
Varicocele and Male Infertility

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Editors

Varicocele and Male Infertility

A Complete Guide

 Springer

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To my late father, Waldemar Esteves, for instilling the virtues of integrity, perseverance, and enthusiasm. To my wife, Fabiola, and sons, Alexandre and Catarina, for their devotion, love, and support. To late Professor Nelson Rodrigues Netto Jr. (UNICAMP), late Professor Anthony Thomas (Cleveland Clinic), and Professor Ashok Agarwal (Cleveland Clinic) for their guidance and support and for being the giants who take their apprentices by their hands and teach them how to climb and, once on their shoulders, show what to see—helping us to see better and further.

—Sandro C. Esteves

I would like to dedicate this book to my wife, Amy, and our three sons, Maurice, Liam, and Xavier, for their love and support; to my mentors, Dr. Kwan-Lun Ho, Dr. In-Chak Law (Kwong Wah Hospital), and Prof. Ashok Agarwal (Cleveland Clinic), for enriching my life with their guidance and support; to my colleague, Dr. Ringo Wing-Hong Chu, for our friendship; and to our patients for inspiring us the art and science of medicine.

—Chak-Lam Cho

Life has taught us that hard work eventually pays off. This book is a solid evidence of the outcome of devotion and determination. Nonetheless, no man is capable of achieving any accomplishment without the love and support of those who surround him. I am proud to dedicate this book to my beautiful wife, Zeinab, for her unconditional love and continuous encouragement to follow my dreams. To the greatest muse who always shed a light on dreary roads, my darling angels, Sarah and Tala.

I am ever so grateful to Prof. Ashok Agarwal for his utter and absolute belief in me and for the opportunities he made possible. He was the driving force to success at a crucial turning point in my life. Last but not least, my sincere gratitude goes to Dr. Edmund Sabanegh, a wonderful mentor and a role model of total dedication to a promising career.

–Ahmad Majzoub

To my late father, Professor RC Aggarwal, for instilling the virtues of honesty, dedication, and hard work. To my wife, Meenu, and sons, Rishi and Neil-Yogi, for their unconditional love and support. To Professor Kevin Loughlin (Harvard Medical School), late Professor Anthony Thomas (Cleveland Clinic), and Professor Edmund Sabanegh (Cleveland Clinic) for their friendship, guidance, and support and for making an indelible positive impression on my life.

–Ashok Agarwal

Foreword

Varicocele and Male Infertility: A Complete Guide is a comprehensive reference book related to the diagnosis, treatment, and pathophysiology of varicoceles. The reader will find that its 58 chapters cover an extensive time period from antiquity to the present day. Furthermore, the topics include material related to the diagnosis of these lesions, early surgery that was used for the treatment of pain, description of more refined surgery that was introduced in cases of male infertility, and new aspects of the pathophysiology of varicoceles as reported on humans and laboratory animals.

The historical chapters indicate that varicoceles were recognized during the time of the Roman Empire, because these lesions were often visible and palpable and caused pain. Surprisingly, the earliest reported surgery to correct a varicocele was published in the first century AD. Although the anatomy was poorly understood, the rudimentary scrotal surgery seemed adequate to provide pain relief for patients. Therefore, this time frame was the so-called Pain Era, and it lasted until the mid-twentieth century before varicocele surgery was first utilized for the treatment of male infertility.

With the start of the “Fertility Era,” the interest in varicoceles increased dramatically, because many more patients were seen with varicoceles and infertility than pain alone. At the start of this new era, various surgical procedures were introduced, such as high inguinal surgery, microsurgery in the inguinal and subinguinal areas, laparoscopy, and robotic surgery. As a result of these techniques, there were fewer postop hydroceles and fewer injuries to the testicular arteries. In addition, other techniques were introduced for adolescents with varicoceles in an attempt to prevent future infertility. Although these procedures were simplified by the utilization of venography, venous occlusion, and sclerosis, this topic is still being debated, and aspects of the debate are included in the specific chapters of the book.

In the mid-twentieth century, the entire field of male infertility was emerging as it became part of the specialty of urology. During this time period, molecular biologists began to investigate and uncover new findings related to the pathophysiology of varicoceles and infertility. For example, the practical application of clinical venography clarified that there was reflux in the internal spermatic veins due to the absence of valves, and this reflux produced increased scrotal heat and pressures in men with varicoceles. However, recent studies revealed that the pressure within the reflexive veins released reactive oxygen species that affected sperm function. Other recent findings revealed evidence of increased sperm DNA damage among men with varicoceles, and

other studies reported that correction of a varicocele may improve Leydig cell function to increase serum testosterone. Recently, some studies reported that a varicocele may influence the outcome of IVF/ICSI and that alterations in the seminal proteomics may affect sperm production within the testes. Overall, many biological discoveries related to varicoceles have been reported in the last 50 years among men with varicoceles and in laboratory animal models, and these findings have been reported in the book chapters.

In summary, those who read and study this book will have many rewards. The information within the book will serve the readers well in the clinical practice and in the laboratory. Furthermore, the readers will recognize that the editors have selected an outstanding group of investigators and clinicians to develop the chapters for this comprehensive reference book. I am honored to have been a contributor, and I am sure that all of the other contributing authors feel the same way. As the reader proceeds through the chapters, I believe that they will refer to the book frequently. In the future, perhaps some of the readers will be stimulated to become authors themselves. In any case, enjoy the book!

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Preface

Varicocele, from the Latin word *varix* (dilated vein) and the Greek word *kele* (tumor), has been recognized as a clinical entity for over a century. This condition is the leading cause of male infertility, as it can impair spermatogenesis through several distinct pathophysiological mechanisms. However, despite over 2000 scholarly articles published since its first report in the eighteenth century, varicocele still elicits debate among scientists and clinicians. The main reason stems from the fact that not all affected men have decreased fertility and impaired gonadal function, thus making varicocele the most debatable issue in the field of urology, andrology, and reproductive medicine.

The field of reproductive medicine has evolved dramatically over the past 40 years. The advent of ICSI in 1992 ignited a big leap forward in the rapid development of assisted reproductive techniques, while little attention has been given to the evaluation of infertile men. We have witnessed a return of interest in male infertility in recent decades driven by the concept that varicocele treatment does not only enhance sperm quality and improve natural pregnancy outcomes but also pose a positive impact on outcomes of assisted reproduction. Thus, it is the prime time to summarize the pertinent background and latest advances in this ever-changing field.

Varicocele and Male Infertility is written by 105 internationally recognized experts from 13 countries and 5 continents and organized in 7 sections and 58 chapters. Part I, dealing with the origin and pathophysiology of varicocele, is encapsulated in 7 chapters; Part II on the clinical evaluation of varicocele is described in 7 elegantly written chapters; Part III on varicocele therapy is dealt in 15 well-elaborated chapters; Part IV has 10 chapters dealing with the controversies surrounding varicocele; Part V on varicocele debate covers both pro and con positions in 8 impressive chapters; Part VI with 7 chapters covers a variety of clinical case scenarios on varicocele; and, lastly, Part VII with clinical practice guidelines is well covered in 4 articles.

Our book is intended to provide a thoughtful and comprehensive view of the significance of varicocele and its impact in male infertility from a multitude of angles. Controversies and the reasons behind these arguments about varicocele were illustrated to all healthcare professionals and researchers by compiling the work from a group of distinguished, internationally recognized contributors. Essential to any practicing urologist, reproductive specialist, and researcher involved in andrology and reproductive medicine, *Varicocele and Male Infertility* is the first of its kind. Filled with art diagrams,

photographs, and tables, this book is an invaluable resource for learning and teaching. Each chapter includes a section of “key points” to allow rapid acquisition of prominent information. Moreover, multiple-choice questions are provided to test the knowledge of the readers. It is an exciting time to be involved in the treatment of infertility. We genuinely hope that this volume will stimulate your interest and enrich your clinical practice in the management of subfertile men with varicocele.

We, the editors, are extremely grateful to our illustrious group of contributors for generously sharing their time, research, clinical knowledge, and wealth of experience. This book would not have been possible without their generous support. Our book blends the most effective collaboration with the members of Springer Nature. The exceptional support of fabulous Development Editor Michael D. Sova and the most talented Editor Kristopher Spring was instrumental in seeing this book get off board from a mere concept to reality. The editors are truly obliged to their families for their love and constant support.

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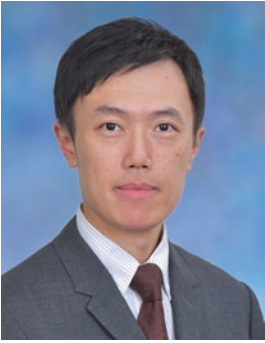
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For more information, visit ResearchGate: https://www.researchgate.net/profile/Ahmad_Majzoub.



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