



# Thoracoscopic S<sup>8</sup> segmentectomy

Agathe Seguin-Givelet<sup>1,2</sup>, Emmanuel Brian<sup>1</sup>, Madalina Grigoroiu<sup>1</sup>, Dominique Gossot<sup>1</sup>

<sup>1</sup>Thoracic Department, Institut du Thorax Curie-Montsouris, Institut Mutualiste Montsouris, Paris, France; <sup>2</sup>Paris 13 University, Sorbonne Paris Cité, Faculty of Medicine SMBH, Bobigny, France

Correspondence to: Dominique Gossot, MD. Thoracic Department, IMM, 42 Bd Jourdan, F-75014 Paris, France. Email: dominique.gossot@imm.fr.

**Abstract:** Thoracoscopic S<sup>8</sup> segmentectomy is a rather straightforward procedure when performed on the left side, but a bit more difficult on the right side due to the presence of S<sup>7</sup> segment. Variations in the bronchovascular anatomy deserve to be known in order not confusing an A<sup>8</sup> artery with a common A<sup>8+9</sup> trunk. The use of preoperative modelisation of bronchovascular anatomy is highly recommended.

**Keywords:** Sublobar resection; segmentectomy; video-assisted thoracic surgery (VATS); indocyanine green (ICG)

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S<sup>8</sup> segmentectomies are indicated for some cT1a non-small cell lung cancers (NSCLCs) for patients who had undergone a previous major pulmonary resection and/or have a compromised pulmonary function and/or who present with two synchronous or metachronous tumors. It can also be proposed for some solitary metastases (*Figure 1*).

S<sup>8</sup> segmentectomies are slightly easier on left side compared to right one because there is no S<sup>7</sup> segment (*Figure 2*). Variations in the distribution of arteries and bronchi require a thorough examination of preoperative modelisation. In this article, we will base on the most frequent anatomical pattern, that is A<sup>8</sup> and a A<sup>9+10</sup> common arterial trunk with the corresponding B<sup>8</sup> and B<sup>9+10</sup> bronchi (*Figure 3*).

## Anatomical landmarks

In most cases, the basilar arterial trunk branches in two arteries: A<sup>8</sup> and A<sup>9+10</sup> (1). This pattern is more frequent on the right side (90%) than on the left side (74%). In a minority of patients, the anatomy is reverse with the following distribution: A<sup>8+9</sup> and A<sup>10</sup> (8% on the right side and 16% on the left side) (*Figure 4*). On the left side all three arteries can be independent (10%) (1). All arteries to the lower lobe must be clearly identified in order to avoid misidentification, such as a low A<sup>8a</sup> being mistaken for an A<sup>9+10</sup>. When in doubt during dissection, it is

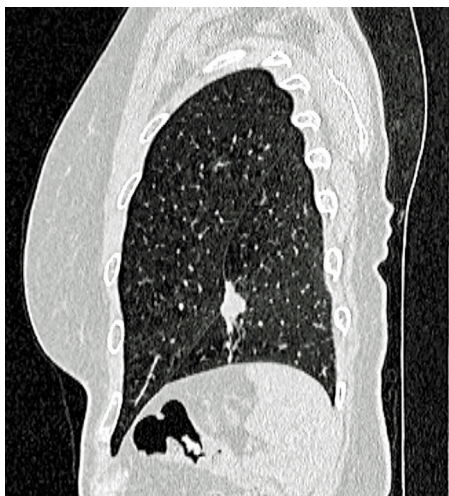
advisable to control only the anterior branch of A<sup>8</sup> (A<sup>8b</sup>), then the bronchus and eventually check the direction of the second branch. An important variation deserves to be known: on the right, A<sup>7</sup> is lacking in 16% of the patients, explaining why A<sup>7</sup> is sometimes not found, even after an extensive dissection of the PA branches. When present, it is discovered on the posterior aspect of the arterial basilar trunk at a variable level between the onset of the middle lobe artery and the basilar arteries (*Figure 5*).

The basilar bronchial trunk usually separates in two branches: B<sup>8</sup> and B<sup>9+10</sup> which lie posterior to the segmental arteries. As for arteries, instead of a common B<sup>9+10</sup> trunk, B<sup>9</sup> can have a common birth with B<sup>8</sup> (*Figure 4*).

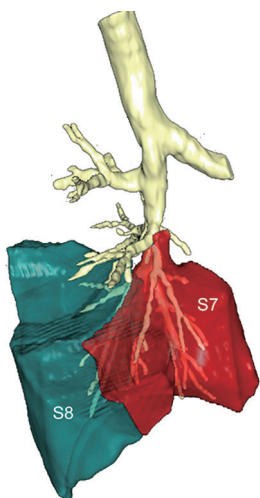
The venous drainage is highly variable. The superior basal vein (SBV), which is the middle root of the IPV, does seldom represent the venous drainage of segment 8. Its posterior branch can drain segment 9 (*Figure 3C*). Actually, in most cases (88%), the inferior pulmonary vein has two tributaries: a V<sup>6</sup> and a common basilar vein. If is thus safer to control the vein within the parenchyma and divide only the anterior branch of the vein (V<sup>8b</sup>) which runs immediately behind the bronchus, rather than controlling V<sup>8</sup> centrally in the inferior pulmonary vein.

## Surgical technique

The basic principles of our technique have been described (2),



**Figure 1** Metastasis from a colonic carcinoma in left segment 8.



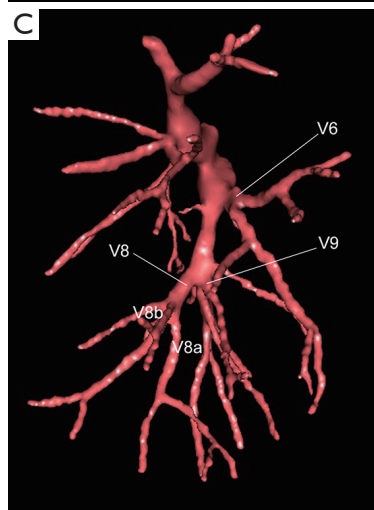
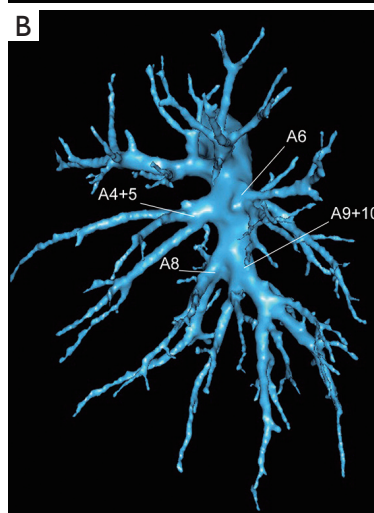
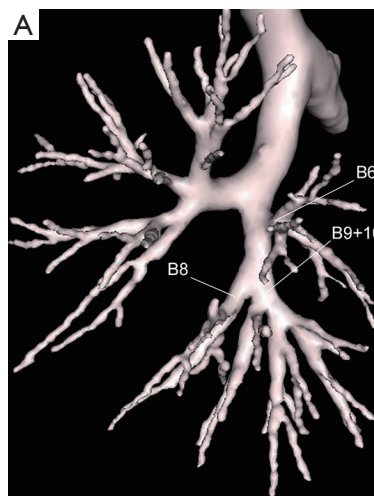
**Figure 2** Three-dimensional modelisation of right segments 8 and 7 (lateral view).

as well as the need for preoperative modelisation (3).

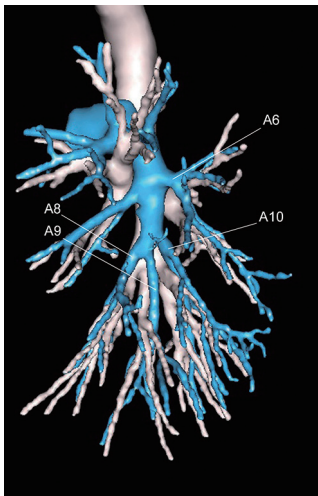
**Opening the fissure and controlling the artery**

This step is similar to the dissection of the fissure during a lower lobectomy or a basilar segmentectomy. But the dissection of arteries must be pursued as low as possible and all branches to the lower lobe must be clearly identified.

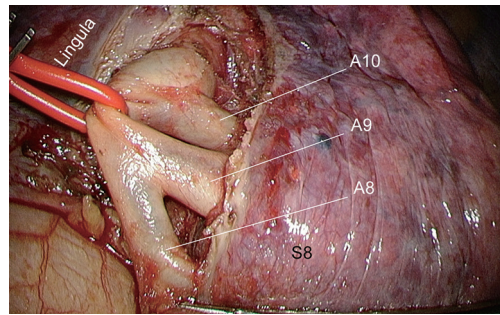
Both A<sup>8</sup> and A<sup>9+10</sup> are looped (*Figure 6*), so that one can retract them forward or backward to expose B<sup>8</sup>. Dissection must be pursued on a sufficient length to detect any



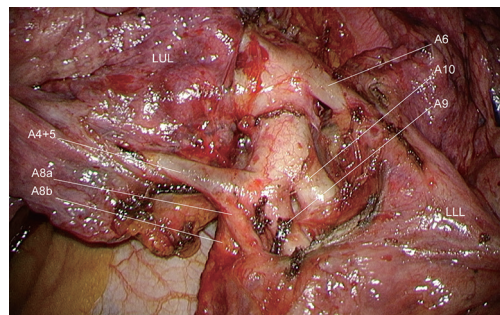
**Figure 3** Anatomical landmarks. (A) B<sup>8</sup> bronchus (front view); (B) A<sup>8</sup> artery (front view); (C) V<sup>8</sup> veins. Note that the posterior branch of the superior basal vein (V<sup>8a</sup>) drains S<sup>9</sup> and must be preserved.



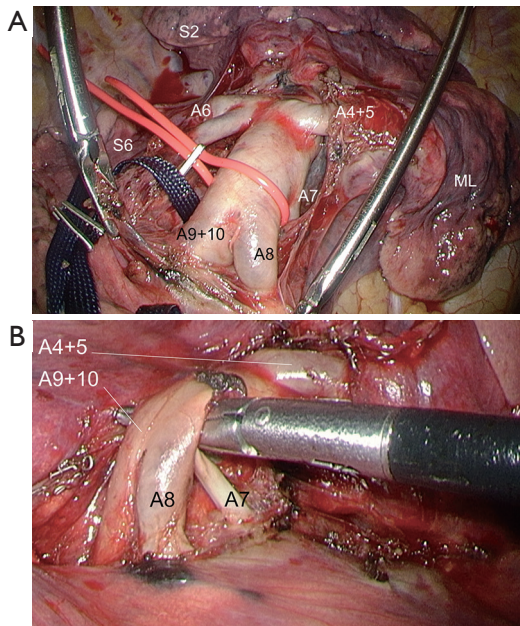
**Figure 4** Anatomical variation of the branching of bronchi and arteries: common bronchial B<sup>8</sup> and B<sup>9</sup> trunk, and common arterial A<sup>8</sup> and A<sup>9</sup> trunk.



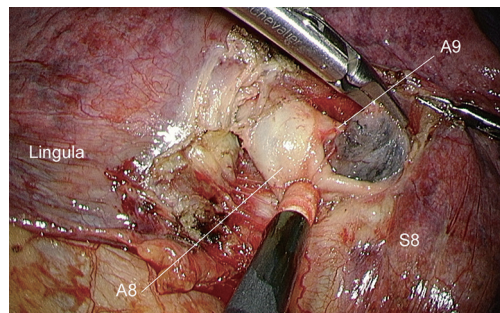
**Figure 6** Dissection and retraction of the basilar trunk in a patient with a common A<sup>8</sup>-A<sup>9</sup> arterial trunk (left).



**Figure 7** Example of a low birth of a lingular artery, at the same level as A<sup>8</sup>. LUL, left upper lobe; LLL, left lower lobe.



**Figure 5** Dissection of the basilar segmental arteries. (A) Overall view; (B) identification of A<sup>7</sup> (right). ML, middle lobe.



**Figure 8** Dissection of intersegmental lymph nodes that are examined intraoperatively (left).

anatomical variation such as a lingular artery raising from A<sup>8</sup> (Figure 7). A<sup>8</sup> is clipped. All lymph nodes located in the arterial division must be dissected, removed and sent for frozen section (Figure 8). If invaded, the procedure should be extended, either to a basilar segmentectomy or even a lower lobectomy in patients operated for NSCLC.

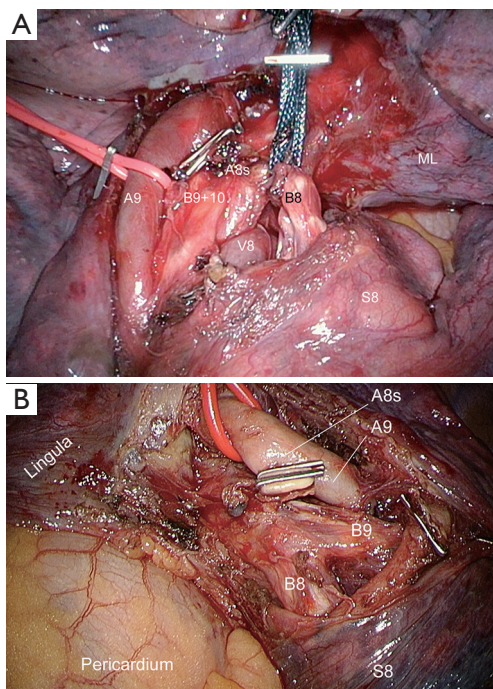
On the right side, a middle lobe artery can raise from A<sup>8</sup> and similarly on the left side a lingular artery can raise from A<sup>8</sup>. This stresses the need for an extensive dissection of all arterial branches in the fissure (Figure 9).

**Dissecting and controlling the bronchus**

By retracting B<sup>9+10</sup> backward, B<sup>8</sup> is exposed (Figure 10). It



**Figure 9** Dissection of A<sup>8</sup> artery arising from the lingular artery (4). Available online: <http://www.asvide.com/article/view/27167>

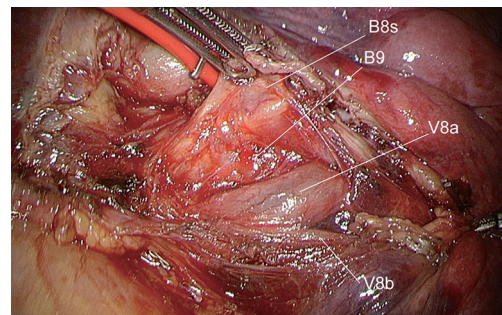


**Figure 10** Division of A<sup>8</sup> exposes B<sup>8</sup> and B<sup>9</sup>: (A) right side; (B) left side. A<sup>8s</sup>, stump of A<sup>8</sup>.

is carefully dissected to avoid any tear of the vein (V<sup>8a</sup>) that runs just behind it. It is then stapled after a reventilation test.

### Dissecting and controlling the vein

There is no need to dissect the inferior pulmonary vein (1,5). Once the bronchus has been stapled, its stump is gently lifted up and its backside is denuded with caution to expose



**Figure 11** Elevating the stump of B<sup>8</sup> exposes the vein. Only its most anterior branch (V<sup>8b</sup>) is divided (left).

the anterior branch of the vein (V<sup>8b</sup>). Its posterior branch (V<sup>8a</sup>), that partially drains S<sup>9</sup>, is preserved (Figure 11).

### Intersegmental plane

The intersegmental plane is determined by systemic injection of indocyanine green (ICG) at the dose of 0.3 mg/kg with fluorescence imaging system (Novadaq™) (6). Cautery dots are made on the parenchyma on this demarcation line, i.e., the plane between S<sup>8</sup> and S<sup>9</sup>.

A long clamp is applied on the parenchyma, following the cautery spots that have been applied. It is checked that the bronchial stump stays remote and will not get stuck within the stapler jaws. The conic shape of S<sup>8</sup> can make precise application of the stapler difficult with a risk of plication of the parenchyma. Thanks to use of two grasping forceps, the parenchyma can be stretched to expose the whole segment 8 and ease stapling.

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