

*Volume One*

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# **Pediatric Orthopaedics**

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**Second Edition**

*edited by*

**Wood W. Lovell, M.D.**

**Robert B. Winter, M.D.**

1988年4月2日



*Volume One*

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# Pediatric Orthopaedics

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**Second Edition**

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## Preface

The intent of the authors in the second edition of *Pediatric Orthopaedics* is to make available to the reader an update in the field of children's orthopaedics.

It is hoped that orthopaedic surgeons and pediatricians as well as others will find this book to their liking.

In the first edition of *Pediatric Orthopaedics*, we attempted to express our sincere gratitude to the contributors. We would again like to acknowledge our deep and sincere appreciation to all these individuals. They, as well as the new contributors, will be responsible for any success that we hope this book will enjoy.

Each contributor is a recognized authority and possesses unique qualifications.

Five new chapters have been added to the second edition. These include Assessment of Gait in Children and Adolescents, Partial Growth Plate Arrest and Its Treatment, Overuse Injuries in Children, Neurofibromatosis, and The Role of the Orthopaedic Surgeon in Child Abuse.

We would be remiss if we did not express our thanks to our publisher and its dedicated staff for their cooperation and guidance.

Wood W. Lovell, M.D.

Robert B. Winter, M.D.



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## Preface to the First Edition

The field of pediatric orthopaedics has changed significantly in recent years. In the main, textbooks have kept abreast of change, to the extent that there is now a broad and useful literature addressed to the techniques of treatment of the orthopaedic disorders of children. The editors believe, however, that their fellow surgeons will have increasingly shared the desire for a work focused especially upon the decision-making process that precedes and governs the selection of surgical technique. Basic research and clinical specialization have had a dual effect upon clinical decision making: They have broadened the field of choice, and at the same time have made judicious choice more difficult.

Chapters that will aid the reader at the critical junctures at which decisions must be made have been contributed by authorities of eminence, persons who have long and successful experience dealing with the conditions

about which they have written. The reader will notice that each topic is covered in depth, and that the emphasis on decision-making will facilitate his assessment of the indications and contraindications for a particular treatment approach.

Although we have attempted to match depth with breadth, children's fractures have not been included because the subject is well covered in other textbooks that have recently appeared.

We would like to state that our task has been made not only worthwhile but pleasurable by the continued thoughtful and kind cooperation of the contributors whose names appear in the pages of this book. They have our deepest thanks.

*Wood W. Lovell, M.D.  
Robert B. Winter, M.D.*

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# 1

## Embryology of the Neuromusculoskeletal Apparatus

*Henry LaRocca*

The field of pediatric orthopaedics includes a host of challenges for the clinician owing to the diversity of the problems to which the developing human organism is prone. Disorders in the growing child share the unique feature of being affected by growth and development, which tend, in many cases, to magnify their significance with the passage of time. Even though the child has enormous capacities for bodily restitution following exogenous injury or insult, he is unusually vulnerable when there has been interference with an essential point in the sequence of development. In general, the more rapid the development or the earlier the stage when an insult occurs the more profound will be the derangement.

Many of the presenting clinical problems represent outcomes of events that occurred before birth, and their evolving complexities tax the ingenuity of those who would manage them. Recognition of the nature of these disorders requires a proper understanding of the development of the neuromusculoskeletal apparatus, which must begin with an awareness of the developmental sequence through which it passes from its initial establishment to its ultimate assumption of definitive form and function.

### THE PROCESS OF ONTOGENY\*

Ontogeny, the development of the individual organism, begins with fertilization of the ovum, at which time two haploid gametes are united to form a diploid zygote, which has imprinted in its chromosomal material all the information necessary to convert one cell into a complex organism. In the human, fertilization occurs in the fallopian tube; the zygote then moves down the tube toward the uterine cavity, taking several days for this migration. As it moves, the zygote undergoes cell division, the process being known specifically as "cleavage." Progressive division leads to the formation of a 32-cell sphere known as the *morula*, which is the form in which the structure reaches the uterine cavity (Fig. 1-1). The total size of the morula is equal to the size of the original ovum, because cleavage cell division results in increasing numbers of cells with progressively smaller sizes. As the cells of the morula continue to divide, fluid from the uterine cavity penetrates within and displaces cells to the periphery, thus forming the blastocyst. This structure is a sphere of cells surrounding a

\*The contents of this section have been extracted from Hamilton WJ, Mossman HW (eds): Human Embryology, 4th ed. Baltimore, Williams & Wilkins, 1972.