

ATLAS OF ORAL
& MAXILLOFACIAL
SURGERY DEEPAK KADEMANI & PAUL TIWANA



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ATLAS OF ORAL & MAXILLOFACIAL SURGERY

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ATLAS OF ORAL
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This book is dedicated to the following individuals:

Most importantly, to my wife, Rupam, who above all has made the greatest sacrifices in sharing my life as an academic surgeon. Thank you for raising our beautiful children, Jai (13), and Radha (11). For all your understanding, patience, and unconditional love, I am eternally grateful.

My parents, Yeshwant and Lakshmi, for their love and for the sacrifices they made to allow me every opportunity to pursue my education. My sister, Preet, for her love and support.

To all those who have invested in my education and career. My academic and surgical mentors, Peter Quinn, David Stanton, Lawrence Levin, Raymond Fonesca, John Mooney, Joseph Foote, Barry Hendler, Leon Assael, Eric Dierks, and Bryce Potter—thank you for being so generous.

I am deeply indebted to my great friend and co-editor, Paul Tiwana, for his hard work and dedication in meeting the greatest challenge of developing this book. To our section editors, authors, and artists, without whom this book would not have been possible.

To all my former, current, and future residents and fellows—thank you for inspiring me. I hope you will use this Atlas to establish the foundation of your operative knowledge.

Deepak Kademani

This book is dedicated to the following individuals:

To the surgeons who mentored and trained me:

Mark F. Erickson, Gene Sbalchiero, Timothy A. Turvey, John R. Zuniga, Raymond P. White, George H. Blakey III, Dennis G. Hillenbrand, Ramon L. Ruiz, Jeffrey C. Posnick, Gerald D. Verdi, Brian Alpert, Douglas P. Sinn, and Robert V. Walker.

They have given so much of themselves to my education and my professional life. Thank you.

To my great friend and colleague, Deepak Kademani, who enthusiastically embarked with me on this journey with vision and perseverance.

To our section editors, authors, and medical illustrators, without whom this text would not have been possible. Thank you for your hard work and dedication.

To my current and former residents, who inspire me every day to be the best surgeon I can be and remind me of my true calling: to be a teacher of surgeons.

To my father, Gurdev, and my mother, Balbir. They sacrificed so much to put the education of their children first. Teachers themselves, they fostered in me a passion for my education, the self-discipline needed for achievement, and the courage to follow my dreams. Also to my brother and sister, Dave and Karen. Thank you all for your understanding, support, encouragement, and love.

Most important, to my wife, Karen, and our two beautiful daughters, Jespreet (10) and Simran (8). They, above all, have borne the cost of an academic surgeon's life. Thank you for sharing me with both my patients and my specialty. Your constant support and unconditional love forms my bedrock, gives the compass of my life direction, and is a beacon that draws me home wherever in the world I happen to be.

Paul Tiwana

The diagnosis and management of benign pathology of the oral/head and neck region is a thought-provoking and formidable discipline in our specialty. In many respects, these exercises remain at the core of oral and maxillofacial surgery practice. I thank the authors of the chapters contained within, therefore, for their contributions on the scientific background and techniques associated with the extirpation of benign entities of the jaws, neck, salivary glands, thyroid, and parathyroid glands. With the direction provided by Deepak Kademani and Paul Tiwana, the development of this project has been a very gratifying experience.

Eric R. Carlson

Human anatomy does not change over time, but surgical approaches and techniques certainly do. The Kademani-Tiwana "K-T" Atlas will quickly become a classic and will be regarded by future generations of surgeons of multiple disciplines as a cornerstone of their learning. The scope of this Atlas is reflective of the scope of modern American oral and maxillofacial surgery, which has evolved into better alignment with that of the rest of the world.

I would like to dedicate my modest contribution to this noble effort to my wife, Barbara; our son, Gregor; and my daughter, Louise. Each has sacrificed, either knowingly or not, and their forbearance over the years regarding the time consumed by my academic endeavors is deeply appreciated and can never be adequately compensated.

Eric Dierks

I would like to thank Elsevier and Deepak Kademani and Paul Tiwana for allowing me to participate in this wonderful project as a section editor. I also would like to thank the authors who have contributed to the cosmetic surgery section of this great Atlas, which will be a tremendous edition to our specialty. Students, residents, and faculty will be able to benefit from it for many years to come. Congratulations to everyone involved in this project.

Tirbod Fattahi

I would like to dedicate my small portion of this text to my mentors, Dr. Robert V. Walker, Dr. William H. Bell, and Dr. Douglas P. Sinn—they opened all the doors! Personally, I dedicate this to the loves of my life, Judy and Richard II.

Richard Finn

The depth and completeness of this Atlas provides the reader a contemporary guide to the procedures undertaken in any leading-edge oral and maxillofacial surgery training program. I would like to extend my appreciation to the authors and section editors for their invaluable contributions to this work. In particular, I commend Drs. Kademani and Tiwana for this ambitious and monumental project that will most definitely appeal to a wide readership, in multiple surgical specialties, which will forever be captivated by this surgical Atlas. Finally and most importantly, I wish to extend my thanks and love to my wife Hope and our wonderful children, Gregor, Gracie, Gabrielle, and Garrisyn for their understanding and eternal support.

G.E. Ghali

I would like to thank all of the authors for their tireless effort in contributing to the creation of this important work. They have shared their expertise and dedicated their effort to produce a reconstructive oral and maxillofacial surgery Atlas that is current and will be a great resource for years to come. Their contributions will help improve the life of others by their skills and their dedication to surgery. I would also like to thank Dr. Deepak Kademani and Dr. Paul Tiwana for their vision for this challenging yet rewarding endeavor.

My wife, Kiralina, deserves special thanks for her endless support and encouragement for me to pursue my dreams in Oral and Maxillofacial Surgery while raising our four beautiful children. Thanks to my amazing children, Gavin, Zoe, Sadie, and Austin, for their love which provides the balance that allows me to have a wonderful life.

Alan Herford

To all of the OMS residents who inspire and challenge me every day.

Pamela Hughes

It has been an honor to oversee and edit this section on orthognathic and craniofacial surgery. Just when we think we have matured in this arena of surgery, we continue to see exciting developments—from planning our surgery with the use of virtual technology, to a more clear understanding of outcomes and the stability of our results. Most surgical procedures have changed little, but planning, execution, and stabilization have advanced to a higher level of predictability. This section incorporates all the changes in this surgical arena as well as providing the insight of experienced surgeons in diagnosis, timing of intervention, procedural technique, stabilization, and projected outcomes and expectations. The readers' take-away information will guide their thoughts and surgical outcomes. This is a win/win for both patients and their surgeons.

As this effort concludes on the Atlas by Paul Tiwana and Deepak Kademani, I feel it will be a valuable contribution to our specialty, to the volume of knowledge of our surgeons, and ultimately to patients. For more than 40 years, it has been personally rewarding to be involved in the development of surgical technique, and this effort was completed with affection for my patients and my dedication to OMS. I am, as always, grateful for the guidance of my mentor, Dr. Robert V. Walker, the support of my family, and the loving encouragement of my wife, Diane.

Douglas P. Sinn

I would like to offer my sincere thanks to Deepak Kademani and Paul Tiwana for the opportunity to contribute to their seminal Atlas. The content is sophisticated, yet it is presented clearly through an incredible number of meticulously rendered brand-new medical illustrations. I appreciate the effort each of my section authors put in to produce their high-quality chapters, presenting the boundaries we push at in the arena of dental implants. Personally, I would like to thank my wife, Michelle, for her insight, patience with my schedule, and her unending support of our endeavors.

Martin B. Steed

Reconstructive oral and maxillofacial surgery has experienced significant advances in the recent past, particularly with the addition of microvascular surgical techniques. I would like to thank all the authors for the comprehensive nature of their chapters in grafting techniques, axial flaps, and free tissue transfer, which I expect to be utilized by residents, fellows, and practicing surgeons in the years and decades to come. My thanks to Deepak Kademani and Paul Tiwana for inspiring and seeing this project through. Nothing I do in life comes without my heartfelt thanks to my wife, Jana, and our children, McKinlee, Tanner, Connor, Whitney, Parker, and Carter for their never-ending support.

Brent Ward

Surgery for temporomandibular joint disorders has been, and always should be, within the confines of oral and maxillofacial surgery. It has been an honor and a privilege to have learned from some of the best surgeons as a young resident, and it continues to be an honor and a privilege to work with the authors in the section on TMJ surgery, who continue to teach and evolve the field of TMJ surgery. Together, we hope to pass on our experiences to the next generation of TMJ surgeons. It is our patients and the future generation of patients who will benefit by the efforts and skills illustrated by the authors. Oral and maxillofacial surgeons should look to no one but themselves to provide the treatment and care for TMJ disorders now and in the future. My thanks to Deepak Kademani and Paul Tiwana for providing us the opportunity to make these contributions and their hard work to complete the task of organizing and producing a great Atlas.

John Zuniga

Preface

The first printed atlases were editions of the text of Claudius Ptolemy, an Alexandrian geographer working circa 150 AD. These were illustrated with a set of 27 maps constructed from Ptolemy's calculations. From this first collection, the concept of the atlas was developed: a bound collection of maps covering the current knowledge of a specific geographic region or world. We initially developed this atlas independently with Elsevier. The similarities in our individual concepts led us to combine our efforts in producing this book. Like Ptolemy, we have aimed our collaborative efforts to produce a landmark publication to define the world of our specialty.

Significant geographic differences in the scope of surgical practice from one country to another continue to exist in oral and maxillofacial surgery. These differences often are based on local educational requirements and training standards. Much of the evolution of our specialty is also balanced with the development of complementary specialties in otorhinolaryngology, head and neck surgery, and plastic and reconstructive surgery. Although our foundations are intimately associated with a comprehensive understanding of oral and craniomaxillofacial disease and function and are based in dentistry, the specialty of oral and maxillofacial surgery has evolved to include both a medical and a dental basis of training. This early and comprehensive focus on oral and craniomaxillofacial disease and function creates several distinct advantages: first, a body of knowledge for dealing with the structural anatomy and function of the oral and craniomaxillofacial complex; second, an in-depth familiarity with histopathology and the progression of diseases of the head and neck; and third, an emphasis on the importance of precise surgical reconstruction to ensure that the demands of oral and facial function are met. This atlas was written to take advantage of these unifying strengths of our specialty. It provides a navigational aid that can guide both experienced

surgeons and surgeons in training through new operations and provide a basis for refinements of already established operations in their repertoire. Each chapter is organized in a similar fashion, guiding surgeons through the complex anatomy, instrumentation, technical operative surgery, and modifications. Our aim is that this Atlas will define and capture the global perspective of oral and maxillofacial surgery.

Within the past few decades, we have seen the specialty of oral and maxillofacial surgery grow and expand. Although many books cover this expanded practice of the discipline, we observed that a comprehensive and detailed atlas covering operative technique was absent in the literature. This book is written to provide practicing surgeons, residents, and students the most up-to-date reference for the technical performance and reasoning behind the many types of operations used in our specialty. From the basic to the most complex, readers will find that each chapter is sequentially organized to provide a comprehensive, concise, and practical description of the operative details needed for contemporary surgical delivery of oral and maxillofacial surgery. A formal section on relevant surgical anatomy has been incorporated to further assist the reader. This section is a new idea in a surgical text, and we believe it will enhance the value of this Atlas. Each chapter has been written by an expert surgeon and author who has a specific area of expertise. We would like to express our gratitude to all the section editors and authors for lending their time and expertise to the development of this Atlas.

It is our hope that the information presented here will form the basis of defining the scope of practice of oral and maxillofacial surgery and will provide a basis for education and training for surgeons in the future, with the ultimate goal of improving the quality of patient care across the world.

Foreword

When Paul Tiwana requested a foreword to accompany the *Atlas of Oral and Maxillofacial Surgery*, I was glad to accommodate him. Paul is not just a dedicated and skilled surgeon, but also an educator who has made research contributions to the field. Early on, Paul developed an interest in the surgical management of cleft and craniofacial malformations. His residency training was followed by a formal fellowship in pediatric craniofacial surgery under my direction in Washington, DC, and he now serves as graduate program director, Division of Oral and Maxillofacial Surgery, at the University of Texas Southwestern Medical Center in Dallas. His clinical practice includes the management of cleft and craniofacial anomalies.

Tiwana's and Kademani's intention in the writing and editing of this atlas is to define and capture the global perspective of oral and maxillofacial surgery. Although the education, training, and scope of practice of the specialty vary widely from country to country, the future direction of oral and maxillofacial surgery should be clear. This atlas serves as a beacon by which the specialty can navigate as it continues to define itself.

The atlas is divided into 11 sections with specific surgical procedures. Dividing the atlas into these 11 sections makes sense, based on surgical anatomy and disease considerations. Each section editor was well selected by Paul and Deepak for his or her expertise and past scientific contributions. The detailed surgical procedures covered in the atlas are relevant and, as a group, are comprehensive for the practice of oral and maxillofacial surgery.

An atlas of this depth and breadth rightfully requires the contributions of many authors from around the world. The task of the editors and publisher is to establish and then demand a consistent, readable format; high-quality contributions by each author; and then meticulous editing to avoid the repetition so commonly seen in texts with multiple authors. By definition, an atlas also must have consistently high-quality and accurate illustrations. This atlas achieves all of these objectives, which is a tribute to the joint efforts of each and every author, the illustrator, the editors, and the publisher.

Through the *Atlas of Oral and Maxillofacial Surgery*, Paul and Deepak have made a significant contribution to the specialty and, more important, to the care of children and adults with craniofacial and maxillofacial deformities of all kinds.

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Foreword

Two widely recognized, midcareer, academic oral and maxillofacial surgeons independently approached Elsevier several years ago with remarkably similar proposals for book projects. Each of these well-established leaders was the product of a contemporary advanced training pathway that was not available in the specialty of oral and maxillofacial surgery during the era of Fred Henny and R.V. Walker—*fellowships*. These aspiring authors had each completed fellowships with different foci: Paul Tiwana in craniofacial surgery and Deepak Kademani in head and neck oncologic surgery. The directors of each of their fellowships were themselves the products of dual training: Posnick in oral and maxillofacial surgery (OMFS) in addition to plastic surgery, and myself in oral and maxillofacial surgery as well as otolaryngology. Kathy Falk and John Dolan at Elsevier quickly saw the wisdom of combining the talents of Tiwana and Kademani. Once united, the co-editors assembled a core group of 11 section editors, who represent acknowledged subspecialty experts in American OMFS. They reviewed multiple proposals from medical illustrators and immediately grasped the talent of Joe Chovan as the artist to uniquely convey the visual message that defines an outstanding surgical atlas and that differentiates the best

from the rest. The result—this book—will come to be recognized as the definitive surgical atlas of the OMFS specialty and will have broad appeal to other specialties.

This Atlas represents the contributions of many thought leaders of our specialty, often in collaboration with younger, rising academic stars. This work will serve as a resource to many and at multiple levels. To OMFS residents in training, it will provide a fecund seed for the development of their surgical fund of knowledge. To fellows in OMFS and other related disciplines, this atlas will help refine their skills and perhaps stimulate their own future contributions. Contemporary broad-scope practitioners will readily find a place on their shelves for this thorough reference. It is a distinct pleasure to have been involved in the creation of this atlas.

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We are deeply grateful to our many friends and colleagues who have supported us and contributed to this book. In particular we wish to thank our section editors—Eric Carlson, Eric Dierks, Alan Herford, Tirbod Fattahi, Ghali Ghali, Martin Steed, Douglas Sinn, Richard Finn, Pamela Hughes, Brent Ward, and John Zuniga—who worked tirelessly to complete their editorial efforts. We thank them immensely for their confidence and support in bringing this project to fruition.

We are also indebted to the many authors who gave their time and expertise in contributing to this book to make it a reality. The editorial process was far easier because of the high-quality, timely submissions by all the authors. We owe a particular debt of gratitude to our primary artist on this

project, Joe Chovan. His artistic interpretation of surgical procedures was simply breathtaking. We also would like to acknowledge the artistic contributions of Devon Stuart and Mary Kate Wright.

Finally, we would like to thank the editorial team at Elsevier for supporting our collective vision in developing this project. In particular we would like to thank Brian Loehr for the management of this project from its inception, Kathy Falk for her support and confidence in guiding the development of this Atlas, and John Dolan, who shared the vision, with Kathy, to put us together to make the Atlas a reality.

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