We have developed an automated technique for retrospectively registering frontal and lateral radionuclide lung scan images with corresponding digital chest radiographs to combine functional information provided by lung scans with greater structural detail demonstrated in radiographs. Consequently, images with inherently different scales, resolution properties, and information content are integrated in a useful manner.

Iterative gray-level thresholding is performed to construct contours encompassing lung regions in digital posteroanterior and lateral chest radiographs. Contours encompassing the high-activity regions of the posterior ventilation image and anterior, posterior, and right and left lateral perfusion images are similarly constructed. The relative dimensions of these contours are used to determine horizontal and vertical factors by which the digital radiographs are scaled to match the lung scan images. Automatic identification of anatomic landmarks allows for rotation and translation of the images prior to superimposition. An interactive display was developed for the simultaneous color visualization of all images.

The lung scan images and digital chest radiographs from 50 patients were analyzed, and four superimposed images composed of different image pairs were constructed for each case. Five radiologists subjectively evaluated the registration accuracy of these superimposed images. Less than 5% of the ratings reflected “poor” or “very poor” registration on a 5-point scale. We believe that this automated scheme for registering frontal and lateral radionuclide lung scan images with radiographic images has potential to aid radiologists in the visualization of images.

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