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Vinay V. Kumar
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Editors

Oral and Maxillofacial Surgery for the Clinician

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Preface

An important question that always comes up when a book of this scope and extent is written is: why do we need one more?

This deserves a thoughtful answer and we shall try to do that while tracing the origin and evolution of this book from an idea. Since its inception in 1969, the *Association of Oral and Maxillofacial Surgeons of India* (AOMSI) has made steady and significant progress in terms of its vision and commitment to promote the field. The members of AOMSI have also evolved into a vibrant, multidimensional, passionate, and committed community of oral and maxillofacial surgeons who are making substantial contribution to the field in India and around the world. So it was only natural that the association decided to express its commitment to academic medicine coinciding with its 50th year in existence.

And what better way to express it than publishing an open source comprehensive textbook on oral and maxillofacial surgery. This book showcases the experts and expertise of AOMSI and has been made freely available to surgeons worldwide through generous funding from the association. We are delighted to see this open access book published for free use by worldwide community of MaxFac surgeons, especially the young surgeons and trainees in the field. This book is published with a CCBY license and we encourage associations and institutes to widely distribute the link to this book for maximum possible usage.

The AOMSI was very conscious that the development of our speciality was not an insular one. As we evolved, we looked for guidance and training from colleagues around the world, and in return, we provided our bit of experience and insights. This exchange of knowledge is extremely important for ultimately improving patient treatment methods, techniques, and outcomes. The same spirit was applied in producing this book as well' as we requested eminent clinicians and researchers from around the world along with our members to contribute to this book.

The book has contributions by society's members within India as well as 41 international authors from various countries. Thus, the extent of this makes it one of the most comprehensive textbooks on the topic. The contributors were invited by the AOMSI keeping in mind their scholastic profile while ensuring diversity and inclusiveness as well as a mix of young and experienced surgeons. All the contributors have a track record of being high-volume clinicians and educators in their field of expertise and are generally working at prestigious teaching institutions. This textbook as a scholarly venture condenses and amalgamates both the authors' personal experience as well as being in line with the current evidence-based treatment principles in the field of maxillofacial surgery. In the beginning, the heterogeneous source of knowledge did pose editorial challenges in standardization of the chapter structuring and scope. However, the final outcome has achieved a blend of evidence-based, diverse surgical practices along with cutting-edge technology for the practice of maxillofacial surgery in a fairly uniform format.

As the title suggests, this is meant to be a comprehensive resource for all clinicians, postgraduate trainees, and young surgeons in their day-to-day clinical work. Graduate students and surgeons will find this book useful in preparing for their university exams as well as board-certified exams from professional organizations. The book will help in decision-making, implementing treatment plans, and managing problems that may arise while executing these

plans. Overall, the key objective is to help crystallize current evidence and provide protocols, guidelines, and recommendations to assist dealing with most clinical scenarios. Keeping this objective in mind, we have included components like case scenarios and video recordings of surgical procedures in the book.

Oral and Maxillofacial Surgery for the Clinician is a compilation of 22 sections incorporating 88 chapters dealing with the nuances in the principles and practice of cranio-maxillofacial and head and neck surgery. An important value addition is the library of 68 demonstrational videos that have been compiled to give the readers a more interactive feel with audiovisual inputs.

The book is structured in a step-ladder fashion to guide the reader through the basic principles of surgery before exposing to the full spectrum of specialty cranio-maxillofacial work. The first section is devoted to the origin and scope of oral and maxillofacial surgery as a specialty and a description of the training standards practiced globally. The next four sections are tailored to discuss the prospective patient, investigations, patient preparation, and anesthesia techniques. Subsequent sections focus on minor surgical procedures involving the practice of dento-alveolar surgery, implantology, and orofacial infections. With the above as the basis, the textbook progresses to complex surgical procedures including facial trauma, orthognathic surgery, TMJ, surgical pathology, and craniofacial and reconstructive surgery. The book also features two exclusive sections which provide the readers a perspective on practice management and research and publication.

The editors of the book would like to thank the office bearers of the AOMSI, in particular, the dynamic and effervescent secretary, Pritham Shetty, for the constant support he gave while undertaking this project.

Brishank Pratap, our tireless and innovative illustrator, needs a special mention for his superb rendition of medical and technical illustrations throughout this book.

Our publisher Springer, particularly, Naren Aggarwal and Jagjeet Kaur, deserves our gratitude for constant support and advice throughout the preparation of this book.

Last but not least, we would like to express our deep appreciation for the authors for their time, efforts, and priceless contributions.

We hope this book will be read worldwide, and we look forward to hear its critical reviews.

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Krishnamurthy Bonanthaya did his postgraduate dental studies from Mangalore University, and then he obtained his MBBS from Kasturba Medical College, Manipal. He is also a fellow of the Royal College of Surgeons of England and Royal College of Surgeons of Ireland. He is currently the project director of Smile Train Project treating cleft lip and palate deformities at Bhagwan Mahaveer Jain Hospital, Bangalore. He also holds the position of professor of oral and maxillofacial surgery, Bangalore Institute of Dental Sciences, which involves undergraduate and postgraduate training and the routine mix of maxillofacial surgical management. He is the editor in chief emeritus of the *Journal of Maxillofacial and Oral Surgery* and has numerous publications to his credit.

Elavenil Panneerselvam completed her postgraduation in oral and maxillofacial surgery from the Tamil Nadu Dr. M.G.R. Government Medical University, Chennai, India. She also has a master's degree in business administration, specializing in hospital management, fellowship in Aesthetic Medicine and has been awarded Fellowship in Dental Surgery by the Royal College of Physicians & Surgeons of Glasgow. She has contributed to textbooks on oral anatomy, local anesthesia, plastic surgery, and pediatric TMJ surgery. Presently, she holds a faculty position at the SRM Dental College (Ramapuram), Chennai, as associate professor in oral and axillofacial surgery. She is a recipient of the MM Cooper Memorial Research Award from the Indian Society for Anatomists and the Ginwalla Trophy from the Association of Oral & Maxillofacial Surgeons of India.

Suvy Manuel after his postgraduation from Government Dental College, Trivandrum, University of Kerala, in 2002, gained the Diplomate of National Board in Oral & Maxillofacial Surgery, Membership from the National Academy of Medical Sciences, New Delhi, India; and Diploma of Membership in Oral surgery, Royal College of Surgeons, Edinburgh.

During his tenure in the UK, he attained the Membership of the Faculty of Dental Surgery, Royal College of Surgeons, England. Subsequently, he attained the Fellowship in Dental Surgery, Royal College of Surgeons, Edinburgh. He is the MOMS RCSEd (Diploma of Membership in Oral Surgery) Examiner for the Royal College of Surgeons of Edinburgh in the Faculty of Dental Examiners, as appointed by the Dental Examinations Committee, RCS Edinburgh.

He is former professor and postgraduate guide at the Kerala University of Health Sciences and is a reviewer for the *Journal of Maxillofacial and Oral Surgery*.

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Jimson Samson completed his postgraduate studies at the prestigious the Tamil Nadu Dr. M.G.R. Medical University, Chennai. Since completing his MDS, he has been in academics. He is a journal reviewer and also a section editor. He has lectured at various national and international conferences. He was also a faculty at OMFS workshops.

His special interest in research has made him Vice-Principal—Research at Tagore Dental College & Hospital, Chennai. In addition, he also heads the Department of Oral and Maxillofacial Surgery. He has published in indexed journals. He is now the Hon. State Secretary of the Association of Oral and Maxillofacial Surgeons of India, Tamil Nadu and Puducherry Branch. He is also an elected member of the Executive Committee of the National Association.

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Part I

Introduction

Oral and Maxillofacial Surgery in India: How Did We Get Here and Where Are We Going?

1

Kishore Nayak

1.1 History of Our Missions and Our Challenges

Any discussion about the history of surgery inevitably begins with an invariable reference to *Suśruta* and his contributions to facial surgery, in particular. While the contributions of the sixth-century sage surgeon may somewhat be nebulous in a foggy poorly documented history, they are inevitably (and arguably) numerous but need not be elaborated here in any manner. What is lesser known and not often spoken about is that Suśruta considered surgery the first and foremost branch of medicine and stated, "Surgery has the superior advantage of producing instantaneous effects by means of surgical instruments and appliances. Hence, it is the highest in value of all the medical tantras. It is eternal and a source of infinite piety, imports fame and opens the gates of Heaven to its votaries. It prolongs the duration of human existence on earth and helps men in successfully fulfilling their missions and earning a decent competence in life." [1, 2]

When applied specifically to the context of the specialty of Oral and Maxillofacial surgery (OMS) emerging in India, it raises many important questions on how we have emerged and more importantly what we see ourselves evolving into in the years to come. Perhaps all those debates that we labored along numerous times were all a part of our coming of age!

Like elsewhere in the world, in the mid-twentieth century, we were probably practitioners of dentoalveolar surgery working under very trying circumstances moving on to where we are today. The specialty in India today, is truly all encompassing in its scope. It embraces the entire and extended spectrum of the practice of oral and maxillofacial surgery, and as the Association of Oral and Maxillofacial Surgeons of India (AOMSI) approaches its 50th year in 2019, there is no better time to look back and reflect on the past and contemplate where we are heading. The changes that we have witnessed have been rapid and hopefully progressive. From being oral surgeons, we transitioned and added maxillofacial surgery and to our quiver and perhaps to the chagrin competing specialties treaded into areas, once considered "gray" and broadened the scope of our practices.

Mino S Ginwalla is regarded as the pioneer of oral and maxillofacial surgery in India. In the 1950s, Dr. Ginwalla arrived in Mumbai following surgical training in Montreal, Canada, and set up his practice at Nair Hospital. He was a part of the founding group of surgeons of the AOMSI in 1969. By the mid-70s, training programs were established in most of the major dental colleges throughout India. Today, there are numerous OMS training programs in India.

The dental qualified persons are governed by the statutes of the Dental Council of India [3]. Currently, the Dental Council of India provides for a comprehensive 3-year program that includes a syllabus and curriculum that exposes trainees to standard procedures covering the full spectrum of oral and maxillofacial surgery [4]. This provides a legal framework for the OMS to function. This qualification itself is only permission to practice the specialty. In today's system, competence and eventual ownership of key surgical domains often only come from structured post-qualification training.

Thus, traditionally, the specialty in India continues to be predominately a dental subspecialty that leans toward the idea of a surgical branch of dentistry. While many arguments have been made for and against the need for a medical degree to augment the specialty, it is safe to postulate that for the near future, we will remain a dental specialty for a variety of reasons. North Americans seem to have found a middle ground and of the 101 OMS training programs in the US, 55 are single-degree programs (dental degree only) and 43 are dual-degree (dental and medical) programs, and three offer both options.

Drawing comparisons to the international scenario, the specialty has always been on a pendulous path remaining undecided on the idea of whether it wants to stay a dental

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specialty or whether it wants to incorporate the medical degree. In the USA where this trend initially started, the practice of the specialty is protected by national, regional, and local legislature as a dental specialty. In reality, there is no perceivable practical difference in the scope of practice between single- or double-degree practitioners in the States. In the UK and many parts of Europe, the specialty has taken leaps and bounds toward the medical path of training and it could very well be only a matter of time before the Specialty remains only remotely associated with Dentistry. The primary challenge was a lack of understanding, which centered on the debate of whether a medical as well as a dental qualification was required prior to surgical training [5].

Oral and maxillofacial surgery remains a specialty of dentistry in India and most training programs involve a graduate study and thesis to obtain the Masters in Dental Surgery (MDS) degree. The dental practice act allows all qualified dentally trained oral and maxillofacial surgeons to practice the unrestricted and full scope of the specialty, similar to what occurs in the European nations that require a medical degree. In most of Europe, OMS has become a medical subspecialty.

Public perception of the scope of practice of the specialty remains below par. The specialty gets confused with other surgical domains within both dentistry and medicine that we share a scope.

1.2 Expertise, Familiarity, and Competence

"Innovation is the combination of different ideas and contribution of the different minds."

Laskin [6] attempts to address this problem by dividing the scope of oral and maxillofacial surgery into three parts: areas of expertise, competence, and familiarity.

- Areas of expertise include oral pathology/oral medicine, dentoalveolar surgery, preprosthetic surgery (including implantology), and maxillofacial traumatology.
- Areas of competence involve orthognathic surgery, temporomandibular joint surgery, and local reconstructive surgery.
- Areas of familiarity are cleft lip and palate surgery, regional reconstructive surgery, oncologic surgery, craniofacial surgery, and cosmetic surgery.

Laskin's system of classification, while seemingly appearing comprehensive, opens itself to a lot of debate and question. While there is no doubt that the areas of "expertise" are unique to our specialty, it is our foray into those areas of competence and familiarity that has led to the expansion of the scope of our specialty. This expansion and contraction of our scope may also be fundamental to continual evolution. A large majority of our colleagues in India and worldwide operate within the boundaries of that scope of practice defined as "expertise." However, to turn areas of familiarity into competence and expertise will require that the training units and staff have the required skills and volume of cases to ensure hands-on experience and documentation. Only under these circumstances can we be assured that the skill sets and competencies will be transferred and become enduring.

It is ideal that all trainees are trained to achieve competence in craniomaxillofacial trauma, orthognathic surgery, and TMJ surgery (i.e., maxillofacial surgery). This and only this can provide the transition from Oral to Maxillofacial surgery. There, however, is a clear and present reality that not all training programs are equipped to achieve this goal. Even though training standards and syllabi exist, these standards are so broad that even programs with a very limited scope of training will meet accreditation standards by reporting a narrow set of hospital-based procedures that are not representative of the scope of practice required of modern OMS. Further, the interest of the trainee in training in the full scope of surgery is a factor that leads to mediocre training. The system of choosing a postgraduate training in OMS in India is severely handicapped and primitive. The factors that decide a trainee's choice of an advanced training program have nothing to do with their aptitude or interest in a specialty. It is purely based on their standing in a national entrance examination or their affordability of a position in a private institution. This leads to complete neglect of the student's natural aptitudes leading to prosthodontists becoming orthodontists and endodontists doomed into the world of oral and maxillofacial surgery. A disinterested trainee will be barely motivated to improve the scope of their practice following completion of their training, often limiting their practice to general dentistry and minimal indulgence in areas of "expertise."

Bell [7], when contemplating the future of education and training in the specialty, raises some very valid concerns, which seem to reflect the issues that affect the specialty and its future worldwide. Many reasons for the training disparities exist today—including training program location, the presence or absence of a trauma center, limited head and neck surgery experience, and local politics—but regardless, the goal should be the same: to train oral and maxillofacial surgeons to competence in the core areas of the specialty that they will eventually practice.

The key point is that we, as a specialty, should ensure that we train to competence and expertise based on geographic location, years in practice, fellowship training, and academic involvement. In years past, if an OMS graduate wished to obtain training in any areas beyond basics, then he or she often sought it outside of the specialty, in either oto-

laryngology or plastic surgery. With the emergence of several teaching hospitals and colleges as well as standalone independent centers of excellence, this scenario has drastically transformed in India. Further, the development of a number of fellowships that have been facilitated by the AOMSI has resulted in a robust system within the specialty that caters to the trainee's desire, merit, and quite often desire to embrace technique and technology. The rapid and natural advent of OMS into areas of oncology and reconstruction, cleft lip and palate, craniofacial surgery, and aesthetic surgery has been unprecedented and the critical mass of those who now fit in comfortably with these are their areas of expertise is on the rise.

This has been a radical transformation. A few decades ago, wandering beyond the realms of dentoalveolar surgery and facial trauma inevitably encountered a glass ceiling. Today this has been most certainly breached. Moreover, while the majority of the specialty holds itself within the original areas of expertise, there is no doubt that the Big Bang Moment for OMS in India has happened and it is a great time to contemplate where we are heading. What does the future hold for the specialty as we drift on our very own Starship Enterprise?

1.3 Predicting the Future

"Look back over the past, with its changing empires that rose and fell, and you can foresee the future, too." Marcus Aurelius.

Are we truly at a threshold or are we pieces in some continuum? What factors will drive our evolution as a specialty in India and our extended regions? What trends can we predictably follow to predict our future? Can we perhaps take a page from other fields in medicine to learn about ourselves? Will changing attitudes and aptitude of a new generation have a powerful impact on our profession or will we forever remain loyal to the vestiges of the legacy left behind for us?

Technology will undoubtedly play an important role in our future. Not just technology in patient care, but technology in our lives. Telemedicine and teleconsults will become a part of our everyday practice allowing us to practice beyond geographic limitations. Teleconferencing will make biannual AOMSI face-to-face conferences obsolete. In 2018, the American Association of Oral and Maxillofacial Surgeons (AAOMS) simulcasted their Dental Implant Conference, as did the American Society of Anesthesiologists. Their experience is that the while their total registration at these meetings went up, the number of in-person registrants did not dissipate. Consultant oral and maxillofacial surgeons all over the world have embraced telemedicine naturally, whether they realized it or not. Mobile technology allows the transfer of patient images and radiographs easily both for opinions and treatment planning. Such ease of access to patient images and documents has become a routine tool in emergency room triages of patients in the evaluation of the priority of care.

While technology in its current form is often perceived, as interruptive to one's lifestyle choices, the advent and immersion of artificial intelligence (AI) will make today's technology ubiquitous without being intrusive. Operating theaters of the future are likely to be guarded by artificial intelligence. Imagine an operating theater that prepares itself based on the radiofrequency identification (RFID) of the surgeon who swipes her/his badge at the door—that surgeon's preference cards get read by the system and a central core will prepare the instruments and supplies based on that surgeon's choices for that particular case booked for him.

Anesthesiology, radiology, and pathology are low-hanging fruits in the AI world. Radiologists in large tertiary-care centers in China, today, do not read radiographs anymore; they simply look at false positives read the previous night by their AI system. The system then learns from such mistakes and makes corrections forever. Computer systems today have the capacity of a thousand human brains to process data. The more data we feed these AI systems, the smarter they get. Google's AI product called LYNA or LymphNode Assistant is a trained algorithm that is capable of spotting the features of tumors that have metastasized, which are notoriously difficult to detect. Self-teaching algorithm systems will likely replace monitoring duties of the anesthesiologists and critical care nurses in the hospital.

Surgical robots are also constantly evolving incorporating precision haptics and AI. Robotic arms can already perform tasks independent of a surgeon yielding it. Imperfections and errors that a surgeon may cause in an operation are avoided in robotic surgery by consistent movements, angles, and access that can only be achieved by that robot. Imagine a robotic arm that can be programed to remove a mesioangular impacted mandibular third molar? The robot surgeon can assess the angulation of the impacted tooth based on the patient's radiograph, adjust its angulation and access, make a buccal trough, and split the tooth precisely. Less error and more precision, perhaps?

The day is not far before a robotic arm can obtain a tissue sample from our patients at a mall kiosk. Algorithms can then diagnose that tissue and their radiographs distancing the patient further away from the conventional practice of medicine. What is the future of our practices and our education in these scenarios? A well-informed patient with access to information and technology may surpass the traditional medicine man for their healthcare. Direct to consumer marketing of healthcare tools such as genetic testing is already prevalent in many countries. Several patients are aware of which chemotherapy may be best effective for the management of