The role of subendometrial microvascularization and uterine artery blood flow changes in IUD-induced side effects

A THESIS
SUBMITTED FOR PARTIAL FULFILLMENT OF MD DEGREE
IN OBSTETRICS AND GYNECOLOGY

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Marwa Radwan Shahin

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List of Abbreviations

°	Degree
BMI	Body Mass Index
cm	centimeter
dB	Decibels
ECM	Extracellular Matrix
EnSCs	Endometrial Stem Cells
FI	Flow Index
Hz	Hertz
IUD	Intrauterine Device
IVF	In-Vitro Fertilization
kHz	kiloHertz
LNG	Levonorgestrel
LNG-14 IUD	Skyla® IUD
LNG-20 IUD	Mirena® IUD
mcg	microgram
mg	milligram
MHz	Megahertz
mm	millimeter
MMP	Matrix Metalloproteinase
MSCs	Endometrial Mesenchymal Stem Cells
PDE	Power Doppler Energy
PI	Pulsatility Index
PID	Pelvic Inflammatory Disease
PIF	Fourier Pulsatility Index
PPI	Peak To Peak Pulsatility Index
PZT	Lead Zirconate Titante
RI	Resistive Index
S/D	Systolic/Diastolic Ratio
SD	Standard Deviation
TAMV	Time Averaged Maximum Velocity
VFI	Vascularization Flow Index
VI	Vascularization Index

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INTRODUCTION

Intrauterine devices (IUDs) are one of the world's most popular methods of reversible birth control. The IUD is a foreign body that is placed in the uterine cavity to prevent pregnancy. Most types of IUDs have a plastic T-shaped frame that is wrapped with copper and/or copper bands. The contraceptive effects of IUDs may be due to a sterile inflammatory reaction in the endometrial cavity which interferes with sperm function, so that fertilization is less likely to occur. IUDs also interfere with implantation but the extent to which this contributes to their contraceptive action is unknown. An IUD is usually used for 3-5 years because it increases the risk of PID with longer duration of use ***(Kalmantis el al., 2009)***.

Copper intrauterine devices (IUDs), first marketed in the early 1970s, represent an important contraceptive option for 150 million women worldwide. The method is safe, rapidly reversible, inexpensive, highly effective, long-acting and non-hormonal; these attributes make it unique and desirable for many users ***(Sivin, 2007)***.

During 5 years of IUD use, pregnancy occurs in less than 2 per 100 insertions. Bleeding and pain are the most common

reasons for removal rates of 10% in the first year and up to 50% within 5 years. In nulliparous women rates of expulsion and removal for bleeding and/or pain are higher than in parous women. Effective use of IUDs for up to 10 years has the same pregnancy rate as tubal interruption. Thus, the IUD may be an alternative to female sterilization, especially in younger women who are more likely to experience regret after sterilization ***(ESHRE, 2008)***. Infection risk is a relative contraindication to fitting any woman with an IUD, it is only present for a few weeks after insertion and probably arises from an undiagnosed cervical infection at the time of insertion. The risk of developing PID following IUD insertion is less than 1% when the risk of sexually transmitted disease is low, as in women who are in a stable, monogamous relationship ***(Grimes et al., 2007)***.

However, increased bleeding and pain cause up to 10% of users to have the device removed within the first year; still higher percentages tolerate some level of these side effects yet retain use of the method ***(Hubacher et al., 2006)***. In one study, 67% of women using the TCu380A complained about menstrual side effects within the first year of use. Anecdotal information accumulated from clinicians and some published information suggests that side effects from the copper IUD decrease over time ***(Suvisaari and Lahteenmaki, 1996)***.