ENDOMETRIAL VOLUME AND ENDOMETRIAL FLOW INDICES IN PREDICTING THE SUCCESS OF IVF/ICSI CYCLES

Thesis

Submitted for partial fulfillment
of the Master degree in
Obstetrics &Gynecology

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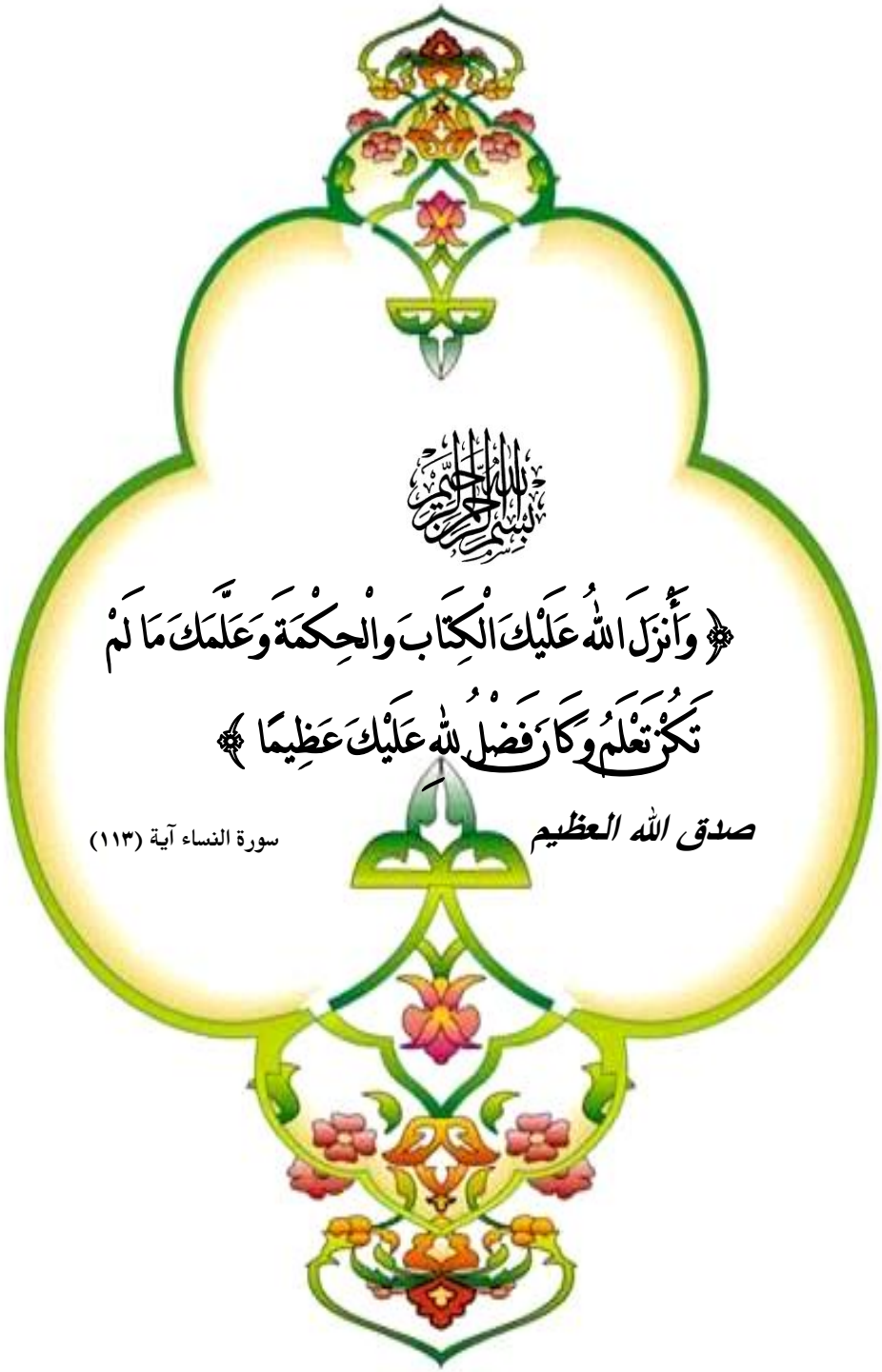
✍ *Mohamed Mahmoud Ahmed*


بسم الله الرحمن الرحيم
﴿ وَأَنزَلَ اللَّهُ عَلَيْكَ الْكِتَابَ وَالْحِكْمَةَ وَعَلَّمَكَ مَا لَمْ تَكُن تَعْلَمُ وَكَانَ فَضْلُ اللَّهِ عَلَيْكَ عَظِيمًا ﴾
سورة النساء آية (١١٣)
صدق الله العظيم

Contents

List of Abbreviations

AFC	:	Antral follicular count
ART	:	Assisted reproductive technology
CG	:	chorionic gonadotrophin
CT	:	Cytotrophoblast
ECM	:	extracellular matrix
ET	:	endometrial thickness
EV	:	endometrial volume
EVT	:	extravillous trophoblast
FI	:	Flow Index
FSH	:	Follicle stimulation hormone
Hcg	:	Human chorionic gonadotropin
HSG	:	Hystrosalpingography
ICSI	:	Intracytoplasmic sperm injection
IGFBP-1	:	insulin-like growth factor binding protein-1
IVF	:	In vitro fertilization
IVFET	:	In vitro fertilization- embryo transfer
PCOS	:	polycystic ovarian syndrome
PI	:	Pulsatility index

PL	:	placental lactogen
PSV	:	Peak systolic velocity
RBC	:	Red blood cell
RI	:	Resistant Index
SD	:	Standard deviation
ST	:	Syncytiotrophoblast
TSH	:	Thyroid stimulating hormone
SIS	:	Saline infusion Sonohysterography
uNK	:	Uterine natural killer
US	:	Ultrasound
VEGF	:	Vascular endometrial growth factor
VFI	:	Vascularization flow index
VI	:	Vascularization Index
VOCAL	:	Virtual Organ Computer-aided Analysis
2-D	:	Two dimensional
3D US-PDA	:	Three-dimensional ultrasound and power Doppler angiography
4D	:	Four dimensional

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Protocol

ENDOMETRIAL VOLUME AND ENDOMETRIAL FLOW INDICES IN PREDICTING THE SUCCESS OF IVF/ICSI CYCLES

Protocol of Thesis

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INTRODUCTION

Assisted reproductive techniques (ART) are used widely to treat fertility problems, which affect approximately 7–15% of women of reproductive age **(Thoma et al., 2013)**. Although there have been several improvements in techniques during the last three decades **(Martins et al., 2011 ; Phillips et al., 2013)** clinical pregnancy and live-birth rates remain at approximately 30–40% and 20–30%, respectively **(Sunkara et al.,2011 ; Gunby et., al 2011)** according to results from the Canadian ART Register in 2007. Increasing these rates is desirable for couples undergoing ART, as treatment failure is a source of psychological distress **(Pasch et al., 2012)** and the most common cause of drop-out before achieving pregnancy **(Verberg et al., 2008).** The success of in vitro fertilization and embryo transfer (IVF-ET) cycles depends mainly on embryo quality and uterine receptivity **(Barker MA et al., 2009).** Endometrial receptivity is regulated by many factors including endometrial perfusion **(Ng et al., 2006).**

Several studies have demonstrated the existence of a correlation between endometrial characteristics and pregnancy rate in IVF/ICSI patients **(Noyes *et al.*, 1995; Richter *et al.*, 2007; Al-Ghamdi et al., 2008).**

Factors affecting the growth of endometrium are still not well understood, but recently many researchers have focused on the angiogenesis and vascularization within the endometrium and found that a poor uterine receptivity in women with thin endometrium may be due to the impairment of blood flow impedance through the endometrium **(Sher and Fisch: 2000; Ng *et al.*, 2007; Ho et al., 2009; Takasaki *et al.*, 2010).**

Some studies have suggested a minimal thickness for a successful pregnancy to occur, while others have reported adverse effects of increased endometrial thickness above which pregnancy is unlikely to occur **(Zenke et al., 2004; Rashidi et al 2005; Schild et al., 2001).** In contrast, others have failed to demonstrate a relationship between endometrial thickness, pattern, and pregnancy and implantation rates **(Laasch et al., 2004; Garcia-Velasco et al., 2003; Dietterich et al., 2002; Yuval et al., 1999; Sundstrom et al 1998).**

Biopsy of the endometrium cannot be considered during the treatment, and this has encouraged the development and use of ultrasonography and Doppler-like non-invasive methods to evaluate ovarian response to the stimulation and uterine receptivity **(Ebrard-Charra *et al.*, 2005)**.

The advantages of ultrasonography include its non-invasiveness, repeatability, real-time monitoring and predictability **(Wang *et al*, 2010).**

Furthermore, numerous other studies on uterine blood flow have led to conflicting conclusions **(Yang *et al.*, 1999; Schild *et al.*, 2001; Basir *et al.*, 2002a, b; Chien *et al.*, 2004).**

Merce. (2002) postulated that endometrial blood flow reflects properly the uterine receptivity because the endometrium is the site where embryonic implantation takes place. Similarly **(Chien et al., 2002)** reported the absence of Color Doppler mapping at the endometrial and sub endometrial levels is related to a significant decrease in the implantation rate , whereas the pregnancy rate increases when vessels can be depicted reaching the sub endometrial halo and the endometrium.

Raine-Fenning et al. (2004) found during the study of implantation window that after an increase in several ultrasonographic parameters three days before ovulation, decreases in the vascular index (VI) and the sub-endometrial vascular flow index (VFI), respectively. These observations suggest that there is specific vascular regulation during the cycle that correlates with endometrial development of a receptive state.

L´ed´ee et al. (2007) assume that the use of Three-dimensional ultrasound and power Doppler angiography (3D US-PDA) a non-invasive technology to assess blood flow, could provide information regarding the local angiogenic processes occurring in the endometrium which are essential for implantation and gestation.

Merce et al. (2008) results show a statistically significant increase in endometrial indexes of vascularization, flow, and vascularization flow indexes on the day of HCG administration in the pregnant group.

Ng et al. (2006) didn't prove the 3D Power Doppler indexes to be good predictors after (FSH) stimulation or on oocyte retrieval day. The difference between results in the studies may be due to the difference in the time of indexes measurement.