AbstractID: 14536 Title: Advances in Instrumentation and Techniques for Quantitative Myocardial Perfusion SPECT

Myocardial perfusion (MP) SPECT (single-photon emission computed tomography) is a leading diagnostic tool for cardiovascular disease. Its continued importance and popularity have been fueled by new advances in instrumentation and image reconstruction and processing methods. Quantitative three-dimensional (3D) image reconstruction methods that model the counting statistics in the acquired data and the physics of the imaging process have been widely adopted in clinical practice. They provide improved reconstructed image noise and accurate compensation of image degrading factors including collimator-detector blur, and photon attenuation and scatter in the patient resulting in significant improvement in both the quality and quantitative accuracy of MP SPECT images. Extension of the quantitative 3D image reconstruction method to four-dimensional (4D) has been shown to benefit 4D gated MP SPECT. Special collimators designed to provide both improved spatial resolution and increased detection efficiency have been developed and implemented on conventional SPECT systems for application to MP SPECT. The need to provide accurate attenuation compensation and anatomical correlation with MP information for individual patient has resulted in the development of multimodality SPECT/CT systems which have become standard system configuration. More recently, dedicated cardiac SPECT and SPECT/CT systems have emerged in the market place that hold great promise to advance MP SPECT a big step forward. The presentation will describe the basic principles of quantitative 3D and 4D image reconstruction methods. Advances in special collimation and SPECT/CT system designs for MP SPECT will be presented. The improvement in image quality and quantitative accuracy will be demonstrated by simulated, experimental phantom and clinical images.

Learning Objectives

1. Describe the basic principles of quantitative 3D and 4D image reconstruction methods that have led to significant improved quality and quantitative accuracy of 3D and 4D gated myocardial perfusion and SPECT images.

2. Describe the recent advances in instrumentation for improve myocardial perfusion SPECT.

3. Demonstrate the advances using simulated, experimental phantom and clinical MP SPECT images.