

Novel Augmented Fluoroscopic Imaging Platform accuracy assessment during Navigation Bronchoscopy in simultaneous comparison with Cone Beam CT and Radial EBUS

Dr. Krish Bhadra, CHI Memorial Hospital, Chattanooga, USA

Abstract:

Background: Early detection of lung cancer relies on diagnosis of pulmonary peripheral lung nodules (PLNs). Biopsy of PLN can be challenging due to the complexity of the bronchial tree, respiratory motion, and lesion size. Currently available modalities in navigation bronchoscopy provide no support for real time visualization of the pathway nor the PLNs.

LungVision is a novel system (LungVision, BodyVision Ltd, Israel), that enables live augmented fluoroscopic imaging for guided endobronchial navigation and biopsy of PLNs. In this study, we assess the LungVision performance indicators, localization accuracy and navigation success, through cross-correlation with both radial EBUS (r-EBUS) and cone beam CT (CBCT). Furthermore, we discuss LungVision contribution to diagnostic yield of navigation bronchoscopy.

Methods: This study was approved by the institutional review board. Patients with PLN referred for bronchoscopy were offered to participate in the study. CT scans were imported into the LungVision planning software, where the physician identified the target PLN and selected the desired pathway. LungVision system was used for real-time localization of the airways and PLN.

When the LungVision display showed the PLN had been reached, a r-EBUS probe was advanced down the catheter to verify LungVision display and r-EBUS image at the tip of the catheter was captured. The r-EBUS probe was then removed from the catheter and the catheter was locked at its position. Cone Beam CT (CBCT) imaging was used to acquire a 3D image of the area of interest with the catheter as guided by LungVision. Finally, desired tissue samples were taken utilizing real time LungVision augmented fluoroscopy of the target PLN. Cross correlation of accuracy was determined with r-EBUS and CBCT imaging.

Results: 20 patients were recruited to the study. Average age was 69.4±7.8 and 23%

were male. Average PLN size was 17.8mm, and 71.4% of the PLNs were located in the upper lobes.

No peri-procedural adverse events were reported. Successful navigation to the PLN, according to LungVision display, was achieved in all cases. PLN location displayed real time by the LungVision system was verified successfully by r-EBUS in 18 cases (90%). CBCT confirmed catheter localization to the PLN at the same location that r-EBUS verified location in 19 cases (95%). Tissue samples were successfully acquired under LungVision guidance with a diagnostic yield of 87.4.

Conclusion: Augmented fluoroscopic imaging, PLNs localization and tool guidance provided by LungVision system is shown to be accurate as it is verified by cross correlation of r-EBUS and CBCT. LungVision's ability of real time lesion localization, tissue motion tracking, and support of image-guided transbronchial biopsy contribute to improved diagnostic yield suggesting that LungVision has the potential to become the standard method of diagnostic navigation bronchoscopy.