Peer review file

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Reviewer A

The classification of pulmonary veins has been verified in great detail.
In particular, the flow chart of pulmonary vein classification will provide useful information for us surgeons.
It was a very suggestive manuscript.

Reply: Thanks for the reviewer's recognition of our work.

Reviewer B

This article is interesting because it proposes a modified classification of PV in bilateral upper lobes of the lung. The construction of a better classification of PVs is important because the demand for sublobar resection is higher than in the past. However, there are some points that need to be clarified.

Comment 1: The method of image analysis is important, so the details of contrast agent dosage and scan timing in CT should be described.

Reply 1: Thanks for the reviewer's suggestion. We have modified our text as advised (see in the unmarked version, Page 5, line 100-113).

Changes in the text: Page 5, line 100-113, we added “On the CT scout image, the scan layer of the mass injection was set at the level of the aortopulmonary window, which showed the pulmonary trunk, ascending aorta, and descending aorta. 20ml of contrast was injected at a rate of 5ml/s, followed by 20ml of normal saline at the same rate. 6 seconds after the injection of contrast agent, the same layer scan was performed on the aforementioned layer. 20 scans were performed, with an interval of 2 seconds. The scan was terminated when the density in the aorta began to decrease. The data were used to

plot time-density curves within the pulmonary artery and ascending aorta. The phase of maximum pulmonary arteriovenous density difference was also recorded. Then the start time of the scan and the dose of contrast agent were set and the contrast was injected at a rate of 5ml/s, followed by 20ml of normal saline at the same rate. These settings enabled the lesions, the pulmonary arteries and the aorta to be developed, and, more importantly, the CT value in the pulmonary vein was higher than that in the pulmonary artery, and showed a density difference in images.".

Comment 2: The reason why the analysis is limited to bilateral upper lobes of the lung needs to be described.

Reply 2: In this paper, we analyzed whether there was a main venous trunk and the degree to which the main trunk was distributed in the center of the upper lobe. Based on these two characteristics, we found similarities in bilateral SPV and classified the general patterns as central vein type, semi-central vein type and non-central vein type. The position analysis method in this classification pattern was not suitable for the comparative analysis of the veins in other symmetrical regions of bilateral lungs. However, the patterns of confluent of venous branches and corresponding proportion in these symmetric regions were worthy of further analysis in the following work. We have added discussion of the limitation of our text as advised (see Page 14, line 368-371).

Changes in the text: Page 14, line 368-371, we added "When we compared the lingual vein with the right middle lobe pulmonary vein, or compared bilateral inferior pulmonary veins, no general distributional features were found based on the location of the venous trunk, but the confluent venous branches and corresponding proportions are worth further analysis."

Comment 3: The classification of vessels in bilateral upper lobes of the lung has already been reported previously. What are the advantages in this article?

Reply 3: Previous reports did not analyze the consistency of bilateral superior pulmonary veins and did not provide a uniform classification. For the first time,

imaging anatomy was used for comparison. By a simple two-step identification process, a general classification method was established in bilateral SPV, and all could be divided into three patterns, specifically, the central vein type, the semi-central vein type and the non-central vein type, and detailed proportion data were given. This uniform general pattern of vein distribution could provide guidance for accurate identification of vein during surgery.

Reviewer C

The authors reported a detailed classification of the superior pulmonary veins and their frequency based on CT data from a very large number of cases. These findings are very useful information for segmentectomy, which is expected to increase in the future. I have some comments.

Comment 1: Although recent 3-D rendering workstations have advanced, it can still be difficult to automatically and completely distinguish between pulmonary arteries and veins. How did the evaluators judge the accuracy of the images?

Reply: In our study, CT data acquisition methods focused on layer thickness, resolution, contrast dose, scan time, reconstruction algorithm, etc. The time-density curves were first obtained from these settings, and then the start time of the scan and the dose of the contrast agent were set accordingly to enable the lesions, pulmonary artery, and aorta to be developed. More importantly, the pulmonary veins had a higher CT value than the pulmonary arteries, showing a density difference on the image. We have added corresponding description in the part of CT Scan and 3D Reconstruction (see Page 5, line 100-113).

Changes in the text: Page 5, line 100-113, we added “On the CT scout image, the scan layer of the mass injection was set at the level of the aortopulmonary window, which showed the pulmonary trunk, ascending aorta, and descending aorta. 20ml of contrast was injected at a rate of 5ml/s, followed by 20ml of normal saline at the same rate. 6 seconds after the injection of contrast agent, the same layer scan was performed on the aforementioned layer. 20 scans were performed, with an interval of 2 seconds. The scan was terminated when the density in the aorta began to decrease. The data were used to

plot time-density curves within the pulmonary artery and ascending aorta. The phase of maximum pulmonary arteriovenous density difference was also recorded. Then the start time of the scan and the dose of contrast agent were set and the contrast was injected at a rate of 5ml/s, followed by 20ml of normal saline at the same rate. These settings enabled the lesions, the pulmonary arteries and the aorta to be developed, and, more importantly, the CT value in the pulmonary vein was higher than that in the pulmonary artery, and showed a density difference in images.".

Comment 2: Please describe the timing of imaging the arterial and venous phases of contrast-enhanced CT.

Reply 2: Thanks for the reviewer's suggestion. Unlike conventional contrast-enhanced CT, in which process the arterial phase scanning was usually triggered automatically by concentration monitoring, and veins were scanned after a delay of 15 seconds. Our CTA data collection focused on the presentation of lesions, bronchus, and pulmonary arteries and veins, rather than the difference between systemic and pulmonary circulation. Our primary concern was the phase of maximum pulmonary arteriovenous density difference, which was monitored at two-second intervals. We have added description in our text (see Page 5, line 103-106).

Changes in the text: Page 5, line 103-106, we added "6 seconds after the injection of contrast agent, the same layer scan was performed on the aforementioned layer. 20 scans were performed, with an interval of 2 seconds. The scan was terminated when the density in the aorta began to decrease.".

Comment 3: Please describe detailed information of the 3D workstation "B30".

Reply 3: Thanks for the reviewer's suggestion. We have modified our text and added 2 references (see Page 5, line 115-118).

Changes in the text: Page 5, line 115-118, we added "The convolution kernel of reconstruction was a relatively low spatial frequency algorithm (e.g., "standard" or "soft-tissue" algorithms B30), which smoothed the image, reduced visible image noise,

and improved the contrast resolution to some degree [8,9].”.