

ORAL RADIOLOGY

Principles and Interpretation

EDITION 7



Stuart C. White

| Michael J. Pharoah

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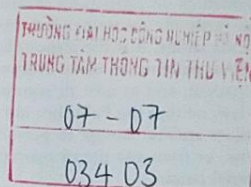
EDITION 7

Stuart C. White, DDS, PhD

Distinguished Professor
Oral and Maxillofacial Radiology
School of Dentistry
University of California, Los Angeles
Los Angeles, California

Michael J. Pharoah, DDS, MSc, FRCD(C)

Professor, Department of Radiology
Faculty of Dentistry
University of Toronto
Toronto, Ontario
Canada



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Contributors

Mariam Baghdady, BDS, MSc, PhD, FRCD(C), Dip ABOMR

University of Toronto
Faculty of Dentistry
Toronto, Ontario
Canada

Byron W. Benson, DDS, MS

Professor and Vice Chair
Department of Diagnostic Sciences
Texas A&M University
Baylor College of Dentistry
Dallas, Texas

Sharon L. Brooks, DDS, MS

Professor Emerita
Periodontics and Oral Medicine
University of Michigan
School of Dentistry
Ann Arbor, Michigan

Laurie C. Carter, DDS, PhD

Professor and Director
Oral and Maxillofacial Radiology
Director of Advanced Dental Education
Virginia Commonwealth University
School of Dentistry
Richmond, Virginia

Allan G. Farman, BDS, PhD (Odont), DSc (Odont)

Professor, Radiology and Imaging Science
Surgical and Hospital Dentistry
Clinical Professor, Department of Diagnostic Radiology School
of Medicine
Adjunct Professor, Department of Anatomical Sciences and
Neurobiology
University of Louisville
Louisville, Kentucky

Fatima Jadu, BDS, MSc, PhD, FRCD(C), Dipl ABOMR

Assistant Professor
Oral and Maxillofacial Radiology
King Abdulaziz University
Faculty of Dentistry
Jeddah, Saudi Arabia

Mel L. Kantor, DDS, MPH, PhD

Professor and Chief
Oral Diagnosis, Oral Medicine & Oral Radiology
Department of Oral Health Practice
University of Kentucky
College of Dentistry
Lexington, Kentucky

Ernest W. N. Lam, DMD, PhD, FRCD(C)

Dr. Lloyd & Mrs. Kay Chapman Chair in Clinical Sciences
Professor and Head of Oral and Maxillofacial Radiology
University of Toronto
Toronto, Ontario
Canada

Linda Lee, DDS, MSc, Dipl ABOP, FRCD(C)

Oral Medicine and Pathology
Princess Margaret Hospital
University Health Network
Associate Professor
University of Toronto
Toronto, Ontario
Canada

John B. Ludlow, DDS, MS, FDS, RCSEd

Professor
Oral and Maxillofacial Radiology
University of North Carolina at Chapel Hill
School of Dentistry
Chapel Hill, North Carolina

Alan G. Lurie, DDS, PhD

Professor and Chair
Oral and Maxillofacial Radiology
University of Connecticut
School of Dental Medicine
Farmington, Connecticut

Sanjay M. Mallya, BDS, MDS, PhD

Assistant Professor
Oral and Maxillofacial Radiology
UCLA School of Dentistry
Los Angeles, California

André Mol, DDS, MS, PhD

Clinical Associate Professor
Department of Diagnostic Sciences
University of North Carolina at Chapel Hill
School of Dentistry
Chapel Hill, North Carolina

Carol Anne Murdoch-Kinch, DDS, PhD

Clinical Professor
Associate Dean for Academic Affairs
University of Michigan School of Dentistry
Ann Arbor, Michigan

Susanne Perschbacher, DDS, MSc, FRCD(C), Dipl ABOMR

Assistant Professor
Oral and Maxillofacial Radiology
University of Toronto
Toronto, Ontario
Canada

Axel Ruprecht, DDS, MScD, FRCD(C)

Gilbert E. Lilly Professor of Diagnostic Sciences
Professor and Director of Oral and Maxillofacial Radiology
Professor of Radiology
Professor of Anatomy and Cell Biology
The University of Iowa
Iowa City, Iowa

William C. Scarfe, BDS, MS, FRACDS

Professor
Radiology and Imaging Sciences
University of Louisville
School of Dentistry
Louisville, Kentucky

Vivek Shetty, DDS, Dr Med Dent

Professor
Oral and Maxillofacial Surgery
UCLA School of Dentistry
Los Angeles, California

Sotirios Tetradis, DDS, PhD

Professor and Chair
Oral and Maxillofacial Radiology
UCLA School of Dentistry
Los Angeles, California

Ann Wenzel, PhD, Dr Odont

Professor and Head
Department of Oral Radiology
School of Dentistry
University of Aarhus
Aarhus, Denmark

Robert E. Wood, DDS, PhD, FRCD(C), DABFO

Head, Department of Dental Oncology
Princess Margaret Hospital
Associate Professor
University of Toronto
Toronto, Ontario
Canada

Preface

Oral radiology is a vibrant field of study. The discovery of x rays by Wilhelm Röntgen in December 1895 forever changed the practice of dentistry and medicine. During the next year, the first dental radiographs were made by Dr. Otto Walkhoff in Germany, Dr. C. Edmund Kells in New Orleans, and Dr. W. H. Rollins in Boston. Dr. Rollins was also a pioneer in the field of radiation safety, and we follow his basic principles to this day. We dedicate this edition to Dr. Harry M. Worth, who devoted his life study to the radiographic appearances of diseases of the jaws. His textbook, issued 50 years ago in 1963, set the standard for radiographic interpretation. He was an inspiration to us both.

Dentists today have ready access to a variety of excellent imaging modalities to assist in the care of their patients. To best use dental radiography in the practice of dentistry, it is important to understand the basic principles of imaging. To this end, this book includes chapters describing the means of producing x rays, the mechanisms by which radiation interacts with living systems, and the safe operation of dental x-ray machines. Other chapters focus on how to make intraoral images and on the imaging principles underlying panoramic and cone-beam computed tomographic (CBCT) machines, multidetector computed tomographic (CT) scanners, and magnetic resonance imaging scanners. We describe how images are captured on film and, increasingly often, with digital sensors.

Of course, the primary purpose of oral radiology is to produce images that may be interpreted for the detection of disease or other abnormalities. The second half of this book is dedicated to the systematic description of the radiographic manifestation of diseases and other conditions in the oral cavity and associated structures, including the paranasal sinuses and temporomandibular joints. Emphasis is placed on the role of understanding the underlying mechanisms of various disease processes to enhance the interpretation of abnormalities as they can appear in various imaging modalities. To be a good diagnostician, it is helpful to be curious, observant, systematic, and thorough. This applies not only to interpreting diagnostic images but also to obtaining a patient's history, conducting the physical examination, and combining this information to arrive at a proper differential

diagnosis. Successful treatment critically depends on accurate diagnosis.

In general, dentists interpret most of the images they prescribe and produce. This responsibility places a special burden on dentists to be well versed in the means of acquiring optimal images as well as in their interpretation. Interpretation of images may be especially challenging for dentists who rarely see abnormalities such as cysts, inflammatory diseases, tumors, or other forms of disease. Also challenging is the unfamiliar presentation of images in a new format, such as a sequence of image slices of an image volume or three-dimensional representations as in advanced imaging modalities, such as cone-beam CT imaging or other types of scanners. This situation is largely remedied by a cadre of trained and experienced oral and maxillofacial radiologists. These individuals assist general dentists and other medical and dental specialists by helping to interpret the images of unusual cases or by suggesting appropriate advanced imaging to investigate an unknown condition more thoroughly. General dentists and their patients benefit by calling on the services of these individuals whenever they come across an image that they are not confident interpreting.

Each new edition of this textbook provides the opportunity to describe recent progress in our rapidly changing field of diagnostic imaging. Every chapter has been revised in light of new knowledge, technology, and techniques. In this edition, two new chapters dealing with the image acquisition and image processing involved with cone-beam CT technology have been added. It is the continuing goal of our textbook to present the underlying science of diagnostic imaging, including the core principles of image production and interpretation for the dental student. We also offer supplemental resources to both instructors and students at a companion Evolve website (<http://evolve.elsevier.com>) for the seventh edition. For instructors, a test bank and image collection will save time in preparing for lectures and examinations.

It is our hope that the reader will find the study of oral radiology as exciting and fulfilling as we have.

Stuart C. White
Michael J. Pharoah

Acknowledgments

We are sincerely appreciative of all authors for sharing their expertise with the reader. Their rich body of knowledge and experience have contributed substantively to this edition. We thank all for sharing their expertise and skills.

This edition welcomes three new authors: Drs. Mariam Baghdady and Fatima Jadu, both from the University of Toronto, and Dr. Sanjay Mallya from UCLA. Dr. Baghdady has extended the chapter on the principles of interpretation, bringing more emphasis on the science behind diagnostic reasoning and image interpretation. Dr. Jadu rewrote the chapter on systemic diseases, with special emphasis on the underlying disease mechanisms. Dr. Mallya rewrote the chapter on panoramic imaging, extending the coverage of the principles underlying image formation as well as novel features available on new panoramic machines. Drs. William Scarfe and Allan Farman extended their coverage of cone-beam CT imaging from one chapter to two, the first on image acquisition and the second on image preparation for interpretation. A new chapter by Drs. Mallya and Sotirios Tetradis describes the radiographic anatomy seen on sagittal, coronal, and axial cone-beam CT images. Finally, Dr. Robert Wood has prepared a new chapter on forensics in dentistry focusing on the role of dental radiography in identifying human remains. And we are most appreciative of authors who continue to contribute their expertise in updating their chapters for the current edition. Lastly, we wish to remember the outstanding contributions of two deceased gentlemen, Drs. A. Peter Fortier and S. Julian Gibbs. Each of these men wrote

insightful chapters in the early editions of this book and contributed to the advancement of our field.

We are particularly grateful to our colleagues and students whose sharp eyes and minds uncover errors and suggest ways for us to improve each edition. Among these individuals are Drs. Mansur Ahmad, Mohamed Khaled Alashiry, Ali Bagherpour, Silvina Friedlander-Barenboim, Mohammed Hussain, Marc Levitan, Gang Li, Brian Lozano, Peter Mah, Matheus Oliveira, Colin Price, Elham Radan, Greg Smith, Susan White, Lisa Yi, Eugene Yu, and Ed Zinman. Also, from the world of industry, we appreciate the assistance of Drs. Kim Brown and Adam Chen, Herb Clay, Betsy Guffey, Gary Piper, Jacqueline Sacrey, Christopher Warren, and Douglas Yoon. We apologize for any individuals inadvertently overlooked on these lists.

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Stuart C. White
Michael J. Pharoah

Contents

PART I Foundations

- 1 Physics, 1
- 2 Biology, 16
- 3 Safety and Protection, 29

PART II Imaging

- 4 Digital Imaging, 41
- 5 Film Imaging, 63
- 6 Projection Geometry, 84
- 7 Intraoral Projections, 91
- 8 Intraoral Anatomy, 131
- 9 Extraoral Projections and Anatomy, 153
- 10 Panoramic Imaging, 166
- 11 Cone-Beam Computed Tomography: Volume Acquisition, 185
- 12 Cone-Beam Computed Tomography: Volume Preparation, 199
- 13 Cone-Beam Computed Tomography: Anatomy, 214
- 14 Other Imaging Modalities, 229
- 15 Quality Assurance and Infection Control, 250
- 16 Prescribing Diagnostic Imaging, 259

PART III Interpretation

- 17 Principles of Radiographic Interpretation, 271
- 18 Dental Caries, 285
- 19 Periodontal Diseases, 299
- 20 Inflammatory Disease, 314
- 21 Cysts, 334
- 22 Benign Tumors, 359
- 23 Other Bone Diseases, 402
- 24 Malignant Diseases, 427
- 25 Systemic Diseases, 452
- 26 Paranasal Sinus Diseases, 472
- 27 Temporomandibular Joint Abnormalities, 492
- 28 Soft Tissue Calcifications and Ossifications, 524
- 29 Salivary Gland Diseases, 542
- 30 Trauma, 562
- 31 Dental Anomalies, 582
- 32 Craniofacial Anomalies, 612

PART IV Other Applications

- 33 Implants, 630
- 34 Forensics, 646

Index, 653