AbstractID: 9268 Title: Optimization and calibration procedures of a contrast-medium based subtraction technique in digital mammography

Purpose: To optimize radiological and clinical parameters for the application of a contrast-medium-based subtraction technique in digital mammography and to evaluate its clinical feasibility using a commercial mammography unit without any external or internal hardware modification. **Method and Materials:** This is a two-stage project. Firstly, an extension of Lemacks' analytical formalism was implemented in order to maximize contrast-to-noise ratios (CNR) in simulated applications of dual-energy and temporal subtraction modalities, and combinations of them. The formalism was validated by imaging tubular structures with an iodine-based contrast medium embedded in a PMMA phantom. Once two optimized techniques were defined, calculations were performed to obtain exposure values limiting the total glandular dose to 2.5 mGy in a dynamical study of 1 mask + 3 post-contrast images. Secondly, these parameters were used to calibrate the gray level in subtracted images as function of contrast medium iodine concentration contained in a multi-well PMMA-phantom. Optimized subtraction techniques are being applied in a clinical study which shall include 20 patients. **Results:** Experimental CNR results surpass Rose's criterion (CNR=5) and validate the predicted advantage of temporal techniques. Dual energy temporal subtraction, with iodine administered in the low energy image arises as the optimum subtraction technique, instead of the predicted advantage of contrast medium administration during the high-energy acquisition. With respect to the calibration, relations between CNR and iodine concentration were found to be approximately linear beyond 8 mg/ml, although for lower concentrations, CNR is undetectable. **Conclusions:** The advantage of temporal over dual energy subtraction in terms of CNR has been validated, particularly of dual energy temporal subtraction. Furthermore, concentrations below 8 mg/ml do not satisfy the detection criterion.