Follow-up on Post-Bronchial Artery Embolization

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History

A 33-year-old male patient came to the hospital complaining of severe coughing with blood-stained sputum. He has been suffering from bronchiectasis and had undergone bronchial artery embolization (BAE) due to an acute hemoptysis three years ago. A 4D CT angiography (CTA) examination was requested for evaluation.

Diagnosis

CT images revealed typical imaging characteristics of bronchial dilation in both lungs associated with bronchiectasis (Fig. 1). Four bronchial arteries (BA) were identified – all issued from the aorta, with two on each side (Fig. 2). Three coils from the previous embolization were seen – two proximally in the recanalized upper right BA and another at the lesser curve of the aortic arch with no signs of BA recanalization. The lower right BA came anteriorly off the descending aorta at the level of T7, and appeared abnormally engorged and tortuous. The upper left BA came off the lesser curve of the aortic arch and divided into two branches – one with normal caliber going around the upper left pulmonary artery and another hypertrophied going tortuously along the lower left pulmonary artery. The lower left BA came anteriorly off the descending aorta at the level of T6 with a normal caliber.

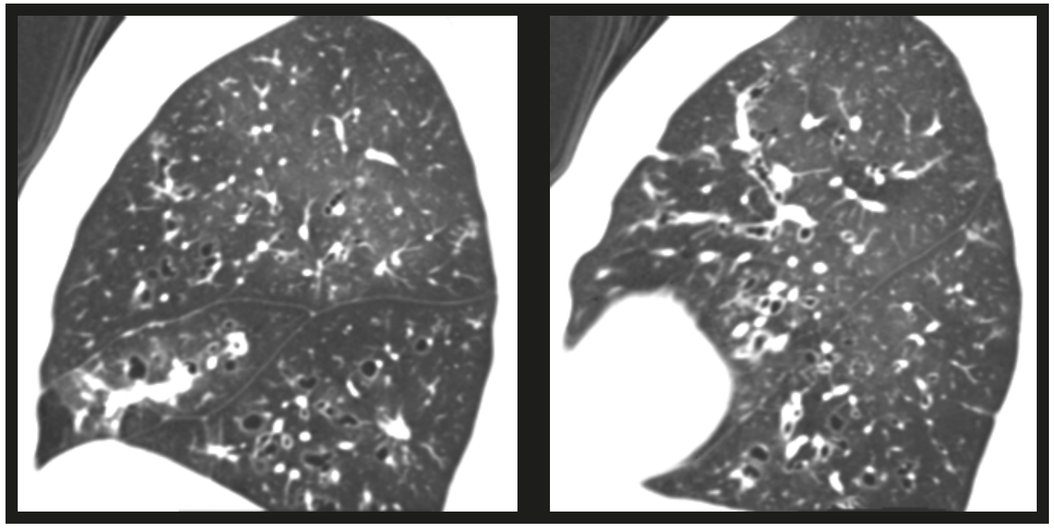
Bronchopulmonary shunting was suspected, could however be ruled out by inspecting time-resolved images (Fig. 3). No parenchymal hypervascularity or extravasation of the contrast agent was seen.

The patient underwent pharmacotherapy and recovered uneventfully.

Comments

BAE for control of hemoptysis was first described in detail by Remy et al. in 1974.[1] It has become a mainstay in the treatment of hemoptysis. The common offenders can be BA, which vary considerably in their site of origin and subsequent branching pattern, as well as the nonbronchial systemic arteries, which associate significantly with a higher rate of technical failure and unsuccessful embolization.[2] Aside from the typical complications associated with angiography, adverse events most frequently arise from unintentional, nontarget embolization, such as the most feared transverse myelitis due to nontarget embolization of the anterior spinal artery arising from the bronchial or intercostobronchial artery. Hemoptysis may recur due to recanalization of previously embolized vessels, missed culprit vessels, or recruitment of new collateral circulation.[3] Digital subtraction angiography (DSA) is primarily applied for BAE, whereas CT is performed to identify the underlying cause and extent of pulmonary diseases, to localize possible bleeding foci, to predict culprit vessels, to lay down the vascular roadmap prior to BAE, and to follow up. There are studies suggesting that multidetector CT may be more accurate than arteriography at delineating the origin and course of both the bronchial and nonbronchial systemic arteries, especially when combined with 3D reconstructions.[4,5] In this case, 80 kV was applied, which contributes not only to radiation dose reduction but also to contrast enhancement even though only 30 mL of contrast agent were used. The isotropic resolution provided by the Dual Source CT scanner helps achieve excellent image quality in visualizing detailed anatomical structures such as the bronchial arteries. Most importantly, the image series acquired by the Adaptive 4D Spiral scan facilitates a time-resolved inspection of the thoracic vascular system, which assists in ruling out a suspicious bronchopulmonary shunting. This is of great importance for interventionists, since an unintentional embolization of the occipital cortex could occur if such a shunt would exist. ●

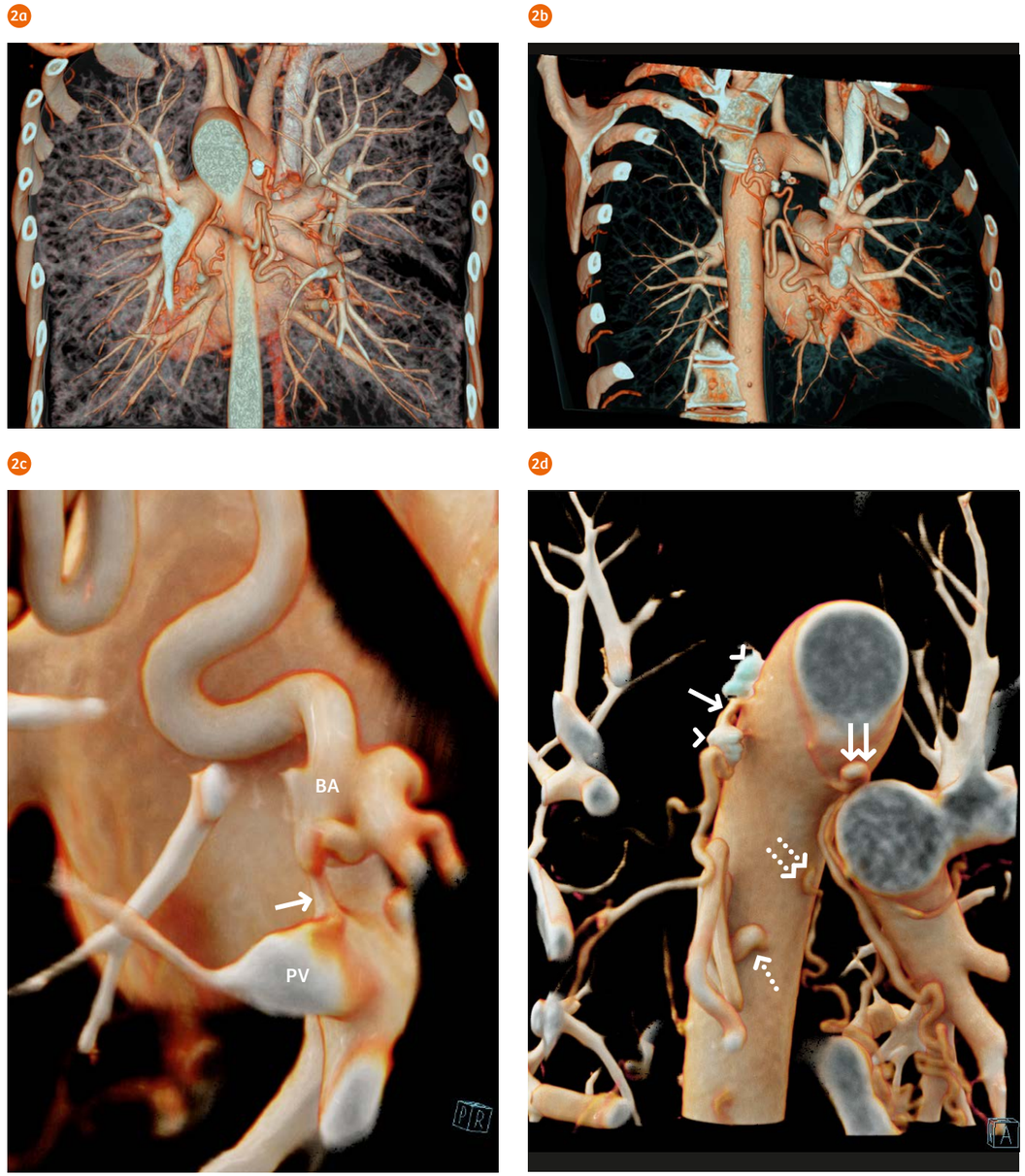
1a 1b



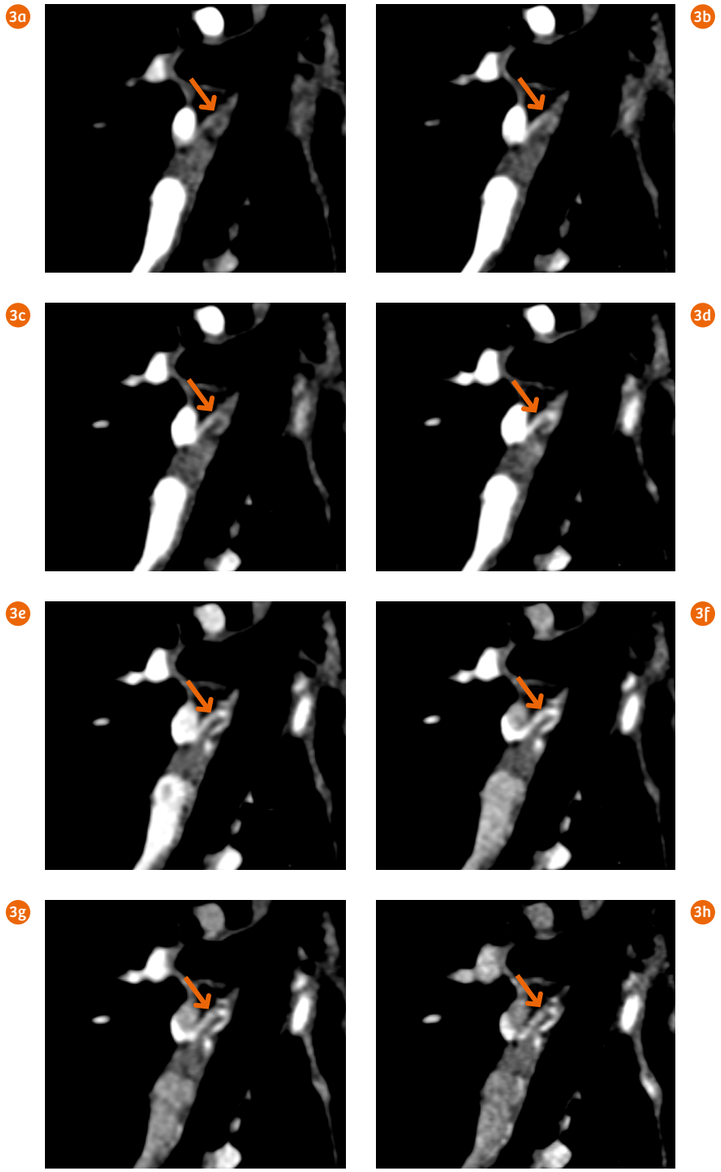
1 Sagittal multiplanar reformations (1 mm) using phase volume acquired by Adaptive 4D Spiral show an increased bronchoarterial ratio, manifested by the signet ring sign, characterizing bronchial dilation associated with bronchiectasis in both lungs (Fig. 1a, right; and 1b, left).

Examination Protocol

Scanner	SOMATOM Force		
Scan area	Thorax	**Rotation time**	0.25 s
Scan mode	Adaptive 4D Spiral	**Slice collimation**	192 × 0.6 mm
Scan length	222.6 mm	**Slice width**	1.0 mm
Scan direction	Shuttle	**Reconstruction increment**	0.7 mm
Scan time	28.5 s	**Reconstruction kernel**	Br36
Tube voltage	80 kV	**Contrast**	320 mgI/mL
Effective mAs	60 mAs	**Volume**	30 mL + 30 mL saline
Dose modulation	NA	**Flow rate**	5 mL/s
$CTDI_{vol}$	26.96 mGy	**Start delay**	12 s
DLP	554.7 mGy cm		



2 Cinematic VRT images (Fig. 2a, posterior view; Fig. 2b and Fig. 2c, oblique views; Fig. 2d, anterior view) show the origins and the courses of the four identified BAs. Two coils (Fig. 2d, arrowheads) are seen in the recanalized upper right BA (Fig. 2d, arrow). The lower right BA is seen as abnormally engorged and tortuous (Fig. 2d, dotted arrow). The upper left BA (Fig. 2d, double arrows) branches into one with normal caliber and another hypertrophied. The lower left BA (Fig. 2d, double dotted arrows) shows a normal caliber. A suspicious bronchopulmonary shunting (Fig. 2c, arrow) is seen.



3 Oblique MPR images show a dynamic view of a suspicious bronchopulmonary shunting (arrows). Image series are acquired with an interval of 1.5 seconds. Shunting is ruled out since there are no signs of refilling from the BA to the pulmonary vein.

References

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