Dedication

To medical professionals dealing with obesity-related metabolic disorders, at all levels, in the quest for knowledge
Preface

Metabolic surgery is an area of increasing specialization that aims at opening new perspectives in the treatment of morbid obesity and its associated diseases. The knowledge and expertise accruing in this interdisciplinary field are currently driving this specialization rapidly forward. However, because so many experts and disciplines are involved in promoting metabolic surgery, it is difficult to efficiently communicate novel ideas, models, and skills. Metabolic surgery is thriving in large centers, where the newest standards can be met and where patients may expect the highest competence.

The objective of this book is to provide a comprehensive insight into the latest developments in metabolic surgery, thus serving the purpose of all those who are invested in treating and managing patients suffering from morbid obesity. All medical doctors should possess the knowledge and clinical skills to provide sufficient treatment in this multidisciplinary field.

The editors succeeded in recruiting international experts, each of whom helps individually to shed light on the diversity of current treatment options. Each chapter provides the foundation for rational decision-making at a given stage of therapy. Additionally, the book elucidates proper perioperative management and adequate substitution strategies, as well as conservative therapeutic approaches.
# Contents

## I Introduction

1. **History of Obesity and Metabolic Surgery**  ........................................... 3  
   *Oliver Thomusch, MD*
   1.1 Surgical Procedures .................................................. 4  
   1.2 Conclusion .......................................................... 11  
   References ......................................................... 11

2. **Conservative Treatment of Overweight and Obesity**  ......................... 13  
   *Hartmut Bertz MD, Andrea Engelhardt, MD*
   2.1 When to Start ....................................................... 14  
   2.2 Nutrition ........................................................... 14  
   2.3 Guidelines of the German Obesity Society ....................... 15  
   2.4 Sports and Physiotherapy ........................................ 15  
   2.5 Psychotherapy ..................................................... 16  
   2.6 Psychoactive Drugs ................................................ 17  
   2.7 Psychodynamic Therapy .......................................... 17  
   2.8 Pharmacological Therapy ......................................... 17  
   2.9 Conclusion ........................................................ 18  
   References .......................................................... 18

3. **Obesity in Children – a Therapeutic Challenge**  .............................. 21  
   *Ulrike Korsten-Reck, MD*
   3.1 Introduction ......................................................... 22  
   3.2 Epidemiology ....................................................... 22  
   3.3 Pathophysiology .................................................. 22  
   3.4 Genetic Factors .................................................... 22  
   3.5 Diagnostics ......................................................... 23  
   3.6 Pediatric Obesity and Lipid Metabolic Changes .................. 23  
   3.7 Physical Activity .................................................. 23  
   3.7.1 Epidemiology .................................................. 23  
   3.7.2 Physical Activity during Childhood ......................... 23  
   3.7.3 Physical Activity and the Onset of Overweight .......... 24  
   3.8 Therapeutic Principles and Objectives .......................... 24  
   3.9 Integration of Sports into Therapy .............................. 25  
   3.9.1 Complications and Contraindications ....................... 25  
   3.9.2 Results ........................................................ 25  
   3.10 Influence of Intervention on Lipid Metabolism Parameters .... 25  
   3.11 Results of Various Intervention Approaches ................... 26  
   References .......................................................... 27

4. **Obesity and Modern Nutrition** .................................................. 31  
   *Volk Schusdziarra, MD, Johannes Erdmann, MD*
   4.1 Obesity – a Disease ............................................... 32  
   4.2 Obesity-disturbed Regulation or the Nutritional Rape of Evolution? 33  
   4.3 Regulation of Food Intake ....................................... 34  
   4.3.1 Gastrointestinal Mechanisms ................................ 34  
   4.3.2 Signal Transduction from GI Tract to CNS ............... 37  
   4.3.3 Central Mechanisms .......................................... 38  
   4.4 Adipose Tissue and Tonic Control .............................. 39  
   4.5 The Power of Cognitive and Sensory Mechanisms .......... 40  
   4.6 Implication for Obesity Treatment .............................. 41  
   References .......................................................... 41

5. **Physical Activity as A Significant Factor in The Therapy of Obesity**  47  
   *Aloys Berg, MD, Daniel König, MD*
   Conventional Therapeutic Approach .................................. 48  
   Pathophysiology and Diagnostics .................................... 48  
   Significance of Inactivity for the Clinical and Physiological Picture 50  
   Practical Sport Therapy ............................................. 51  
   Contraindications and Complications for Sport Therapy .... 51  
   Conclusions in Practice ............................................. 52  
   References .......................................................... 52

6. **The Role of Adipokines and Gastrointestinal Tract Hormones in Obesity** 53  
   *Julian Świerczynski, MD, Tomasz Sledzinski, MD*
   Introduction .......................................................... 54  
   Free Fatty Acids ..................................................... 56  
   Adipokines ........................................................... 57  
   Obesity, Inflammation, and Cardiovascular Disease .......... 57  
   Obesity and Cancer .................................................. 58  
   The Adipokines ...................................................... 59  
   Cytokines, Chemokines and Growth Factors ..................... 65  
   Other Adipokines .................................................... 65  
   Miscellaneous Substances Produced by Adipose Tissue .... 66  
   Steroid Hormones .................................................... 67  
   The Gastrointestinal Tract Hormones and Obesity .......... 68  
   Circulating Adipokines and Gastrointestinal Tract Hormones in Obese Subjects Prior to and Following Bariatric Surgery . 74  
   References .......................................................... 76
7  Diabetological Assessment of Metabolic Surgery ........................................ 81
   Janusz Gumprecht, MD, Katarzyna Nabrdalik, MD
7.1  Role of Foregut in Diabetes .............................................................. 82
7.2  Bariatric Surgery Studies ................................................................. 83
7.3  Interventional Diabetology ............................................................... 84
7.4  Conclusions ............................................................................. 85
   References ............................................................................. 85

8  Lipids and Bariatric Surgery ................................................................. 89
   Tina Schewe, MD, Karl Winkler, MD
8.1  Metabolism of Lipids .................................................................. 90
8.1.1  Exogenous Lipid Metabolism .................................................. 90
8.1.2  Endogenous Lipid Metabolism ................................................ 90
8.1.3  Reverse Cholesterol Transport .............................................. 90
8.2  Laboratory Methods of Lipid Analysis and Their Clinical Utility .... 91
8.3  Clinical Impact of Hyperlipidemia ................................................ 91
8.3.1  Hypercholesterolemia .............................................................. 91
8.3.2  Hypertriglyceridemia ............................................................... 91
8.3.3  Combined Hyperlipidemia ....................................................... 92
8.4  Atherogenic Dyslipidemia and the Metabolic Syndrome ............... 92
8.5  Therapeutic Considerations ......................................................... 92
8.6  Pathophysiology of Hyperlipidemia in Obese Patients .................. 93
8.7  Lipids after Bariatric Surgery ........................................................ 93
8.7.1  Restrictive Procedures ............................................................ 93
8.7.2  Malabsorptive Procedures ...................................................... 93
8.7.3  Combined Procedures: Malabsorptive and Restrictive .......... 95
8.8  Conclusion ............................................................................. 95
   References ............................................................................. 96

9  The Border of Internal Medicine and Metabolic Surgery .................... 99
   Iwon Karcz-Socha, MD
9.1  Adipose Tissue as the Organ of Internal Secretion ....................... 100
9.2  Neurohumoral Regulation of the Body's Energy Balance and the Development of Obesity ...................... 100
9.3  The Clinical Aspect of Obesity ..................................................... 101
9.4  Diagnosis, and Then What? .......................................................... 102
9.5  Summary ............................................................................. 103
   References ............................................................................. 103

10 Innovative Approach to Treatment of the Metabolic Syndrome ......... 107
    Joel Ricci, MD, Michael Timoney, MD, George Ferzli, MD
10.1  Background ........................................................................ 108
10.2  Diabetes and the Metabolic Syndrome ....................................... 108
10.2.1  Public Health and Economic Crisis ..................................... 108
10.2.2  Success and Failure of Medical Management of Diabetes .... 108
10.3  What Is the Metabolic Syndrome? ............................................. 109
10.4  History of Metabolic Surgery ..................................................... 110
10.5  Pathogenesis of Metabolic Syndrome ....................................... 110
10.5.1  Insulin Resistance ................................................................. 111
10.5.2  The Adipoinsular Axis ........................................................... 111
10.5.3  The Enteroinsular Axis .......................................................... 112
10.6  Metabolic Effects of Gastrointestinal Surgery .............................. 112
10.6.1  Intestinal Malabsorption ........................................................ 113
10.6.2  Hormonal Regulation ............................................................ 114
10.6.3  The Gut Hypothesis ............................................................... 114
10.7  Established Surgical Techniques ................................................. 115
10.7.1  Restrictive Procedures .......................................................... 115
10.7.2  Malabsorptive Procedures .................................................... 116
10.7.3  Novel Techniques ................................................................. 116
10.8  Ongoing Trials .................................................................... 117
   References ............................................................................. 118

11 Venous Thromboembolism – Prophylaxis and Treatment .................... 123
    Stefan Utsolino, MD, Magnus Kaffarnik, MD
11.1  Risk Factors for Venous Thromboembolism ................................. 124
11.2  Clinical Signs of Thromboembolism .......................................... 125
11.2.1  D-Dimer Test .................................................................. 125
11.2.2  Imaging Studies ................................................................. 126
11.3  Pharmacokinetics in the Obese ................................................... 126
11.4  Thromboembolism in Medical Patients ..................................... 126
11.5  Thromboembolism in Bariatric Surgery ...................................... 127
11.6  Dosing of Heparins in the Obese ............................................... 127
11.6.1  Monitoring Low-molecular-weight Heparin ......................... 128
11.6.2  Alternatives to Heparins: Mechanical Measures .................... 129
11.6.3  Anticoagulants under Investigation ..................................... 131
11.7  Bleeding Risk versus Thromboprophylaxis ................................ 131
11.8  Vena caval Filters ................................................................ 132
11.9  Timing of Prophylaxis ............................................................... 132
11.10 Duration of Prophylaxis ............................................................... 133
11.11 Recommendations ................................................................. 133
11.11.1 Prophylaxis of Venous Thromboembolism ................. 133
11.11.2 Therapeutic Anticoagulation .............................................. 133
   References ............................................................................. 133

12 Principals of Nutrition after Surgical Procedure ................................. 137
    Hartmut Bertz, MD, Andrea Engelhardt, MD
12.1  Macronutrients ................................................................ 138
12.1.1  Proteins ........................................................................ 138
12.1.2  Carbohydrates ................................................................. 138
12.1.3  Lipids ........................................................................... 138
25 Modern CT and MR Applications .......... 297
   Tobias Baumann, MD, Elmar Kotter, MD
   25.1 Measurement of Body Fat Content and Distribution by Cross-sectional Imaging .... 298
      25.1.1 Definition and Classification of Adipose Tissue Deposits .......... 298
      25.1.2 Aspects of Adipose Tissue Quantification .......... 299
      25.2 Abdominal Imaging after Metabolic Surgery .... 307
         25.2.1 Abdominal CT after Bariatric Surgery .......... 307
         25.2.2 Pouch Size .......... 309
         25.2.3 Stomach Motility ............ 310
            References .......... 311
   26 Laboratory Tests to Diagnose Nutritional Deficiencies .......... 315
      Julian Swierczynski, MD
      26.1 Macronutrient deficiencies .......... 318
      26.2 Micronutrient deficiencies .......... 323
      26.2.1 Vitamins .......... 323
         26.2.2 Microelements .......... 326
            References .......... 328
   27 Life Quality Tests .......... 331
      Simon Kuesters, MD
      27.1 Introduction .......... 332
      27.2 Medical Outcome Study Short Form 36 .......... 332
      27.3 Impact of Weight on Quality of Life .......... 333
      27.3.1 Outcome after Bariatric Surgery and Quality of Life .......... 332
      27.3.2 Bariatric Analysis and Reporting Outcomes System .......... 333
      27.3.3 Bariatric Quality of Life Index .......... 335
      27.4 Which Test Should Be Used? .......... 335
      28 Pregnancy .......... 339
         Jarek Kobiela, MD, Wojciech Makarewicz, MD,
         Magdalena Wojanowska, MD, Tomasz Stefaniak, MD,
         Lukasz Kaska, MD, A. J. Lachinski, MD
      28.1 Incidence and Implications of Obesity .......... 340
      28.2 Treatment of Obesity: Bariatric Surgery .......... 340
      28.3 Pregnancy after Bariatric Surgery .......... 341
      28.4 Preconception and Antepartum .......... 341
      28.4.1 Vomiting .......... 341
      28.4.2 Nutritional and Micronutrient Deficiencies .......... 341
      28.4.3 Gestational Diabetes and Hypertension .......... 343
      28.4.4 Weight Gain .......... 343
      28.5 Intrapartum .......... 343
      28.6 Postpartum .......... 344
      28.7 Conclusion .......... 344
      28.7.1 Conclusion .......... 345
         References .......... 345
   V Secondary and Redo Operations
   29 Principals of Metabolic Revisional Surgery .......... 349
      W. Konrad Karcz, MD, Waleed Bukhari, MD,
      Simon Kuesters, MD, Mark Daoud, MD
      29.1 Indications for Revisional Surgery .......... 350
      29.2 Contra-indications for revisional Surgery .......... 351
      29.3 Diagnostics Prior to Revision .......... 351
      29.4 Revisional Surgery Following Obsolete
         Bariatric Operations .......... 351
         29.5 Restoration of Restriction .......... 356
         29.6 Introduction of Malabsorption .......... 360
            References .......... 364
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Plastic Surgery after Massive Weight Loss</td>
<td>367</td>
</tr>
<tr>
<td>Björn Stark, MD, Gunther Felmer, MD</td>
<td></td>
</tr>
<tr>
<td>30.1 Introduction</td>
<td>368</td>
</tr>
<tr>
<td>30.2 Timing of Plastic Surgery Procedures and General Considerations</td>
<td>368</td>
</tr>
<tr>
<td>30.3 Body Contouring Procedures</td>
<td>370</td>
</tr>
<tr>
<td>30.3.1 Abdominoplasty</td>
<td>370</td>
</tr>
<tr>
<td>30.3.2 Belt Lipectomy</td>
<td>371</td>
</tr>
<tr>
<td>30.3.3 Thigh Lift</td>
<td>371</td>
</tr>
<tr>
<td>30.3.4 Body Lift</td>
<td>372</td>
</tr>
<tr>
<td>30.3.5 Buttock Lift</td>
<td>373</td>
</tr>
<tr>
<td>30.3.6 Brachioplasty</td>
<td>374</td>
</tr>
<tr>
<td>30.3.7 Mastopexy – Reduction Mammaplasty</td>
<td>375</td>
</tr>
<tr>
<td>30.3.8 Corrections for Gynecomastia</td>
<td>376</td>
</tr>
<tr>
<td>30.3.9 Chest Lift</td>
<td>376</td>
</tr>
<tr>
<td>30.3.10 Facial and Cervical Rhinoplasty (Face-Neck Lift)</td>
<td>377</td>
</tr>
<tr>
<td>30.3.11 Liposuction</td>
<td>377</td>
</tr>
<tr>
<td>30.4 Complications</td>
<td>378</td>
</tr>
<tr>
<td>30.5 Lymphatic Issues in Body-Contouring Surgery</td>
<td>378</td>
</tr>
<tr>
<td>30.6 Conclusions: Plastic Surgery in a Comprehensive Treatment Plan</td>
<td>379</td>
</tr>
<tr>
<td>References</td>
<td>379</td>
</tr>
<tr>
<td>31 Hernias after Bariatric Surgery</td>
<td>381</td>
</tr>
<tr>
<td>Robert E. Brolin, MD</td>
<td></td>
</tr>
<tr>
<td>31.2 Open Procedures</td>
<td>382</td>
</tr>
<tr>
<td>31.3 Laparoscopic Procedures</td>
<td>382</td>
</tr>
<tr>
<td>31.4 Conclusion</td>
<td>385</td>
</tr>
<tr>
<td>References</td>
<td>385</td>
</tr>
<tr>
<td>32 Chronic Venous Insufficiency and Venous Ulcers in the Obese</td>
<td>387</td>
</tr>
<tr>
<td>Carolin Kayser, MD</td>
<td></td>
</tr>
<tr>
<td>32.1 Definition</td>
<td>388</td>
</tr>
<tr>
<td>32.2 Etiology and Risk Factors</td>
<td>388</td>
</tr>
<tr>
<td>32.3 Pathophysiology</td>
<td>388</td>
</tr>
<tr>
<td>32.3.1 Changes in the Major Veins in CVI</td>
<td>388</td>
</tr>
<tr>
<td>32.3.2 Changes in Microcirculation</td>
<td>389</td>
</tr>
<tr>
<td>32.3.3 Associated Changes</td>
<td>389</td>
</tr>
<tr>
<td>32.3.4 Influence of Obesity</td>
<td>389</td>
</tr>
<tr>
<td>32.4 Clinical Findings</td>
<td>390</td>
</tr>
<tr>
<td>32.5 Diagnostics</td>
<td>390</td>
</tr>
<tr>
<td>32.5.1 Radiography</td>
<td>392</td>
</tr>
<tr>
<td>32.5.2 Duplex Scanning</td>
<td>392</td>
</tr>
<tr>
<td>32.5.3 Liquid Crystal Thermography</td>
<td>393</td>
</tr>
<tr>
<td>32.5.4 Air Plethysmography</td>
<td>393</td>
</tr>
<tr>
<td>32.5.5 Photoplethysmography</td>
<td>393</td>
</tr>
<tr>
<td>32.5.6 Ambulatory Venous Pressure</td>
<td>393</td>
</tr>
<tr>
<td>32.5.7 Studies of Microcirculation</td>
<td>394</td>
</tr>
<tr>
<td>32.5.8 Selection of Diagnostic Methods</td>
<td>394</td>
</tr>
<tr>
<td>32.6 Therapy</td>
<td>395</td>
</tr>
<tr>
<td>32.6.1 Mechanical Compression Therapy</td>
<td>395</td>
</tr>
<tr>
<td>32.6.2 Local Skin and Wound Care</td>
<td>396</td>
</tr>
<tr>
<td>32.6.3 Systemic Medical Therapy</td>
<td>396</td>
</tr>
<tr>
<td>32.6.4 Local Medical Therapy</td>
<td>398</td>
</tr>
<tr>
<td>32.6.5 Physical Therapy and Exercise</td>
<td>398</td>
</tr>
<tr>
<td>32.6.6 Interventional Therapy</td>
<td>398</td>
</tr>
<tr>
<td>32.7 Prophylaxis and Aftercare</td>
<td>399</td>
</tr>
<tr>
<td>32.8 Conclusion</td>
<td>399</td>
</tr>
<tr>
<td>References</td>
<td>399</td>
</tr>
<tr>
<td>33 Perspectives of Metabolic Surgery</td>
<td>403</td>
</tr>
<tr>
<td>Goran Marjanovic, MD, W. Konrad Karcz, MD</td>
<td></td>
</tr>
<tr>
<td>33.1 Present conservative therapeutic strategies</td>
<td>404</td>
</tr>
<tr>
<td>33.2 Change in faith: from conservative to bariatric surgery</td>
<td>404</td>
</tr>
<tr>
<td>33.3 Change in thinking: Development of metabolic surgery</td>
<td>405</td>
</tr>
<tr>
<td>33.4 Refinement of metabolic surgery techniques and new directions</td>
<td>405</td>
</tr>
<tr>
<td>33.5 Improving restriction</td>
<td>405</td>
</tr>
<tr>
<td>33.6 Improving the function of the lower oesophageal sphincter</td>
<td>406</td>
</tr>
<tr>
<td>33.7 Improving satiety through neural stimulation</td>
<td>407</td>
</tr>
<tr>
<td>33.8 Change in development: Synthesis of new metabolic operative</td>
<td>408</td>
</tr>
<tr>
<td>33.9 Change of paradigm: Setting new Barriers</td>
<td>408</td>
</tr>
<tr>
<td>References</td>
<td>409</td>
</tr>
<tr>
<td>Subject Index</td>
<td>413</td>
</tr>
</tbody>
</table>