

Contents



<i>Contributors</i>	v
<i>Foreword by Mandeep S Dhillon</i>	ix
<i>Foreword by Jaspreet Sidhu</i>	xi
<i>Foreword by DD Tanna</i>	xiii
<i>Preface</i>	xv

SECTION I: Introduction to 3D Technology

1. 3D Printing Biosphere for Medical and Orthopaedic Applications	3
<i>Vaibhav Bagaria</i>	
2. Fundamentals of 3D Software and Hardware Technologies in Orthopaedic	10
<i>Chetan Sood, Ravikant Kamal</i>	
3. Techniques, Benefits and Challenges of 3D Technology in Orthopaedics	20
<i>Bhavuk Garg, Jaiben George</i>	
4. 3D Modeling and Simulation for Preoperative Planning	26
<i>Ankit Dadra, Siddhartha Sharma, Rohit Arora, Prasoon Kumar</i>	
5. 3D Printing in Orthopaedic Teaching and Training	36
<i>Maryada Venkateshwar Reddy, Sujitkumar Vakati R, Falguni Pati, Bojedla Sri Sai Ramya</i>	
6. Regulatory Issues and Quality Control in 3D Printed Orthopaedic Implants	48
<i>Vibhu Krishnan Viswanathan, Vijay Kumar Jain</i>	
7. Three-dimensional Medical Imaging in Orthopaedics: Acquisition, Digitization, 3D Reconstruction, and Applications	55
<i>Bhushan S Borotikar, Surabhi Thatte</i>	

SECTION II: 3D Printing in Orthopaedics

8. Biomaterials in Orthopaedics and 3D Printable Biomaterials	75
<i>Falguni Pati, Sujitkumar Vakati R, Maryada Venkateshwar Reddy, Bojedla Sri Sai Ramya</i>	
9. 3D Printed Synthetic Bone Grafts: The Future	90
<i>Sujitkumar Vakati R, Falguni Pati, Maryada Venkateshwar Reddy, Bojedla Sri Sai Ramya</i>	
10. Bioprinting in Orthopaedics	98
<i>Kavita Kumari Thakur, Ramesh R Lekurwale</i>	
11. Patient-specific Instrumentation and Implants: Design for Defect and Deformity (3D)	103
<i>Vikas Jain, Lalit Maini</i>	
12. Fusion Imaging in Surgical Planning	116
<i>Abhay Meena, Lalit Maini</i>	
13. Role of 3D Printing in Orthopaedic Oncology	124
<i>Abhijeet Ashok Salunke, Lalit Maini, Nandlal Bharwani, Vikas Warikoo, Keval Patel, Raghavendra Bhalerao, Krupa Shah, Shashank Pandya</i>	

SECTION III: Deformity Correction and Skeletal Optimization using 3D Technology

- 14. Proximal Femoral Neck Lengthening Osteotomy using 3D Technology** 135
Taral Nagda, Lalit Maini, Vikas Jain, Jaideep Dhamele, Sagar Parekh, Rashi Gupta
- 15. Multiaxial Deformities: Optimal Correction by 3D Technology** 147
Amit Sharma, Lalit Maini

SECTION IV: Regional Skeletal Solutions in Trauma and Non-Trauma using 3D Technology

- 16. 3D Printing in Pelvi-Acetabular Trauma** 157
Tarun Verma, Lalit Maini
- 17. 3D Printed Pedicle Trajectory Guides for Complex Spinal Deformities** 163
Vyom Sharma, Aju Bosco, Anand Ramachandran
- 18. 3D Printed Cups for Total Hip Replacement: An Update on the Technology and the Surgical Technique** 177
Shobit Deshmukh, Vaibhav Bagaria
- 19. Role of 3D Printing in Foot and Ankle Trauma and Orthopaedics** 189
Rajiv Shah, Shivam Shah
- 20. Reconstruction of Severe Glenoid Defects in Shoulder Arthroplasty: The Role of 3D Technology** 197
Daniel LJ Morris, Ben W Gooding, Amol A Tambe

SECTION V: Science and Research Behind 3D Metal Printing and Osteointegration Concepts

- 21. Porous Metal Scaffolds for Enhanced Osseointegration: A Comprehensive Examination of Preclinical and Clinical Applications** 207
Jaideep Singh Bhardwaj, Souptick Chanda
- 22. Basics of FEA in 3D Printed Implants** 214
Souptick Chanda

SECTION VI: Computer-aided Simulations of 3D Printed Implants

- 23. Role of Computer-aided Design and Numerical Simulations in 3D Printed Orthopaedic Implants** 221
Kumar Satyam, Kumar Kartikeya, Anil Kumar, Murali Pullela, Enrique Escobar de Obaldia

SECTION VII: Computer-Assisted Orthopaedic Surgery

- 24. Introduction to Computer-Assisted Orthopaedic Surgery (CAOS)** 231
Karthik Vishwanathan
- 25. Non-Robotic Options Humanoid Robotics: 3D Planning with Mixed Reality Navigation** 235
Manish R Shah, Darshan U Shah, Monil D Patel, Dharan H Shah

SECTION VIII: Virtual Reality in Orthopaedics Training

- 26. Virtual Reality in Orthopaedics** 249
Abhishek Jain

SECTION IX: Challenges and Ethical Considerations

- 27. Regulatory Issues and Quality Control in 3D Printing** 257
Nitish Bansal

SECTION X: Different Case Studies with 3D Technology Applications

28. Trabecular Cone Utilization for Effective Defect Management in Revision Total Knee Arthroplasty (TKA): A Case Report	263
<i>Yuvarajan Palanisamy</i>	
29. Towards Personalized Hand Reconstruction: 3D Printed Biodegradable Implants for Bony Tumours	269
<i>Chinmoy Das, Partha Pratim Das</i>	
<i>Index</i>	275