

Three-dimensional computed tomography for a mediastinal basal pulmonary artery

Running Head: Mediastinal basal pulmonary artery

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Abstract

Anatomical variations of the pulmonary artery increase the risks for vessel injury and critical mistakes during pulmonary artery resection. A case that underwent left lower lobectomy for lung cancer with a mediastinal lingular and basal pulmonary artery that had been detected preoperatively by three-dimensional computed tomography is presented. During thoracoscopic surgery, the mediastinal basal pulmonary arteries were found with careful dissection. The pulmonary arteries were divided, and left lower lobectomy was performed safely. This rare variation of the left pulmonary artery is important to detect before lobectomy to ensure safe surgery. In such cases, three-dimensional computed tomography is necessary.

There is some variation of the branching pattern of the pulmonary artery, particularly in the left lung. The most common variation is the mediastinal lingular pulmonary artery (1). Understanding of pulmonary artery abnormalities is most important for lung resection under video-assisted thoracic surgery (VATS) because of the difficulties associated with the limited field of view with VATS. A case in which a mediastinal lingular pulmonary artery was found preoperatively by three-dimensional computed tomography (3D-CT) is reported. This variation is extremely rare and very critical for left lobectomy, particularly for left upper lobectomy. In this case, left lower lobectomy was performed safely because the variation was discovered preoperatively. Preoperative 3D-CT is very important to identify pulmonary artery variations.

Case Report

A 78-year-old man was referred to our department with suspected lung cancer in the left lower lobe. Enhanced CT revealed a 23-mm-diameter tumor in the lower lobe that was strongly suspected to be lung cancer. We decided to perform left lower lobectomy for lung cancer, and 3D images of the pulmonary artery and vein were constructed by 3D-CT preoperatively, which is done routinely to confirm the branching of vessels to ensure that the operation is performed safely and quickly. 3D-CT revealed that two branches were flowing into the lower lobe. One was the normal branch through the back of the left main bronchus, which was relatively narrower than usual. Another was the so-called mediastinal lingular artery, which went through the front of the left main bronchus and entered the lower lobe (S8+9b), providing arteries into the lingular segment. The tumor was diagnosed as lung cancer by fine needle aspiration cytology, and lower lobectomy was performed. First, the main pulmonary artery and mediastinal lingular pulmonary artery were carefully dissected from the back or the front of the hilum, and after confirmation of the pulmonary arteries flowing into the lower lobe, they were divided by endostaplers. Then, the lower pulmonary vein and lower bronchus were divided by endostaplers, and the left lower lobe was removed from the chest cavity. Subsequently, mediastinal lymph node and hilar lymph node dissections were performed by taping the pulmonary arteries. The main pulmonary artery was

narrower than usual, but because of the preoperative 3D-CT examination, it was relatively easy and safe to identify these arteries. The tumor was diagnosed as adenocarcinoma, with a pathological stage of T1bN0M0. The patient's postoperative course was stable, and he was discharged 15 days after the operation.

Comment

In the lung surgery field, pulmonary vascular variations are not uncommon. Sobotich et al. reported that 16.4% of patients had pulmonary vessel variations, and 47.8% of these variations occurred in the left lung (1). Among the variations of the left pulmonary artery, the most common variation is the so-called mediastinal lingular artery, which is the first branch of the left main pulmonary artery. The mediastinal lingular artery, which includes the A4+A5 type and either the A4 or A5 type, has been reported in 27.3% of cases (2). However, a mediastinal basal artery is extremely rare, and only a few cases have been reported (3,4). There might be cases that are not noticed during operations because it is difficult to identify if it is not detected preoperatively. The present case is the first report of a combination mediastinal lingular and basal artery with left main pulmonary artery, and the first time it has been shown clearly by 3D-CT. In such cases, if there is no information about pulmonary artery abnormalities, the lobectomy would be difficult to perform safely, and sometimes mistakes could be made (4), particularly when incomplete fissures are present. Incomplete oblique fissures in the left lung have been reported to occur in from 21% to 46.6% of cases (5,6). This means that care is needed in many cases of left lobectomy.

Complete VATS has been accepted as a standard operation for stage IA lung cancer (7,8). This is a very useful method to see the details of the structure while performing the operation. On the other hand, it is relatively difficult to see the whole lung and the sizes of arteries or veins. This disadvantage could cause misunderstanding of vessel abnormalities during surgery. 3D-CT could overcome this disadvantage because it clearly shows the structure of the pulmonary vessels and bronchi preoperatively. Of course, it is possible to detect these abnormalities by axial views of chest CT, but it takes a long time to learn and to perform a careful evaluation before operation. 3D-CT could provide easy and reliable images of

abnormalities of pulmonary vessels and bronchi for many surgeons. Thus, 3D-CT is very useful for lung surgery and should be performed before surgery if possible.

A mediastinal lingular and basal artery is very rare, but it is very important to identify to facilitate safe left lobectomy. 3D-CT provides strong support for confirming pulmonary vessel structure.

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Figure Legends:

Figure 1. Three-dimensional CT shows the left main pulmonary artery (open arrow) and the left mediastinal lingular and basal pulmonary artery (arrow). Their size looks similar, and the left main pulmonary artery includes A4, A6, A9a, and A10, and the left mediastinal pulmonary artery includes A5, A8, and A9b.

Figure 2. Picture taken during the operation (left) and its schema (right). The mediastinal pulmonary artery comes from the back of the superior pulmonary vein and enters the basal segment after providing A5.

Figure1

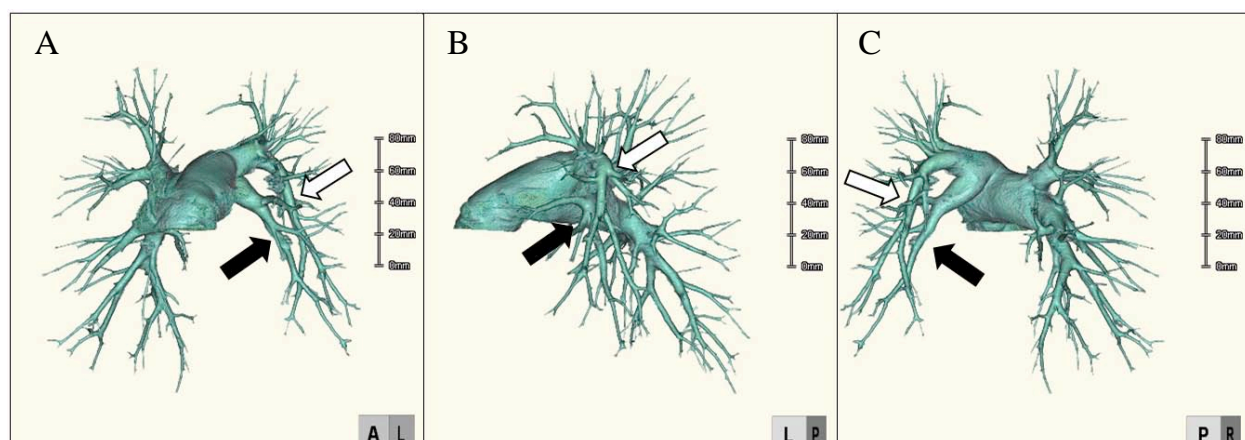


Figure2

