

AbstractID: 11951 Title: Emerging X-ray Fluoroscopic Guidance Technologies for Challenging Cardiovascular Interventions

X-ray fluoroscopy remains the primary guidance modality for cardiac interventions due to its appealing combination of real-time imaging, high spatial resolution, simplicity of use, and compatibility with conventional catheter devices. However fluoroscopy has well-recognized limitations. The lack of depth resolution and poor soft tissue contrast in an x-ray projection make it difficult to precisely position devices with respect to target cardiac structures. Ionizing radiation dose is an ongoing concern, particularly for interventions with long imaging times such as catheter-based electrical mapping and ablation of atrial fibrillation.

Technologies which reduce dose and add three-dimensional context to the live fluoroscopic image offer a route towards overcoming these limitations. Scanning-beam digital x-ray (SBDX) is an inverse geometry fluoroscopic system that provides both dose reduction and real-time tomosynthesis, a feature that can be exploited for image-based 3D tracking of catheter electrodes. The operating principles of SBDX will be reviewed and recent investigations of 3D catheter tracking based on multiplanar tomosynthesis will be presented. Fusion of live fluoroscopy with roadmaps derived from pre-acquired 3D image data (e.g. CT, MRI) can allow the interventionist to visualize structures lacking x-ray contrast, or to perform novel therapies targeted to the physiologic status of cardiac tissue. A fluoroscopic fusion system for recanalization of chronically occluded arteries and for targeted stem cell therapy will be discussed.

This lecture will provide an overview of the demands and constraints of fluoroscopically-guided cardiovascular interventions, dose reduction and 3D catheter tracking capabilities enabled by the SBDX system, and clinical application of fluoroscopy fused with 3D roadmaps.

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Learning Objectives:

1. Review the demands and constraints of fluoroscopically-guided interventions
2. Understand the principles of SBDX dose reduction and 3D catheter tracking
3. Discuss x-ray fluoroscopy combined with 3D imaging for cardiovascular interventions