Purpose: To study iodine uptake in digital mammography images obtained by temporal image subtraction after intravenous administration of contrast medium and use of dual-energy.

Methods: 20 patients classified as BIRADS 4 or 5 were invited to participate in a study of contrast-medium enhanced subtraction of mammographic images. A Senographe DS digital unit was used, and patients were injected during the procedure with iodine-based contrast medium. A biopsy was taken after the radiographic procedure. Images were craniocaudal, obtained under a single (weak) compression. For dual-energy subtraction a low-energy mask and four post-contrast high-energy images were acquired, the latter at 1, 2, 3 and 5 minutes after the mechanical-power contrast medium injection. For temporal subtraction a pre-contrast mask was obtained at high-energy settings. Two subtraction schemes were employed, one requiring radiologist identification of adipose, healthy glandular and lesion ROIs for normalization before subtraction, and one self-normalized (for temporal sequences). Samples from biopsies were analyzed with specific immunohistochemical markers to determine vascular and lymphatic neovasculature within the lesion.

Results: The procedure was well tolerated by patients. 75% of cases were malignant, mostly invasive ductal carcinomas. An area of enhancement (high iodine contrast) at the suspected lesion location was observed in most of malignant cases. No enhancement was observed in most of benign cases. Iodine contrast was higher for dual-energy subtraction than single-spectrum temporal analysis while contrast-to-noise ratios were similar. Enhancement kinetic curves showed, for most of malignant cases, rapid uptake followed by slow washout. Correlation between kinetics of enhancement and intratumoral density of vascular and lymphatic vessels is being analyzed.

Conclusions: This preliminary analysis corroborates the feasibility of contrast-enhanced digital mammography and the potential use of the technique to identify breast lesions. Final analysis of our data should indicate the specific advantages of each technique being investigated.