

Krishnamurthy Bonanthaya  
Elavenil Panneerselvam  
Suvy Manuel  
Vinay V. Kumar  
Anshul Rai  
*Editors*

# Oral and Maxillofacial Surgery for the Clinician

---

## Oral and Maxillofacial Surgery for the Clinician

---

Krishnamurthy Bonanthaya  
Elavenil Panneerselvam • Suvy Manuel  
Vinay V. Kumar • Anshul Rai  
Editors

# Oral and Maxillofacial Surgery for the Clinician

### *Editors*

Krishnamurthy Bonanthaya  
Bhagwan Mahaveer Jain hospital  
Bangalore  
India

Suvy Manuel  
Ananthapuri Hospitals & Research Institute  
Kerala Institute of Medical Sciences  
Trivandrum, Kerala  
India

Anshul Rai  
Associate Professor  
Department of Dentistry  
All India Institute of Medical Sciences  
Bhopal, Madhya Pradesh  
India

Elavenil Panneerselvam  
Associate Professor  
SRM Dental College, Ramapuram  
Chennai, Tamil Nadu  
India

Vinay V. Kumar  
Department of Maxillofacial Plastic Surgery  
Uppsala University Hospital  
Uppsala  
Sweden

### *Video Editors*

Jimson Samson  
Vice Principal  
Prof & Head of Department  
Department of Oral & Maxillofacial Surgery  
Tagore Dental College & Hospital  
Chennai, India

Nehal Patel  
Director, DCKH Cleft Center  
K. P. Sanghvi Hospital  
Surat, India

### *Illustrator*

Mr Brishank Pratap  
Goa, India

### *Voice-over for Videos*

Madhulaxmi Marimuthu  
Professor  
Saveetha Dental College  
Chennai, India

Vivek Narayanan  
Dean, SRM Dental College  
Kaatangulathur  
Chennai, India



This book is an open access publication.

ISBN 978-981-15-1345-9 ISBN 978-981-15-1346-6 (eBook)

<https://doi.org/10.1007/978-981-15-1346-6>

© The Association of Oral and Maxillofacial Surgeons of India 2021

**Open Access** This book is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this book are included in the book's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the book's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.  
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

---

## 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, post-graduate 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.

Bangalore, India  
Chennai, India  
Trivandrum, India  
Uppsala, Sweden  
Bhopal, India  
Chennai, India  
Surat, India

Krishnamurthy Bonanthaya  
Elavenil Panneerselvam  
Suvy Manuel  
Vinay V. Kumar  
Anshul Rai  
Jimson Samson  
Nehal Patel

---

# Contents

## Part I Introduction

- 1 Oral and Maxillofacial Surgery in India: How Did We Get Here and Where Are We Going? . . . . . 3**  
Kishore Nayak

## Part II Preoperative Assessment and Patient Preparation/Optimization

- 2 Preoperative Evaluation and Investigations for Maxillofacial Surgery . . . . . 11**  
B. Krishnan and Satyen Parida
- 3 Management of Medical Comorbidities in Maxillofacial Surgery . . . . . 25**  
Aditya Moorthy and Shreya Krishna
- 4 Medical Emergencies in Oral and Maxillofacial Surgical Practice . . . . . 49**  
Nallamilli V. S. Sekhar Reddy

## Part III Anesthesia for Oral and Maxillofacial Surgery

- 5 Local Anesthesia in Oral and Maxillofacial Surgery . . . . . 61**  
Reena Rachel John
- 6 Office-Based Anesthesia in Oral and Maxillofacial Surgery-The American Model and Training . . . . . 79**  
Payal Verma and Deepak G. Krishnan
- 7 Anaesthesia for Maxillo Facial Surgery . . . . . 95**  
Rebecca Jacob, Subramanyam S. Mahankali, Renita Maria, Suman Ananathanarayana, Garima Sharma, and Mary Thomas

## Part IV Imaging in Oral and Maxillofacial Surgery

- 8 Radiology for Maxillofacial Surgeons: The Essentials . . . . . 121**  
Shyamsundar K. Joshi and Annie I. Kochuveetil

## Part V Principles of Maxillofacial Surgery

- 9 Operating Room Protocols and Infection Control . . . . . 173**  
Rishi Kumar Bali
- 10 Pharmacotherapy in Oral and Maxillofacial Surgery . . . . . 195**  
Latha P. Rao
- 11 Wound Closure and Care in Oral and Maxillofacial Surgery . . . . . 217**  
Ravi Veeraraghavan

|   |     |
|---|-----|
| <b>12 Postoperative Care of the Maxillofacial Surgery Patient</b> . . . . .                             | 239 |
| J. Naveen Kumar and Poornima Ravi   |     |
| <b>Part VI Dentoalveolar and Oral Surgery</b>   |     |
| <b>13 Principles and Techniques of Exodontia</b> . . . . .  | 259 |
| Anuj Jain   |     |
| <b>14 Management of Impacted Third Molars</b> . . . . .   | 299 |
| George Varghese   |     |
| <b>15 Management of Impacted Canines</b> . . . . .  | 329 |
| George Varghese   |     |
| <b>16 Endodontic Surgery</b> . . . . .  | 349 |
| Deepti Simon  |     |
| <b>17 Preprosthetic Surgery</b> . . . . .   | 361 |
| Bobby John  |     |
| <b>Part VII Dental Implantology</b>   |     |
| <b>18 Basics of Dental Implantology for the Oral Surgeon</b> . . . . .                                  | 385 |
| Supriya Ebenezer, Vinay V. Kumar, and Andreas Thor  |     |
| <b>19 Bone Augmentation Procedures in Implantology</b> . . . . .  | 407 |
| Vinay V. Kumar, Supriya Ebenezer, and Andreas Thor  |     |
| <b>Part VIII Odontogenic Infections</b>   |     |
| <b>20 Odontogenic Infections: General Principles</b> . . . . .  | 429 |
| Anand Shukla and Divya Mehrotra   |     |
| <b>21 Fascial Space Infections</b> . . . . .  | 441 |
| Rajasekhar Gaddipati  |     |
| <b>22 Osteomyelitis, Osteoradionecrosis, and Medication-Related<br/>Osteonecrosis of Jaws</b> . . . . . | 461 |
| Christian Walter and Christoph Renné  |     |
| <b>Part IX Maxillary Sinus and the Oral Surgeon</b>   |     |
| <b>23 Maxillary Sinusitis</b> . . . . .   | 475 |
| Kandasamy Ganesan and Neelam Rathod   |     |
| <b>24 OroAntral Communications and OroAntral Fistula</b> . . . . .                                      | 491 |
| Suvy Manuel   |     |
| <b>Part X Nerve Injuries and Neuralgias of Oral and Maxillofacial Region</b>                            |     |
| <b>25 Trigeminal Nerve Injuries</b> . . . . .   | 515 |
| Tara Renton   |     |
| <b>26 Trigeminal Neuralgia</b> . . . . .  | 531 |
| Kandasamy Ganesan and Asha Thomson  |     |



## **Part XI Benign Pathologies of the Oral and Maxillofacial Region**

- 27 Cysts of the “Oro-Maxillofacial Region” . . . . . 549**  
Neelima Malik
- 28 Benign Odontogenic Tumours . . . . . 577**  
Anjan Kumar Shah
- 29 Reactive Lesions of Oro-Maxillofacial Region . . . . . 599**  
Raja Sekhar Gali
- 30 Fibro-osseous Lesions in the Maxillofacial Region . . . . . 615**  
Taranjit Kaur
- 31 Vascular Anomalies of the Oro-Maxillofacial Region . . . . . 629**  
Sanjiv Nair and Sunil S. Shroff

## **Part XII Aesthetic Procedures in Oral and Maxillofacial Region**

- 32 Non-surgical Modalities of Facial Rejuvenation and Aesthetics. . . . . 661**  
Arun Kumar Panda and Aarti Chowdhary
- 33 Botulinum Toxin and Fillers for Maxillofacial Esthetics. . . . . 691**  
Sainath Matsa
- 34 Hair Transplantation . . . . . 707**  
Sreedhar Reddy Pothula and B. S. Jayanth
- 35 Ear Reconstruction. . . . . 731**  
Paritkumar Ladani
- 36 Management of Facial Scars . . . . . 747**  
Velupillai Ilankovan and Anna Sayan
- 37 Surgical Facelift. . . . . 759**  
Velupillai Ilankovan and Tian Ee Seah
- 38 Rhinoplasty . . . . . 775**  
Nasir A. Nasser

## **Part XIII Advances in Oral and Maxillofacial Surgery**

- 39 Lasers in Oral and Maxillofacial Surgery . . . . . 817**  
Shravan Renapurkar and Robert A. Strauss
- 40 Piezosurgery in Oral and Maxillofacial Surgery . . . . . 831**  
Shravan Renapurkar and Sowjanya Nagamalla
- 41 Computer-Assisted Navigation Surgery in Oral and Maxillofacial Surgery. . . . 841**  
Shintaro Sukegawa and Takahiro Kanno

## **Part XIV Practice Management in Oral and Maxillofacial Surgery**

- 42 Human Factors Recognition to Enhance Team Working  
and Safer Patient Care . . . . . 865**  
Peter A. Brennan and Rachel S. Oeppen

|           |  |     |
|-----------|--|-----|
| <b>43</b> | <b>De Novo Practice of Oral and Maxillofacial Surgery</b> .....        | 871 |
|           | Srinivas Gosla Reddy and Avni Pandey Acharya                           |     |
| <b>44</b> | <b>Medicolegal Issues in Maxillofacial Surgery</b> .....               | 883 |
|           | George Paul and Manjunath Rai  |     |
| <b>45</b> | <b>Research and Publishing in Oral and Maxillofacial Surgery</b> ..... | 927 |
|           | George Dimitroulis   |     |

## **Part XV Salivary Gland Pathologies**

|           |   |     |
|-----------|---|-----|
| <b>46</b> | <b>Salivary Gland Pathologies</b> .....                           | 939 |
|           | Nisheet Anant Agni  |     |
| <b>47</b> | <b>Obstructive Salivary Gland Disease and Sialendoscopy</b> ..... | 975 |
|           | Prithvi S. Bachalli and Aditya Moorthy                            |     |

## **Part XVI Maxillofacial Traumatology**

|           |  |      |
|-----------|--|------|
| <b>48</b> | <b>Primary Assessment and Care in Maxillofacial Trauma</b> .....                               | 983  |
|           | Saurabh Saigal and Manal M. Khan   |      |
| <b>49</b> | <b>Management of Soft Tissue Injuries in the Maxillofacial Region</b> .....                    | 997  |
|           | Abhay Datarkar and Shikha Tayal  |      |
| <b>50</b> | <b>Dentoalveolar Injuries and Wiring Techniques</b> .....                                      | 1013 |
|           | Omkar Anand Shetye   |      |
| <b>51</b> | <b>Principles of Internal Fixation in Maxillofacial Surgery</b> .....                          | 1039 |
|           | Abhilasha Yadav  |      |
| <b>52</b> | <b>Fractures of the Mandible</b> .....   | 1053 |
|           | Anshul Rai   |      |
| <b>53</b> | <b>Fracture of the Mandibular Condyle</b> .....  | 1085 |
|           | Vikas Dhupar   |      |
| <b>54</b> | <b>Intraoral Endoscopic Approach for Treatment of Condylar Fractures of the Mandible</b> ..... | 1115 |
|           | Frank Wilde  |      |
| <b>55</b> | <b>Maxillary Fractures</b> .....   | 1125 |
|           | Oommen Aju Jacob and Akhilesh Prathap  |      |
| <b>56</b> | <b>Fractures of the Zygomaticomaxillary Complex</b> .....                                      | 1151 |
|           | Elavenil Panneerselvam, Poornima Ravi, and B. Sasikala   |      |
| <b>57</b> | <b>Orbital Fractures</b> .....   | 1201 |
|           | Ananthanarayanan Parameswaran, Madhulaxmi Marimuthu, Shreya Panwar, and Beat Hammer            |      |
| <b>58</b> | <b>Frontal and Naso-Orbito-Ethmoid Complex Fractures</b> .....                                 | 1251 |
|           | Kannan Balaraman   |      |
| <b>59</b> | <b>Gunshot Injuries of the Maxillofacial Region</b> .....                                      | 1267 |
|           | Lt Col Rohit Sharma and Maj Anson Jose   |      |
| <b>60</b> | <b>Panfacial Fractures</b> .....   | 1283 |
|           | Kiran S. Gadre, Balasubramanya Kumar, and Divya P. Gadre                                       |      |

|  |      |
|--|------|
| <b>61 Residual Deformities of the Maxillofacial Region</b> .....                                   | 1303 |
| Samson Jimson  |      |
| <b>Part XVII Temporomandibular Joint Disorders</b>   |      |
| <b>62 Myofascial Pain Dysfunction Syndrome</b> .....   | 1343 |
| Mirza Farhatullah Baig and Yashoda Ashok   |      |
| <b>63 Internal Derangements of the Temporomandibular Joint</b> .....                               | 1361 |
| Gary Warburton   |      |
| <b>64 Temporomandibular Joint Dislocation</b> .....  | 1381 |
| V. B. Krishnakumar Raja  |      |
| <b>65 Temporomandibular Joint Ankylosis</b> .....  | 1401 |
| Sonal Anchlia  |      |
| <b>Part XVIII Orthognathic Surgery</b>   |      |
| <b>66 Diagnosis and Planning in Orthognathic Surgery</b> .....                                     | 1437 |
| Johan P. Reyneke and Carlo Ferretti  |      |
| <b>67 Surgery-First Orthognathic Approach</b> .....  | 1463 |
| N. Viveka Vardhan Reddy and Abhinand Potturi   |      |
| <b>68 Orthognathic Surgery for Mandible</b> .....  | 1477 |
| Varghese Mani  |      |
| <b>69 Orthognathic Surgery for the Maxilla-LeFort I and Anterior<br/>Maxillary Osteotomy</b> ..... | 1513 |
| Ashok Dabir and Jayesh Vahanwala   |      |
| <b>70 Facial Asymmetry</b> .....   | 1549 |
| Neelam N. Andrade, Paul Mathai, and Neha Aggarwal  |      |
| <b>71 Obstructive Sleep Apnea Syndrome</b> .....   | 1577 |
| Suresh Menon   |      |
| <b>Part XIX Developmental Deformities of the Oral and Maxillofacial Region</b>                     |      |
| <b>72 Cleft Lip</b> .....  | 1593 |
| Pritham N. Shetty, Jaideep Singh Chauhan, Mamatha Patil,<br>Neha Aggarwal, and Dipesh Rao          |      |
| <b>73 Cleft Palate</b> .....   | 1633 |
| P. V. Narayanan and H. S. Adenwalla  |      |
| <b>74 Alveolar Bone Grafting</b> .....   | 1655 |
| Veerabahu Muthusubramanian and Kalarikkal Mukundan Harish  |      |
| <b>75 Cleft Maxillary Hypoplasia</b> .....   | 1675 |
| Philip Mathew, Mustafa. K, and Paul Mathai   |      |
| <b>76 Cleft Rhinoplasty</b> .....  | 1703 |
| Sunil Richardson and Rakshit Vijay Sinai Khandeparker  |      |

**Part XX Craniofacial Anomalies**

- 77 Rare Facial Clefts** ..... 1735  
Srinivas Gosla Reddy and Avni Pandey Acharya
- 78 Hemifacial Microsomia (HFM) and Treacher Collins Syndrome** ..... 1769  
Manikandhan Ramanathan
- 79 Modern Management of Craniosynostosis** ..... 1813  
David Koppel and Jaime Grant

**Part XXI Malignant Pathologies of the Oral and Maxillofacial Region**

- 80 Premalignant Lesions and Conditions of the Oral Cavity** ..... 1845  
El Mustafa, Sat Parmar, and Prav Praveen
- 81 Oral Squamous Cell Carcinoma: Diagnosis and Treatment Planning** ..... 1853  
Vijay Deshmukh and Kishore Shekar
- 82 Principles of Surgical Management of Oral Cancer** ..... 1869  
Sushma Mehta and Moni Abraham Kuriakose
- 83 Sarcoma of the Maxillofacial/Head and Neck Region** ..... 1893  
D' Souza Jacob and Boyapati Raghu
- 84 Adjunctive Therapy in Oral Cancer** ..... 1903  
Amit Dhawan
- 85 Access Surgeries and Osteotomies for the Maxillofacial Region** ..... 1915  
Madan G. Ethunandan

**Part XXII Reconstructive Procedures of the Oral and Maxillofacial Region**

- 86 Soft Tissue Reconstruction of the Maxillofacial Region** ..... 1941  
Benjamin Turner, John Collin, and Rui Fernandes
- 87 Distraction Osteogenesis of the Maxillofacial Region** ..... 1969  
R. S. Neelakandan
- 88 Hard Tissue Reconstruction of the Maxillofacial Region** ..... 1997  
Srinivasa R. Chandra and Vijay Pillai

---

## List of Videos

- Video 7.1 Demonstrates the technique of blind nasal intubation
- Video 7.2 Demonstrates the various steps involved in submental intubation
- Video 11.1 Various intra oral suturing techniques
- Video 14.1 Surgical removal of impacted lower third molar (Mesio angular)
- Video 14.2 Surgical removal of impacted lower third molar (Horizontal)
- Video 14.3 Surgical removal of impacted maxillary third molar
- Video 15.1 Surgical removal of impacted maxillary canine
- Video 17.1 Labial Frenectomy
- Video 17.2 Lingual Frenectomy
- Video 18.1 Posterior tooth replacement (Implant)
- Video 18.2 Immediate (Extraction socket) implant placement
- Video 18.3 Multiple teeth implant placement
- Video 18.4 Placement of zygoma implant
- Video 19.1 Chin graft
- Video 19.2 Placement of zygoma implant
- Video 24.1 OAF Closure by buccal advancement flap along with Caldwell luc procedure and nasal antrostomy
- Video 26.1 Ginwala operation
- Video 27.1 Cyst enucleation (mandible)
- Video 27.2 Cyst enucleation (maxilla)
- Video 28.1 Mandibulectomy (marginal)
- Video 28.2 Mandibulectomy (segmental)
- Video 30.1 Surgical management (bone recontouring) of fibrous dysplasia
- Video 32.1 Facial rejuvenation-HIFU
- Video 33.1 Botox injection for facial wrinkles
- Video 34.1 Hair transplant—FUE
- Video 34.2 Hair transplant—FUT
- Video 35.1 Ear reconstruction
- Video 38.1 Rhinoplasty
- Video 46.1 Sialolith-Removal of Sub mandibular calculi
- Video 46.2 Surgical excision of mucocele
- Video 46.3 Superficial Parotidectomy
- Video 47.1 Sialoendoscopy (mandibular)
- Video 48.1 Tracheostomy
- Video 50.1 Eyelet wiring technique
- Video 50.2 Arch bar technique
- Video 50.3 IMF technique
- Video 52.1 ORIF of mandibular symphysis fracture
- Video 53.1 Submandibular incision
- Video 53.2 Transmasstetric approach
- Video 53.3 Retromandibular approach
- Video 53.4 Pre auricular incision

- Video [53.5](#) Alkayat bramley incision
- Video [53.6](#) Rhytidectomy incision
- Video [56.1](#) Gillies temporal approach
- Video [56.2](#) Lateral brow incision
- Video [57.1](#) Infra-orbital approach for orbital fracture
- Video [57.2](#) Trans-conjunctival approach for orbital floor reconstruction with 3D mesh
- Video [63.1](#) Level 1 Arthroscopy of TMJ
- Video [63.2](#) Level 2 Arthroscopy of TMJ
- Video [63.3](#) Level 3 Arthroscopy of TMJ
- Video [65.1](#) TMJ ankylosis-interpositional gap arthroplasty
- Video [68.1](#) BSSO with bur
- Video [68.2](#) BSSO with saw
- Video [68.3](#) Genioplasty
- Video [69.1](#) Lefort 1 osteotomy
- Video [69.2](#) Anterior maxillary osteotomy
- Video [72.1](#) Millard rotation advancement repair
- Video [72.2](#) Bilateral cleft lip repair
- Video [73.1](#) Suspension palatoplasty
- Video [73.2](#) Revision palatoplasty Furlow
- Video [73.3](#) Partial palatal split palatoplasty
- Video [75.1](#) Anterior maxillary distraction
- Video [75.2](#) Cleft osteotomy (Lefort 1)
- Video [76.1](#) Cleft rhinoplasty
- Video [81.1](#) Wide excision of precancerous lesion
- Video [82.1](#) Modified radical neck dissection (MRND)
- Video [87.1](#) Extra oral mandibular Molina Distractor
- Video [88.1](#) Free fibula osteocutaneous flap harvesting

---

## Chapter Contributors and Video Contributors

---

### Contributors

**Avni Pandey Acharya** GSR Institute of Cranio-maxillofacial & Facial Plastic Surgery, Hyderabad, Telangana, India

**H. S. Adenwalla** Department of Plastic Surgery, Burns and the Charles Pinto Centre for Cleft Lip, Palate and Craniofacial Anomalies, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India

**Neha Aggarwal** Nair Hospital Dental College, Mumbai, Maharashtra, India  
Meenakshi Cleft and Craniofacial Centre, Chennai, Tamil Nadu, India

**Nisheet Anant Agni** Department of Oral and Maxillofacial Surgery, SMBT Institute of Dental Sciences and Research, Nashik, India

**Suman Ananathanarayana** Department of Anesthesiology, Columbia Asia Referral Hospital, Yeshwantpur, Bangalore, Karnataka, India

**Sonal Anchlia** Department of Oral & Maxillofacial Surgery, Government Dental College & Hospital, Ahmedabad, Gujarat, India

**Neelam N. Andrade** Department of Oral and Maxillofacial Surgery, Nair Hospital Dental College, Mumbai, Maharashtra, India

**Yashoda Ashok** Department of Oral and Maxillofacial Surgery, Meenakshi Ammal Dental College and Hospitals, Chennai, Tamil Nadu, India

**Prithvi S. Bachalli** Department of Oral and Maxillofacial Surgery, Rangadore Memorial Hospital, Apollo Hospitals, Bangalore, Karnataka, India

**Mirza Farhatullah Baig** Department of Oral and Maxillofacial Surgery, Saveetha Dental College, Chennai, Tamil Nadu, India

**Kannan Balaraman** Department of Oral and Maxillofacial Surgery, Ganga Medical Centre and Hospitals, Coimbatore, Tamil Nadu, India

**Rishi Kumar Bali** Postgraduate Department of OMFS, DAV Dental College Hospital, Yamunanagar, Haryana, India

**Peter A. Brennan** Maxillofacial Unit, Queen Alexandra Hospital, Portsmouth, UK

**Srinivasa R. Chandra** Department of Head and Neck Oncology and Reconstructive Microvascular and Oral and Maxillofacial Surgery, Fred and Pamela Buffett Cancer Center, UNMC, Omaha, NE, USA

**Jaideep Singh Chauhan** Department of Maxillofacial Surgery, the Smile Train CHL Hospital, Indore, Madhya Pradesh, India

**Aarti Chowdhary** Department of Periodontology, SD Dental College and Hospital, Parbhani, Maharashtra, India

**John Collin** Department of Oral and Maxillofacial Surgery, University of Florida, Jacksonville, FL, USA

**Ashok Dabir** D. Y. Patil University School of Dentistry, Nerul, Navi Mumbai, India  
Breach Candy Hospital, Mumbai, India

**Abhay Datarkar** Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Medical College Premises, Nagpur, Maharashtra, India

**Vijay Deshmukh** Deshmukh Institute of Maxillofacial Surgery and Research Centre, Aurangabad, Maharashtra, India

JIIU'S Indian Institute of Medical Sciences, Jalna, Maharashtra, India

**Amit Dhawan** Department of Oral and Maxillofacial Surgery, SGRD Dental Institute, Amritsar, India

**George Dimitroulis** Maxillofacial Unit, St. Vincent's Hospital—University of Melbourne, Melbourne, Australia

**Vikas Dhupar** Department of Oral and Maxillofacial Surgery, Goa Dental College and Hospital, Bambolim, Goa, India

**Supriya Ebenezer** Department of Oral Surgery and Stomatology, University of Bern, Bern, Switzerland

**El Mustafa** Department of Oral and Maxillofacial Surgery, Queen Elizabeth Hospital, Birmingham, UK

**Madan G. Ethunandan** Consultant Oral and Maxillofacial/Skull Base Surgeon, Honorary Senior Clinical Lecturer, Lead, Head and Neck Cancer, University Hospital Southampton, Southampton, UK

**Carlo Ferretti** , Johannesburg, South Africa  
Department of Maxillofacial and Oral Surgery, University of Pretoria, Pretoria, South Africa

**Rui Fernandes** Department of Oral and Maxillofacial Surgery, Head and Neck Oncologic Surgery and Microvascular Fellowship, University of Florida, Jacksonville, FL, USA

**Rajasekhar Gaddipati** Department of Oral and Maxillofacial Surgery, Mamata Dental College, Khammam, Telangana, India

**Divya P. Gadre** Gadre Clinic, Pune, Maharashtra, India

**Kiran S. Gadre** Gadre Clinic, Pune, Maharashtra, India  
Department of Oral and Maxillofacial Surgery, Bharati Vidyapeeth Dental College and Hospital, Pune, Maharashtra, India

**Raja Sekhar Gali** Department of Oral and Maxillofacial Surgery, Narayana Dental College and Hospital, Nellore, Andhra Pradesh, India  
Medicover Hospital, Nellore, Andhra Pradesh, India

**Kandasamy Ganesan** Department of Oral and Maxillofacial Surgery, Southend University Hospitals NHS Trust, Southend-on-Sea, UK  
University of Leeds, Leeds, UK

**Jaime Grant** Birmingham Children's Hospital, Birmingham, UK

**Beat Hammer** CFC Hirslanden Kopf Zentrum, Aarau, Switzerland



**Kalarikkal Mukundan Harish** Department of Oral & Maxillofacial Surgery, Ragas Dental College, Chennai, Tamil Nadu, India

**Velupillai Ilankovan** Oral and Maxillofacial Surgery, Poole Hospital NHS Foundation Trust, Poole, UK

**D' Souza Jacob** Maxillofacial Unit, Royal Surrey County Hospital, Guilford, UK

**Oommen Aju Jacob** Department of Oral and Maxillofacial Surgery, Ananthapuri Hospitals and Research Institute, Trivandrum, Kerala, India

Kerala Institute of Medical Sciences, Trivandrum, Kerala, India

**Rebecca Jacob** Department of Anesthesiology, Columbia Asia Referral Hospital, Yeshwantpur, Bangalore, Karnataka, India

**Anuj Jain** Oral and Maxillofacial Surgeon, Department of Trauma and Emergency Medicine, All India Institute of Medical Sciences, Bhopal, Madhya Pradesh, India

**B. S. Jayanth** Oral and Maxillofacial Surgeon, ABMSS, Bengaluru, Karnataka, India

**Samson Jimson** Department of Oral and Maxillofacial Surgery, Tagore Dental College and Hospital, Chennai, Tamil Nadu, India

**Bobby John** Department of Oral and Maxillofacial Surgery, Government Dental College, Kottayam, Kerala, India

Kerala University of Health Sciences, Thrissur, Kerala, India

**Reena Rachel John** Department of Oral and Maxillofacial Surgery, Vinayaka Mission's Sankarachariar Dental College and Hospital, VMRF, DU, Salem, India

**Maj Anson Jose** Oral and Maxillofacial Surgery, ADC R&R, New Delhi, India

**Shyamsundar K. Joshi** Department of Radiology, SDM College of Medical Sciences and Hospital, Shri Dharmasthala Manjunatheshwara University, Dharwad, India

**Takahiro Kanno** Department of Oral and Maxillofacial Surgery, Shimane University, Faculty of Medicine, Izumo, Shimane, Japan

**Taranjit Kaur** Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Jamnagar, Gujarat, India

**Manal M. Khan** Department of Burns and Plastic Surgery, AIIMS Bhopal, Bhopal, Madhya Pradesh, India

**Rakshit Vijay Sinai Khandeparker** Department of Oral and Maxillofacial Surgery, Goa Dental College and Hospital, Bambolim, Goa, India

**Annie I. Kochuveetil** Department of Radiology, SDM College of Medical Sciences and Hospital, Shri Dharmasthala Manjunatheshwara University, Dharwad, India

**David Koppel** Scottish National Craniofacial Service for Children and Young People, Royal Hospital for Children, Glasgow, UK

**Shreya Krishna** Oral and Maxillofacial Surgery, Rangadore Memorial Hospital, Apollo Hospitals, Bangalore, India

**V. B. Krishnakumar Raja** Department of Oral & Maxillofacial Surgery, SRM Dental College & Hospital, Ramapuram, Chennai, Tamil Nadu, India

**B. Krishnan** Department of Dentistry, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India

**Deepak G. Krishnan** Oral and Maxillofacial Surgery, University of Cincinnati Medical Center, Cincinnati, OH, USA

Cincinnati Children's Hospital and Medical Center, Cincinnati, OH, USA

**Balasubramanya Kumar** Department of Oral and Maxillofacial Surgery, St. Marthas's Hospital, Bangalore, Karnataka, India

Bhagwan Mahaveer Jain Hospital, Vikram Hospital, Bangalore, Karnataka, India

**Vinay V. Kumar** Department of Maxillofacial and Plastic Surgery, Uppsala University Hospital, Uppsala, Sweden

**Moni Abraham Kuriakose** Cochin Cancer Research Centre, Kochi, Kerala, India

**Paritkumar Ladani** Swiss Cleft and Craniofacial Centre, BSES MG Hospital, Mumbai, India

**Subramanyam S. Mahankali** Department of Anesthesiology, Columbia Asia Referral Hospital, Yeshwantpur, Bangalore, Karnataka, India

**Neelima Malik** Department of Oral and Maxillofacial Surgery, Krishna Institute of Medical Sciences "Deemed to be University", Karad, Maharashtra, India

**Varghese Mani** Department of Oral and Maxillofacial Surgery, Mar Baselios Dental College, Kothamangalam, Kerala, India

**Suvy Manuel** Department of Oral and Maxillofacial Surgery, Ananthapuri Hospitals and Research Institute, Trivandrum, Kerala, India

Kerala Institute of Medical Sciences, Trivandrum, Kerala, India

**Renita Maria** Department of Anesthesiology, Columbia Asia Referral Hospital, Yeshwantpur, Bangalore, Karnataka, India

**Madhulaxmi Marimuthu** Department of Oral & Maxillofacial Surgery, Saveetha Dental College & Hospital, Chennai, Tamil Nadu, India

**Paul Mathai** Nair Hospital Dental College, Mumbai, Maharashtra, India

Department of Oral and Maxillofacial Surgery, Jubilee Mission Medical College & Research Institute, Thrissur, Kerala, India

**Philip Mathew** Department of Oral and Maxillofacial Surgery, Jubilee Mission Medical College & Research Institute, Thrissur, Kerala, India

**Sainath Matsa** Praseedha Clinic for Maxillofacial Cosmetic Surgery, Chennai, Tamil Nadu, India

**Divya Mehrotra** Department of Oral and Maxillofacial Surgery, King George's Medical University, Lucknow, India

**Sushma Mehta** Mazumdar Shaw Cancer Center, Bengaluru, Karnataka, India

**Suresh Menon** Department of Oral and Maxillofacial Surgery, Vydehi Institute of Dental Sciences and Research Centre, Bangalore, Karnataka, India

**Aditya Moorthy** Department of Oral and Maxillofacial Surgery, Rangadore Memorial Hospital, Apollo Hospitals, Bangalore, Karnataka, India

**Mustafa. K** Department of Craniofacial Surgery, Kanachur Institute of Medical Sciences, Mangalore, Karnataka, India

**Veerabahu Muthusubramanian** Department of Oral & Maxillofacial Surgery, Ragas Dental College, Chennai, Tamil Nadu, India

**Sowjanya Nagamalla** Department of Oral and Maxillofacial Surgery, Virginia Commonwealth University Medical Center, Richmond, VA, USA

**Sanjiv Nair** Department of Oral and Maxillofacial Surgery, Bhagwan Mahaveer Jain Hospital, Bengaluru, Karnataka, India

**P. V. Narayanan** Consultant Plastic Surgeon, Jubilee Mission Medical College & Research Institute, Thrissur, Kerala, India

**Nasir A. Nasser** Barts & London NHS Trust, Whipps Cross University Hospital, London, UK  
University Hospital, Berne, Switzerland

**J. Naveen Kumar** Oral and Maxillofacial Surgery, Sri Ramachandra Institute of Higher Education and Research, Chennai, India

**Kishore Nayak** Bhagvan Jain Mahaveer Hospital, Bangalore, India

**R. S. Neelakandan** Department of Oral and Maxillofacial Surgery, Meenakshi Ammal Dental College and Hospital, MAHER, Chennai, Tamil Nadu, India

**Rachel S. Oeppen** Consultant Radiologist, University Hospital Southampton, Southampton, UK

**Arun Kumar Panda** Department of Oral & Maxillofacial Surgery, SD Dental College and Hospital, Parbhani, Maharashtra, India

**Elavenil Panneerselvam** Department of Oral and Maxillofacial Surgery, SRM Dental College, Ramapuram, Chennai, Tamil Nadu, India

Department of Orbit & Oculoplasty, Aravind Eye Hospital, Chennai, Tamil Nadu, India

**Shreya Panwar** Department of Oral & Maxillofacial Surgery, Meenakshi Ammal Dental College & Hospital, Chennai, Tamil Nadu, India

**Ananthanarayanan Parameswaran** Department of Oral and Maxillofacial Surgery, Meenakshiammal Dental College & Hospital, Chennai, Tamil Nadu, India

Department of Orbit, Oculoplasty, Reconstructive & Aesthetic Surgery, Shankara Nethralaya, Chennai, Tamil Nadu, India

Department of Orbit & Oculoplasty, Aravind Eye Hospital, Chennai, Tamil Nadu, India

**Satyen Parida** Department of Anesthesiology and Critical Care, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India

**Sat Parmar** Department of Oral and Maxillofacial Surgery, Queen Elizabeth Hospital, Birmingham, UK

**Mamatha Patil** Department of Oral and Maxillofacial Surgery, Sparsh Hospital, Bangalore, Karnataka, India

**George Paul** Kerala University of Health Sciences, Thrissur, Kerala, India

Dr MGR Medical University, Chennai, Tamil Nadu, India

**Vijay Pillai** Department of Head and Neck Surgical Oncology, Mazumdar Shaw Cancer Center, Narayana Health, Bangalore, Karnataka, India

**Sreedhar Reddy Pothula** Oral and Maxillofacial Surgery, Pioneer advanced Hair Transplant Centre, Bengaluru, Karnataka, India

**Abhinand Potturi** SVS Institute of Dental Sciences, Mahabubnagar, Telangana State, India

**Akhilesh Prathap** Department of Oral and Maxillofacial Surgery, Pushpagiri College of Dental Sciences, Thiruvalla, Kerala, India

**Prav Praveen** Department of Oral and Maxillofacial Surgery, Queen Elizabeth Hospital, Birmingham NHS Foundation Trust, Birmingham, UK

**Boyapati Raghu** Maxillofacial Unit, Royal Surrey County Hospital, Guilford, UK

**Anshul Rai** Department of Dentistry, All India Institute of Medical Sciences, Bhopal, Madhya Pradesh, India

**Manjunath Rai** Department of OMFS, A. J. Institute of Dental Sciences, Mangalore, Karnataka, India

Faculty of Dentistry, RGUHS, Bangalore, India

**Manikandhan Ramanathan** Department of Oral and Maxillofacial surgery, Meenakshi Ammal Dental College and Hospital, MAHER University, Chennai, Tamil Nadu, India

Meenakshi Cleft and Craniofacial Centre, Chennai, Tamil Nadu, India

**Dipesh Rao** Bhagwan Mahaveer Jain Hospital, Bangalore, Karnataka, India

**Latha P. Rao** Department of Craniomaxillofacial Surgery, Aster Medcity, Kochi, Kerala, India

**Neelam Rathod** Department of Oral and Maxillofacial Surgery, Southend University Hospitals NHS trust, Southend-on-Sea, UK

**Poornima Ravi** Department of Oral and Maxillofacial Surgery, SRM Dental College, Ramapuram, Chennai, Tamil Nadu, India

**Srinivas Gosla Reddy** GSR Institute of Cranio-maxillofacial & Facial Plastic Surgery, Hyderabad, Telangana, India

**N. Viveka Vardhan Reddy** Oral and Maxillofacial Surgery, SVS Institute of Dental Sciences, Mahabubnagar, Telangana, India

**Shravan Renapurkar** Department of Oral and Maxillofacial Surgery, Virginia Commonwealth University Medical Center, Richmond, VA, USA

**Christoph Renné** Group Practice for Pathology Wiesbaden, Wiesbaden, Germany

**Tara Renton** Oral Surgery, Kings College, London, UK

**Johan P. Reyneke** Center for Orthognathic Surgery, Mediclinic, Cape Town, South Africa  
Department of Oral and Maxillofacial Surgery, Faculty of Health Sciences, University of the Western Cape, Cape Town, South Africa

Department of Oral and Maxillofacial Surgery, University of Oklahoma, Oklahoma City, OK, USA

**Sunil Richardson** Richardson's Dental and Craniofacial Hospital, Nagercoil, Tamil Nadu, India

**Saurabh Saigal** Department of Anaesthesiology, AIIMS Bhopal, Bhopal, Madhya Pradesh, India

**B. Sasikala** Department of Oral and Maxillofacial Surgery, SRM Dental College, Ramapuram, Chennai, Tamil Nadu, India

**Anna Sayan** Poole Hospital NHS Foundation Trust, Poole, UK

**Tian Ee Seah** TES Clinic for Face and Jaw, Singapore, Singapore

**Nallamilli V. S. Sekhar Reddy** Panineeya Institute of Dental Sciences and Research Centre, Hyderabad, Telangana, India

**Anjan Kumar Shah** Department of Oral and Maxillofacial Surgery, Rajarajeswari Dental College, Bangalore, India

Bhagwan Mahaveer Jain Hospital, Bangalore, India

**Garima Sharma** Department of Anesthesiology, Columbia Asia Referral Hospital, Yeshwantpur, Bangalore, Karnataka, India

**Lt Col Rohit Sharma** Oral and Maxillofacial Surgery, 11 Corps Dental Unit, Jalandhar Cantt, India

**Kishore Shekar** Head and Neck Surgeon (OMFS), Ninewells Hospital and Dundee, University Medical School, Dundee, UK

**Pritham N. Shetty** Department of Oral and maxillofacial surgery, Bangalore Institute of Dental Science, Bangalore, Karnataka, India

**Omkar Anand Shetye** Department of Oral and Maxillofacial Surgery, Goa Dental College and Hospital, Bambolim, Goa, India

**Sunil S. Shroff** Department of Oral and Maxillofacial Surgery, Bhagwan Mahaveer Jain Hospital, Bengaluru, Karnataka, India

**Anand Shukla** Department of Oral and Maxillofacial Surgery, King George's Medical University, Lucknow, India

**Deepti Simon** Department of Oral and Maxillofacial Surgery, Government Dental College, Trivandrum, Kerala, India

Kerala University of Health Sciences, Thrissur, Kerala, India

**Robert A. Strauss** Department of Oral and Maxillofacial Surgery, Virginia Commonwealth University Medical Center, Richmond, VA, USA

**Shintaro Sukegawa** Division of Oral and Maxillofacial Surgery, Kagawa Prefectural Central Hospital, Takamatsu, Kagawa, Japan

**Shikha Tayal** Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Medical College Premises, Nagpur, Maharashtra, India

**Mary Thomas** Department of Anesthesiology, Regional Cancer Centre, Medical College Campus, Thiruvananthapuram, Kerala, India

**Andreas Thor** Department of Maxillofacial and Plastic Surgery, Uppsala University Hospital, Uppsala, Sweden

**Asha Thomson** Norfolk and Norwich University Hospitals, Norfolk, UK

**Benjamin Turner** Department of Oral and Maxillofacial Surgery, University of Florida, Jacksonville, FL, USA

**Jayesh Vahanwala** Department of Oral and Maxillofacial Surgery, Vaidik Dental College & Research Centre, Nani Daman, India

Breach Candy Hospital, Mumbai, India

**George Varghese** Principal, Professor and Head, Department of Oral and Maxillofacial Surgery, Pushpagiri College of Dental Sciences, Tiruvalla, Kerala, India

**Ravi Veeraraghavan** Department of Oral and Maxillofacial Surgery, Amrita School of Dentistry, Ernakulam, India

**Payal Verma** Oral and Maxillofacial Surgery, University of Cincinnati Medical Center, OH, Cincinnati, USA

**Christian Walter** Oral and Maxillofacial Surgery—Plastic Surgery, Mediplus Clinic Mainz, Mainz, Germany

**Gary Warburton** Department of Oral and Maxillofacial Surgery, University of Maryland School of Dentistry, Baltimore, MD, USA

**Frank Wilde** Department of Oral and Plastic Maxillofacial Surgery, Armed Forces Hospital, Ulm, Germany  
Department of Oral and Maxillofacial Surgery, University Hospital, Ulm, Germany

**Abhilasha Yadav** Department of Oral and Maxillofacial Surgery, Awadh Dental College & Hospital, Jamshedpur, Jharkhand, India

## Video Contributors

**Prithvi S. Bachalli** Department of Oral and Maxillofacial Surgery, Rangadore Memorial Hospital, Apollo Hospitals, Bangalore, Karnataka, India

**Ramdas Balakrishna** Department of Oral and Maxillofacial Surgery, KLE's Institute of Dental Science and Research, Bangalore, India

**Anandh Balasubramanian** Department of Oral and Maxillofacial Surgery, Tagore Dental College and Hospital, Chennai, Tamil Nadu, India

**Mohan Baliga** Department of Oral and Maxillofacial Surgery, Manipal College of Dental Sciences, MAHE, Mangalore, Karnataka, India

**Biswajit Kumar Biswas** Avinash Institute of craniofacial and Reconstructive Surgery, Kolkata, India

**Lokesh Bhanumurthy** Department of Oral and Maxillofacial Surgery, Tagore Dental College and Hospital, Chennai, Tamil Nadu, India

**Rohit Chandra** Oral and Maxillofacial Surgeon, Department of Plastic Surgery, Max Hospitals, Vaishali and Noida, India

**Jaideep Singh Chauhan** Department of Oral and Maxillofacial Surgery, CHL Hospitals, Indore, Madhya Pradesh, India

**Anil Kumar Desai** Craniofacial Unit, SDM College of Dental Sciences & Hospital, Dharwad, India

**Anjaneya Dube** Department of Oral and Maxillofacial Surgery, Saptarshi Hospital and Cancer Centre, Jabalpur National Hospital, Jabalpur, India

**Gunjan Dube** Dube Surgical and Dental Hospital, Jabalpur, Madhya Pradesh, India

**Shehzana Fatima** Oral and Maxillofacial Surgeon, Dubai Health Authority, Dubai, UAE

**S. Girish Rao** Oral and Maxillofacial Surgeon, Shri Shankara Cancer Hospital and Research Center, Apollo Hospitals, Sagar Hospitals, Trustwell Hospital, NIMHANS, Bangalore, India

**Charu Girotra** Department of OMFS, School of Dentistry, D. Y. Patil Deemed to be University, Navi Mumbai, Maharashtra, India

**Gaurav Mahesh Gupta** Centre for Craniomaxillo Facial and Facial Plastic Surgery, Pushpanjali Hospital & Research Centre, Agra, Uttar Pradesh, India

**Rebecca Jacob** Department of Anesthesiology, Columbia Asia Referral Hospital, Yeshwantpur, Bangalore, India

**Jagadish Chandra** Department of OMFS, Yenepoya Dental College, Yenepoya Deemed to be University, Mangalore, India

**Samson Jimson** Department of Oral & Maxillofacial Surgery, Tagore Dental College & Hospital, Chennai, India



**Adarsh Kudva** Department of Oral and Maxillofacial Surgery, Manipal College of Dental Sciences, Mahe University, Manipal, India

**Deepak Kulkarni** Department of Oral and Maxillofacial Surgery, Dr D Y Patil Dental College, Pune, India

**Balasubramanya Kumar** Department of Oral and Maxillofacial Surgery, Bhagwan Mahaveer Jain Hospital, Vikram Hospital, Bangalore, India

**Paritkumar Ladani** Swiss Cleft and Craniofacial Centre, BSES MG Hospital, Mumbai, India

**Ummar Mangalath** Department of Oral and Maxillofacial Surgery, MES Dental College, Perinthalmanna, Kerala, India

**Philip Mathew** Department of Oral and Maxillofacial Surgery, Jubilee Mission Medical College and Hospital, Thrissur, Kerala, India

**Sainath Matsa** Praseedha Clinic for Maxillofacial Cosmetic Surgery, Chennai, Tamil Nadu, India

**Aditya Moorthy** Department of Oral and Maxillofacial Surgery, Rangadore Memorial Hospital, Apollo Hospitals, Bangalore, Karnataka, India

**Ravindran Nair** Department of Oral and Maxillofacial Surgery, Government Medical College, Manjeri, Kerala, India

**Anuradha Navaneetham** Department of Oral and Maxillofacial Surgery, M R Ambedkar Dental College, Rajiv Gandhi University, Bangalore, India

**Nilesh Pagaria** Oral and Maxillofacial Surgeon, Shrikrishna Hospital, Raipur, Chhattisgarh, India

**Arun Kumar Panda** Department of Oral & Maxillofacial Surgery, SD Dental College and Hospital, Parbhani, Maharashtra, India

**Ananthanarayanan Parameswaran** Department of Oral and Maxillofacial Surgery, Meenakshi Ammal Dental College & Hospital, Chennai, Tamil Nadu, India

**Nehal Patel** NuFace Maxillofacial Hospital, Surat, Gujarat, India

**Kavitha Prasad** Faculty of Dental Sciences, Ramaiah University of Applied Sciences, Bengaluru, India

**Satish Kumaran Pugazhendi** Department of Oral and Maxillofacial Surgery, M. R. Ambedkar Dental College, Bangalore, India

**Gunaseelan Rajan** Oral and Maxillofacial Surgeon, Rajan Dental Hospital, Chennai, Tamil Nadu, India

**Rajasekhar Gaddipati** Department of Oral and Maxillofacial Surgery, Mamata Dental College, Khammam, Telangana, India

**Sushmitha Rajmohan** Department of Dentistry & Maxillofacial Surgery, ESIC Model Hospital, Indore, India

Aasya the Clinic for Face Jaws & Teeth, Vijaynagar, Indore, MP, India

**Vidya Rattan** Unit of Oral & Maxillofacial Surgery, Oral Health Sciences Centre, Postgraduate Institute of Medical Education & Research, Chandigarh, India

**Pothula Sreedhar Reddy** Oral and Maxillofacial Surgeon, Pioneer Advanced Hair Transplant Center, Bangalore, India

**Sunil Richardson** Richardson's Dental and Craniofacial Hospital, Nagercoil, Tamil Nadu, India

**Senthil Murugan** Department of Oncology & Reconstructive Microsurgery, Saveetha Dental College, Saveetha University, Chennai, Tamil Nadu, India

DWIJAN Microsurgery Research & Training Centre, Chennai, India

**Navin Shah Sunderlal** Department of Oral and Maxillofacial Surgery, KM Shah Dental College, Sumandeep Vidyapeeth, A Central deemed to be University, Vadodara, Gujarat, India

**Yeshaswini Thelekkat** Department of Oral & Maxillofacial Surgery, Azeezia College of Dental Sciences and Research Kollam, Kollam, Kerala, India

**Joji Thomas** Department of Oral and Maxillofacial Surgery, Cosmopolitan Hospital Pvt Ltd, Trivandrum, Kerala, India

**P. Varun Menon** The Charles Pinto Centre for Cleft Lip, Palate and Craniofacial Anomalies, Jubilee Mission, Medical College & Research Institute, Thrissur, Kerala, India

**Sankar Vinod Vichattu** Department of OMFS, Mar Baselious Dental College, Kotamangalam, Kerala, India

**B. Vikraman** Department of Oral and Maxillofacial Surgery, Ragas Dental College & Hospital, Chennai, Tamil Nadu, India

**Gary Warburton** Department of Oral & Maxillofacial Surgery, University of Maryland Dental School, Baltimore, MD, USA



---

## About the Editors

**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*.

Currently, he is attached to the maxillofacial units at Ananthapuri and KIMS Hospitals, Trivandrum, India.

**Vinay V. Kumar** completed his master's in oral and maxillofacial surgery from Nair Hospital Dental College, Mumbai, India, in 2008. He was an ITI Scholar in the Department of Maxillofacial and Plastic Surgery in Johannes Gutenberg University (JGU) Mainz, Germany, in 2010, where he went on to complete his Doctorate of Medicine in Dentistry (2013), obtain a practicing license, and served as a visiting faculty. He completed the MD and PhD program at the University of Medicine, Rostock, Germany in 2018. He is currently a Specialist Oral and Maxillofacial Surgeon in the Department of Maxillofacial and Plastic Surgery, Uppsala University Hospital, Sweden in the Department of Maxillofacial Surgery, Uppsala University, Sweden.

**Anshul Rai** is an Associate Professor in Department of Dentistry at All India Institute of Medical Sciences Bhopal, MP. He has 54 publications to his credit out of which 24 belong to prestigious international journals. He has contributed as a coauthor to *Textbook of Oral and Maxillofacial Surgery* by Dr. Borle. He is a Fellow of Indian Board of Oral and Maxillofacial Surgery (FIBOMS) and a fellow of the International Board for the Certification of Specialists in Oral and Maxillofacial Surgery (FIBCSOMS). He is a reviewer for *Journal of Maxillofacial and oral surgery* and *Indian Journal of Dental Research*.

**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.

He is a member of the Board of Studies for Postgraduate Studies of Oral and Maxillofacial Surgery at the Tamil Nadu Dr. M.G.R. Medical University, Chennai.

**Nehal Patel** completed his master's in oral and maxillofacial surgery from A.B. Shetty Institute of Dental Sciences, Mangalore. He did his fellowship in Cleft and Craniofacial Surgery from Mangalore. He did his mini residency in TMJ Arthroscopy and Total Joint replacement from the USA. He worked as consultant cleft and craniofacial surgeon in BSES MG Hospital. He is currently working as Director, ABMSS CLEFT PROJECT in Surat, Gujarat.

---

## 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

---

K. Nayak (✉)

Bhagwan Mahaveer Jain Hospital, Bangalore, India

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