Vicente Gilsanz
Osman Ratib

Hand Bone Age

A Digital Atlas of Skeletal Maturity

Second Edition

Bone Age for iPad®, iPhone®, and iPod touch®

Springer

Hand Bone Age

Vicente Gilsanz • Osman Ratib

Hand Bone Age

A Digital Atlas of Skeletal Maturity

Second Edition

Springer

Prof. Vicente Gilsanz
Department of Radiology
Childrens Hospital Los Angeles
4650 Sunset Blvd., MS#81
Los Angeles, CA 90027
USA

Prof. Osman Ratib
University Hospital of Geneva
Nuclear Medicine Division
24, Rue Micheli-du-Crest
1205 Geneva
Switzerland

ISBN 978-3-642-23761-4 e-ISBN 978-3-642-23762-1
DOI 10.1007/978-3-642-23762-1
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2011940860

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Acknowledgement

This atlas would not have been possible without the exceptional contributions of Doctors Maria Ines Boechat und Xiaodong Liu, who painstakingly helped in the review, interpretation and assessment of hundreds of hand and wrist radiographs.

Contents

Introduction

1

Bone age assessment is frequently performed in pediatric patients to evaluate growth and to diagnose and manage a multitude of endocrine disorders and pediatric syndromes. For decades, the determination of bone maturity has relied on a visual evaluation of the skeletal development of the hand and wrist, most commonly using the Greulich and Pyle atlas. With the advent of digital imaging, multiple attempts have been made to develop image-processing techniques that automatically extract the key morphological features of ossification in the bones to provide a more effective and objective approach to skeletal maturity assessments. However, the design of computer algorithms capable of automatically rendering bone age has been impeded by the complexity of evaluating the wide variations in bone mineralization tempo, shape and size encompassed in the large number of ossification centers in the hand and wrist. Clearly, developing an accurate digital reference that integrates the quantitative morphological traits associated with the different degrees of skeletal maturation of 21 tubular bones in the hand and 8 carpal bones in the wrist is not an easy task.

In the development of this digital atlas, we circumvented the difficulties associated with the design of software that integrates all morphological parameters through the selection of an alternative approach: the creation of artificial, idealized, sex- and age-specific images of skeletal development. The models were generated through rigorous analyses of the maturation of each ossification center in the hands and wrists of healthy children, and the construction of virtual images that incorporate composites of the average development for each ossification center in each age group. This computer-generated set of images should serve as a practical alternative to the reference books currently available.

V. Gilsanz and O. Ratib, *Hand Bone Age*,
DOI 10.1007/978-3-642-23762-1_1, © Springer-Verlag Berlin Heidelberg 2012