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## BOOK REVIEW

*Live/Real Time 3D Echocardiography (First Edition)* Navin C. Nanda, Ming Chon Hsiung, Andrew P. Miller, Fade G. Hage Wiley-Blackwell, A John Wiley & Sons, Ltd., Publication, 2010, ISBN: 9781405161411. The Atrium, Southern Gate, Chichester, West Sussex, United Kingdom. 312 pp. US$269.95.

Three-dimensional (3D) echocardiography has made great strides from its humble beginning. In the 1970s when still rudimentary two-dimensional (2D) transthoracic echocardiographic (TTE) imaging was only being introduced into the larger echocardiography community, there were already efforts to convert 2D images into 3D data sets. As early as 1974, descriptions of room-size transthoracic 3D TTE acquisition systems appeared in the medical literature. In the 1980s, a more compact and thus more practical approach was developed utilizing a standard 2D TTE probe mounted on a mechanical arm that controlled a rotational movement of the 2D probe. In the 1990s, 3D imaging was extended into the realm of transesophageal imaging (TEE).

All these initial efforts in 3D echocardiography imaging shared the same basic principle. There was no true 3D volume acquisition. Instead, a series of individual 2D images was acquired, one image at the time. After the first image was acquired, the imaging plane was rotated either via mechanical movements of the entire probe or electronically within phased-arrays of probe crystals. The process was repeated until the entire region of interest was scanned. The image series acquired on the ultrasound system was then transferred to a dedicated computer work station where specialized software would reconstruct 2D images into 3D data sets. This whole process was labor intensive and time consuming. Because of often marked delay between image acquisition and image reconstruction, the diagnostic information uncovered by these early 3D echocardiography systems could not be conveyed to referring physicians, interventional cardiologist or cardiac surgeon in real time.

The field of 3D echocardiography was revolutionized in the first decade of the 21st century by the introduction of first transthoracic then transesophageal matrix array probes. Unlike standard 2D probes which usually contain between 64 and 128 piezoelectric elements, matrix array probes have thousands of imaging elements. This allows matrix array probes to acquire true 3D data sets in real time. In addition, this new 3D imaging technique is often live, meaning that 3D image acquisition and 3D image display on the screen are simultaneous. With live imaging, 3D echocardiography has finally reached the stage that we take for granted with 2D imaging: image acquisition, manipulation and display are all accomplished on the ultrasound system in real time.

Dr. Navin Nanda and his colleagues have been in the forefront of all these developments in 3D echocardiography and were instrumental in advancing both the technological aspects as well as the clinical applications of 3D echocardiography. *Live/Real Time 3D Echocardiography* is their latest contribution to the field of matrix array-based 3D ultrasound imaging. *Live/Real Time 3D Echocardiography* is both a textbook and an extensive atlas indispensible to anyone interested in learning and utilizing 3D echocardiography. The book is the result of a collaborative effort between the University of Alabama at Birmingham, Birmingham Veterans Administration Medical Center and Cheng Shin General Hospital in Taipei, Taiwan.

Even with the newest technological advancements, the process of 3D imaging, whether echocardiographic or radiologic, is often non-intuitive and there is frequently a quite steep learning curve. *Live/Real Time 3D Echocardiography* will provide even a novice 3D echocardiographer with a roadmap on how to acquire, process and interpret 3D echocardiograms. The book has 16 chapters, over 800 still images as well as over 350 movies on the included DVD.

The book starts with chapters dedicated to the history of 3D echocardiography and technological aspects of 3D echocardiographic imaging. These are followed by a very useful tutorial on how to do a 3D echocardiogram; this chapter includes the 3D examination protocol and the description of a normal anatomy as visualized by matrix array-based 3D echocardiography.

The book has a beautiful graphical design and an easy to follow text layout. Most still images are in high-quality color. DVD-based movie clips are an extremely useful feature. I had no problem playing clips on the supplied DVD using Windows XP, Windows 7 or Mac OS 10. The clip collection provides a large number of 3D examples of native and prosthetic valve disease, left and right ventricular function assessment and chamber quantification, ischemic heart disease, cardiomyopathies, congenital heart disease, cardiac masses and pericardial disorders.

The clips are cross-referenced to appropriate book sections where readers can get in-depth descriptions of normal and pathological findings. Clips are organized in folders that correspond to

book chapters. After clicking a small arrow to the left of the folder, the list of individual clips in each folder is revealed. Even an echocardiographer inexperienced in 3D ultrasound imaging will easily understand what is depicted in each clip since all relevant cardiac structures and important findings are clearly labeled.

Most of the images and clips presented in the book are acquired using 3D TTE probe. However, there is a separate chapter dedicated to 3D TEE images with the special emphasis on the imaging of the mitral valve. 3D TEE echocardiography provides remarkable en face views of cardiac structures. Such views are particularly useful in evaluating the mitral valve, interatrial septum and the thoracic aorta. There are also separate chapters dedicated to emerging 3D echocardiographic technologies such as real time nonstitched full volume imaging and 3D speckle tracking.

In summary, *Live/Real Time 3D Echocardiography* by Dr. Nanda and colleagues should find place in the library of any modern echocardiographer interested in 3D imaging.

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