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Computerized Analysis of Biomarkers in Diagnosis of Breast Cancer

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The objective of this study is for investigation and refinement of emerging anatomic and functional breast imaging techniques for improving the survival and quality of life for patients with breast cancer. The project is to design and optimize an innovative and efficient computerized dynamic analysis system (CDAS) for identifying breast cancer biomarkers in internal cell architecture and cell behavior and for distinguishing specific subtypes of cancer cells. The CDAS includes the following modules: (a) quantitative image analysis, (b) image processing including noise removal and contrast enhancement, (c) declustering for isolation of cells and nucleus, (d) a set of adaptive algorithms to be designed for enhancing and segmenting different intensity, size, shape and texture biomarkers and neoplasia cells.

The above results from left: Original cancer cell image, Enhancement result, Pre-segmented result, Result after all processing.

In summary, this preliminary study may create clinical tools for: 1) detecting breast cancer earlier; 2) more accurately quantifying the extent of disease; 3) non-invasively evaluating ductal carcinoma in situ (DCIS) involvement; 4) identifying micrometastases and residual microscopic disease, and 5) enhancing therapy by means of imaging-guided biomarker or tumor-specific delivery of pharmacologic, chemosensitizing, or radiosensitizing agents to tumors.