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Real-time Visualization of Fluoro-Invisible Pulmonary Nodules and Their Relative Position to the Biopsy Tool Tip During Bronchoscopy Can Potentially Increase Diagnostic Yield Using C-Arm Based Tomography

Sonali Sethi MD, Joseph Cicenya MD, Cleveland Clinic Foundation, Cleveland, OH, USA

INTRODUCTION

The LungVision platform provides an augmented fluoroscopy view of peripheral pulmonary nodules during diagnostic bronchoscopy procedures. This platform allows access and guidance in difficult to reach areas of the lung as well as real-time visualization of lung nodules. During the procedure, this platform provides an accurate three-dimensional computer assisted tomographic reconstruction of the designated nodule area (C-Arm Based Tomography, CABT) showing tool tip position relative to the lung nodule in real time. This allows physicians to utilize advanced technology, similar to cone-beam CT, using traditional bronchoscopy C-arm fluoroscopy equipment and not requiring a hybrid operating room.

CASE SUMMARY

We report our first three cases of LungVision CABT performed under general anesthesia in a bronchoscopy suite equipped with a low-end 9" Siemens Arcadis varic vc10A fluoroscopy C-arm. LungVision was used for real-time localization of the airways and nodules, as well as for directional guidance and assistance during biopsy. When the LungVision display showed the target had been reached, CABT scanning was done to acquire an image of the lung nodule and tissue samples were taken. Final catheter position was verified in multiple planes with CABT, similar to cone-beam CT. Radial EBUS was used in all cases. Nodule size, location, and presence of bronchus sign was determined from pre-operative CT data. The first

case was a 73 year old female smoker with a 15 mm right upper lobe solid lesion which was not visible on fluoroscopy. The nodule was visualized using CABT as well as the tool tip position relative to the lung nodule. The final diagnosis was Lymphoplasmacytic inflammation. The second case was a 77 year old female former smoker with a 25 mm right upper lobe solid lesion which was not visible on fluoroscopy however was visible using CABT. The final diagnosis was non-small cell lung cancer. The third case was a 62 year old female former smoker with a history of breast cancer. She had a 21 mm left upper lobe lung nodule which was not visible on fluoroscopy. The lung nodule was visible using CABT. The final diagnosis was non-small cell lung cancer.

CONCLUSION

Intraprocedural augmented fluoroscopy with computer assisted body tomography (CABT) is a feasible and effective tool to assist in lung nodule biopsies. LungVision is a novel platform that enables real-time nodule and pathway overlay on native fluoroscopy and further allows real-time three-dimensional CABT, similar to cone-beam CT imaging, however using standard fluoroscopy equipment. This allows the bronchoscopist the ability to visualize smaller nodules and confirm a lesion has been accessed, potentially increasing diagnostic yield, without requiring cone-beam CT access within their institution.



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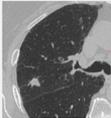
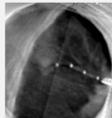
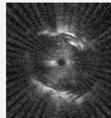
METHODS

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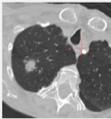
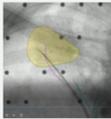
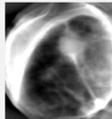
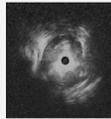
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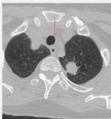
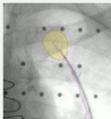
CASE 1

Gender	Female					Diagnosis: Lymphoplasmatic Inflammation
Age	73 y/o	CT Planning LungVision Navigation LungVision Confirmation REBUS Confirmation				
Smoking History	Current					
Cancer History	No					
Lesion Lobe	RUL					
Lesion Size	15 mm					
Lesion Type	Solid					

CASE 2

Gender	Female					Diagnosis: Non-small cell lung cancer
Age	77 y/o	CT Planning LungVision Navigation LungVision Confirmation REBUS Confirmation				
Smoking History	Former					
Cancer History	No					
Lesion Lobe	RUL					
Lesion Size	25 mm					
Lesion Type	Solid					

CASE 3

Gender	Female					Diagnosis: Non-small cell lung cancer
Age	62 y/o	CT Planning LungVision Navigation LungVision Confirmation REBUS Confirmation				
Smoking History	Current					
Cancer History	Breast					
Lesion Lobe	LUL					
Lesion Size	21mm					
Lesion Type	Solid					