

## Case 6

# Ultra-low Dose and Ultra-fast Scan in a Patient with Dyspnea

By Guoqiang Chen, MD; Kai Sun, MD; Xiaolin Liu; Ruiping Zhao; Xi Zhao, MD\*

Department of Radiology, Baotou Central Hospital, Inner Mongolia, P.R. China

\* Siemens Healthcare, P.R. China

## History

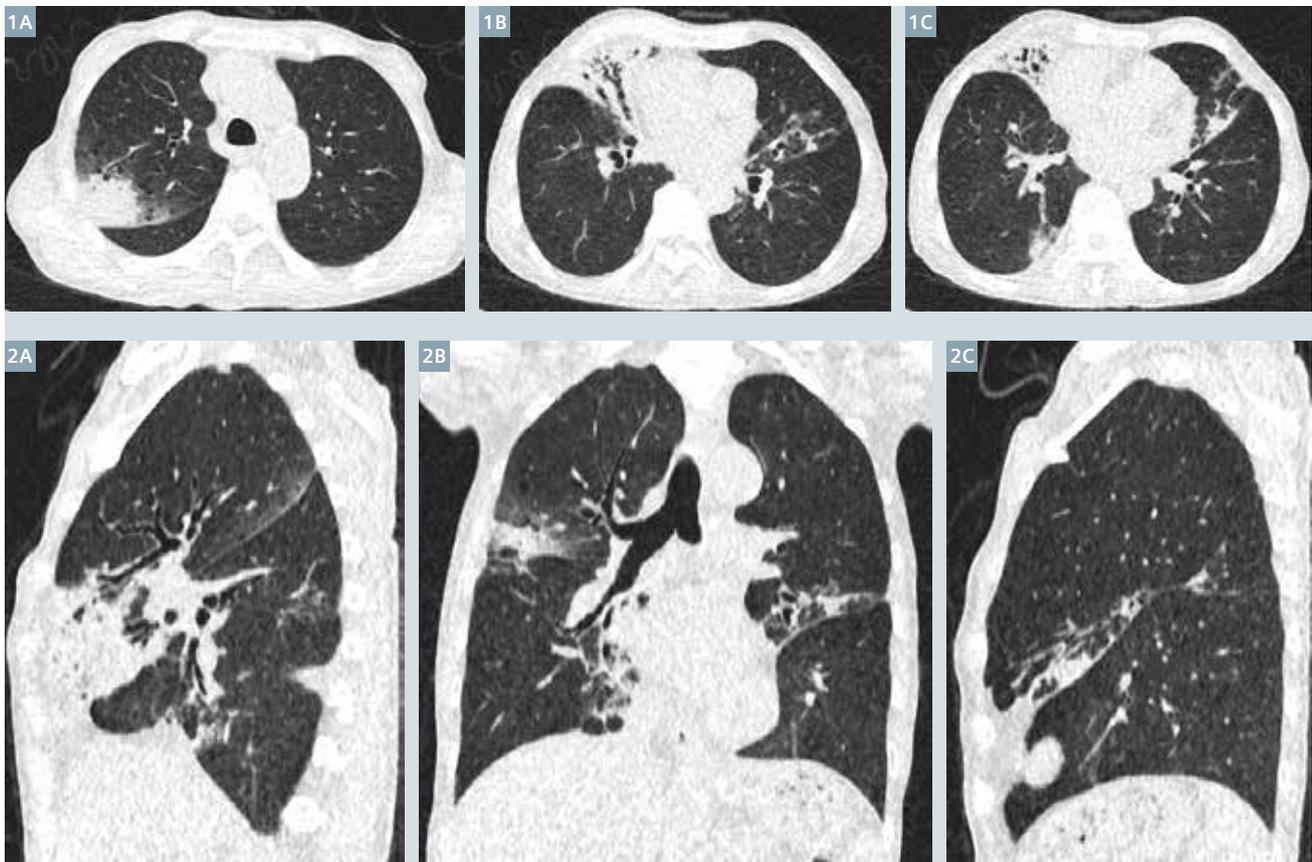
A 77-year-old male patient, until recently a heavy smoker, was hospitalized complaining of dysphagia and emaciation for the past month. He had neither fever nor chest pain upon admission but a recurrent cough with white sputum and progressive dyspnea gradually developed. A chest radiography revealed right upper lung infiltrates and pulmonary atelectasis in the

right middle lobe. A thoracic CT scan was requested for further evaluation.

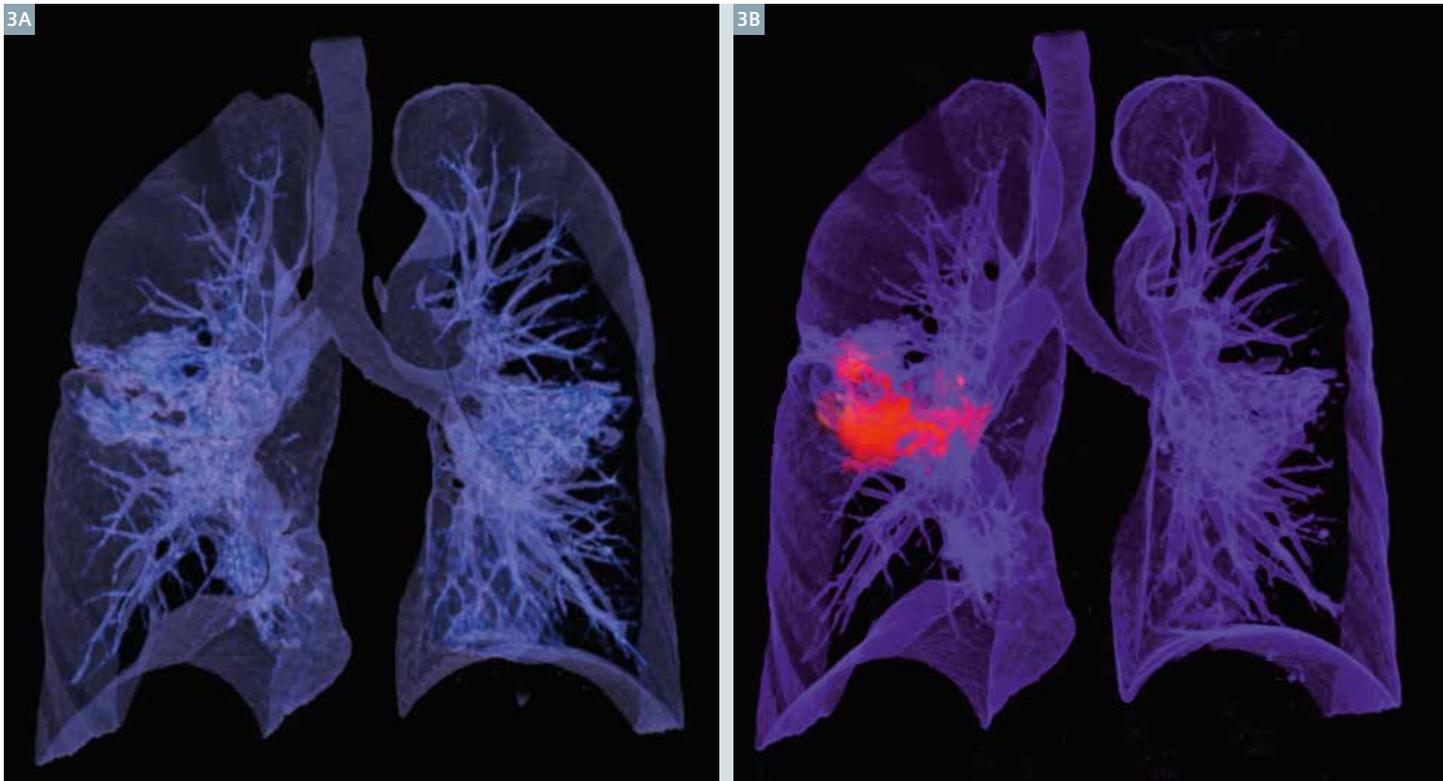
## Diagnosis

The CT images revealed areas of air-space consolidation in the right upper, right middle, right lower, and left lingular lobes with associated areas of ground-glass attenuation and signs

of air bronchogram. Bilateral diffuse bronchial wall thickening and interlobular septal thickening were present. The minor fissure was inferiorly displaced, suggesting a volume loss of the right middle lobe. Pleural thickening in the posterior wall of the right lower lobe and of the lateral wall of the left lingular lobe were present. No suspicious findings were seen in the mediastinum.



**1, 2** 1.5 mm axial (Fig. 1) and MPR (Fig. 2) images reveal multiple areas of air-space consolidation with associated areas of ground-glass attenuation and signs of air bronchogram in both lungs. Diffuse bronchial wall thickening and interlobular septal thickening are present. The minor fissure is inferiorly displaced suggesting a volume loss of the right middle lobe. Pleural thickening in the posterior wall of the right lower lobe and the lateral wall of the left lingular lobe are also present.



3 VRT images with different presets show bilateral areas of air-space consolidation in three dimensions.

The patient was treated with empiric antibiotic therapy, and a follow-up CT scan was recommended.

### Comments

Thoracic CT scans have been performed in clinical routine for decades. Recent developments in CT technology have greatly improved CT performance in terms of speed and radiation dose reduction. In this case, the patient suffered from dyspnea and could not hold his breath during the scan. A scan in Turbo Flash mode was performed in free breathing and completed in a total scan time of 0.42 s. Another highlight was the Selective Photon Shield (SPS) II featuring two special tin filters applied to both tubes. The filters optimize the X-ray spectrum and significantly improve the air/soft tissue contrast. A total effective dose of only 0.04 mSv was achieved, which is less than the dose of a standard X-ray radiography examination.[1]

The combination of Turbo Flash and the SPS has great potential for routine ultra-low dose thoracic CT scans. ■

### Examination Protocol

Scanner	SOMATOM Force
Scan area	Thorax
Scan length	311 mm
Scan direction	Cranio-caudal
Scan time	0.42 s
Tube voltage	Sn100 kV
Tube current	24 mAs
Dose modulation	CARE Dose4D
CTDI <sub>vol</sub>	0.09 mGy
DLP	2.8 mGy cm
Effective dose	0.039 mSv
Rotation time	0.25 s
Pitch	3.2
Slice collimation	192 × 0.6 mm
Slice width	1.5 mm
Reconstruction increment	1 mm
Reconstruction kernel	Br40 ADMIRE 5

### References

- [1] AAPM Report No. 96: The Measurement, Reporting, and Management of Radiation Dose in CT-Report of AAPM Task Group 23 of the Diagnostic Imaging Council CT Committee [http://www.aapm.org/pubs/reports/rpt\\_96.pdf](http://www.aapm.org/pubs/reports/rpt_96.pdf).