



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكرو فيلم

# بسم الله الرحمن الرحيم



**MONA MAGHRABY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم



# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



**MONA MAGHRABY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# 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



**MONA MAGHRABY**



# **The Accuracy of 3D Ultrasound versus 2D in Predicting Placental Invasion Prenatally: Prospective Study**

## **Thesis**

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

**By**

**Mohamed EL Said Kouta**

*M.B.B.Ch., 2012, Faculty of Medicine – 6 October  
University, Resident at Al Galaa Teaching Hospital*

**Under supervision of**

**Prof. Dr. Hazem Amin Hassan EL Zanini**

*Professor of Obstetrics and Gynecology*

*Faculty of Medicine -Ain Shams University*

**Prof. Dr. Mohamed EL Sherbiny**

*Professor of Obstetrics and Gynecology*

*Faculty of Medicine -Ain Shams University*

**Dr. Rehab Mohamed Abd El Rahman**

*Assistant Professor of Obstetrics and Gynecology*

*Faculty of Medicine -Ain Shams University*

*Faculty of Medicine*

*Ain Shams University*

**2020**



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



صَلَّى اللَّهُ الْعَظِيمِ

سورة المجادلة (١١)

# Acknowledgment

*First and foremost, I feel always indebted to **ALLAH**, the Most Kind and Most Merciful.*

*I'd like to express my respectful thanks and profound gratitude to **Prof. Dr. Hazem Amin Hassan EL Zanini**, Professor of Obstetrics and Gynecology Faculty of Medicine -Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

*I am also delighted to express my deepest gratitude and thanks to **Professor Dr. Mohamed EL Sherbiny**, Professor of Obstetrics and Gynecology Faculty of Medicine -Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

*I am deeply thankful to **Dr. Rehab Mohamed Abd El Rahman**, Assistant Professor of Obstetrics and Gynecology Faculty of Medicine -Ain Shams University, for her great help, active participation and guidance.*

*Mohamed Kouta*

# *List of Contents*

Title	Page No.
List of Contents .....	4
List of Tables .....	I
List of Figures .....	II
<b>Introduction</b> .....	IV
<b>Aim Of The Work</b> .....	3
<b>Placental anatomy</b> .....	4
<b>Placenta previa and accreta</b> .....	11
<b>Role of us in placenta previa and accreta</b> .....	24
<b>Patients And Methods</b> .....	45
<b>Results</b> .....	53
<b>Discussion</b> .....	69
<b>Summary</b> .....	77
<b>Conclusion</b> .....	79
<b>Recommendations</b> .....	80
<b>References</b> .....	81

## *List of Tables*

Table No.	Title	Page No.
<b>Table (1):</b>	Demographic characteristics among the studied.....	53
<b>Table (2):</b>	2D Ultrasound findings among the studied cases .....	54
<b>Table (3):</b>	3D Ultrasound findings among the studied cases .....	56
<b>Table (4):</b>	Placental invasion among the studied cases.....	57
<b>Table (5):</b>	Hysterectomy among the studied cases. ....	58
<b>Table (6):</b>	Comparsion according to placental invasion regarding demographic characteristics. ....	59
<b>Table (7):</b>	Agreement between placental invasion and 2D ultrasound findings.....	61
<b>Table (8):</b>	Diagnostic characteristics of 2D Ultrasonography in the diagnois of placental invasion.....	63
<b>Table (9):</b>	Diagnostic characteristics of 3D Ultrasonography in the diagnosis of placental invasion.....	65
<b>Table (10):</b>	Diagnostic characteristics of combined 2D and 3D Ultrasonography in the diagnosis of placental invasion.....	67



# *List of Figures*

Fig. No.	Title	Page No.
<b>Figure (1):</b>	Gross anatomy of placenta .....	5
<b>Figure (2):</b>	Microscopic anatomy of placenta Gray H. Anatomy of the human body. ....	6
<b>Figure (3):</b>	Transabdominal study shows the placenta completely covering the internal os (arrow). ....	24
<b>Figure (4):</b>	Transvaginal study shows a posterior placenta with the tip of the placenta on the internal os (arrow). The placenta is adjacent to the internal os but does not cover it. ....	25
<b>Figure (5):</b>	Transabdominal study shows an over-distended bladder giving the appearance of a previa in a patient with NO placenta previa.....	27
<b>Figure (6):</b>	A normal placenta can have vascular lakes, typically a few small, sonolucent spaces with a regular shape and normal underlying myometrial thickness. ....	33
<b>Figure (7):</b>	The placental lacunae in placenta accreta are numerous, irregular in shape, and the underlying myometrium may be thinned. ....	33
<b>Figure (8):</b>	Partial hydatidiform mole: ultrasound shows endometrial cavity filled with a partially solid and partially multicystic mass measuring 7.5x5.5x4.4cm. focal anechoic spaces can be seen. ....	34
<b>Figure (9):</b>	Sonogram of placenta previa and placenta previa accrete. Panel. ....	35
<b>Figure (10):</b>	Ultrasound and Doppler images of placenta accretat, Placenta previa with accreta .....	36
<b>Figure (11):</b>	Placental lacunae in placenta increta, a transverse transabdominal ultrasound (A) demonstrates tortuous placental lacunae (arrow) confirmed on the color flow doppler study (B, arrow). ....	39
<b>Figure (12):</b>	Magnetic resonance image of normal placental attachment (no accreta). ....	41
<b>Figure (13):</b>	Magnetic resonance image suggestive of placenta accreta.....	41
<b>Figure (14):</b>	Placenta increta on MRI. ....	42

---

<b>Figure (15):</b> .....	48
<b>Figure (16):</b> .....	49
<b>Figure (17):</b> interoperative image showing anarchic vascularization over the uterine serosa. Placenta percreta was confirmed....	50
<b>Figure (18):</b> 2D Ultrasound findings among the studied cases. ....	55
<b>Figure (19):</b> 3D Ultrasound findings among the studied cases. ....	56
<b>Figure (20):</b> Placental invasion among the studied cases. ....	57
<b>Figure (21):</b> Hysterectomy among the studied cases.....	58
<b>Figure (22):</b> Comparison according to placental invasion regarding GA at delivery.....	60
<b>Figure (23):</b> Comparison according to placental invasion regarding number of previous CS.....	60
<b>Figure (24):</b> Comparison according to placental invasion regarding 2D ultrasound findings.....	61
<b>Figure (25):</b> Comparison according to placental invasion regarding 3D ultrasound findings.....	62
<b>Figure (26):</b> Diagnostic characteristics of 2D Ultrasonography in the diagnosis of placental invasion. ....	64
<b>Figure (27):</b> Diagnostic characteristics of 3D Ultrasonography in the diagnosis of placental invasion.....	66
<b>Figure (28):</b> Diagnostic characteristics of combined 2D and 3D Ultrasonography in the diagnosis of placental invasion.....	68

## *List of Abbreviations*

Abb.	Full term
2D .....	Two-dimensional
3D .....	Three-dimensional
3DPD .....	3-dimensional power Doppler
ACOG	American College of Obstetricians and Gynecologists
BMI.....	Body mass index
BPMF .....	Basal plate myometrial fibers
C19.....	Chromosome 19
CBC .....	Complete blood picture
CI .....	Confidence interval
CS .....	Cesarean section
DNA.....	Deoxyribonucleic acid
EDD .....	Estimated Date of Delivery
EGA .....	Estimated gestational age
EVT.....	Extravillous trophoblast
HGF .....	Hepatocyte growth factor
IGF2.....	Insulin-like growth factor 2
MAP.....	Morbidly adherent placenta
MMPs .....	Matrix metalloproteinases
MRI.....	Magnetic resonance imaging
mRNA.....	Messenger RNA
NPV .....	Negative predictive value
OR.....	Odds ratio
PAS.....	Placenta accreta spectrum
PPROM.....	Preterm premature rupture of membranes
PPV.....	Positive predictive value

## *List of Abbreviations Cont...*

Abb.	Full term
PRBC .....	Packed red blood cells
REBOA .....	Resuscitative endovascular balloon occlusion of the aorta
RH.....	Rhesus factor
ROTEM .....	Rotational thromboelastometry
RR.....	Relative risk
SMFM.....	Society for Maternal-Fetal Medicine
TEG .....	Thromboelastography
TGF- $\beta$ .....	Transforming growth factor- $\beta$
TIMPs.....	Tissue inhibitors of metalloproteinase
US .....	Ultrasound
VEGF.....	Vascular endothelial growth factor

## ABSTRACT

**Background:** Accurate antenatal diagnosis of morbid adherent placenta and placental invasion and degree of invasion of placenta, allowing multidisciplinary management during delivery, proved the improvement of maternal and fetal outcomes. Placenta previa with any uterine surgery for example previous caesarean section are the most important known risk factors for morbid adherent placenta and placental invasion.

**Objective:** To evaluate the precision of 3D ultrasound compared to 2D in predicting degree of placental invasion in women with placenta previa.

**Patients and Methods:** We examine 50 patients with placenta previa attending the outpatient clinic at Ain Shams University Maternity Hospital in the period between January 2018 and November 2019, prospective cohort study.

**Results:** Regarding the most important criteria for 2D ultrasound in predicting placental invasion was loss of retroplacental space that show the highest significant non chance agreement with placental invasion.

Regarding 3D ultrasound and power Doppler the most important criteria in prediction of placental invasion and bladder invasion was hyper vascularity between uterine serosa-bladder wall interface had the highest significant non chance agreement.

**Conclusion:** There was no conclusive scientific diagnostic criteria that 3D ultrasound more accurate than 2D ultrasound in detection of placental invasion, however 3D ultrasound colored Doppler can provide images for abnormal placentation and evaluation of dynamic hyper vascularity of uteroplacental space using its multiplanes capability and colored power doppler that's offer images more obvious and more precise than 2D ultrasound in portrayal of abnormal placentation

**Keywords:** Three-dimensional, cesarean section, placenta accreta

# INTRODUCTION

Now a days with increase rate of Cesarean section placenta previa and its spectrum increases as this kind of delivery considered as a major risk factor for inappropriate site for placentation and may result in placental invasion to the underlying layers of uterus and other obstetric complication.

Severe invasive placentation may discovered at the time of delivery can lead to unpreferable complication , such as potential risks of uterine bleeding tratogenic injury of adjacent viscera (*Chou, 2004; Wu et al., 2005*).

During antenatal care and assessment of fetal wellbeing ultrasonography is used routinely for diagnosis of placental site and if there is abnormality detected or not however, placental invasion to myometrium and degree of this invasion mostly diagnosed during delivery, upon trying to remove the placenta ,this trials can lead to sever uterine bleeding and maternal morbidity .therefore an accurate prenatal diagnosis is required to reduce the risk of maternal/fetal morbidity and mortality. (*Tikkanen et al., 2011*).

Invasive placentation can be classified according to degree of invasion and either bladder invaded or not so There are three form of; placenta accrete and placenta increta and placenta percreta with bladder invasion, which present a great obstetrical challenge as life threatening hemorrhage resulting in maternal mortality, caesarean hysterectomy, injury of the bladder and post-partum hemorrhage may occur. (*Mazouni et al., 2007*).



Therefore, it very important to know the degree of invasive placentation exactly before delivery so that an experienced team of surgeons and obstetrician can be assembled in advance to deal with expected complications, taking in consideration to decrease complication to mother.

Although the most accurate gold standard diagnostic tool is clinical pathology post cesarean hysterectomy, however reliable diagnosis is of such importance regarding this clinical entity, all types of imaging techniques have been tried in an attempt to improve prenatal diagnosis. MRI had superior to two-dimensional (2D) ultrasonography (US) and 3D US but cannot used as the standard screening tool for the diagnosis of invasive placentation. The 2D ultrasound may be used as screening tool as it is more available and cheaper before the 3D ultrasound. Three-dimensional (3D) power Doppler. To sum up ultrasound could represent a core stone for diagnosis of abnormal placentation and 3D color Doppler more confirmatory tool to suggest effective criteria for sever adherent placentation diagnosis and bladder invasion (*Chou et al., 2001*).