Advances in scintillation camera technology during the past four years have made it possible to implement high energy (511 keV) imaging of fluorodeoxyglucose labeled with a positron emitter, ^{18}F (^{18}FDG) using the scintillation camera. Initial experience using collimated singles counting with SPECT has shown the technique to be useful in the identification of injured but viable myocardial tissue, especially when used in conjunction with ^{99m}Tc Sestamibi (^{99m}Tc-MIBI) utilizing a dual isotope, single acquisition More recently manufacturers have implemented coincidence detection techniques for imaging the annihilation radiation from positron emitters using a dual-head scintillation camera, techniques that were previously only possible using expensive dedicated positron emission tomography (PET) systems. This has been accomplished by the implementation of high count rate electronics, increased crystal thickness, and the addition of technology to the scintillation camera that was previously used only with dedicated PET systems [(no collimation or minimal collimation using slits), timing window coincidence counting, photopeak-Compton detection, and two and three dimensional data acquisition]. The addition of geometric attenuation correction and attenuation correction using transmission scanning further increases the quality of coincidence imaging with the scintillation camera. The addition of this new technology has resulted in improved spatial resolution and sensitivity which improve detectibility for tumor and brain imaging over that obtainable with routine SPECT imaging. The systems with coincidence imaging have achieved the spatial resolution of current state-of-the-art dedicated PET scanners but currently have limited sensitivity. This results in dedicated PET scanners still having a sensitivity advantage. The implementation of coincidence imaging technology has only minimally affected the routine diagnostic imaging capabilities of the scintillation camera.

Objectives

At the completion of this presentation the audience will be able to:

1. Describe the modifications to the scintillation camera that have been made to implement coincidence imaging.

2. State the specifications of current scintillation cameras operating in the coincidence mode.

3. Describe the limitations of current coincidence imaging technology with scintillation cameras.

Acknowledgment: This work was supported in part by a grant from Elgems, Ltd., Haifa, Israel.