Pediatric Lower Limb Deformities

Sanjeev Sabharwal
Editor

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Principles and Techniques of Management

Springer

Editor
Sanjeev Sabharwal, MD, MPH
Department of Orthopedics
Division of Pediatric Orthopedics
Rutgers-New Jersey Medical School
Newark, NJ, USA

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To all children with limb deformities and their caregivers.

Foreword

"There is only one child in the world and the Child's name is All Children." Thus did the poet Carl Sandburg succinctly describe the universal appeal of children and humankind's concern for child welfare, health, and happiness. The most successful charitable organizations, such as Easter Seals (originally, the National Society for Crippled Children) and the March of Dimes (originally, the National Foundation for Infantile Paralysis), continue to focus fundraising and service projects on children with birth defects and developmental and acquired deformities and disorders.

Likewise, major service organizations and clubs, including the Shriners and the Scottish Rite Freemasons, point to their respective children's hospitals with pride and a sense of accomplishment. All of these efforts, which occupy so much time and energy, are directed towards a single goal: helping clinicians and researchers cure or relieve those conditions that prevent a child from reaching his or her full potential. In this regard, there is no higher calling that a human being could possibly undertake than being a frontline soldier in the battle against childhood diseases, disorders, and deformities.

Up until the mid-twentieth century, surgery focused on correcting pediatric congenital, developmental, and acquired musculoskeletal defects and deformities had a limited capacity to obtain full restoration of function. Often times, amputation proved the most practical means of achieving maximal functional capacity for a child with certain limb deficiencies. Correction of angular long bone deformities, for example, involved wedge resection of osseous tissue that would certainly improve the angulation but left the youngster with the need for clunky shoes or braces (or both) to get around.

In 1951, Prof. G. A. Ilizarov discovered how to create new osseous tissue in a widening distraction gap. He worked in far-off Siberia, alone at first, away from the prying eyes of Soviet colleagues, giving him a chance to learn by trial and error the parameters of his evolving methodology. More than 30 years elapsed before surgeons in Western countries learned of Ilizarov's discoveries. By then, techniques and instrumentation had been perfected, basic science research was completed, and a massive Medical Center had been constructed in Kurgan, USSR, all to provide care to children and adults with musculoskeletal conditions never before thought treatable.

As a result, the Methods of Ilizarov first appeared in Western medicine as a mature system of treatment, capable of achieving stunning results. In a sense, the situation resembled the appearance of Nike Athena in Greek mythology, who sprung as a fully grown adult from the head of Zeus, armor-clad and battle-ready.

In the 25 years since the introduction of Ilizarov's therapeutic strategies into Western medicine, ingenious surgeons have found ways to combine Ilizarov's distraction osteogenesis with well-established principles of deformity correction, growth rate prediction, and soft tissue releases to yield new and ever-evolving paradigms to deal most effectively with conditions that interfere with a child's full participation in life's activities.

Although these combined surgical techniques are reported piecemeal in journal articles and at open meetings, there has not been, until now, a textbook updating the current principles of pediatric deformity correction in a comprehensive way. The volume you are holding in your hands was specifically designed to overcome such a deficiency. Dr. Sabharwal has prevailed upon leading practitioners of these modern strategies to write chapters in their fields of interest

and clinical research. As a result, this book is a remarkable compendium of primary source material that will aid clinicians around the world in treating lower limb deformities of childhood.

My only regret is that visionary founders of the charitable organizations and service clubs who dedicated so much effort to establish children's hospitals and child-centered research and support enterprises are not alive today to see what has become of their dreams and hard work. They would be amazed, that's for sure!

Orange, CA, USA Stuart A. Green, MD

Preface

In titling his 1741 book, Nicolas Andry coined the phrase *Orthopédie* from two Greek words: *orthos*, "straight, correct," and *paiedeia*, "rearing of children." While the field of orthopedics has branched further into a number of subspecialties affecting various body parts in the young and old, Andry's original illustration of a straight stake tied to a crooked sapling has withstood the test of time. However, despite the ubiquitous presence of lower limb deformities in children globally (albeit with varied etiologies), a textbook devoted to the treatment of the "crooked child" is sorely missing from the current literature.

This unique text is primarily intended for orthopedic surgeons and trainees worldwide who have an interest in pediatric lower limb deformities. This book is not meant to be a "how to apply an external fixator to the tibia" type of manual, but rather a broad-based text highlighting both general principles and specific strategies for managing the entire spectrum of pediatric lower limb deformities, applying to circumstances of various etiology and resource availability. The authors of the 32 chapters are well-known leaders in the field of pediatric lower limb deformities, and I am truly indebted to every one of them and their coauthors for their excellent contributions. I invited these contributors not only on the basis of their expertise in the field but also in light of the diversity of their working environments and unique challenges that they face when treating children with limb deformities.

This book is divided into five parts, although each chapter can serve as a standalone guide for the clinician dealing with a specific patient. Part I highlights the general principles and techniques, including patient evaluation, decision making, and various surgical methods for deformity correction. Part II deals with related concepts, including management of soft tissue contractures, amputation, and working in resource-challenged environments. Part III includes lower limb deformities associated with specific metabolic, neuromuscular, and tumor-related conditions, as well as skeletal dysplasias. Part IV covers specific congenital and developmental disorders of the lower extremity. Finally, Part V explores various sequelae and complications associated with lower extremity deformities in the growing child. All authors were encouraged to incorporate relevant figures, tables, and highlight boxes to clearly deliver their message to you, the reader. While I did spend many hours editing and making suggestions to each of the corresponding authors, my role here was simply that of a facilitator.

When asked why I chose the field of pediatric orthopedics, I often respond by saying, "It just feels right to make a child's crooked leg straight," perhaps not too far off from what Nicholas Andry had in mind more than 250 years ago. While that may be too simplistic of an answer, I do hope that this book will resonate with you and help guide your encounters with these children and their caretakers.

Newark, NJ, USA — Sanjeev Sabharwal, MD, MPH

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I am grateful to my parents, grandparents, mentors, and students for helping me recognize the importance of integrity and hard work. Thanks to my dear wife, Ranjit, who for the past 30 years took care of essentially everything so that I could pursue an academic career in pediatric orthopedics. I deeply appreciate our three children, Samir, Simran, and Sabhyta, for keeping me honest and grounded.

Contents

Contributors

Erin Baker, MPT Rubin Institute for Advanced Orthopedics, Sinai Hospital, Baltimore, MD, USA

Anil Bhave, MS (PT) Rubin Institute for Advanced Orthopedics, Sinai Hospital, Baltimore, MD, USA

F. Erkal Bilen, MD, FEBOT Department of Orthopedics and Traumatology, Istanbul Memorial Hospital, Piyalepasa Bulvari Okmeydani, Istanbul, Marmara, Turkey

John G. Birch, MD, FRCS(C) Department of Orthopedics, Texas Scottish Rite Hospital for Children, Dallas, TX, USA

Mary Campbell, DPT Rubin Institute for Advanced Orthopedics, Sinai Hospital, Baltimore, MD, USA

In Ho Choi, MD, PhD Division of Pediatric Orthopedics, Seoul National University Children's Hospital, Seoul, Republic of Korea

David Y. Chong, MD Department of Orthopedic Surgery, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Noémi Dahan-Oliel, PhD, OT Clinical Research/Rehabilitation, Shriners Hospital for Children, Montreal, QC, Canada

Mark T. Dahl, MD Gillette Children's Specialty Healthcare, University of Minnesota, St. Paul, MN, USA

Jon R. Davids, MD Shriners Hospital for Children, Sacramento, CA, USA

Richard S. Davidson, MD Department of Orthopedic Surgery, The Children's Hospital of Philadelphia, Philadelphia, PA, USA

Ellen Dean Davis, MD Department of Orthopedics, St. Joseph's Regional Medical Center, Wayne, NJ, USA

Colleen P. Ditro, DNP Department of Orthopedic Surgery, Nemours Alfred I. duPont Hospital for Children, Wilmington, DE, USA

I. Levent Eralp, MD Department Orthopedics and Traumatology, Istanbul Medical School, University of Istanbul, Sisli, Istanbul, Turkey

François R. Fassier, MD Department of Orthopedics, Shriners Hospital for Children – Canada, Montreal, QC, Canada H3G1A6

David S. Feldman, MD Department of Orthopedic Surgery, Division of Pediatric Orthopedics, Hospital for Joint Diseases, New York University, New York, NY, USA

Austin T. Fragomen, MD Department of Orthopedics, Hospital for Special Surgery, New York, NY, USA

Corinna C. Franklin, MD Shriners Hospital for Children, Philadelphia, PA, USA

Sangeet Gangadharan, DNB Orth Paediatric Orthopedics Unit, CMC Hospital, Christian Medical College, Vellore, Tamil Nadu, India

J. Eric Gordon, MD Department of Pediatric Orthopedic Surgery, St. Louis Children's Hospital, St. Louis, MO, USA

Stuart A. Green, MD Department of Orthopedic Surgery, School of Medicine, University of California, Irvine, Orange, CA, USA

Joseph J. Gugenheim, MD Texas Orthopedic Hospital, Houston, TX, USA

Reggie Hamdy, MD Division of Pediatric Orthopedics, Department of Orthopedics, Shriners Hospital for Children, McGill University, Montreal, QC, Canada

John A. Herring, MD, FRCS (Ire, Hon) Department of Orthopedic Surgery, The Texas Scottish Rite Hospital for Children, University of Texas Southwestern Medical School, Dallas, TX, USA

John E. Herzenberg, MD, FRCSC International Center for Limb Lengthening, Rubin Institute for Advanced Orthopedics, Sinai Hospital of Baltimore, Baltimore, MD, USA

Christopher Iobst, MD Department of Orthopedic Surgery, Nemours Children' s Hospital, Orlando, FL, USA

Viral V. Jain, MD Department of Orthopedic Surgery, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

Ashok N. Johari, MS(Orth), DOrth Department of Paediatric Orthopedics, Children's Orthopedic Centre, Mumbai, Maharashtra, India

Benjamin Joseph, MS Orth, MCh Orth Department of Paediatric Orthopedics, Aster Medcity, Kochi, Kerala, India

Lori Karol, MD Department of Orthopedic Surgery, Texas Scottish Rite Hospital, Dallas, TX, USA

Seung-Ju Kim, MD, PhD Department of Orthopedic Surgery, KEPCO Medical Center, Seoul, Republic of Korea

Mehmet Kocaoglu, MD Department of Orthopedics and Traumatology, Istanbul Memorial Hospital, Piyalepasa Bulvari Okmeydani, Istanbul, Marmara, Turkey

Adam M. Kurland, BA Department of Orthopedic Surgery, Division of Pediatric Orthopedics, Hospital for Joint Diseases, New York University, New York, NY, USA

Dong Hoon Lee, MD, PhD Department of Orthopedic Surgery, Severance Children's Hospital, Seoul, Republic of Korea

William Mackenzie, MD, FRCSCC, FACS Department of Orthopedic Surgery, Nemours Alfred I. duPont Hospital for Children, Wilmington, DE, USA

Vrisha Madhuri, D Orth, MS Orth, MCh Orth (L pool) Paediatric Orthopedics Unit, CMC Hospital, Christian Medical College, Vellore, Tamil Nadu, India

Hidenori Matsubara, MD, PD Department of Orthopedic Surgery, Kanazawa University Hospital, Kanazawa, Ishikawa, Japan

James McCarthy, MD Department of Orthopedic Surgery, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

Mark L. Miller, MD Department of Pediatric Orthopedic Surgery, St. Louis Children's Hospital, St. Louis, MO, USA

Taral Vishanji Nagda, MS, DNB, D Ortho Department of Pediatric Orthopedics, Hinduja Hospital Mumbai, Mumbai, Maharashtra, India

Unni G. Narayanan, MBBS, MSc, FRCS(C) Department of Surgery, The Hospital for Sick Children, University of Toronto, Toronto, ON, Canada

Scott C. Nelson, MD Department of Orthopedic Surgery, Loma Linda University School of Medicine, Loma Linda, CA, USA

Chang-Wug Oh, MD Department of Orthopedic Surgery, Kyungpook National University Hospital, Daegu, South Korea

Dror Paley, MD, FRCSC St. Mary's Medical Center, Paley Advanced Limb Lengthening Institute, West Palm Beach, FL, USA

Sandeep A. Patwardhan, MS (Orth), D Orth Department of Pediatric Orthopedics, Sancheti Institute for Orthopedics and Rehabilitation, Pune, Maharashtra, India

Daniel E. Prince, MD, MPH Paley Advanced Limb Lengthening Institute, West Palm Beach, FL, USA

Ashok Kumar Ramanathan, MBBS, MS (Ortho) Department of Orthopedic Surgery, Madurai Medical College, Madurai, Tamil Nadu, India

Karl E. Rathjen, MD Department of Orthopedic Surgery, Texas Scottish Rite Hospital for Children, University of Texas Southwestern Medical Center, Dallas, TX, USA

Anthony I. Riccio, MD Department of Orthopedic Surgery, Texas Scottish Rite Hospital for Children, University of Texas Southwestern Medical Center, Dallas, TX, USA

S. Robert Rozbruch, MD Department of Orthopedics, Hospital for Special Surgery, New York, NY, USA

Weill Cornell Medical College, Cornell University, New York, NY, USA

Daniel K. Ruggles, DO Department of Orthopedic Surgery, Nationwide Children's Hospital, Columbus, OH, USA

Sanjeev Sabharwal, MD, MPH Department of Orthopedics, Rutgers-New Jersey Medical School, Newark, NJ, USA

Lior Shabtai, MD Department of Pediatric Orthopedics, Tel Aviv Sourasky Medical Center, Dana Children's Hospital, Tel Aviv, Israel

Hitesh Shah, MS (Orthopedics), DNB (Orthopedics) Department of Orthopedics, Kasturba Medical College, Kasturba Hospital, Manipal University, Manipal, Karnataka, India

N.D. Siddesh, MS (Orthopedics), FRCS (Glasg) Department of Orthopedics, Kasturba Medical College, Guro Hospital, Manipal University, Manipal, Karnataka, India

Hae-Ryong Song, MD, PhD Department of Orthopedic Surgery, Korea University Medical Center, Seoul, Republic of Korea

Shawn C. Standard, MD International Center for Limb Lengthening, Rubin Institute for Advanced Orthopedics, Sinai Hospital of Baltimore, Baltimore, MD, USA

Peter M. Stevens, MD Department of Orthopedics, University of Utah, Salt Lake City, UT, USA

Abdel Majid Sheikh Taha, MD Department of Orthopedic Surgery, Division of Pediatric Orthopedics, Hospital for Joint Diseases, New York University, New York, NY, USA

Mihir M. Thacker, MD Department of Orthopedic Surgery, Nemours Alfred I. duPont Hospital for Children, Wilmington, DE, USA

Hiroyuki Tsuchiya, MD, PD Department of Orthopedic Surgery, Kanazawa University Hospital, Kanazawa, Ishikawa, Japan

Hugh G. Watts, MD Department of Orthopedic Surgery, Shriners Hospital for Children, Los Angeles, CA, USA

Sarah Zawodny, MD Department of Orthopedic Surgery, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA