Contribution ID: **8** Type: **Oral**

Clinical commissioning of the MARS spectral photon-counting CT and its first clinical application for the diagnosis of crystal arthropathies

Friday, 28 October 2022 10:45 (10 minutes)

Purpose: To assess the image quality and dose performance of the first SPCCT for extremity imaging, and to demonstrate its clinical benefit for the diagnosis and management of crystal arthropathies.
Methods: The MARS Extremity 5x120 is a small-bore point-of-care SPCCT scanner designed for conducting clinical investigations on the upper extremities. We carried out the first full clinical commissioning of the scanner, which included basic and adapted image quality and radiation dose metrics, dedicated phantoms, and automated analysis techniques. Basic metrics were evaluated to determine whether they met international standards for quality assurance and national regulations. Material discrimination capabilities were evaluated using various high- and low-Z materials. The volume dose index (CTDIvol) was measured on a custom-made 10-cm diameter CTDI phantom. In order to assess the potential of the MARS scanner in detecting, quantifying and distinguishing different crystals, we developed a custom phantom that mimics peripheral joints with synthetic crystal inserts at concentrations typically found in patients with crystal arthropathies.
Results: Image quality metrics, such as CT number of water, uniformity, noise level and slice thickness, satisfies all technical specifications and comply with international standards. The in-plane spatial resolution was 1.5 lp/mm (10% MTF), about 3 times higher compared to conventional CT. An excellent longitudinal spatial resolution of 5.0 lp/mm (10% MTF) was obtained. A good spectral correlation and linearity was found. The CTDIvol for the routine hand and wrist protocol was 9.81 mGy, equivalent to 3.82 mGy for a standard 32 cm CTDI phantom. Preliminary results from the discrimination potential for various crystals involved in crystal arthropathies are very promising.
Conclusion: SPCCT are emerging imaging modalities that promise to revolutionize clinical practice allowing new diagnostic features through the detection, identification and quantification of multiple materials simultaneously. Nonetheless, adapted image quality and radiation dose metrics are necessary to fully benefit from the spectral information. Results from this study show that the SPCCT have the potential to provide useful clinical information for enhanced diagnosis of crystal-related arthropathies.

Primary authors: Dr GALLEGO MANZANO, Lucia (CHUV - Centre hospitalier universitaire vaudois); Mr MONIN, Pascal (CHUV - Centre hospitalier universitaire vaudois); Mr SAYOUS, Yann (University of Canterbury, Christchurch, New Zealand); Dr RACINE, Damien (CHUV - Centre hospitalier universitaire vaudois); Dr DAMET, Jérôme (Centre hospitalier universitaire vaudois); Dr BECCE, Fabio (CHUV - Centre hositalier universitaire vaudois); VIRY, Anais (CHUV - Centre hospitalier universitaire vaudois)

Presenter: Dr GALLEGO MANZANO, Lucia (CHUV - Centre hospitalier universitaire vaudois)

Session Classification: Session III: Imaging

Track Classification: Diagnostics