for two to four years. An increase in calcification was observed in nine cases. Five of these cases were diagnosed with DCIS: Four were Van Nuys 1; one was Van Nuys 2. All five cases were of low-grade-malignancy.
Conclusions: The diagnostic method using FNAC to visualize calcification using high-resolution ultrasonography is an effective method to reduce the non-efficient, invasive breast cancer detecting method of ST-MMT. The few low-grade DCIS cases included were not detected with ultrasound. However, we believe it is not a diagnostic error. As a result, we stopped using the ST-MMT from 2010. In spite of this, in the MMG screening performed in our facilities from 2010 to 2012, the detection rate of only a NPCBC without mass on MMG was 0.17 %. This detection rate is excellent in our country.

OPT2-003

Computer Aided Detection of Breast Cancer on Ultrasound Imaging Using Deep Learning

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Objectives: Although breast ultrasound imaging is powerful and effective tool to detect breast lesions and have been widely performed worldwide, it is an operator-dependent test, hence the accuracy for detection and diagnosis of breast lesions depend on the operator. We develop a computer-aided detection system for masses in ultrasound image using deep convolutional neural network.
Methods: A data set containing 818 ultrasound images were collected from our institute. Breast lesions on these images were cropped as 256x256 pixel images manually. All images were flipped horizontally and were collected to make new images. After data augmentation, a total of 2604 images were obtained. These images were labeled and classified by histological tissue type: cyst, concentrated cyst, ductal carcinoma in situ, fibroadenoma, intraductal papilloma, lymph node, invasive lobular carcinoma, mastitis, mastopathic change, mucinous carcinoma, invasive papillotubular carcinoma, phyllodes, tumor, invasive scirrhous carcinoma or invasive solidtubular carcinoma. For training and testing, the data set was randomly divided into a training set and an independent test set with a ratio of 80:20. Classification of data set images were trained using convolutional neural network(CNN) with ten hidden layers including convolutional layers and pooling layers. Its accuracy of classification was evaluated. Data set was also classified as either benign or malignant, and trained using CNN. Its accuracy, sensitivity and specificity were also evaluated.
Results: Images were classified as 14 tissue type and trained. The accuracy for classification of each tissue type was 86.9%. Images were classified as either benign or malignant. The accuracy, sensitivity and specificity were 95.4%, 93.2% and 96.4%, respectively.
Conclusions: We achieved 95% of accuracy for classification from ultrasound imaging using CNN. Deep learning could potentially help detecting and diagnosing the breast cancer, improving accuracy and productivity of diagnosing breast cancer by physician.

OPT2-004

Color Doppler Findings of Malignant Breast Masses -Jabts Bc-04 Study Part 2-

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Objectives: The JABTS BC-04 study was conducted to assess the usefulness of color Doppler. In this part of the study, color Doppler findings of malignant masses were analyzed.
Methods: Breast masses examined by ultrasound between October 2013 and December 2015 were registered from 16 institutions in Japan. We collected B-mode images, color Doppler images and clinical data on these breast masses. A Centralized Image Interpretation Committee evaluated collected images. Vascularity, vascular pattern (penetrating flow, surrounding marginal flow), incident angle and disruption of penetrating vessels on color Doppler were evaluated.
Results: In total, 839 solid malignant masses were analyzed. The mean age of breast cancer patients was 57.7±13.7 years (mean±SD). Vascularity was classified as: 0, 1+, 2+, 3+. The frequency of each class was: 0: 37 (4%); 1+: 220 (26%); 2+: 398 (48%); 3+: 184 (22%). Vascularity was higher in masses with ER-negative ($p<0.001$), PgR-negative ($p<0.001$), HER2-positive ($p<0.001$) and high Ki-67 ($p<0.001$). The vascularity of malignant masses increased as the tumor diameter increased ($p<0.001$). Age and histological type did not impact vascularity. Regarding vascular patterns, only penetrating flow was recognized in 489 masses (58%). Although both penetrating and surrounding marginal flows were recognized in 236 masses (28%), in 146 penetrating flow was dominant. Incident angle frequencies were: 45°≤: 55 (7%); <45°: 409 (49%); near 0°: 186 (22%). Penetrating flow and low incident angle were found significantly more frequently in breast cancers ($P<0.001$).
Conclusions: Vascularity was associated with factors related to the malignancy of breast cancer.

OPT2-005

Minimal Breast Cancer (≤ 5Mm): Ultrasonographic Features with Clinicopathological and Immunohistochemical Characteristics

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Objectives: To investigate ultrasound (US) features, clinicopathological and immunohistochemical characteristics of minimal (pathologic size ≤ 5mm) breast cancers.
Methods: A total of 528 lesions from 475 invasive breast cancer patients were enrolled. US features with clinicopathological and immunohistochemical characteristics were evaluated according to the pathological size (≤ 5mm vs. > 5mm). BI-RADS US final assessments and findings were recorded for each lesion. Final standard references were based on surgical pathologies.
Results: In 528 lesions, 62 lesions were minimal breast cancers (≤ 5mm). On multivariate analysis, an irregular shape, a parallel orientation, a microlobulated margin, an isoechogenicity, absence of posterior feature, and minimal vascularity on US were independent factors predicting minimal breast cancers (all US features $p \leq 0.003$, except irregular shape $p = 0.959$). Final assessment of category 4B was also a predicting factor of minimal breast cancer ($p < 0.001$). Early stage,