Office-Based Laryngeal Surgery

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To Sawsan, Aya, Adam, and Jad Hamdan

To Dahlia, Ben, and John Sataloff, and Shyam Akula

To Luke James Kilcur

Preface

Advances in technology and instrumentation during the last few decades have improved the precision, case, and popularity of office-based laryngeal surgery. In-office surgery of the larynx has been performed with increasing frequency throughout the world. In patients who have been selected correctly, office-based surgery may provide several advantages over MicroDirect laryngoscopy in the operating room. These include eliminating the risks of general anesthesia, hastening the time from diagnosis to receipt of biopsy results, decreasing health care costs, and other benefits. However, in-office surgery requires expertise, informed patient selection, adequate instrumentation, patient education, and office staff training in order to be performed safely and effectively.

This book is intended to provide otolaryngologists with the information necessary to perform office-based surgery of the larynx appropriately. Much of the information may be known to laryngologists who already perform such procedures; however, many other otolaryngologists could add office-based laryngeal surgery to their practices, thereby offering a valuable option for selected patients. The authors discuss core knowledge essential to laryngeal surgeons, administration of topical anesthesia in an office setting, patient counseling and selection, techniques of various procedures, and other topics that we believe will be helpful for physicians who perform office-based laryngeal surgery.

The first four chapters provide core knowledge helpful in understanding voice disorders and are essential for accurate diagnosis, surgical patient selection, and understanding modern surgical techniques. They are modified with permission from prior publications by the author (RTS). This core information also has been included in the authors' prior books published by Springer for the convenience of our readers, and because mastery of these topics is critical to understanding voice and other laryngeal disorders and to providing optimal treatment. Chapter 1 provides a focused, brief review of the anatomy and physiology of phonation. This information is essential not only in helping to understand and establish diagnoses of laryngeal disorders but also to understand the precision required to achieve optimal outcomes with laryngeal surgery, whether it is performed in the operating room or in the office. Chapters 2 and 3 review the comprehensive medical evaluation (history and

physical examination) performed for patients with voice complaints. Chapter 4, written in collaboration with Johnathan Sataloff, MD, offers an overview of many medical conditions that may affect the voice and of their treatments. In a majority of patients, nonsurgical treatment including voice therapy is appropriate before decisions are made regarding the need for laryngeal surgery, and prior to decisions about the venue in which laryngeal surgery should be performed.

Chapters 5, 6, 7, 8, 9, 10, 11, and 12 provide background information (including literature review) needed for various office-based surgical procedures, details of surgical techniques, illustrations, and videos. Chapter 5 discusses basic principles of in-office surgery, patient selection, safety, and patient tolerance. Much of the material in this chapter is new, but portions of the chapter are modified with permission from prior publications by the author (RTS). Chapter 6 on topical anesthesia discusses appropriate anesthetic agents, modes of administration, effects of topical anesthesia on the larynx and pharynx, and potential systemic complications of topical anesthesia. Chapter 7 discusses basics in surgical techniques and operative approaches for office-based laryngeal surgery including transnasal, percutaneous, and transoral approaches. Chapter 8 reviews office-based injection laryngoplasty. This chapter reviews important anatomical and surgical considerations, sites and force of injection, short-term and long-term outcomes of office-based injection laryngoplasty, and potential complications. The chapter includes case and video examples to assist the reader in understanding the principles put forth. Chapter 9 on office-based laryngeal injection of botulinum toxin discusses the various indications and techniques. Videos provide examples of injection through a flexible endoscope, and external injection using laryngeal electromyographic guidance. Chapter 10, "Office-Based Laryngeal Laser Therapy," provides information on various kinds of lasers, lesions appropriate for office-based laser management, techniques, limitations and complications of in-office laser surgery, and clinical case discussion. Chapter 11 reviews office-based injection of steroids and other substances including cidofovir, 5-fluorouracil, saline, growth factors, and other materials. Special considerations and clinical examples are included. Chapter 12, "Office-Based Laryngeal Biopsy, Excision of Masses and Dilation," presents information on biopsy, precise resection of vocal fold masses, the little-known procedure of in-office laryngeal dilation for laryngeal stenosis, and other topics.

As the popularity of office-based laryngeal surgery continues to increase, it is important for laryngologists, otolaryngologists, nurses and medical assistants, physician assistants, nurse practitioners, speech-language pathologists, singing voice specialists, acting voice specialists, and others involved in the care of patients with voice disorders to understand the principles, precautions, and limitations of office-based laryngeal surgery. While office-based surgery seems intrinsically safer than general anesthesia, monitoring and access to emergency care usually is better in an operating room than in an office, especially if that office is not close to a hospital. For some patients, surgery in an operating room is safer. Patients undergoing surgery in the office require medical evaluation and clearance, informed consent, and other procedures similar to those required for patients undergoing surgery in an operating room and under anesthesia, in many cases. A thorough understanding of

the strengths and limitations of office-based laryngeal surgery allows safe and effective application of this in a valuable option for patient care. The authors hope that this book proves helpful to collect interest in understanding and/or mastering the techniques and judgments required for optimal office-based laryngeal surgery.

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Part II In-Office Surgery

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About the Authors

Abdul-latif Hamdan MD, EMBA, MPH, FACS, is currently Professor of Otolaryngology—Head and Neck Surgery, head of the Division of Laryngology, and director of "Hamdan Voice Unit" at the American University of Beirut Medical Center AUBMC. He is also Adjunct Professor of Otolaryngology—Head and Neck Surgery at Drexel University College of Medicine. Dr. Hamdan completed his medical education and residency training in otolaryngology—head and neck surgery at AUBMC, following which he completed a fellowship in laryngology at Vanderbilt University Medical Center. He has also earned a master's degree in health science, a master's degree in hospital administration, and an executive master's degree in business administration from AUB, in addition to a diploma in strategy and innovation from Oxford University. He is the founder of the "Hamdan Voice Unit" at AUBMC, the "Lebanese Voice Association" in Lebanon, the "Hamdan International Award" at the Voice Foundation, and the Voice Foundation Lebanon Chapter. He is a member of the Voice Foundation Board of Directors and Advisory Board, a fellow of the American College of Surgeons, corresponding fellow of the American Laryngological Association, in addition to being a member of International Association of Phonosurgeons.

Dr. Hamdan is a faculty member in the Department of Otolaryngology Head and Neck Surgery at AUBMC providing clinical care in the field of voice and laryngology, performing the full spectrum of phonosurgical procedures with special emphasis on office-based laryngeal surgery. He has authored and co-authored 160 publications in peer-reviewed and indexed journals. His research covers mainly the laryngeal manifestations of systemic diseases in addition to unsedated office-based laser therapy. He has assumed the position of medical director of strategy and innovation at AUBMC for 3 years following his position as the chairperson of the Faculty Development Committee for 2 years. During his tenure, he had organized several workshops to promote the business aspect of medicine among faculty members. He is the author of seven books, among which are *Strategic Thinking in a Hospital*

Setting, *Laryngeal Manifestations of Systemic Diseases* , *Obesity and Voice*, *Non-Laryngeal Cancer and Voice*, and *Voice Disorders in Athletes, Coaches and other Sports Professionals*. Dr. Hamdan is also a member of the Lebanese Syndicate of Professional Artists and member of Societe des Auteurs, Compositeurs et Editeurs de Musique. He has composed 36 musical tracks and has released four musical CDs.

Robert Thayer Sataloff MD, DMA, FACS, is professor and chairman of the Department of Otolaryngology—Head and Neck Surgery and senior associate dean for clinical academic specialties, Drexel University College of Medicine. Dr. Sataloff is Director of Otolaryngology and Communication Sciences Research at the Lankenau Institute for Medical Research, and Director of Otolaryngology Education at Lankenau Medical Center. He also holds adjunct professorships in the Departments of Otolaryngology—Head and Neck Surgery at Thomas Jefferson University, Temple University, and the Philadelphia College of Osteopathic Medicine, and he is a faculty of the Academy of Vocal Arts. He serves as conductor of the Thomas Jefferson University Choir. Dr. Sataloff is also a professional singer and singing teacher. He holds an undergraduate degree from Haverford College in music theory and composition; graduated from Jefferson Medical College, Thomas Jefferson University; received a Doctor of Musical Arts in Voice Performance from Combs College of Music; and completed residency in otolaryngology – head and neck surgery and a fellowship in otology, neurotology, and skull base surgery at the University of Michigan. Dr. Sataloff is chairman of the board of directors of the Voice Foundation and of the American Institute for Voice and Ear Research. He also has served as chairman of the board of governors of Graduate Hospital; president of the American Laryngological Association, the International Association of Phonosurgery, the Pennsylvania Academy of Otolaryngology—Head and Neck Surgery, and the American Society of Geriatric Otolaryngology; and numerous other leadership positions. Dr. Sataloff is editor-in-chief of the *Journal of Voice*, editor emeritus of *Ear, Nose and Throat Journal*, associate editor of the *Journal of Singing*, editorial board member of *Medical Problems of Performing Artists*, and editorial reviewer for numerous otolaryngology journals. He has written over 1,000 publications including 69 books, and he has been awarded more than $5 million in research funding. His H-index is 43 (as of May 2022). He has invented more than 75 laryngeal microsurgical instruments distributed currently by Integra Medical, ossicular replacement prostheses produced by Grace Medical, and a novel laryngeal prosthesis (patent pending). He holds a patent on a unique thyroplasty implant. His medical practice is limited to care of the professional voice and to otology/neurotology/skull base surgery. Dr. Sataloff has developed numerous novel surgical procedures including total temporal bone resection for formerly untreatable skull base malignancy, laryngeal microflap and mini-microflap procedures, vocal fold lipoinjection, vocal fold lipoimplantation, and others. Dr. Sataloff is recognized as one of the founders of the field of voice, having written the first modern comprehensive article on care of singers, and the first chapter and book on care of the professional voice, as well as having influenced the evolution of the field through his own efforts and through the Voice Foundation for over four decades. Dr. Sataloff has been

recognized by Best Doctors in America (Woodward White Athens) every year since 1992, *Philadelphia Magazine* since 1997, and Castle Connolly's "America's Top Doctors" since 2002.

(*Updated 5/19/2022*)

Mary J. Hawkshaw RN, BSN, CORLN, FCPP, is research professor and vice chair for academic initiatives in the Department of Otolaryngology—Head and Neck Surgery at Drexel University College of Medicine. She has been associated with Dr. Robert Sataloff, Philadelphia Ear, Nose & Throat Associates, and the American Institute for Voice & Ear Research (AIVER) since 1986. Ms. Hawkshaw graduated from Shadyside Hospital School of Nursing in Pittsburgh, Pennsylvania, and received a Bachelor of Science degree in nursing from Thomas Jefferson University in Philadelphia. In addition to her specialized clinical activities, she has been involved extensively in research and teaching. She mentors medical students, residents, and laryngology fellows, and has been involved in teaching research, writing, and editing for over three decades. In collaboration with Dr. Sataloff, she has co-authored more than 183 articles, 102 book chapters, and 20 textbooks. She is on the editorial boards of the *Journal of Voice* and *Ear*, *Nose and Throat Journal*. She has served as secretary/treasurer of AIVER since 1988 and was named executive director of AIVER in January 000. She has served on the board of directors of the Voice Foundation since 1990. Ms. Hawkshaw has been an active member of the Society of Otorhinolaryngology and Head-Neck Nurses since 1998. She is recognized nationally and internationally for her extensive contributions to care of the professional voice.

(*Updated 4/30/2021*)

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Part I
Core Knowledge

Chapter 1
Anatomy and Physiology of the Voice

To treat voice patients knowledgeably and responsibly, health care providers must understand the medical aspects of voice disorders and their treatment. This requires core knowledge of the anatomy and physiology of phonation. The human voice consists of much more than simply the vocal folds, popularly known as the vocal cords. State-of-the-art voice diagnosis, nonsurgical therapy, and voice surgery depend on understanding the complex workings of the vocal tract. Physicians and other health care professionals specializing in the care of voice patients, especially voice professionals, should be familiar with at least the basics of the latest concepts in voice function. The physiology of phonation is much more complex than this brief chapter might suggest, and readers interested in acquiring more than a clinically essential introduction are encouraged to consult other literature [1].

1.1 Anatomy

The larynx is essential to normal voice production, but the anatomy of the voice is not limited to the larynx. The vocal mechanism includes the abdominal and back musculature, rib cage, lungs, pharynx, oral cavity, and nose, among other structures. Each component performs an important function in voice production, although it is possible to produce voice even without a larynx—for example, in patients who have undergone laryngectomy. In addition, virtually all parts of the body play some role in voice production and may be responsible for voice dysfunction. Even something as remote as a sprained ankle may alter posture, thereby impairing abdominal, back, and thoracic muscle function and resulting in vocal inefficiency, weakness, and hoarseness.

The larynx is composed of four basic anatomic units: skeleton, intrinsic muscles, extrinsic muscles, and mucosa. The most important components of the laryngeal skeleton are the thyroid cartilage, cricoid cartilage, and two arytenoid cartilages

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(Fig. 1.1). Intrinsic muscles of the larynx are connected to these cartilages (Fig. 1.2). One of the intrinsic muscles, the *thyroarytenoid muscle* (its medial belly also is known as the vocalis muscle), extends on each side from the vocal process of the

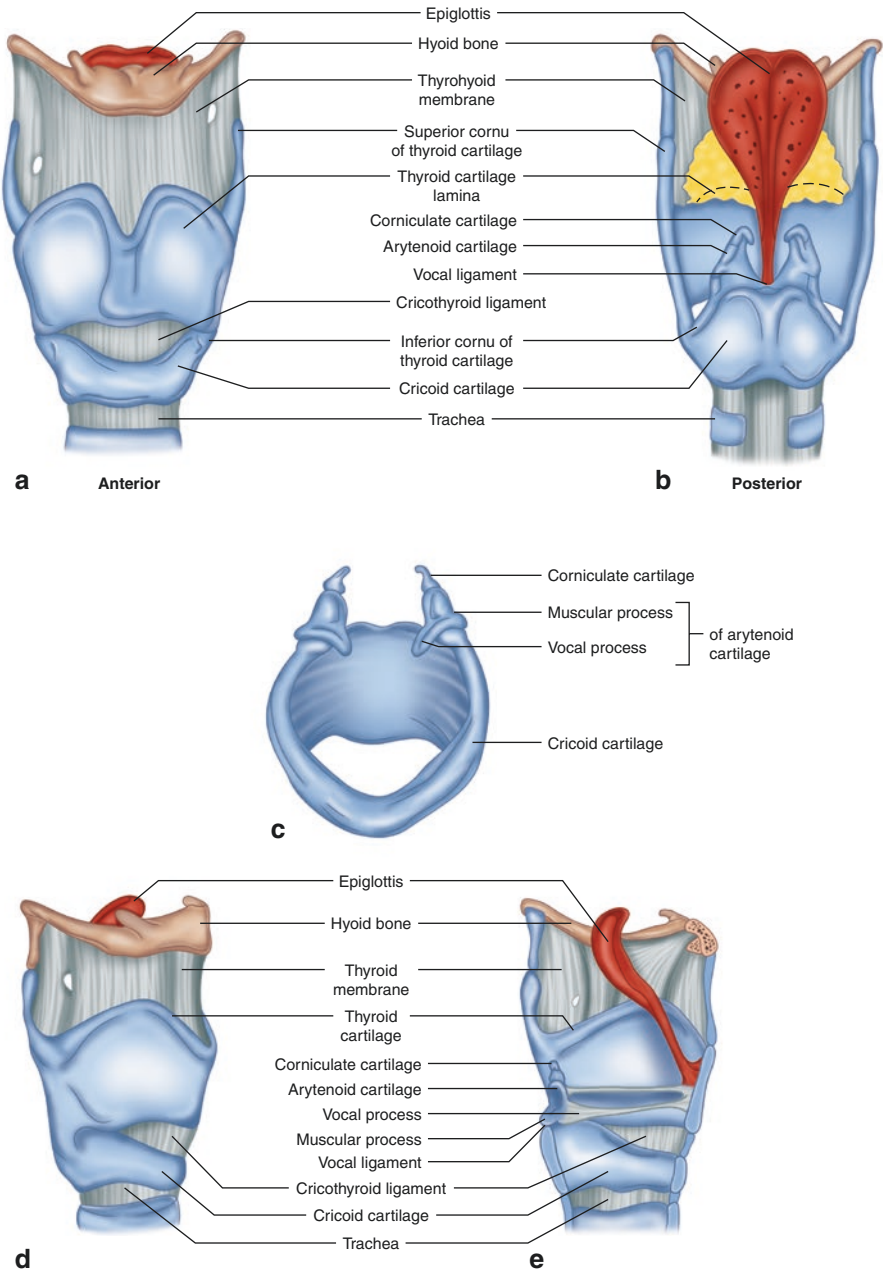

Fig. 1.1 Cartilages of the larynx

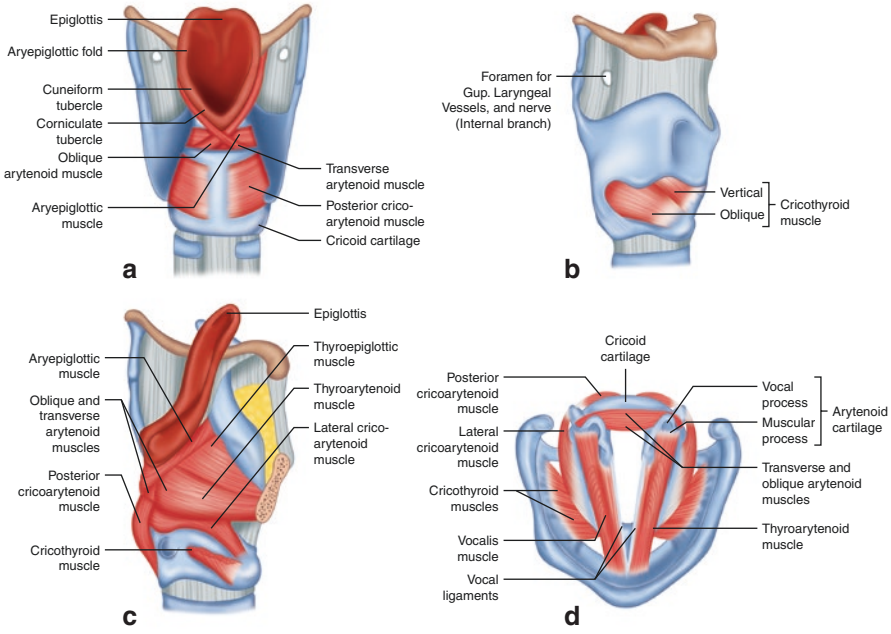

Fig. 1.2 Intrinsic muscles of the larynx

arytenoid cartilage to the inside of the thyroid cartilage just below and behind the thyroid prominence ("Adam's apple"), forming the body of the vocal folds. The vocal folds act as the *oscillator* or *voice source* of the vocal tract. The space between the vocal folds is called the *glottis* and is used as an anatomic reference point. The intrinsic muscles alter the position, shape, and tension of the vocal folds, bringing them together (adduction), moving them apart (abduction), or stretching them by increasing longitudinal tension (Fig. 1.3). They are able to do so because the laryngeal cartilages are connected by soft attachments that allow changes in their relative angles and distances, thereby permitting alteration in the shape and tension of the tissues suspended between them. The arytenoid cartilages on their eliptoid cricoarytenoid joints are capable of motion in multiple planes, permitting complex vocal fold motion and alteration in the shape of the vocal fold edge associated with intrinsic muscle action (Fig. 1.4). All but one of the muscles on each side of the larynx are innervated by one of the two *recurrent laryngeal nerves*. Because this nerve runs in a long course (especially on the left) from the neck down into the chest and then back up to the larynx (hence, the name "recurrent"), it is injured easily by trauma, neck surgery, and chest surgery. Injury may result in vocal fold paresis or paralysis. The remaining muscle (*cricothyroid muscle*) is innervated by the superior laryngeal nerve on each side, which is especially susceptible to viral and traumatic injury. It causes changes in longitudinal tension that are important in voice projection and pitch control. The "false vocal folds" are located above the vocal folds, and unlike