

The Clinical Proof of 2D Versus 3D

During the 45th Annual Meeting of the American Society of Neuroradiology, held in Chicago June 9 -12, 2007, Lawrence N. Tanenbaum, M.D., FACR, Section Chief MRI, CT and Neuroradiology, New Jersey Neuroscience Institute, Edison Imaging, discussed differences between 2D and 3D MR image acquisitions.

Dr. Tanenbaum and his associates use volume acquisitions every day in their practice, such as the detection and surveillance of multiple sclerosis (MS) and for imaging of hippocampus in epilepsy. Regarding his recent experience with GE's new volumetric imaging applications, he remarked, "We are about to enter an era with more exciting techniques. The most impactful, new volumetric technique is Cube™."

Significant to this application are pulse sequence changes that require shorter RF pulses and provide tighter echo spacing, leading to less blur and the ability to use longer echo trains while maintaining signal-to-noise ratio (SNR), he explained. "Clever modulation of the flip angle during acquisition tends to actually eliminate a lot of the blur you get with fast spin echo, and provides a driven equilibrium effect that boosts SNR," he added. Cube leverages the resultant reshaped signal decay state with very long echo trains boosting speed while maintaining SNR.

Historically, a potential pitfall for MR acquisitions has been long acquisition times, which limit practical application in many clinical settings and can also lead to an increase in motion artifacts.

However, this is circumvented with the development of an advanced, data-driven parallel imaging technique for use with Cube. ARC* uses information available in each plane or dimension to help improve reconstruction accuracy, lessen motion artifacts and reduce calibration lines.

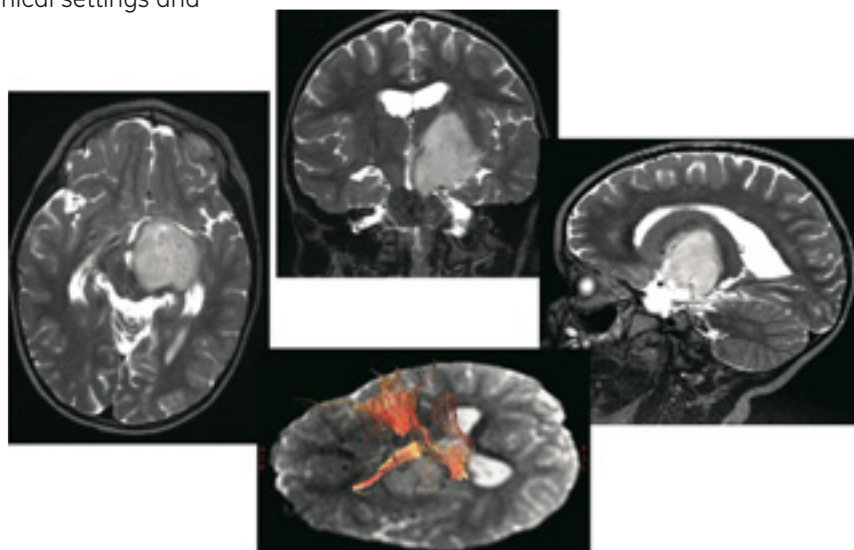


Figure 1. Moderate grade glioma Cube 1.5T and fibertrak images of three-year-old male

*ARC: Autocalibrating Reconstruction for Cartesian imaging

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Dr. Lawrence Tanenbaum

Combining ARC with Cube acquisitions, Dr. Tanenbaum achieved acceleration factors of four to nine, providing isotropic whole brain acquisitions in approximately three minutes. “We’ve experienced very impressive results.”

“Although Cube is a very sophisticated sequence, this application is easy-to-use, robust and very fast,” Dr. Tanenbaum said. When used with ARC, he was able to routinely acquire 1.2 mm to 0.6 mm isotropic voxels with T2 and FLAIR contrast. “The reconstructed very thin, gap-free slices facilitate high resolution data interrogation of complete volume data – something we do not have with 2D.” He noted the clinical result is the ability to see MS lesions as small as 2 mm.

“This application is changing the way we scan at Edison Imaging,” Dr. Tanenbaum said, “and Cube has already replaced other techniques in my practice.”

According to Dr. Tanenbaum, other potential uses of Cube are with fMRI and Tractography, providing excellent fusion and automatic segmentation results with 3D rather than 2D. Volumetric techniques have the power to drive quantitative assessments that are impractical and “almost inappropriate to do with 2D because of thick sections and intervening gaps innate to 2D imaging. With capabilities, it can become a gold standard acquisition.”

For Dr. Tanenbaum, the benefits of volumetric MR imaging go beyond speed and the ability to reformat. “The susceptibility artifact that propagates in plane does not propagate through plane, so you get a pristine, orbital floor and skull base.” He further believes that volumetric multi-plane imaging can help minimize additional scans, reducing total scan times in many cases. Yet, the true value lies in the ability to arm clinicians with a better diagnostic tool. “You can’t argue against thin-slice, gap-free studies for the detection of disease. This will change the way we scan.” ■



Lawrence N. Tanenbaum, M.D., FACR

Lawrence N. Tanenbaum, M.D., FACR, is Chief of MR, CT and Neuroradiology at Edison Imaging Associates and Solaris Health Systems. For over 30 years, the radiologists of Edison Imaging have led the way in providing the medical communities of central New Jersey with a full range of imaging services, utilizing the latest, most advanced technologies, including GE’s Signa HDxt 3.0T and 1.5T MR Scanners.

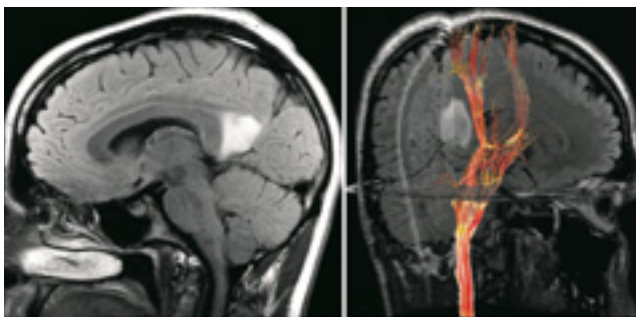


Figure 2. Cube FLAIR and FiberTrak at 3.0T Glioma

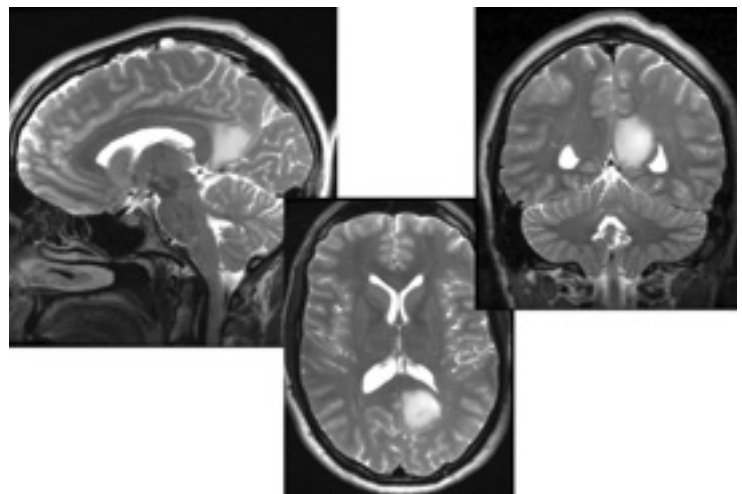


Figure 3. Cube T2 3.0T Glioma