the three groups according to the mean value of Subendometrial VI.	49
Figure 9:	Comparison between the three groups according to the mean value of Subendometrial FI.	50
Figure 10:	Comparison between the three groups according to the mean value of Sub VFI.	51
Figure 11:	Receiver Operating Characteristic (ROC) curve to define the best cutoff to uterine PI to predict menorrhagia.	52

Figure 12: Receiver Operating Characteristic (ROC) curve to define the best cutoff to uterine RI to predict menorrhagia.	53
Figure 13: Receiver Operating Characteristic (ROC) curve to define the best cutoff to Subendometrial PI to predict menorrhagia.	54
Figure 14: Receiver Operating Characteristic (ROC) curve to define the best cutoff to Subendometrial RI to predict menorrhagia.....	55
Figure 15: Receiver Operating Characteristic (ROC) curve to define the best cutoff to Subendometrial VI to predict menorrhagia.	56
Figure 16: Receiver Operating Characteristic (ROC) curve to define the best cutoff to Subendometrial FI to predict menorrhagia.	57
Figure 17: Receiver Operating Characteristic (ROC) curve to define the best cutoff to Subendometrial VFI to predict menorrhagia.	58
Figure 18: Receiver Operating Characteristic (ROC) curve to define the best cutoff to endometrial cavity width to predict menorrhagia.....	61
Figure 19: This case in group 1, shows coronal plane of uterus with IUCD perforating the myometrium.	63
Figure 20: This case in group 1, shows site of penetration of the transverse limb of myometrium.	63
Figure 21: This case in group 1, shows another example of IUCD perforating the myometrium in the coronal plane.	64

Figure 22:	This case in group 2, shows coronal plane of the uterus with IUCD less than the width of endometrium.....	64
Figure 23:	This case in group 1, shows three orthogonal planes of three dimensional power Doppler (3DPD) of the uterus.....	65
Figure 24:	This case in group 1, shows three dimensional power Doppler (3DPD) indices: vascularization index (VI), flow index (FI) and vascularization flow index (VFI).....	65

List of Abbreviations

Abb.	Full term
AAFP	: American Academy of Family Physicians
ACOG	: American College of Obstetricians and Gynecologists
AUB	: Abnormal uterine bleeding
AUC	: Area under the curve
Cu	: Copper
DUB	: Dysfunctional uterine bleeding
FI	: Flow Index
FIGO	: International Federation of Gynecology and Obstetrics
hCG	: Human chorionic gonadotropin
HMB	: Heavy menstrual bleeding
IUCD	: Intrauterine contraceptive device
IVC	: inferior vena cava
JZ	: Junctional zone
LARC	: Long-acting reversible contraception
LNG	: Levonorgestrel-releasing
MRI	: Magnetic resonance imaging
NPV	: Negative predictive value

NSAID	: Non-steroidal anti-inflammatory drugs
PI	: Pulsatility index
PPV	: Positive predictive value
PTT	: Partial thromboplastin time
RI	: Resistance Index
ROC	: Receiver operating characteristic
SD	: Standard deviation
SPSS	: Statistical package for social science
TVUS	: Transvaginal ultrasound
VCI	: Volume contrast imaging
VFI	: Vascularization flow Index
VI	: Vascularization Index
VOCAL	: Virtual organ computer-aided analysis
2D	: Two dimensional
3D	: Three-dimensional
3DPD	: Three-dimensional power Doppler

INTRODUCTION

Intrauterine contraceptive device (IUCD) is a widely accepted method for birth control among many women around the world. However, menorrhagia is among its side effects that may cause iron deficiency anemia and usually ends by removing the IUCD in the first year after its insertion in many cases (*de Souza and Geber, 2007*).

Many studies suggested possible mechanisms that explain the cause of menorrhagia in patients using IUCD; one of them reported that IUCD insertion increases the production of prostaglandins in the endometrium which cause an increase in vascularity, vascular permeability and inhibit platelet activity and therefore, increase menstrual bleeding (*Xin et al., 2009*).

Three-dimensional (3D) imaging technology has established itself as a useful adjunct complementary to traditional two-dimensional imaging of the female pelvis. One of its advantages is its ability to demonstrate the coronal view of the uterus, which allows further explanation of many gynecological disorders. Coronal plane of endometrium may be assessed prior to IUCD insertion. IUCD transverse limbs should not extend past the endometrial cavity into the myometrium (*Wong et al., 2015*).

Three-dimensional power Doppler enables quantitative evaluation of vessels in the volume studied due to the use of angio histogram function in which 3-dimensional vascularization and

blood flow indices: Vascularization Index (VI), Flow Index (FI) and Vascularization flow Index (VFI), are counted automatically (*Dubiel et al., 2010*).

AIM OF THE WORK

To study 3D coronal plane of the uterus and subendometrial 3D power Doppler indices in cases using intrauterine contraceptive devices for contraception with and without menorrhagia, aiming to find the best predictor of menorrhagia with IUCD insertion.