

Computerized Analysis of benign and malignant lesions on breast ultrasound

Ultrasound is currently used to diagnosis simple benign breast cysts with a reported accuracy of 96 to 100%. However, because of substantial overlap in the sonographic characteristics of benign and malignant solid lesions, it has been argued that ultrasound should not be routinely used to determine whether a particular solid lesion is benign or malignant. Our objective is to explore the diagnosis capability of breast sonography through quantitative, computer extracted features. Our preliminary studies with digitized ultrasound film yield promising results. We are now retrospectively collecting another database of 300 ultrasound cases from an electronic archive. All of these cases have either gone to biopsy or aspiration. To date, we have analyzed 235 images from 88 patients with 115 lesions, of which 95 lesions were benign and 20 were malignant. Of the 235 images, 170 are of benign lesions, and 65 are of malignant lesions.

In the analysis, each lesion is manually extracted by a radiologist. Then, features related to lesion margin, shape, echogenicity (texture) and posterior acoustic attenuation are automatically extracted. Linear discriminant analysis is used to merge the features into an estimate of the likelihood of malignancy. Consistency and round-robin analyses yield Az values of .80 and .77, respectively. Inclusion of all 300 cases is expected to improve the training of the LDA in the task of distinguishing benign from malignant lesions.

Research supported in parts by USPHS Grants RR11459 and T32 CA 09649, and U.S. Army grant 972445. M. Giger is a shareholder in R2 Technolgy, Inc