

Cone beam CT guided endobronchial biopsy

assisted by 3D tumor segmentation overlay with live fluoroscopy

Patient history

This is a 59 years old female with no smoking history. The lung nodules were incidentally found while performing a preoperative examination for renal lithiasis. The CT scan showed pseudo-nodular consolidation with two ground glass opacities, one with a diameter of 32 mm in the posterior segment of the right upper lobe (RUL) and a similar one with a diameter of 17 mm in the right lower lobe (RLL). She was scheduled for endobronchial biopsy of the RUL lesion to achieve tissue sampling for pathological analysis.

Procedure

Subsequent to patient intubation, the ceiling mounted C-arm system (Azurion 7C20 Flexmove, Philips) was positioned on the left side of the patient, centering the field of view of the detector to include both lungs. Cone beam CT data (XperCT, Philips) was acquired during an 8-second roll protocol, while temporarily suspending mechanical ventilation. Using the cone beam CT data, the RUL lung nodule was highlighted in 3D by the physician using commercially available software (Lung Suite, Philips) during a process called segmentation. Throughout the procedure, the nodule segmentation was visualized in an overlay with live fluoroscopy (3D Dynamic Roadmap, Philips) parallel to standard fluoroscopy imaging. Geometric correspondence of the augmented live fluoroscopy with the 3D tumor segmentation was maintained throughout the case while manipulating C-arm angulation, table position and image-zoom settings.

After cone beam CT data acquisition and segmentation, a bronchoscope (Ambu® aScope™) was introduced into the airways. A curved steerable catheter 2.00 mm was inserted into the working channel and then navigated to the lesion using the 3D segmentation overlay with live fluoroscopy (3D Dynamic Roadmap, Philips). After reaching a position in the vicinity of the target lesion, final catheter position was verified in multiple planes (i.e. LAO, RAO, and 90 degrees lateral) with 3D live fluoroscopy overlay and confirmed with

an additional cone beam CT scan. Tissue samples were obtained using multiple biopsy tools and were sent for pathologic examination.

Diagnostic outcome:

The RUL lesion showed to be pulmonary adenocarcinoma with ALK and EGFR mutation, and the patient was subsequently referred for oncological treatment.



Dr. Javier Flandes Aldeyturriaga

is Associate Chief Physician of the Respiratory Service, Director of the Bronchoscopy Unit and Assistant Director of the Private-Sector Area at the Fundación Jiménez Díaz (Madrid). He runs the only bronchoscopy unit in Spain, which has all the bronchoscopic techniques, being the leader in treatments Reduction Pulmonary emphysema through valves endobronchial and COILS, bronchoscopy Rigid and Flexible, LASER, cryotherapy. He is also one of the pioneers in using cone beam CT imaging and augmented fluoroscopy for endobronchial lung biopsies.

Conclusion

Cone beam CT provides intra- procedural 3D real-time imaging which enables precise localization of nodules when compared to conventional bronchoscopy. The available augmented live fluoroscopy with 3D tumor segmentation from Philips Lung suite provides high position accuracy of biopsy devices and thus excellent diagnostic yield. With the field of advanced bronchoscopy and interventional pulmonology moving towards novel diagnostic and therapeutic approaches focused around lung cancer patient, the availability of advanced imaging is of paramount importance to ensure safety, efficacy and to meet quality standards of care.

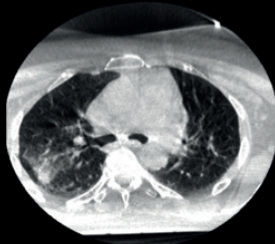
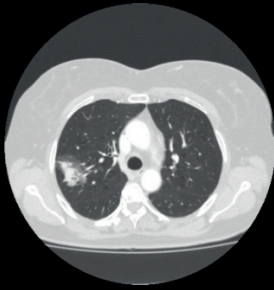


Figure 1a: Pre-operative CT (left) and intra-operative cone beam CT (right) showing right upper lobe (RUL) nodule.

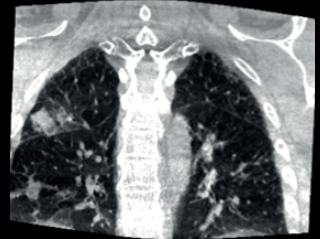
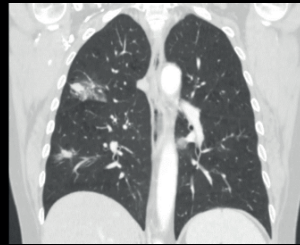


Figure 1b: Pre-operative CT (left) and intra-operative cone beam CT (right) showing right upper lobe (RUL) nodule.

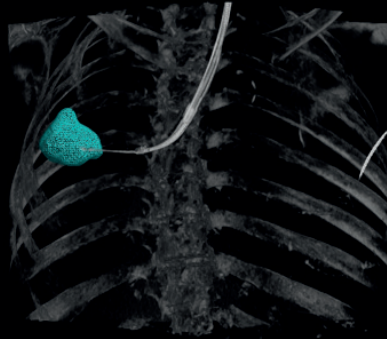


Figure 2: Coronal cone beam CT (left) and 3D (right) confirmation of accurate lesion targeting.

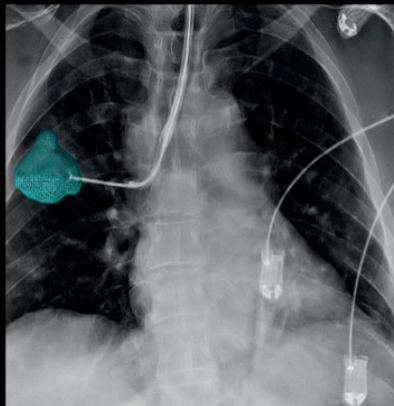
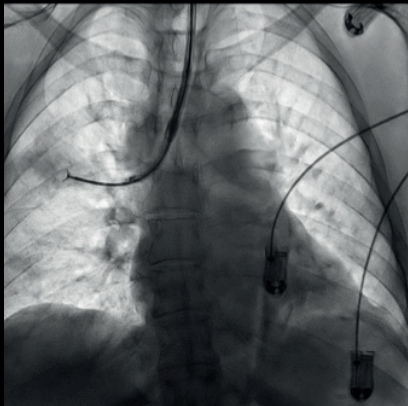


Figure 3: Standard 2D live fluoroscopy (left) versus corresponding augmented live fluoroscopy (right) guidance during endobronchial biopsy.



Results from case studies are not predictive of results in other cases.
Results in other cases may vary.

© 2019 Koninklijke Philips N.V. All rights reserved. Specifications are subject to change without notice. Trademarks are the property of Koninklijke Philips N.V. or their respective owners.

4522 991 49471 * MAY 2019

How to reach us
Please visit www.philips.com
healthcare@philips.com
www.philips.com/lungsuite