

# General Principles of Orthopedics and Trauma

K. Mohan Iyer  
*Editor*

 Springer

# General Principles of Orthopedics and Trauma



K. Mohan Iyer

Editor

# General Principles of Orthopedics and Trauma

 Springer

*Editor*

Dr. K. Mohan Iyer  
Bangalore University  
Bangalore  
Karnataka  
India

ISBN 978-1-4471-4443-4 ISBN 978-1-4471-4444-1 (eBook)

DOI 10.1007/978-1-4471-4444-1

Springer London Heidelberg New York Dordrecht

Library of Congress Control Number: 2012950397

© Springer-Verlag London 2013

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.

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.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media ([www.springer.com](http://www.springer.com))

*Dedicated to my wife,  
Nalini K. Mohan  
And  
Daughter, Dr. Deepa Iyer  
M.B.B.S., MRCP(UK)  
And  
Son, Mr. Rohit Iyer, B.E.*



# Foreword



Several decades ago I was fortunate to hear Dr. Iyer speak about a limited, posterior greater trochanteric osteotomy as an adjunct to a posterior approach to the hip. Since then I have used this method, as it allows easy access to the hip for joint replacement and then a secure posterior capsule and short external rotator muscle repair upon joint closure. Postoperative dislocations ceased to be an issue. As you might recognize, I have looked forward to additional contributions from Dr. Iyer, and here we have it – General Principles of Orthopedics and Trauma, Orthopedics of the Upper and Lower Limb and Trauma

Management in Orthopedics(Springer).

What a huge task to organize such books: Deciding on the material to be included, writing multiple chapters, and asking for skilled contributors who will embrace the challenge and have the talents to write either a general or subspecialty chapter. The text is aimed at the newcomer to this field of medicine, and it will serve that purpose quite well. I have always felt the best approach to learning orthopedic surgery is to read, cover to cover, a text such as this, aggressively study anatomy, read about the problems in the patients under one’s care, read subspecialty texts, and read at least the abstracts in selected journals. By doing these things one can be an educated person in the field – but it starts with the basic text!



In addition to the fundamentals, Dr. Iyer has added details about trauma and regional orthopedics. A cad has said only two types of doctors are necessary, and the others are optional. One of these is a physician who cares for broken bones. Details about fractures are essential to the field and to humanistic patient care. The regional chapters serve as a transition to the later reading about each anatomic region in detail, what will be required to become an orthopedic surgeon.

So there you have it. An editor who is an energetic, dedicated scholar and teacher. Plus, the type of textbook most needed to jump into the field of musculoskeletal medicine and surgery. Learning is a joy. Lucky readers, enjoy the intellectual journey.

Rochester, MN, USA

Robert H. Cofield, M.D.

# Preface

This book is mainly an introduction to the principles of Orthopedics, which is written by different Orthopedic Surgeons, who have specialized in, or are interested in, the subjects they have written in. This volume mainly concentrates on the broad disciplines of Orthopedics. The chapter on Arthroscopy of the Knee joint has numerous snaps which is a developing subspeciality. The chapter on Sports Injuries and Total Joint Replacement are also recognized these days as subspecialities. The chapter on the Role of Radiology and Imaging in Orthopedics has been specially written for this book.

I was an undergraduate and post-graduate teacher at the University of Liverpool, UK, and the University of London, UK, for the undergraduates and for the final FRCS candidates. On returning home to Bangalore, India, I was an undergraduate teacher at St. John's Hospital, Bangalore, India, and at M.S. Ramaiah Medical Teaching Hospital, Bangalore, India, and I am indebted to all my students for their constant desire to master Orthopedics at their young age. Above all, I would like to thank all my teachers who did not spare any effort to discuss with me topics of Orthopedic interest, both in the lecture hall and in their spare time.

I am deeply indebted to my dear friend, Mr. Magdi E. Greiss, M.D., M.Ch. (Orth), FRCS, Senior Consultant Orthopedic Surgeon North Cumbria University Hospitals, UK, Former President, BOFAS, UK, for his timely help in specially preparing the snaps that have been used in this book, despite him being extremely busy in setting up of a foot and ankle clinic for the World Orthopaedic Concern in developing countries.

I would express my sincere thanks to Mr. Adhish Avasthi, M.B.B.S., M.S. Orth., MRCS Registrar Orthopedics and Mr. Richard Hill, FRCS Ed, FRCS (Tr&Orth) Ed, Consultant Orthopedic Surgeon, Department of Trauma & Orthopedics, St Richard's Hospital, Chichester PO19 6SE, West Sussex, UK, for his comprehensive description on Common Sports Injuries, which is a subspeciality in vogue at the moment. I would also like to thank Dr. Suhas Namjoshi, Consultant Radiologist, Hillingdon Hospital, London, UK, M.B.B.S. (Bom), DMRE (BOM), DMRE(Liverpool), FRCR (UK), for his unique chapter on 'Role of Radiology and Imaging in Orthopedics', which is written up to give students an idea of the importance of Radiology and Imaging in Orthopedics. I would thank Dr. Geethan I, M.S. Orth., DNB (Orth), Orthopedic Surgeon, Fellow, Ortho One, Speciality Hospital, Coimbatore, India,

and Dr. David V. Rajan, M.S. Orth., MNAMS, FRCS (G) Consultant Orthopedic Surgeon, Director, Ortho One, Coimbatore, India, and Past President of the Indian Arthroscopy Society for their timely help on the chapter on 'Arthroscopy of the Knee Joint', which was specially written up for this book.

I would like to thank Sharad Goyal, D.Orth. (Gold Med), M.S. Orth., DNB Orth, M.Ch. Orth. (Liv), Orthopedic Surgeon, Department of Trauma & Orthopedics, St Richard's Hospital, Chichester PO19 6SE, West Sussex, UK for his active interest and help in completing my book.

Finally, I would like to thank Dr. Robert H. Cofield, M.D., Emeritus Chairman, Department of Orthopedic Surgery, Mayo Clinic, Professor of Orthopedics, Mayo Clinic College of Medicine, Rochester, MN, for his ever encouraging foreword for this book of mine.

I would like to express my sincere thanks to Springer-Verlag for their kind permission to allow me to reproduce 35 snaps of my book entitled *Clinical Examination in Orthopedics* (Springer) for this book of mine.

Above all I would like to thank Mr. Steffan D. Clements, Editor, Clinical Medicine, Springer (London) for his untiring guidance in the preparation of this book.

I would like to express my sincere gratitude and thanks to all the Orthopedic Surgeons for their valuable contribution in their subspecialities. This textbook is mainly valuable and a must for the beginner who faces Orthopedics as he encounters in daily life, and, when combined with my book entitled *Clinical Examination in Orthopedics* (Springer), would make him complete in all aspects of Orthopedics, both clinical and theoretical.

I am very grateful to my son who has helped me in the tables, corrections, diagrams, charts and formatting of this book and its presentation.



A handwritten signature in blue ink, appearing to read 'K. Mohan Iyer', written over a horizontal line.

**(Dr. K. Mohan Iyer)**

# Acknowledgements

I am extremely thankful to Dr. Dilip Malhotra, M.S.Orth, MCh.Orth, FICS, Consultant Orthopedic Surgeon, International Hospital Bahrain, for his valuable help in clinical photographs and radiographs. I am indebted to Mr. S. Siddiqui, MS.Orth., FRCS.Orth, Consultant Orthopedic Surgeon, Kettering General Hospital, Kettering, UK, for his contribution on the chapter on the Hand and Fingers in Regional Orthopedics and for the chapter on the Hand and Fingers in Orthopedic Trauma. I would like to thank Mr. Shaishav Bhagat M.S.(Ortho), MRCS (Edinburgh), FRCS (Tr. & Orth), Specialist registrar, Kettering General Hospital, UK, who has written the chapters on “Polytrauma and Trauma in the Foot and Ankle” along with Mr. Bhavik M. Shah MS. Orth, MCh.Orth, FRCS.Orth, Consultant Orthopedic Surgeon, Kettering General Hospital, Kettering, UK. I would express my gratitude to Mr. D K Menon, MS Orth (AIIMS), DNB (Orth), MCh (Orth) Liverpool, FRCS (Tr & Orth) Honorary Senior Lecturer (Medical Education), University of Leicester Consultant Orthopedic Surgeon, Kettering General Hospital, Rothwell Road, Kettering, Northamptonshire, NN16 8UZ, England, United Kingdom, for his chapters on The Hip in Regional Orthopedics and The Hip in Trauma Management in Orthopedics.

I would also like to thank Mr. Shibu P. Krishnan, Orthopedic Surgeon, MS.Orth, D’Orth, DNB, MRCS, FRCS (Tr & Orth) for his valuable help in Regional Trauma of Orthopedics involving the Cervical Spine, Thoracolumbar Spine, Sacrum and Coccyx and Scoliosis with Spinal deformities. I am extremely thankful to Dr. Sughran Banerjee, M.B.B.S., AFRCS, Dip.SICOT, Consultant Orthopedic Surgeon for his chapters on “Injuries of the Thumb in Trauma Management in Orthopedics”. Above all I am very thankful to Mr. M.A. Syed, M.B.B.S., MRCSEd, FRCS. Orthopedic Surgeon, Kent, UK for his contribution on “Amputations’ in General Orthopedics”. I would like to express my gratitude to Dr. Suhas Namjoshi, M.B.B.S.(Bom), DMRE(BOM), DMRE(Liverpool), FRCR(UK) Consultant Radiologist, Hillingdon, UK for his chapter on “Role of Radiology and Imaging in Orthopedics”. I am also grateful to Professor Naresh Shetty, Dean and Professor of Orthopedics, M.S. Ramaiah Medical Teaching Hospital for writing up the chapters on Carpal Tunnel syndrome and Dequervain’s stenosing tenosynovitis in Regional

Orthopedics and in Fractures of the both bones in the forearm, Monteggia fracture-dislocation, Galeazzi fracture-dislocation, Colles' and Smith's fracture in Trauma in Orthopedics. I am extremely grateful to Magdi E. Greiss, M.D., MCh(Orth), FRCS, Senior Consultant Orthopedic Surgeon North Cumbria University Hospitals UK, Former President, BOFAS (UK) for his valuable collection of X-rays/Snaps used in this book. I would like to thank Dr. Sharad Goyal for his chapter on "The pelvis" in Trauma in Orthopedics, and on the chapter on Total Joint Replacement in General Orthopedics and also thank Mr. Lee J. Taylor, FRCS, Senior Consultant Orthopedic Surgeon, Department of Trauma and Orthopedics, St Richards Hospital, Chichester, West Sussex PO19 6SE, UK for his help and encouragement on Total Hip Replacement, and his permission to use the X-rays in this chapter on Total Joint Replacement. I am extremely grateful to Dr. Javad Parvizi, M.D., Rothman Institute, Philadelphia, PA 19107 for permitting us to describe his Parvizi criteria in Infection after Total Joint Replacement and their treatment. I am extremely indebted to Mr. Adhish Avasthi, M.B.B.S., M.S.Orth, M.R.C.S., Registrar Orthopedics and Mr. Richard Hill, FRCS Ed, FRCS (Tr&Orth) Ed, Consultant Orthopedic Surgeon, Department of Trauma and Orthopedics, St Richards Hospital, Chichester West Sussex, PO19 6SE, UK for his comprehensive description on Common Sports Injuries, which is a subspeciality in vogue. I am extremely thankful to Dr Geethan I, M.S. Orth, DNB(Orth), Orthopedic Surgeon and Dr. David V. Rajan M.S.Orth, MNAMS, FRCS(G), Consultant Orthopedic Surgeon, Director, Ortho One, Coimbatore, India, and Past President of the Indian Arthroscopy Society, India for their contribution on the chapter on Arthroscopy of the Knee. Above all, I am extremely grateful to Professor Naresh Shetty, M.S.Orth, Dean and Professor of Orthopedics, M.S. Ramaiah Medical Teaching Hospital, Bangalore-560 054, India, who along with me has written the chapters on The Wrist Joint in Regional Orthopedics and The Forearm and Wrist in Trauma in Orthopedics.

# Contents

<b>1</b>	<b>Anatomy of Bone, Fracture, and Fracture Healing</b> . . . . .	<b>1</b>
	K. Mohan Iyer	
<b>2</b>	<b>Complications of Fractures</b> . . . . .	<b>13</b>
	K. Mohan Iyer	
<b>3</b>	<b>Fractures in Children</b> . . . . .	<b>23</b>
	K. Mohan Iyer	
<b>4</b>	<b>Infection</b> . . . . .	<b>27</b>
	K. Mohan Iyer	
<b>5</b>	<b>Osteoarthritis</b> . . . . .	<b>47</b>
	K. Mohan Iyer	
<b>6</b>	<b>Rheumatoid Arthritis</b> . . . . .	<b>59</b>
	K. Mohan Iyer	
<b>7</b>	<b>Tuberculosis</b> . . . . .	<b>75</b>
	K. Mohan Iyer	
<b>8</b>	<b>Peripheral Nerve Lesions</b> . . . . .	<b>103</b>
	K. Mohan Iyer	
<b>9</b>	<b>Congenital Deformities</b> . . . . .	<b>117</b>
	K. Mohan Iyer	
<b>10</b>	<b>Metabolic and Endocrine Disorders</b> . . . . .	<b>137</b>
	K. Mohan Iyer	
<b>11</b>	<b>Developmental Disorders</b> . . . . .	<b>163</b>
	K. Mohan Iyer	
<b>12</b>	<b>Degenerative Disorders</b> . . . . .	<b>187</b>
	K. Mohan Iyer	

<b>13</b>	<b>Poliomyelitis and Spina Bifida</b> .....	199
	K. Mohan Iyer	
<b>14</b>	<b>Cerebral Palsy</b> .....	209
	K. Mohan Iyer	
<b>15</b>	<b>Bone Tumors</b> .....	213
	K. Mohan Iyer	
<b>16</b>	<b>Back Pain and Slipped Intervertebral Disc</b> .....	243
	K. Mohan Iyer	
<b>17</b>	<b>General Affections of the Soft Tissues</b> .....	273
	K. Mohan Iyer	
<b>18</b>	<b>Amputations</b> .....	281
	Mujahid Ali Syed	
<b>19</b>	<b>Arthroscopy of the Knee Joint</b> .....	291
	I. Geethan and David V. Rajan	
<b>20</b>	<b>Total Joint Replacement</b> .....	317
	Sharad Goyal and Gyanendra Kumar Singh	
<b>21</b>	<b>Common Sports Injuries</b> .....	375
	Adhish Avasthi and Richard Hill	
<b>22</b>	<b>Radiology and Imaging in Orthopedics</b> .....	395
	Suhas Namjoshi	
<b>23</b>	<b>Plaster of Paris in Orthopedics</b> .....	405
	K. Mohan Iyer	
<b>Index</b>	.....	409