The ART of Understanding ENDOMETRIUM

Senior Editors Onder CELIK Cihat UNLU I. Ipek MUDERRIS Nilufer CELIK

Edited by Senol SENTURK Ertan ZAN S. Suphan ERSAHIN Safak HATIRNAZ

© Copyright 2020

Printing, broadcasting and sales rights of this book are reserved to Academician Bookstore House Inc. All or parts of this book may not be reproduced, printed or distributed by any means mechanical, electronic, photocopying, magnetic paper and/or other methods without prior written permission of the publisher. Tables, figures and graphics cannot be used for commercial purposes without permission. This book is sold with banderol of Republic of Turkey Ministry of Culture. Scientific and ethical responsibility of each chapter in the book belongs to the authors of the relevant chapter.

ISBN	Publishing Coordinator
978-605-258-796-6	Yasin Dilmen
Name of Book	Page and Cover Design
The ART of Understanding ENDOMETRIUM	Akademisyen Dizgi Ünitesi
Editors Onder CELIK Cihat UNLU I. Ipek MUDERRIS Nilufer CELIK	Publisher Certificate Number 25465 Printing and Binding Göktuğ Ofset
Edited by Senol SENTURK Ertan ZAN S. Suphan ERSAHIN Safak HATIRNAZ	Bisac Code MED033000 DOI 10.37609/akya.1435

WARNING

The information contained in this product is only presented as a source for licensed medical workers. It should not be used for any professional medical advice or medical diagnosis. It does not constitute a doctor-patient, therapist-patient and / or any other health-presentation service relationship between the Bookstore and the recipient in any way.

This product is not a synonym or a substitute for professional medical decisions. The Academician Bookstore and its affiliated companies, writers, participants, partners and sponsors are not responsible for injuries and / or damage to humans and devices arising from all applications based on product information.

In the case of prescription of drugs or other chemicals, checking over the current product information for each drug defined by the manufacturer to determine the recommended dose, duration, method and contraindications of the drug is recommended.

It is the physician's own responsibility to determine the optimal treatment an dose for the patient, and to establish a basis for the knowledge and experience of the treating physician about the patient.

The Academician Bookstore is not responsible for any changes to the product, repackaging and customizations made by a third party.

GENERAL DISTRIBUTION

Akademisyen Kitabevi A.Ş.

Halk Sokak 5 / A Yenişehir / Ankara Tel: 0312 431 16 33 siparis@akademisyen.com

www.akademisyen.com

Preface

I want to talk about a few features that make this book privileged. As far as I know, this is the first English book on Assisted Reproductive Technology in our country. The fact that the most preferred language of international medical science is English and our enthusiasm in writing an internationally acceptable publication encouraged us to do so. We wrote the sections in the form of questions and answers, not in the form of classsical narrative style. In this way, we feel that the topics may be easier to understand and read faster. Section authors were selected among young scientists. Thus, it was also aimed to encourage our younger colleagues gain experience in writing books internationally. This book is a pioneer one aiming to understand and define the endometrium. The word "*ART*" in the title of the book refers to art literally and "Assisted Reproductive Technology" in short.

First and foremost, endless thanks to the Almighty Allah who designed the flawless endometrium and ovary. With great pride and pleasure, I hereby thank all those who gave me the wisdom and strength to write this book. Initially, I would like to thank my father who has dedicated his life to the sole purpose of my success and prosperity. He is an inspiration for all my efforts and rightful owner of all the success I achieve in life. I feel proud to sincerely express my gratitude to my daughter and guide, Sudenaz Celik who kept on encouraging me to positively go ahead with this book. I am obliged to thank Dr. Cihat Unlu and Dr. Ipek Muderris for their excellent guidance and constant encouragement. Their matchless experience in Assisted Reproductive Technology has been a great help to me write this book. I am extremely thankful to my wife Dr. Nilufer Celik who has always been kind, supportive and approachable even for the most trivial of my problems. Getting the support of my family has always made me feel sheltered. I would also like to thank my friends Dr. Mustafa Ulas and Dr. Suleyman Aydin, who were with me in my most difficult moments. I owe endless thanks to my infertile patients who take every kind of sacrifice to have a baby. Finally, I would like to express my gratitude to the Turkish German Gynecological Foundation (TGGF) for its contributions at all stages from the creation of the scientific infrastructure to the publication of this book.

Prof. Dr. Onder CELIK



TURKISH - GERMAN GYNECOLOGICAL

EDUCATION and RESEARCH FOUNDATION

Book Preface

Assisted reproductive techniques and success rates in IVF reached a point we could not imagine since the first successful IVF application in 1998. Many infertile patients can now have children at the end of a short period.

Although we have achieved such successful results in our field, IVF treatment still fails in many of our patients. The most accused organ here is the "Endometrium". Even in patients with high-quality embryos, successful implantation is sometimes not possible. Hundreds of studies and researches have been carried out and are still in progress in this field.

This book provides researchers with detailed information on the subject of "Endometrium" and "Implantation", from physiology to advanced clinical practice. I have no doubt that researchers and other colleagues will benefit by our book, which is a kind of guide in the field.

I want to express my gratitude to Prof. Dr. Onder CELIK for motivating all of us in presenting such a valuable book in the Turkish Medical Literature and forming the mainframe of this work. Also, I would like to thank all my colleagues who wrote the chapters and to the Academician Publishing House.

Prof. Dr. Cihat UNLU

Dear colleagues

Due to the rapid developments in the field of Reproductive Biology, many readers need different perspectives in order to understand the topics in the published materials. Endometrium is of equal importance to the ovaries in terms of its place and importance in reproductive biology. However, it is a tissue that has not been adequately studied in terms of clinical, molecular and genetic aspects. This book was written by a professional team to explain the importance and mystery of the endometrium to the reader. It is proud that this is the first English book written in our country that tries to explain the endometrium.

This first edition of the book of "The ART of Understanding Endometrium" was created by our writer team as a result of long, meticulous and careful work. In this respect I would like to thank all team mates. All the topics in this book have been written by young scientists in the light of recent developments in reproductive medicine.

Hope to be useful for all readers

Prof. Dr. I. Ipek MUDERRIS

List of Contributors

Onder CELIK, MD, Professor

Private Clinic Obstetrics and Gynecology, Usak, Turkey

Cihat UNLU, MD, Professor

Department of Obstetrics and Gynecology, School of Medicine, Acıbadem University, Istanbul

I. Ipek MUDERRIS, MD, Professor

Department of Obstetrics and Gynecology, Erciyes University School of Medicine, Kayseri, Turkey

Bulent DURAN, MD, Professor Adatıp Private Hospital, IVF Center, Kocaeli, Turkey

N. Engin AYDIN, MD, Emeritus Professor

Izmir Katip Celebi University School of Medicine, Izmir, Turkey

Suleyman AYDIN, PhD, Professor

Firat University School of Medicine, Department of Clinical Biochemistry, Elazıg, Turkey

Ferhat CENGIZ, Embryologist Bahcesehir University Medical Park Hospital IVF Center, Istanbul, Turkey

Safak HATIRNAZ, MD, Associate Professor Medicana Samsun International Hospital IVF Unit, Samsun, Turkey

Semih DALKILIC, PhD Fırat University Faculty of Science Department of Biology, Moleculer Biology and Genetics, Elazig Turkey

Senol SENTURK, MD, Assistant Professor

Recep Tayyip Erdogan University, Faculty of Medicine, Department of Obstetrics and Gynecology, Rize, Turkey

Suat Suphan ERSAHIN, MD, Assistant Professor

Altınbas Üniversity Department of Obstetrics and Gynecology, Istanbul, Turkey

Ertan ZAN, MD Private Clinic Obstetrics and Gynecology, Alanya, Turkey

Nilufer CELIK, MD Department of Clinical Biochemistry, Behcet Uz Children's Hospital, Izmir, Turkey

Sudenaz CELIK, Student Kent College Guzelbahce High School, Izmir, Turkey

Ali Dogukan ANGIN, MD, Chief resident

University of Health Sciences, Dr Lütfi Kirdar Kartal Training and Research Hospital, Department of Obstetrics and Gynecology, Istanbul, Turkey

Emine Eda AKALIN, MD

University of Health Sciences, Dr Lütfi Kirdar Kartal Training and Research Hospital, Department of Obstetrics and Gynecology, Istanbul, Turkey

Banuhan SAHIN MD, Assistant Professor

Amasya University, Sabuncuoğlu Şerefeddin Training and Research Hospital, Gynecology and Obstetrics Clinic, Amasya, Turkey

Bugra SAHIN, MD Turhal State Hospital, Gynecology and Obstetrics Clinic, Tokat, Turkey

Canan Soyer CALISKAN, MD Department of Obstetrics and Gynecology, SBU Samsun Training and Research Hospital, Turkey

Hasan ULUBASOGLU, MD Ankara City Hospital, Turkey

Atiye Aysemin YAGCI, MD Amasya University Department of Gynecology and Obstetrics, Turkey

Samettın CELIK, MD

Training and Research Hospital, Samsun, Turkey

х

Emin USTUNYURT, Associate Professor

Department of Obstetrics and Gynecology, Bursa Yuksek Ihtisas Research and Training Hospital, Bursa, Turkey

Ismail BIYIK, MD

Kutahya Health Sciences University, School of Medicine, Department of Obstetrics and Gynecology, Turkey

Mustafa ULAS, Assistant Professor

Firat University School of Medicine, Department of Physiology, Elazıg, Turkey

Nevzat KARINCA, MD Usak State Hospital, Obstetrics and Gynecology, Usak, Turkey

Mefkure E. SAHIN, MD

Kayseri City Hospital Department of Obstetrics and Gynecology, Kayseri, Turkey

Gokhan ACMAZ, MD, Associate Professor

Department of Obstetrics and Gynecology, Erciyes University School of Medicine, Kayseri, Turkey

Erdem SAHIN, MD, Assistant Professor

Department of Obstetrics and Gynecology, Erciyes University School of Medicine, Kayseri, Turkey

Yusuf MADENDAG, MD, Associate Professor

Department of Obstetrics and Gynecology, Erciyes University School of Medicine, Kayseri, Turkey

Fatma OZDEMIR, MD, Assistant Professor

Department of Obstetrics and Gynecology, Erciyes University School of Medicine, Kayseri, Turkey

Ilknur COL MADENDAG, MD

Kayseri City Hospital Department of Obstetrics and Gynecology, Kayseri, Turkey

Mustafa BERTAN DEMIR, MD

Kayseri City Hospital Department of Obstetrics and Gynecology, Kayseri, Turkey

Mehmet AK, MD

Kayseri City Hospital Department of Obstetrics and Gynecology, Kayseri, Turkey

Aylin SAGLAM, MD

Aksaray University of School of Medicine, Department of Obstetrics and Gynecology, Turkey

Mustafa Dogan OZCIL, MD, Assistant Professor

Department of Obstetrics and Gynecology, Mustafa Kemal University School of Medicine, Hatay, Turkey

xii

Table of Contents

Section I: ENDOMETRIUM and IMPLANTATION

1. ROLE OF ENDOMETRIUM ON SPATIAL ORIENTATION AND
NAVIGATION OF BLASTOCYST
Onder CELIK, Ferhat CENGIZ, Nevzat KARINCA
2. ENDOMETRIUM: HISTOPATHOLOGICAL PERSPECTIVE
N. Engin AYDIN and Aylin SAGLAM
3. EMBRYOLOGY OF UTERUS
Mehmet AK
4. ENDOMETRIUM, EUTOPIC ENDOMETRIUM, PERITONEUM:
ARE THEY OF THE SAME ORIGIN?
Emine Eda AKALIN and Ali Dogukan ANGIN
5. DECIDUA
Ertan ZAN
6. IMPLANTATION
Fatma OZDEMIR, I. Ipek MUDERRIS
7. EARLY PLACENTATION
Aylin SAGLAM
8. MAJOR HISTOCOMPATIBILITY ANTIGENS, ENDOMETRIUM
AND EMBRYO
Mustafa BERTAN DEMIR
9. STEM CELL PROPERTIES OF ENDOMETRIUM
Hasan ULUBASOGLU
10. PARACRINE MEDIATORS OF ENDOMETRIAL GROWTH AND
DIFFERENTIATION
Erdem SAHIN, Yusuf MADENDAG, I. Ipek MUDERRIS

	٠	
v	I	11
л	I	v

11. ESTROGEN AND PROGESTERONE REGULATED	~
ENDOMETRIAL GENES	. 81
Mefkure E. SAHIN, Ilknur C. MADENDAG, I. Ipek MUDERRIS	
12. IMMUNITY AT MATERNAL FETAL EDGE	. 87
Emin USTUNYURT	
13. MATERNAL IMMUNE RECOGNITION OF PREGNANCY	. 95
Mefkure E. SAHIN, I. Ipek MUDERRIS	
14. HORMONAL AND BLASTOCYST MEDIATED ENDOMETRIAL	
DIFFERENTIATION?	101
Gokhan ACMAZ, I. Ipek MUDERRIS	
15. ENDOMETRIAL CHANGES IN EARLY IMPLANTATION 1	107
Fatma OZDEMIR, I. Ipek MUDERRIS	107
16. WINDOW OF IMPLANTATION (WOI)	115
S. Suphan ERSAHIN	
Section II: RECEPTIVITY	
17. ARTIFICIAL BLASTOCYST CONCEPT TO IMPROVE	
ENDOMETRIUM RECEPTIVITY	119
Onder CELIK, Nilufer CELIK, Sudenaz CELIK	,
Onder Ohling, Muller Ohling, Judenal Ohling	
18. GENETIC MARKERS OF ENDOMETRIAL RECEPTIVITY	123
Banuhan SAHIN and Bugra SAHIN	
19. ANDROGENS, ENDOMETRIUM AND RECEPTIVITY GENES	129
Onder CELIK, Senol SENTURK	
20. ENDOMETRIAL RECEPTIVITY ARRAY (ERA)	130
Semih DALKILIC, Nilufer CELIK, and Suleyman AYDIN	139
Semin Direktere, where Celerk, and Surcyman Art Dire	
21. RECEPTIVITY EVALUATION WITH SPECTROSCOPY	153
Onder CELIK, Mustafa ULAS	
22. ULTRASONOGRAPHIC EVALUATION OF ENDOMETRIAL	
RECEPTIVITY 1	157
Atiye Aysemin YAGCI	

	COS AND ENDOMETRIAL RECEPTIVITY163 ilufer CELIK
	NDOMETRIOSIS AND ENDOMETRIUM167 nder CELIK, Safak HATIRNAZ, Cihat UNLU
	RUGS AND ENDOMETRIUM173 nder CELIK, Mustafa ULAS, Mustafa D. OZCIL
Al	URGERY FOR BENIGN GYNECOLOGICAL CONDITIONS ND RECEPTIVITY
EN	CREENING OF ENDOMETRIAL MICROBIOMS BEFORE MBRYO TRANSFER
LI	NDOMETRIUM, EMBRYO AND IMPLANTATION: ITTLE KNOWN FACTS
	STROGEN AND PROGESTERON SUPPORT IN IVF CYCLES 205 umettin CELIK
	OCAL ENDOMETRIAL INJURY
	FFECTS OF SUPEROVULATION ON ENDOMETRIUM
	NDOMETRIAL INJURY SCORING SYSTEM (EISS)233 nder CELIK, Mustafa D. OZCIL