AbstractID: 10053 Title: Use of 320-slice MDCT in Vascular, Cardiac and Brain Studies: Initial Clinical Experience and Radiation Dose Assessments

A 320-slice multi-detector computed tomography (MDCT) scanner has been in use at the University of Florida for six months. Implementation of this new technology required a multidisciplinary team to take into account many crucial factors. First, selection of an adequate site proved to be difficult because of weight and cooling specifications, which forced a modification of the initial plans, resulting in the scanner being installed about 50 yards away from the main CT hub, thus creating certain workflow issues and minor staffing problems. Second, the size of the computer hardware combined with the hospital's decision to install a dedicated thin-slice archive (TSA) of several Terabytes in capacity also resulted in additional space and cooling requirements. This TSA allows clinicians and researchers to access originally-acquired volumetric data for comparison and protocol-optimization purposes for months post-study. Third, use of the scanner poses extremely demanding network bandwidth requirements in the area where the scanner resides, as data acquired are immediately stored in the TSA, and other generated images are transferred to PACS main archives and workstations. Fourth, the need for workstations which can adequately display and allow manipulation of perfusion and 3D studies in several key areas of the medical campus, such as neurosurgery and cardiology did not become fully evident until the tremendous benefits of the scanner became apparent to the hospital's medical staff.

As the two main clinical applications of the scanner are cardiac and brain imaging, two clinical projects were initiated immediately in conjunction with the Emergency Department: chest pain patients and patients in the stroke alert protocol. These are long-term studies which are expected to yield clinical results later in the year. To date, the scanner is being used for all types of CT angiography (CTA) studies, but in particular, cardiac-gated studies. Cardiac perfusion studies will begin later in the summer as software becomes available, though brain perfusion studies are already being performed routinely. A critical part of this implementation and of the optimization of clinical protocols is that of radiation dose. The diagnostic physics group at UF has begun a dual effort in this aspect: first, in the determination of organ doses by direct measurement using a commercially-available optically-stimulated luminescent (OSL) dosimetry system which makes use of individual small OSL detectors placed on anthropomorphic phantoms and scanned using the clinically-approved protocols. Second, to perform MonteCarlo simulations of such organ doses as well as the corresponding equivalent doses for the purpose of comparing them with the scanner-generated computed tomography dose index (CTDI) and dose-length product (DLP) values displayed and stored in the study's DICOM header. Preliminary data on organ and equivalent doses will be presented for brain-perfusion, cardiac and brain CTA and AVM studies.

Educational Objectives:

1. Understand the issues on planning and installation of a 320-slcie MDCT scanner
2. Understand the use of the scanner in vascular, cardiac and brain studies
3. Understand the process of optimization of clinical protocols for these studies
4. Understand the impact on patient doses which result from these studies.