Cancer in Pregnancy and Lactation: The Motherisk Guide
Cancer in Pregnancy and Lactation: The Motherisk Guide

Edited by

Gideon Koren
Founder and Director, Motherisk Program and Professor of Pediatrics, Pharmacology, Pharmacy and Medical Genetics, University of Toronto, Canada.

Michael Lishner
Professor of Medicine, Sackler Faculty of Medicine, Tel Aviv University and Head of Department of Medicine A, Meir Hospital, Kfar Saba, Israel.
Contents

Preface vii
Acknowledgement viii
List of contributors ix

Section 1 – Specific tumors during pregnancy
1. Bone malignancies in pregnancy 1
   Michael Lishner and Alla Osadchy
2. Breast cancer and pregnancy 3
   Liat Mlynarsky and Michael Lishner
3. Cervical cancer during pregnancy 8
   Asnat Walfisch
4. Hepatocellular carcinoma in pregnancy 16
   Parvaneh Yazdani-Brojeni and Michael Lishner
5. Hodgkin’s lymphoma in pregnancy 18
   David Pereg and Michael Lishner
6. Intracranial tumors in pregnancy 21
   Michael Lishner and Geert W. ‘t Jong
7. Treatment of acute and chronic leukemia during pregnancy 24
   Tal Shapira-Rotenberg and Michael Lishner
8. Lung cancer and pregnancy 33
   Hisaki Fujii and Michael Lishner
9. Malignant melanoma and pregnancy 40
   Michael Lishner and Michael P. Tan
10. Non-Hodgkin’s lymphoma during pregnancy 49
    David Pereg and Michael Lishner

Section 2 – Fetal effects of cancer treatments and interventions
11. Ovarian tumors and pregnancy 53
    Rinat Hackmon
12. Thyroid cancer and pregnancy 60
    Michael P. Tan

13. Pregnancy and radiation 69
    Eyal Fenig
14. Chemotherapy during pregnancy 79
    Israel Mazin, David Pereg, and Michael Lishner
15. Nonobstetrical surgical interventions during pregnancy 95
    Bi Lan Wo, Angela Mallozzi, and Alon Shrim

Section 3 – Management of maternal complications during treatment
16. Management of complications associated with cancer or antineoplastic treatment during pregnancy 117
    Michael P. Tan
17. Management of nutritional problems in the pregnant cancer patient 128
    Deborah A. Kennedy
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>Pharmacological and nonpharmacological treatment of chemotherapy-induced nausea and vomiting</td>
<td>134</td>
<td>Caroline Maltepe</td>
</tr>
<tr>
<td>19.</td>
<td>Fertility considerations and methods of fertility preservation in patients undergoing treatment for cancer</td>
<td>143</td>
<td>Avi Leader</td>
</tr>
<tr>
<td></td>
<td><strong>Section 4</strong> – Long-term effects of in utero exposure on children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Long-term neurodevelopment of children exposed in utero to treatment for maternal cancer</td>
<td>157</td>
<td>Irena Nulman, Claire Tobias, BA, and Elizabeth Uleryk</td>
</tr>
<tr>
<td>21.</td>
<td>Fertility of children exposed in utero to chemotherapy</td>
<td>167</td>
<td>Tal Schechter and Ronen Loebstein</td>
</tr>
<tr>
<td>22.</td>
<td>Lactation and cancer chemotherapy</td>
<td>179</td>
<td>Taro Kamiya and Shinya Ito</td>
</tr>
<tr>
<td>23.</td>
<td>Breast cancer and pregnancy: critical review of the effects of prior and subsequent pregnancy on the prognosis of young women with breast tumor</td>
<td>189</td>
<td>Nava Siegelmann-Danieli and Ronen Loebstein</td>
</tr>
</tbody>
</table>

*Index* 206
Preface

Cancer in pregnancy, the tragic collusion of the best time in a woman’s life with her worst of times, creates a serious clinical and ethical challenge. The very drugs that can eradicate rapidly growing cancer may damage the rapidly growing embryo.

Cancer is the second leading cause of death among women during their reproductive years, yet sources of concise data and guidance for the management of cancer in pregnancy are scarce. Cancer in Pregnancy and Lactation: The Motherisk Guide fills that resource gap as it contains updated data published over the past 5 years.

Written by a dedicated group of experts in the fields of clinical pharmacology, maternal–fetal toxicology, and hemato-oncology, this Guide contains the evidence-based information physicians need to address complex issues of maternal diagnosis, treatment, prognosis, and long-term impact on the unborn child.

This book is complemented by the Motherisk On-line Cancer in Pregnancy Consultative Forum. The Forum provides clinicians with ready access to expert guidance and a place to share their clinical experiences. Operational since 2000, the on-line Consultative Forum is receiving questions from individuals throughout the world. Questions and comments to the Forum are reviewed and answered by Consortium of Cancer in Pregnancy Evidence (CCoPE) members.

We invite you to visit the Forum at www.motherisk.org/cforum, review past questions and answers, and submit your own queries and comments. For as more and more clinicians engage in the informed dialog that this Guide and the Consultative Forum promote, their shared insights will help to generate new knowledge. We can think of no more effective way to advance the cause of science while also addressing immediate, life-threatening clinical issues.

Gideon Koren, MD
Michael Lishner, MD
Acknowledgement

Supported by an unrestricted grant by Shoppers Drug Mart, Canada
Contributors

Liat Drucker, MD
Oncogenetic Laboratory, Meir Medical Center, Kfar Saba, Israel

Eyal Fenig, MD
Professor of Oncology, Head of Radiotherapy, Davidoff Center, Rabbin Medical Center, Petha Tikva, Israel

Hisaki Fujii, MD, PhD
Clinical Fellow, Division of Clinical Pharmacology and Toxicology, The Hospital for Sick Children, Toronto, Ontario, Canada

Rinat Hackmon, MD
High Pregnancy Risk Fellow, University of Toronto, Saint Michael's Hospital, Toronto, Ontario, Canada

Shinya Ito, MD, FRCPc
Professor and Division Head, Division of Clinical Pharmacology and Toxicology, The Hospital for Sick Children, Toronto, Ontario, Canada

Geert W. ‘t Jong, MD, PhD
Fellow in Clinical Pharmacology, Division of Clinical Pharmacology and Toxicology, The Hospital for Sick Children, Toronto, Ontario, Canada

Taro Kamiya, MD
Division of Clinical Pharmacology and Toxicology, The Hospital for Sick Children, Toronto, Ontario, Canada

Deborah A. Kennedy, MBA, ND
Graduate Student, Leslie Dan Faculty of Pharmacology, University of Toronto, The Hospital for Sick Children, Toronto, Ontario, Canada

Avi Leader, MD
Resident, Department of Medicine A, Meir Medical Center, Kfar Saba, Israel

Michael Lishner, MD
Professor of Medicine, Sackler Faculty of Medicine, Tel Aviv University and Head of Department of Medicine A, Meir Hospital, Kfar Saba, Israel

Ronen Loebstein, MD
Director, Institute of Clinical Pharmacology and Toxicology, Sheba Medical Center, Tel Hashomer, Israel

Angela Mallozzi, MD
Maternal Fetal Medicine, Department of Obstetrics and Gynecology, Royal Victoria Hospital, Montreal, Quebec, Canada

Caroline Maltepe, BA
Coordinator, Motherisk NVP Helpline, The Motherisk Program, The Hospital for Sick Children, Toronto, Ontario, Canada

Israel Mazin, MD
Department of Medicine, Meir Medical Center, Kfar Saba, Israel

Irena Nulman, MD, FRCPc Neurology, PhD
Associate Director, Motherisk Program, Division of Clinical Pharmacology and Toxicology, The Hospital for Sick Children, Toronto; Associate Professor of Pediatrics, and Program Director, Fellowship Training Program in Clinical Pharmacology, University of Toronto, Ontario, Canada
### List of contributors

<table>
<thead>
<tr>
<th>Name</th>
<th>Position and Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alla Osadchy, MD</td>
<td>Clinical Fellow, Division of Clinical Pharmacology and Toxicology, The Hospital for Sick Children, Toronto, Ontario, Canada</td>
</tr>
<tr>
<td>David Pereg, MD</td>
<td>Doctor of Internal Medicine and Cardiology, Meir Medical Center, Kfar Saba, Israel</td>
</tr>
<tr>
<td>Tal Schechter, MD</td>
<td>Assistant Professor of Pediatrics, Staff Physician, Division of Hematology-Oncology, The Hospital for Sick Children, Toronto, Ontario, Canada</td>
</tr>
<tr>
<td>Tal Shapira-Rotenberg, MD</td>
<td>Department of Internal Medicine A, Meir Medical Center, Kfar Saba, Israel</td>
</tr>
<tr>
<td>Alon Shrim, MD</td>
<td>The Motherisk Program, Division of Clinical Pharmacology and Toxicology, The Hospital for Sick Children, Toronto, Ontario, Canada</td>
</tr>
<tr>
<td>Nava Siegelmann-Danieli, MD</td>
<td>Maccabi Health Services, Tel-Aviv, Israel</td>
</tr>
<tr>
<td>Michael P. Tan, MD, MSc</td>
<td>Motherisk Counselor, Division of Pharmacology and Toxicology, The</td>
</tr>
<tr>
<td>Shelly Tartakover-Matalon, PhD</td>
<td>Researcher, Meir Medical Center, Kfar-Saba and Tel-Aviv University, Tel-Aviv, Israel</td>
</tr>
<tr>
<td>Claire Tobias, BA</td>
<td>Fetal Alcohol Syndrome Clinic Coordinator, The Hospital for Sick Children, Toronto, Ontario, Canada</td>
</tr>
<tr>
<td>Elizabeth Uleryk</td>
<td>Library Director, The Hospital for Sick Children, Toronto, Ontario, Canada</td>
</tr>
<tr>
<td>Asnat Walfisch, MD</td>
<td>High Risk Pregnancy, Department of Obstetrics and Gynecology, Hilil-Yafe Medical Center, Hadera, Israel</td>
</tr>
<tr>
<td>Bi Lan Wo, MD</td>
<td>Fellow in Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Royal Victoria Hospital, McGill University, Montreal, Quebec, Canada</td>
</tr>
<tr>
<td>Parvaneh Yazdani-Brojeni, MD</td>
<td>Clinical Pharmacologist, Research Fellow, The Hospital for Sick Children, Toronto, Ontario, Canada</td>
</tr>
</tbody>
</table>