

Current Status of Single Photon Emission CT.

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In the current approach of single photon emission computed tomography (spect) the 3-D volume distribution of isotope uptake in an organ is viewed as a stack of 2-D slice distribution, and these slice images form the basic tomograms. A basic tomogram is constructed by acquiring the uptake projection profile data at many angles from individual slice distribution, followed by computer-based back-projection process in either iterative or analytic manner. The filtered back-process is a well accepted technique. The underlying objective of the spect process is to remove the superposition process, which is the major contrast-reducing factor in conventional imaging. Thus the spect image intensity is proportional to the uptake density and promises various quantitation possibilities. Historically, there have been two spect approaches, I.E. single slice and rotating camera based systems. The former put major emphasis on highest utilization of photons emanating from the slice imaged and thus are good for dynamic studies. However, for total organ volume imaging these systems require sequential scanning and tend to be dedicated systems for limited clinical procedures. On the other hand, the camera-based systems allow full 3-D imaging of whole organ volume after one camera rotation. Presently, these systems use one or two camera heads. These systems also have the advantage of using the cameras for conventional static or whole body scan imaging. Mainly, because of the latter advantage the camera-based systems have become increasingly popular. However, the camera-based spect imaging requires a high level of precision in detector performance and engineering, and it was only recently that stable, distortion-free camera performance with well centered rotational motion was recognized to be essential in the generation of artifact-free images. It is apparent that camera-based spect imaging has strong potential for more diagnostic information, but its use should be handled with care. In this talk, the operating principles, the physical and technical aspects of spect imaging technology will be reviewed for proper understanding of this rapidly rising new imaging modality.