Dale A. Miles, DDS, MS

Oral and Maxillofacial Radiologist
Fountain Hills, Arizona
# Table of Contents

Preface vii  
Acknowledgments ix  

1 Cone Beam Volumetric Imaging in Clinical Practice 1  

2 Basic Principles 9  

3 Anatomic Structures 15  

4 Airway Analysis 47  

5 Dental Findings 57  

6 Impacted Teeth 67  

7 Implant Site Assessment 81  

8 Odontogenic Lesions 91  

9 Orthodontic Assessment 127  

10 Orthognathic Surgery and Trauma Imaging 145  

11 Paranasal Sinus Evaluation 177  

12 Temporomandibular Joint Evaluation 215  

13 Systemic Findings 255  

14 Vertebral Body Evaluation 289  

Index 305
Like any innovation in the dental profession, the availability of cone beam volumetric imaging (CBVI) has preceded understanding of its use. It happened with panoramic imaging as it did with digital radiographic imaging. The cone beam images in this atlas will educate dental professionals on how to use CBVI technology to better visualize the diseases and disorders that they encounter with their patients.

One aim of this atlas is to refresh the reader’s memory of anatomy. As dentists, we never “worked” in the axial plane of section after our anatomy training; we have lived in a world of plain films or digital images, all in the format of 2-D grayscale panoramic, intraoral, or lateral cephalometric images. CBVI allows us to visualize patient anatomy and pathology like never before. With this technology we can not only view the patient’s problems in three planes of section but colorize the image data sets in 3-D. CBVI helps to reveal bony changes caused by pathology. In addition, the level of anatomic detail in the 3-D image sets means that clinicians placing implants no longer have to experience anxiety about whether they are placed correctly. CBVI allows us to determine the precise location of the inferior alveolar nerve in relation to impacted mandibular third molars, which improves preoperative planning and reduces patient morbidity as well as our liability.

At last, we can see our patients’ problems in a whole new manner—in 3-D and color. I hope this book helps you understand how CBVI can improve your clinical experiences and the management of your patients’ treatment.
Acknowledgments

I am deeply appreciative to Mr Andrew Kim (CyberMed USA) and to Professor C. Young Kim (CyberMed International) for allowing me to beta test the initial software and to continue to use their product to image patient data sets to help readers visualize patient problems in a whole new light.

I would like to acknowledge Mr Bob Pienkowski and Mr Jim Fritz (Planmeca USA) for having the vision and patience to adopt this software and collaborate with CyberMed International to bring this technology to dentists and help us with our patients.

I would also like to thank the referring clinicians of Northwest Radiology in Seattle, Washington, for their confidence in my interpretive skills to serve their practice needs. This laboratory service, the clinicians they serve, and their wonderful patients have produced the data volumes that are featured in this text. Thanks to you all.

Thanks to Dr Ron Shelley for his help with my website. He represents the best of our profession, a dentist who cares about his patients and continually learns new techniques to help them with their dental problems.

Thanks also to Ms Tomoko Tsuchiya and Mr H.W. Haase, the publishers of Quintessence, for the opportunity to educate my colleagues about this incredible technology.

Finally, special thanks to my wife Kathryn for her support, love, confidence, sacrifice, and patience with me throughout my career and this project. I will make up the time, I promise.
Odontogenic Lesions

Although many odontogenic cysts and tumors are rare, the application of cone beam volumetric imaging (CBVI) to characterize these lesions is invaluable for preoperative planning and clinical management.
**Fig 8-2d** A sagittal slice (60.0 mm thick) rendered in 3-D color shows the lesion and soft tissue outlines. Note also the transparent airway and paranasal sinus regions.

**Fig 8-2e** An axial slice (60.0 mm thick) rendered in 3-D color showing lesion and soft tissue outlines. Note also the transparent airway and paranasal sinus regions.
Fig 8-2f. A full 3-D color rendering shows the lesion and soft tissue outlines. Note the apparent perforation of the anterior cortical bone. This is a pseudoperforation caused by the slice thickness. The cortex, though thinned, is intact, as seen in the previous images.

Fig 8-2g. A full 3-D color rendering shows the lesion and soft tissue outlines. Again, note the apparent perforation of cortical bone. This image is fully rendered, so the “perforation” actually comes from the image processing. The opacity and transparency functions may have been manipulated incorrectly. All 2-D and 3-D image data must be examined to make a correct assessment.
**Fig 12-5h** The 3-D color reconstruction compares left and right sides. The left condyle is hypoplastic; lipping is evident. The loose body is not very apparent.

**Fig 12-5i** A 3-D color view created with the Cube tool shows the loose body in the left condyle (arrow).