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## A rare anomaly of the right superior pulmonary vein: Report of a case

Yoshinobu Ichiki<sup>a,\*</sup>, Kesei Kakizoe<sup>b</sup>, Takayuki Hamatsu<sup>b</sup>, Taketoshi Suehiro<sup>c</sup>, Makiko Koike<sup>d</sup>, Fumihiko Tanaka<sup>e</sup>, Keizo Sugimachi<sup>b</sup><sup>a</sup> Department of Chest Surgery, Onga Nakama Medical Association Onga Hospital, Onga-gun, Japan<sup>b</sup> Department of Surgery, Onga Nakama Medical Association Onga Hospital, Onga-gun, Japan<sup>c</sup> Department of Emergency, Onga Nakama medical association Onga hospital, Onga-gun, Japan<sup>d</sup> Department of Radiology, Onga Nakama medical association Onga hospital, Onga-gun, Japan<sup>e</sup> Second Department of Surgery, University of Occupational and Environmental Health, School of Medicine, Kitakyushu, Japan

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## ABSTRACT

**INTRODUCTION:** Although there are a lot of variations of pulmonary veins (PVs) including dangerous type that could cause serious complications during the surgery, limited information has been reported about these variations. We have experienced an extremely rare anomaly of the right superior PV.

**PRESENTATION OF CASE:** A 74-year-old man patient with right lung cancer visited our hospital. Chest computed tomography (CT) revealed a pulmonary nodule in the right lower lobe. Contrast-enhanced three-dimensional CT (3D-CT) showed that the right superior PV ran abnormally between the right main pulmonary artery (PA) and the right main bronchus. We performed right lower lobectomy and systematic nodal dissection. The operative findings confirmed that the right superior PV ran abnormally same as 3D-CT.

**DISCUSSION:** In most reported cases, anomalous PVs pass behind the right bronchi or into the roof of the left atrium. The anomaly reported in the present case has been reported in only one case report. This case suggests that the space between the right main PA and the right main bronchus is not always safe for dissection.

**CONCLUSION:** Preoperative 3D-CT is useful for avoiding unexpected bleeding.

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## 1. Introduction

We have experienced various branching patterns of the pulmonary vein (PV) during pulmonary surgery. Some studies have reported on the variants of the right PV posterior to the bronchus and the right top vein, which terminates into the roof of the left atrium (LA). These PV variants have the potential to cause serious unexpected bleeding during surgery. We experienced an extremely rare type of dangerous anomaly of the right superior PV.

## 2. Case report

The patient was a 74-year-old asymptomatic man who visited our hospital after an abnormal shadow was detected on a chest X-ray. Chest computed tomography (CT) revealed a pul-

monary nodule of 2.7 cm in diameter in the right lower lobe (Fig. 1). Contrast-enhanced three-dimensional CT (3D-CT) showed that the superior right PV abnormally ran between the right main pulmonary artery (PA) and the right main bronchus, and the right upper bronchi (B<sup>1+3</sup> and B<sup>2</sup>) branched separately from the right main bronchus (Fig. 2). A systemic CT examination revealed no other tumors.

We performed a right lower lobectomy and systematic nodal dissection using video-assisted thoracoscopic surgery (VATS). The operative findings also showed that the superior right PV abnormally ran between the right main PA and the right main bronchus (Fig. 3). The postoperative course was uncomplicated. The pathological findings showed papillary adenocarcinoma with areas of a lepidic, acinar or micropapillary growth involving the bronchial wall and a hilar lymph node with pleural invasion and lymphatic and vascular permeation (Fig. 4). Metastatic carcinoma cells were detected in 1 of the 21 lymph nodes that were examined. The pathological stage was pT2aN2M0 stage IIIA: however, the patient rejected adjuvant chemotherapy.

**Abbreviations:** PV, pulmonary vein; LA, left atrium; CT, computed tomography; 3D-CT, three-dimensional CT; PA, pulmonary artery; VATS, video-assisted thoracoscopic surgery; UVPBI, right upper lobe vein posterior to the bronchus intermedium.

\* Corresponding author at: Department of Chest Surgery, Onga Nakama Medical association Onga hospital, Onga-gun, 1725-2 Ooaza-Ozaki Ongacho, Onga-gun, Fukuoka 811-4342, Japan.

E-mail address: [y-ichiki@med.uoeh-u.ac.jp](mailto:y-ichiki@med.uoeh-u.ac.jp) (Y. Ichiki).

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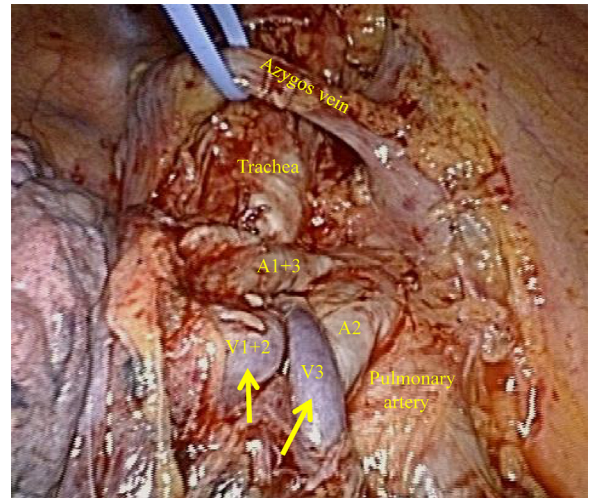
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**Fig. 1.** Chest computed tomography (CT) revealed a pulmonary nodule of 2.7 cm in diameter in the right lower lobe.

**3. Discussion**

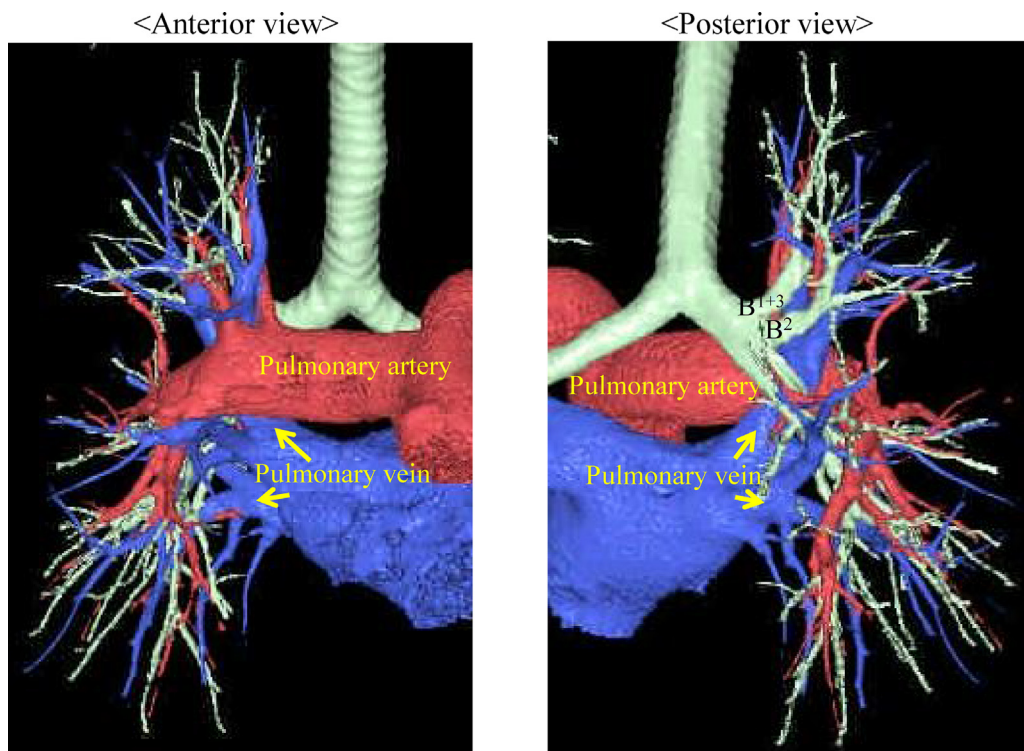
Several types of PV anomalies have been reported. Webb et al. reported an anomalous PV passing behind the intermediate bronchus in 1984 [1]. Tsuboi et al. reported another anomalous PV passing behind the right main bronchus in 1997 [2]. Asai et al. retrospectively reviewed the CT images and medical records of 725 patients. The right upper lobe vein posterior to the bronchus intermedius (UVPBI) was found in 41(5.7%) of 725 CT cases, and in 9 (3.9%) of 230 right thoracotomy cases. Three UVPBI drainage sites were observed: (1) the superior pulmonary vein group (55%); (2) the inferior pulmonary vein group (41%); and (3) the superior segmental vein group (4%) [3]. A right top vein is a rare variation of the anomalous PV, which terminates into the roof of the LA proximal to the right superior PV. It was firstly described in anatomic specimens by von Haller [4] in 1747 and was re-evaluated by Lickfett et al. using magnetic resonance angiography [5]. The accessory vein on the right was named as the, “top vein”. It was shown to



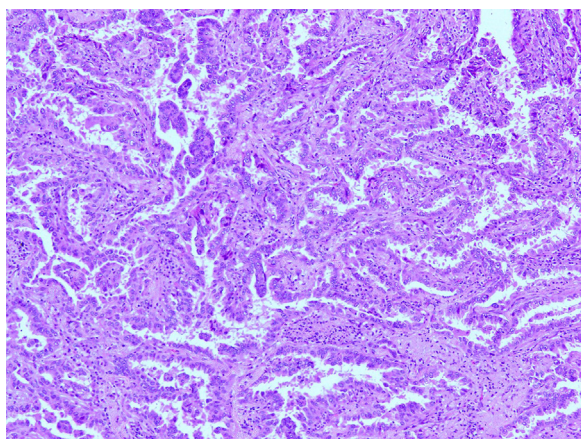
**Fig. 3.** The operative findings also showed that the superior right PV abnormally ran between the right main PA and the right main bronchus.

enter the roof of the LA superomedial to the right superior PV, by Lacomis et al. [6]. In a review of 303 patients with chest disorders, Akiba et al. found 10 (3.3%) anomalous PVs [7]. They proposed 6 types of right top PV as a new classification, based on the route (behind the intermediate bronchus or others) and the inflow site (LA, PV, or others) [7].

To the best of our knowledge, the type of anomalous PV that was observed in the present case has been previously reported in only one report [8]. Moreover, this case suggested that the space between the right main PA and the right main bronchus is not always safe for dissecting well-known organs. We obtained information on the right PV anomaly before surgery using 3D-CT. We could therefore avoid the risk of unexpected bleeding. Preopera-



**Fig. 2.** Contrast-enhanced three-dimensional CT (3D-CT) showed that the superior right PV abnormally ran between the right main pulmonary artery (PA) and the right main bronchus, and the right upper bronchi (B<sup>1+3</sup> and B<sup>2</sup>) branched separately from the right main bronchus.



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**Fig. 4.** The pathological findings showed papillary adenocarcinoma with areas of a lepidic, acinar or micropapillary growth involving the bronchial wall and a hilar lymph node with pleural invasion and lymphatic and vascular permeation.

tive 3D-CT is essential, especially when using VATS to treat the pulmonary blood vessels. We experienced an extremely rare type of dangerous anomaly of the right superior PV. Anatomically, the right superior PV runs anterior to the right main PA. We therefore regard the space between the right main PA and the right main bronchus as a no-blood-vessel area. However, we experienced an extremely rare case that could lead to the revision of this opinion.

We state that this work has been reported in line with the SCARE criteria [9].

#### Conflicts of interest

None.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial-in Chief of this journal on request.

#### Authors contribution

Yoshinobu Ichiki: study design, data collections, data analysis, writing Kesei Kakizoe: data collections.

Takayuki Hamatsu: data collections Taketoshi Suehiro: data collections Makiko Koike: data analysis.

Fumihiro Tanaka: study design, data collections, data analysis Keizo Sugimachi: data collections.

#### Guarantor

Yoshinobu Ichiki

#### Registration of research studies

None.

#### Ethical approval

None.

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