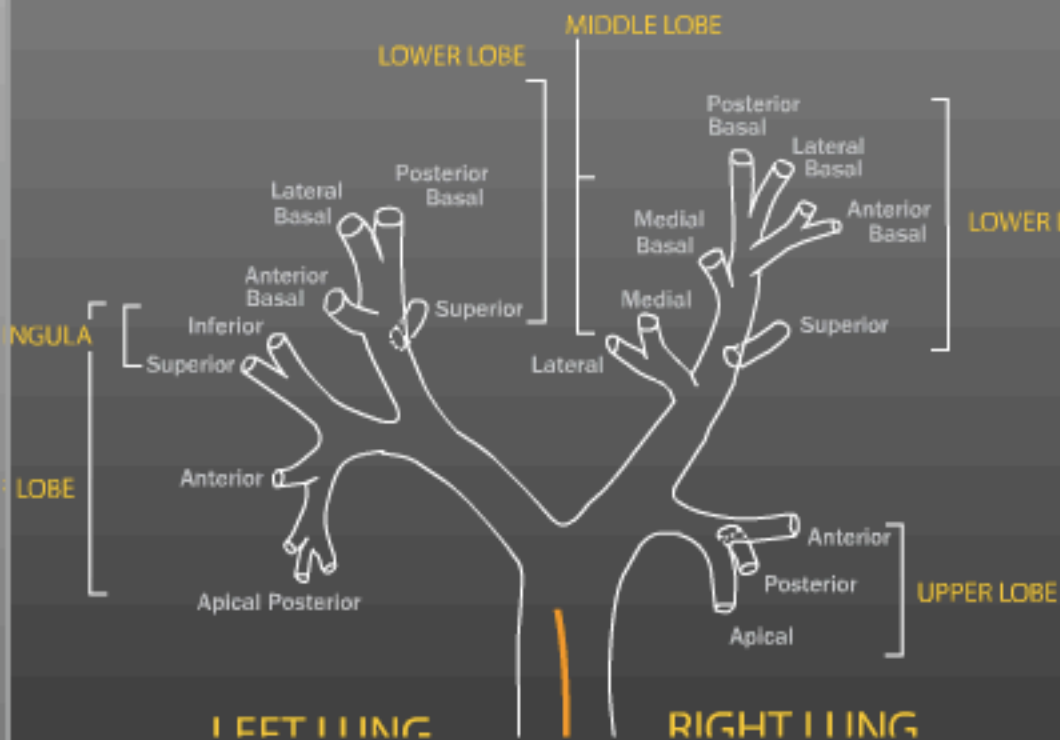
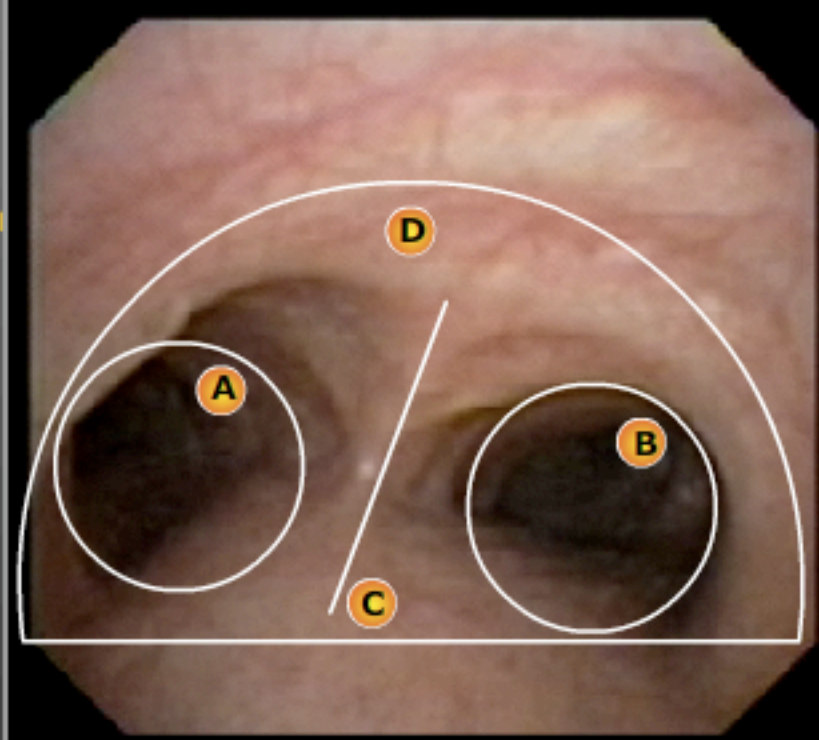


Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW



LABELING CONTROLS



● Bronchial Tree Labels

● Bronchoscope View Labels

● Bronchial Tree Diagram

● Bronchoscope Indicator



Thoracicanesthesia.com Bronchoscopy Simulation

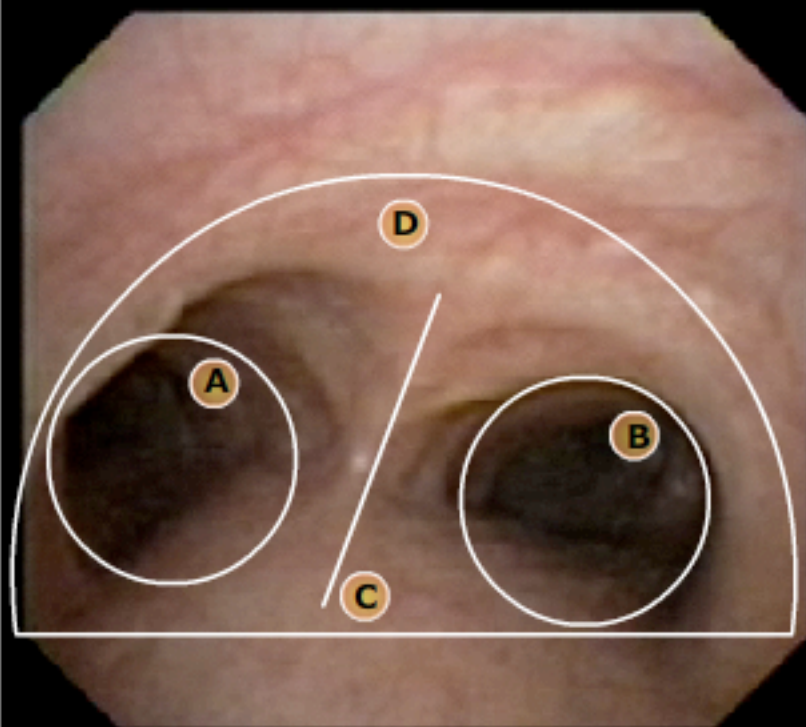
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(A) Left mainstem bronchus (LMB)

This bronchus is very long (average length being 5cm) with a very large caliber lumen. When the lumen is this large, it helps the bronchoscopist identify this as the level of the main carina. The LMB bifurcates into the left upper and lower lobes, which are not visible this proximal in the airway. Notice there are no bifurcations immediately visible.

BRONCHOSCOPE VIEW



LABELING CONTROLS

- Bronchial Tree Labels
- Bronchial Tree Diagram
- Bronchoscope View Labels
- Bronchoscope Indicator



Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

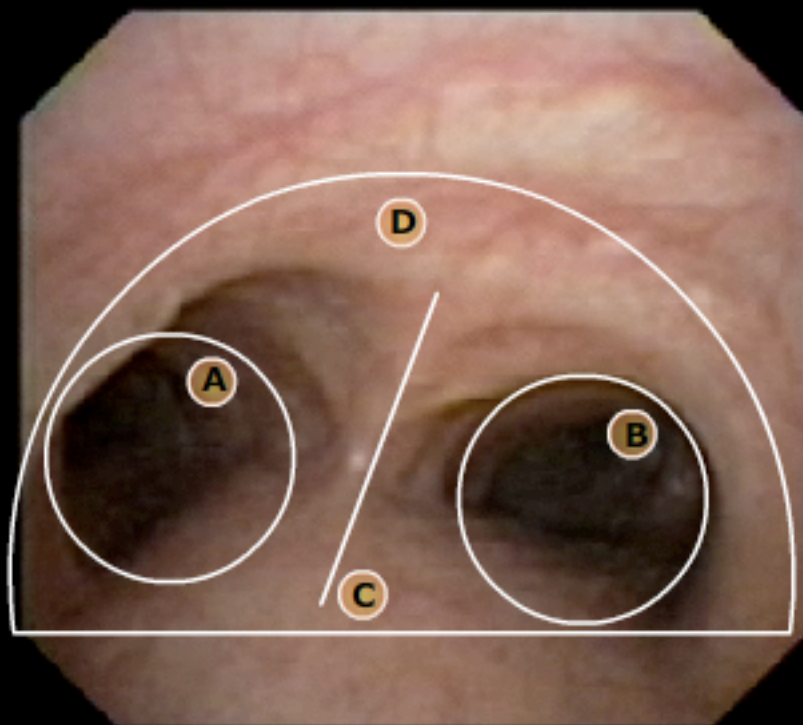
Close Label

(B) Right mainstem bronchus (RMB)

This bronchus is very short due to the immediate take-off of the right upper lobe (RUL) bronchus, which is not always immediately visible. Here, there is some indication that the RUL is at the 3 o'clock position.

As with the LMB, take note of the large caliber lumen. 1st generation bronchi are large and usually have no bifurcations in sight.

BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

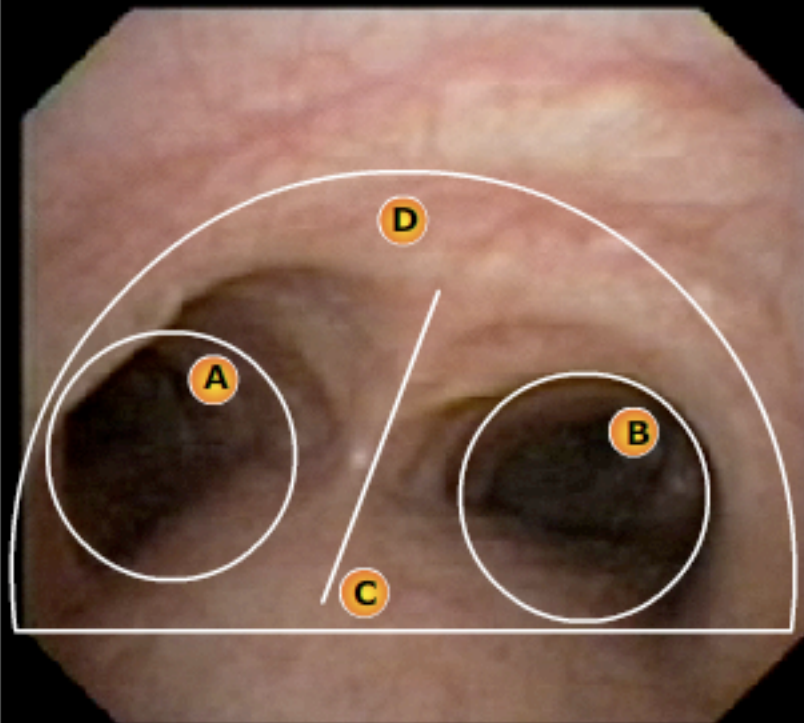
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(D)

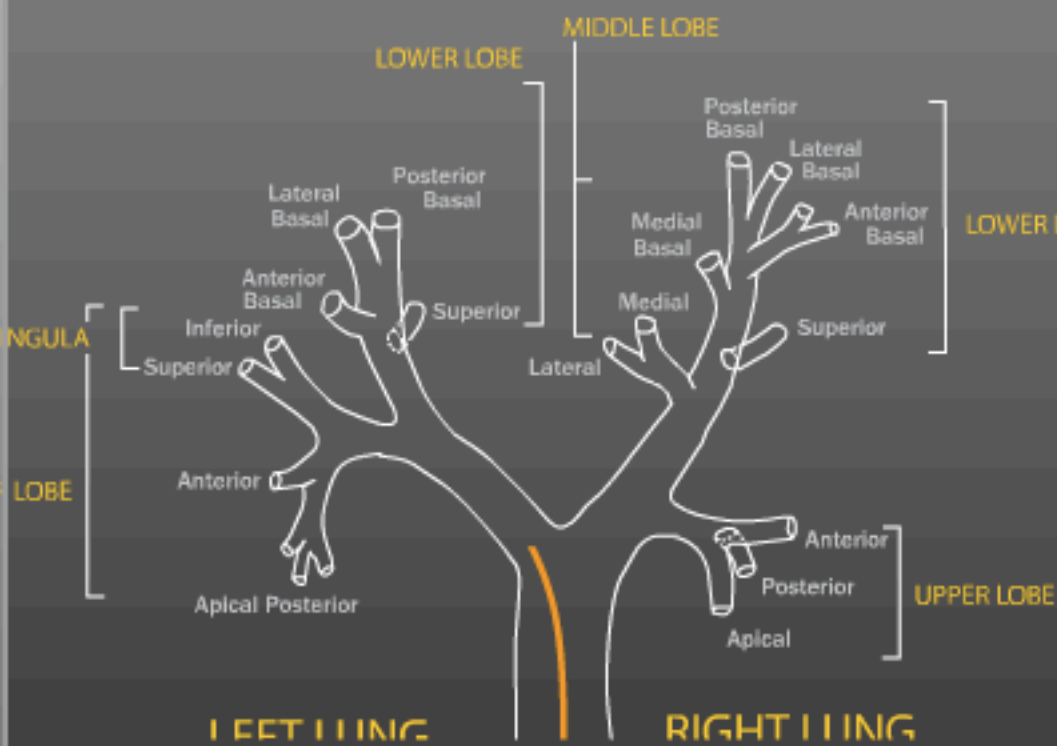
Semi-circular shaped lumen is very characteristic of the main carina. It has a flat membranous trachea posteriorly (which is also the anterior wall of the esophagus) and a dome appearance anteriorly. The tracheal rings are very prominent.

BRONCHOSCOPE VIEW

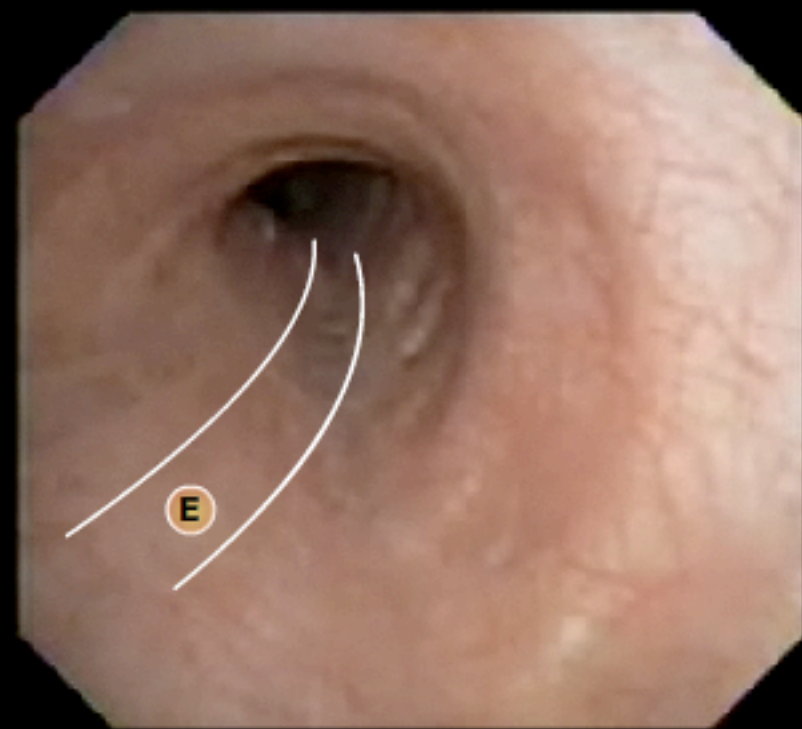


Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW



LABELING CONTROLS

- Bronchial Tree Labels
- Bronchial Tree Diagram
- Bronchoscope View Labels
- Bronchoscope Indicator



Thoracicanesthesia.com Bronchoscopy Simulation

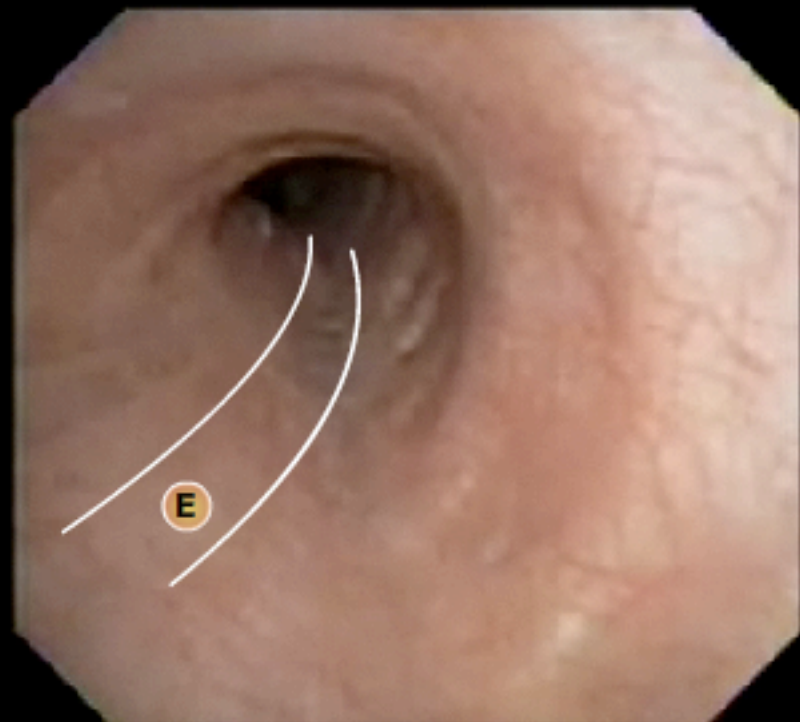
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(E)

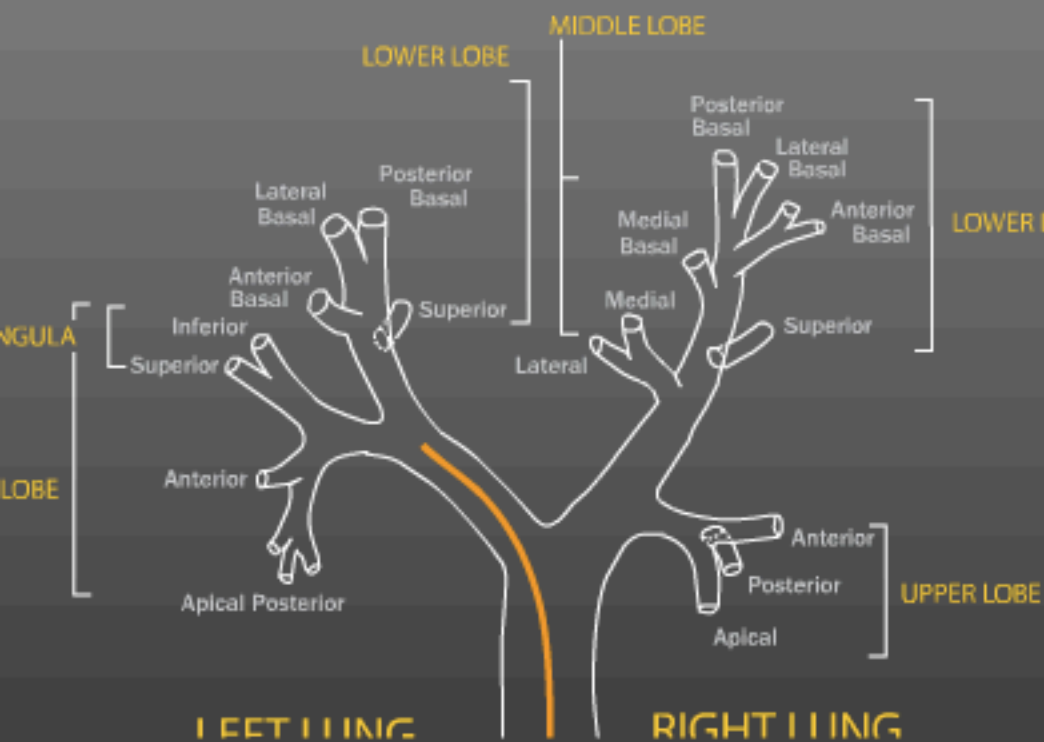
Longitudinal muscular bundles that continue from the membranous part of the trachea. They line the posterior wall of the Left Mainstem Bronchus (LMB). These bundles are also visible on the right side.

BRONCHOSCOPE VIEW

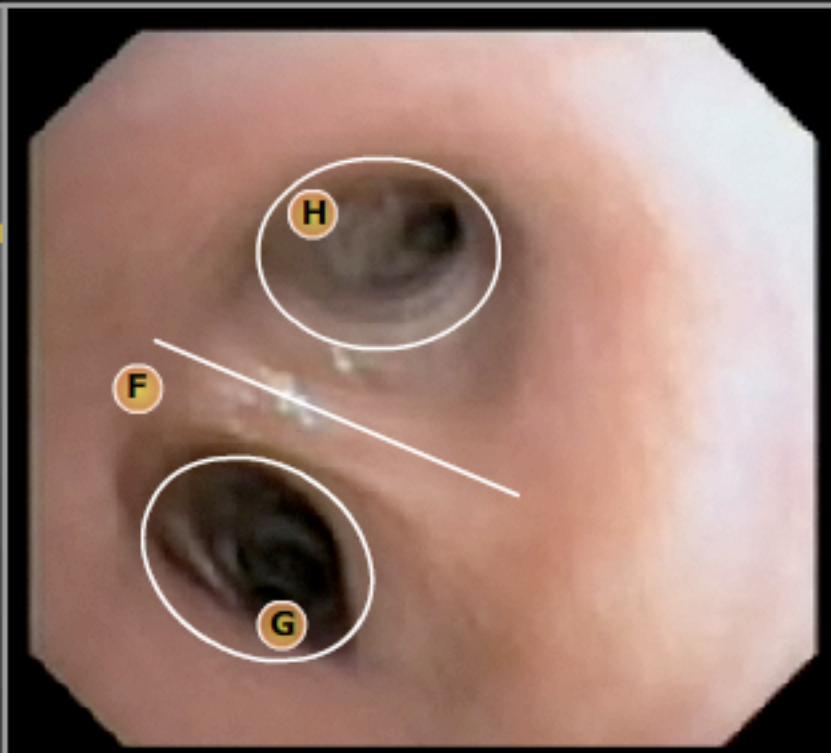


Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(F)

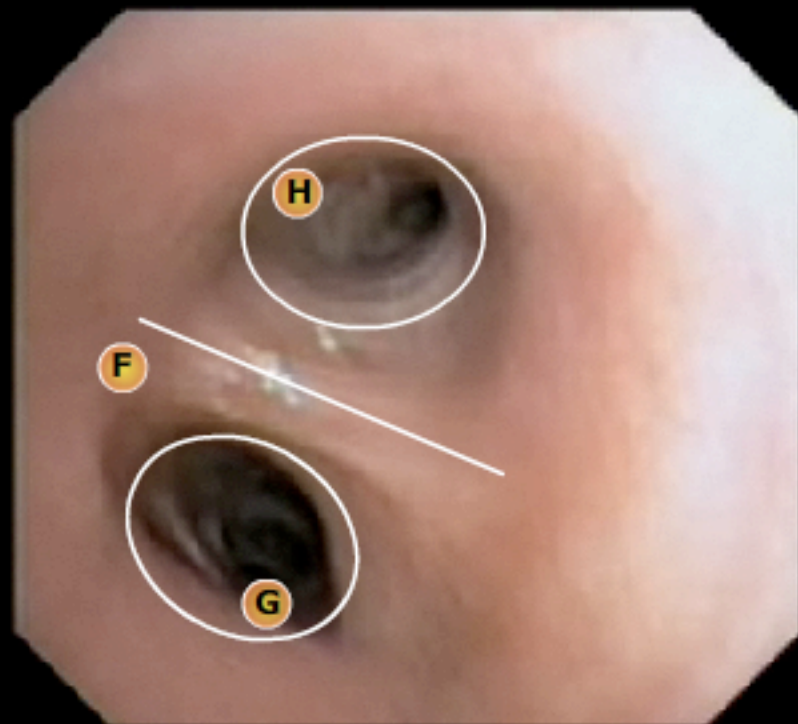
Left Upper Lobe (LUL) and Left Lower Lobe (LLL) bifurcation, leading to 2nd generation bronchi. It is not sharp. Notice how the caliber of each lumen is now significantly smaller compared to the main carina and bifurcations are immediately visible.



Main Carina

Anatomically, this carina is typically positioned in the 8 – 2 o'clock position and divides the LUL/LLL in a 1:1 proportional split. In other words, both lumen are approximately equal in size.

BRONCHOSCOPE VIEW



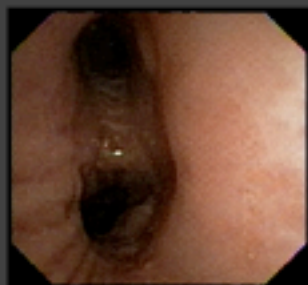
Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label ☒

(G) Left Lower Lobe (LLL)

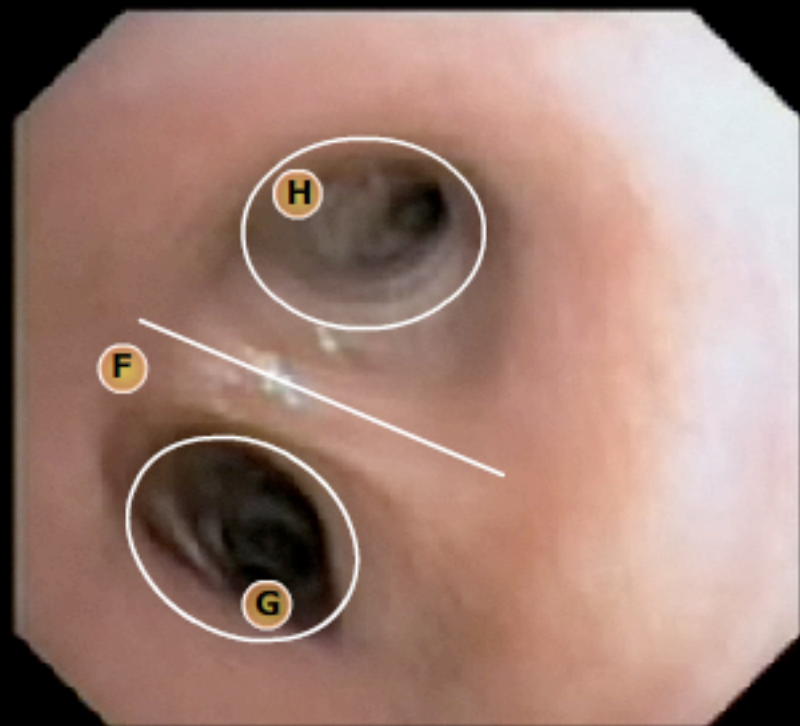
Approximately equal in caliber to the left upper lobe (LUL) bronchus. It can be distinguished from the LUL by following the longitudinal muscular bundle lines that appear along the posterior wall of the mainstem bronchus.



They are usually more prominent entering the LLL, providing a useful distinguishing feature. In this video the lines are not very prominent, but they are definitely still visible.

Example of more prominent bundles

BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

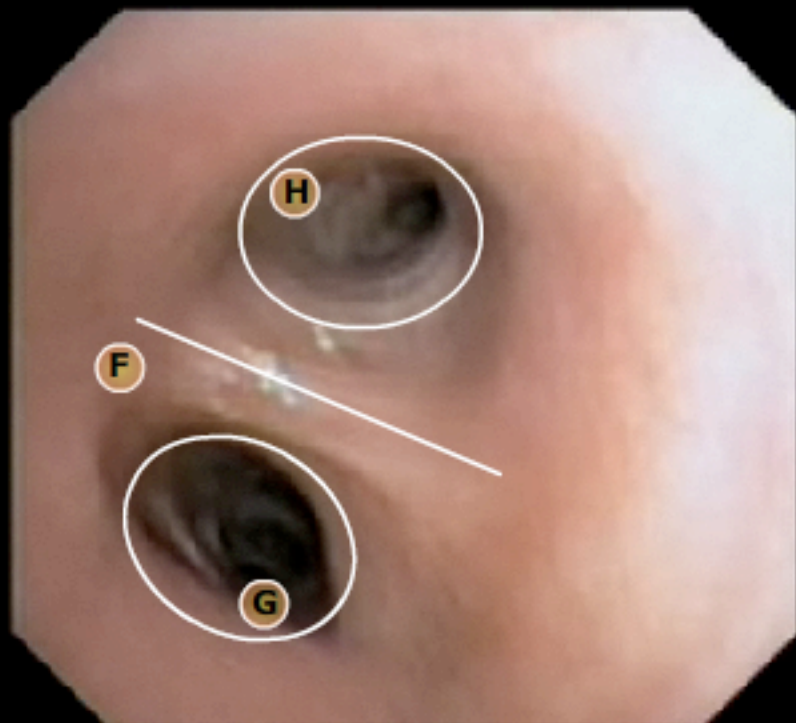
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(H) Left Upper Lobe (LUL)

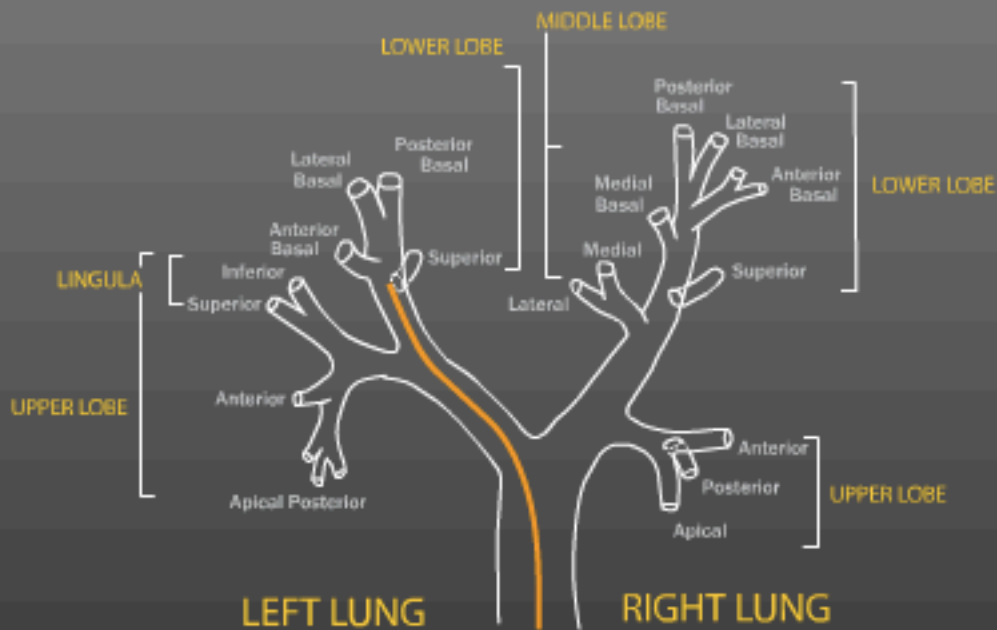
Approximately equal in caliber to the left lower lobe (LLL) bronchus. The LUL divides into UPPER and LOWER (lingular) divisions leading to a total of 5 segments.

BRONCHOSCOPE VIEW

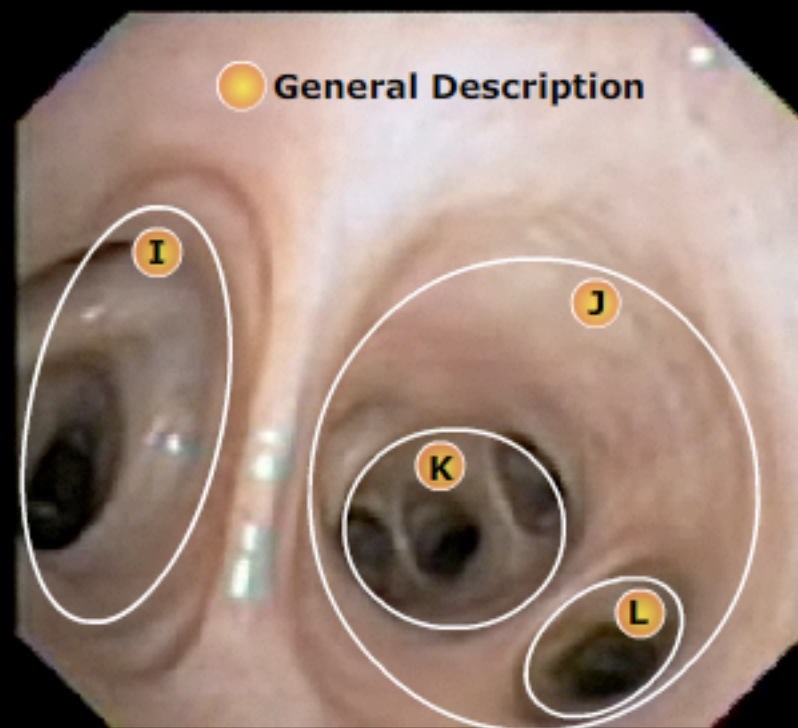


Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

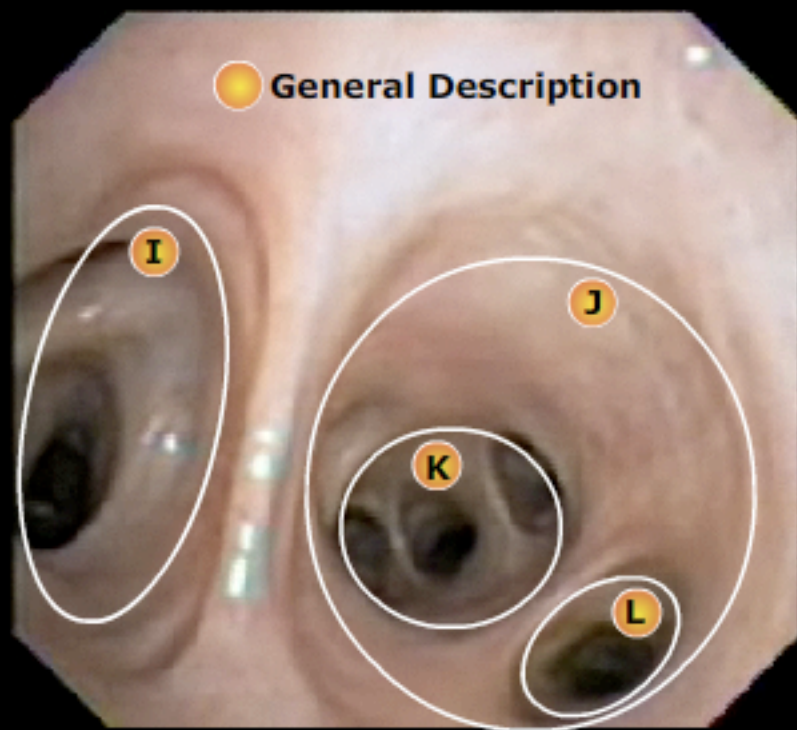
BRONCHIAL TREE NAVIGATION MAP VIEW

Left Lower Lobe (LLL)

At this level of the airway, bronchial segments vary significantly from person to person. There are, however, some generalizations. Typically, the LLL divides into 4 segments (compared to 5 segments of the RLL): 1 superior segment (**I**), and 3 (commonly) or 4 basal segments (**J**). The superior segment is easily identified on the left, coursing in a superior direction (**I**). Here bifurcations are seen within the superior segment. The 3 basal segments occasionally exist as 4 separate bronchi (**J**), as is visible in this patient. This video is an example of a LLL with 4 basal segments: anterior, lateral and posterior (**K**) and medial (**L**). In patients with only 3 basal segments, the anterior and medial bronchi are fused.

Close Label

BRONCHOSCOPE VIEW




Thoracicanesthesia.com Bronchoscopy Simulation

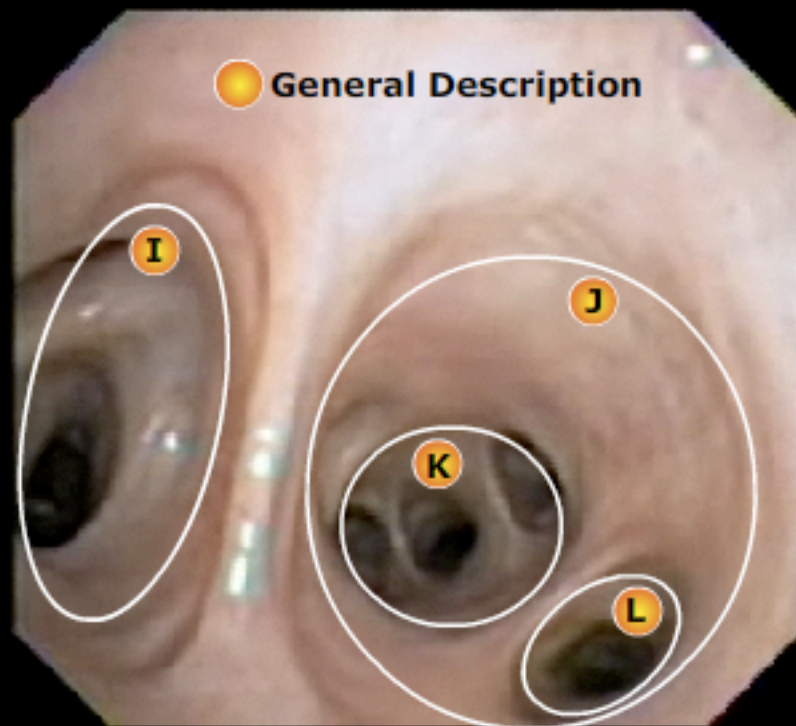
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

and 3 (commonly) or 4 basal segments (**J**). The superior segment is easily identified on the left, coursing in a superior direction (**I**). Here bifurcations are seen within the superior segment. The 3 basal segments occasionally exist as 4 separate bronchi (**J**), as is visible in this patient. This video is an example of a LLL with 4 basal segments: anterior, lateral and posterior (**K**) and medial (**L**). In patients with only 3 basal segments, the anterior and medial bronchi are fused, creating the anterior medial basal segment. As mentioned, the RLL divides into 5 segments, with these anterior and medial basal segments being separate structures most of the time.

BRONCHOSCOPE VIEW

 General Description



Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

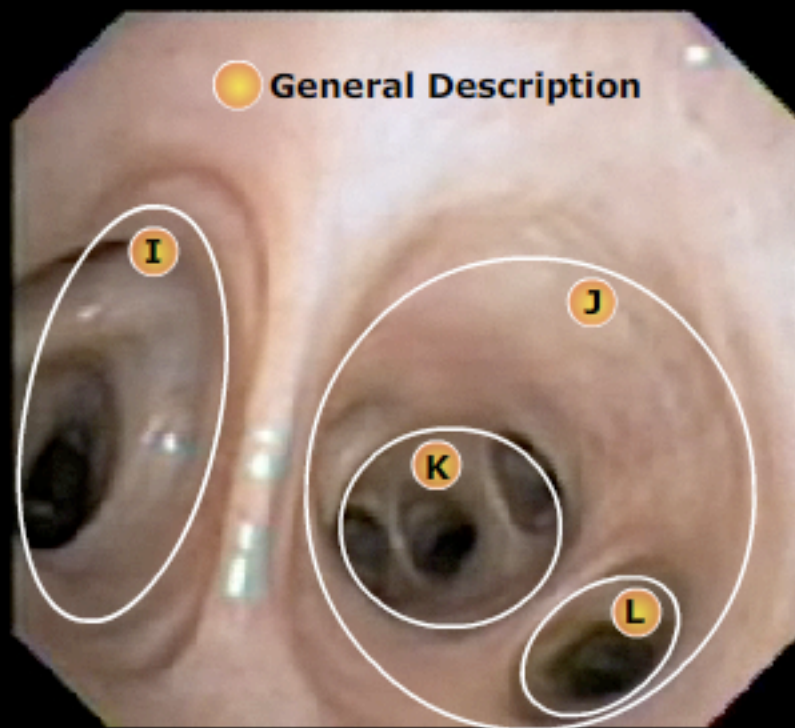
Close Label

(I) Superior Segment

Easily identified on the left coursing in a superior direction.
Bifurcations are immediately seen, usually quite easily.

BRONCHOSCOPE VIEW

● General Description



Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

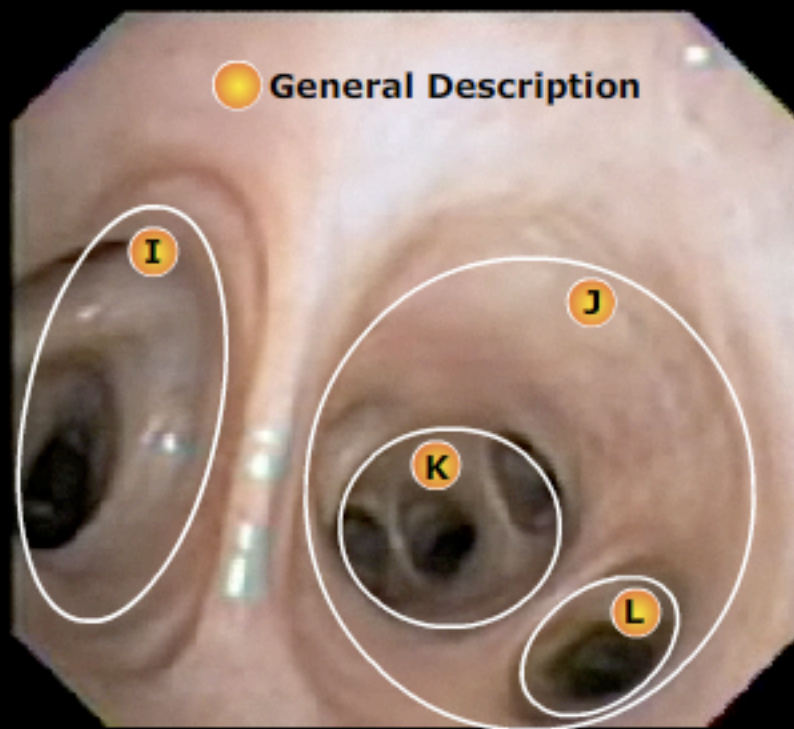
Close Label

(J)

Combined bronchus leading to basal segments. In this patient, there are 4 basal segments: anterior, lateral and posterior (**K**) and medial (**L**). Typically, patients exhibit only 3 basal segments, with the anterior and medial bronchi usually fused, creating the anterior medial basal segment.

BRONCHOSCOPE VIEW

General Description



Thoracicanesthesia.com Bronchoscopy Simulation


BRONCHIAL TREE NAVIGATION MAP VIEW

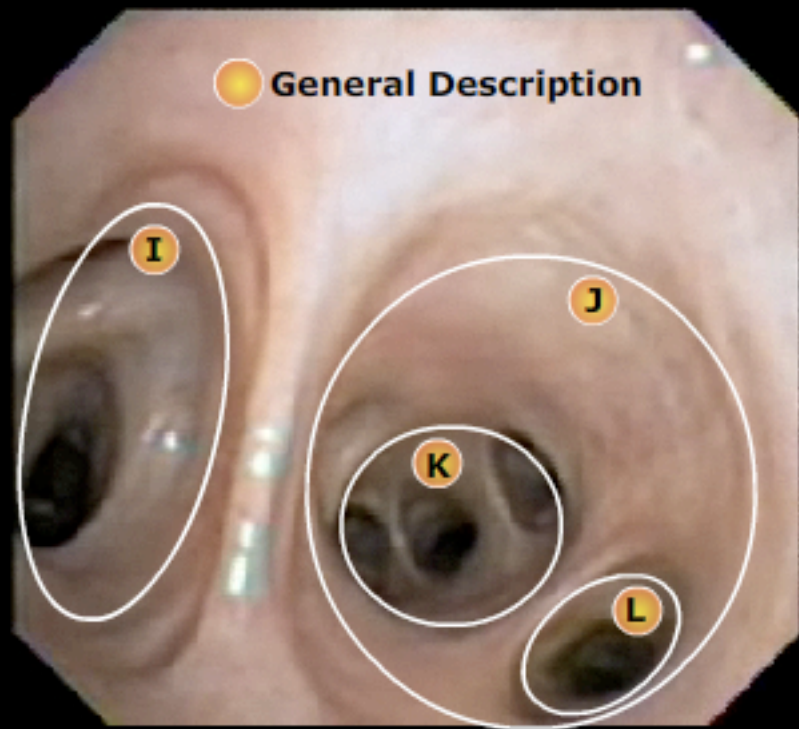
Close Label

(K)

Anterior, lateral and posterior basal segments.

BRONCHOSCOPE VIEW

 General Description



Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

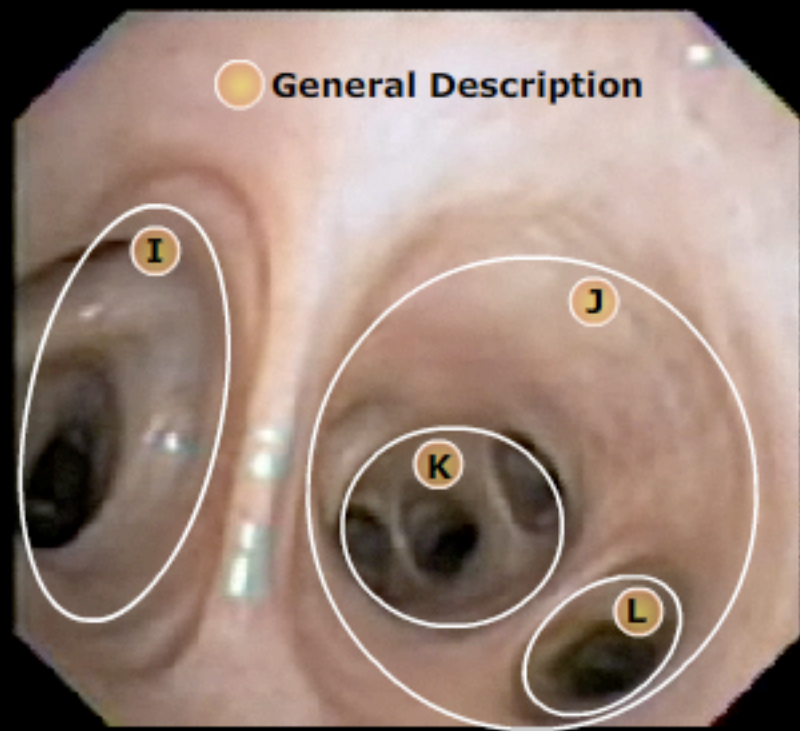
Close Label

(L)

Medial basal segment.

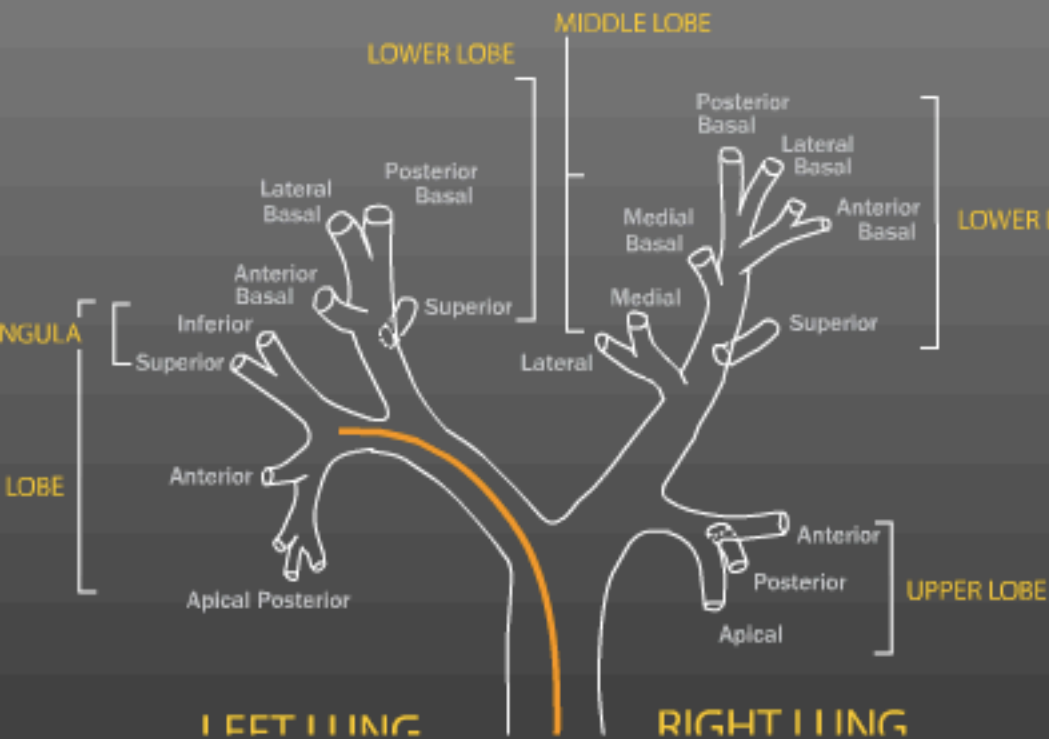
BRONCHOSCOPE VIEW

General Description

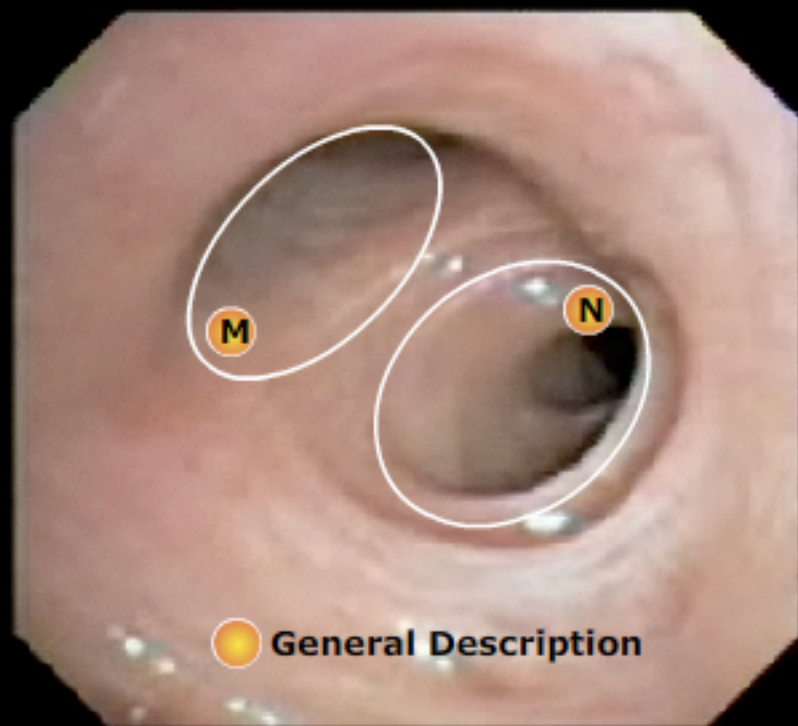


Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

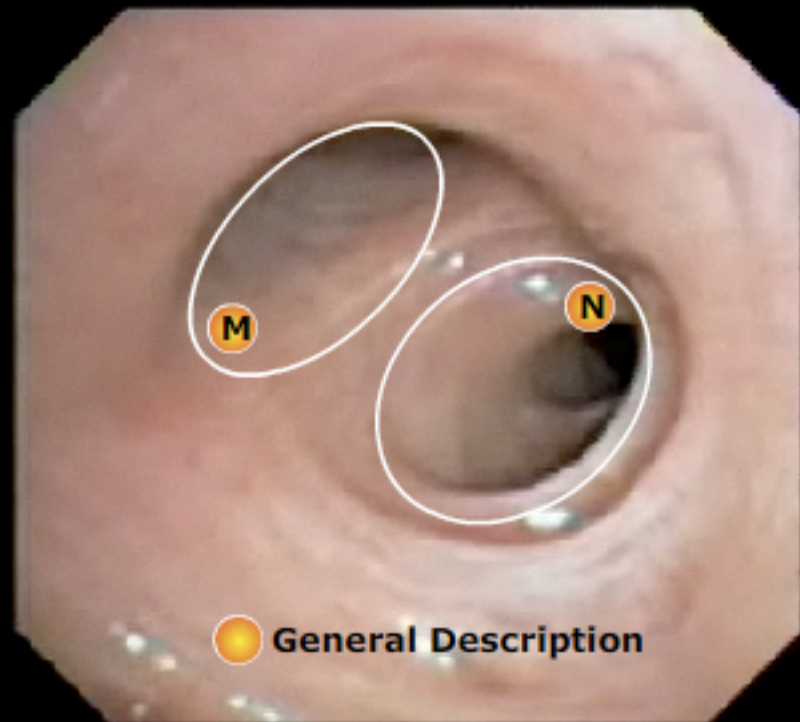
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label ☒

This is the left upper lobe (LUL). The upper division, or left upper lobe proper (**M**) divides into the fused apical-posterior segments and the anterior segment, for a total of 3 segments. The lower division, or lingula (**N**), divides into superior and inferior segments. In total, the LUL has five segments. The lingular bronchus is easily identifiable by its :

- 1) rightward direction and
- 2) two bifurcations immediately visible (prior to those of the upper lobe proper).

BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

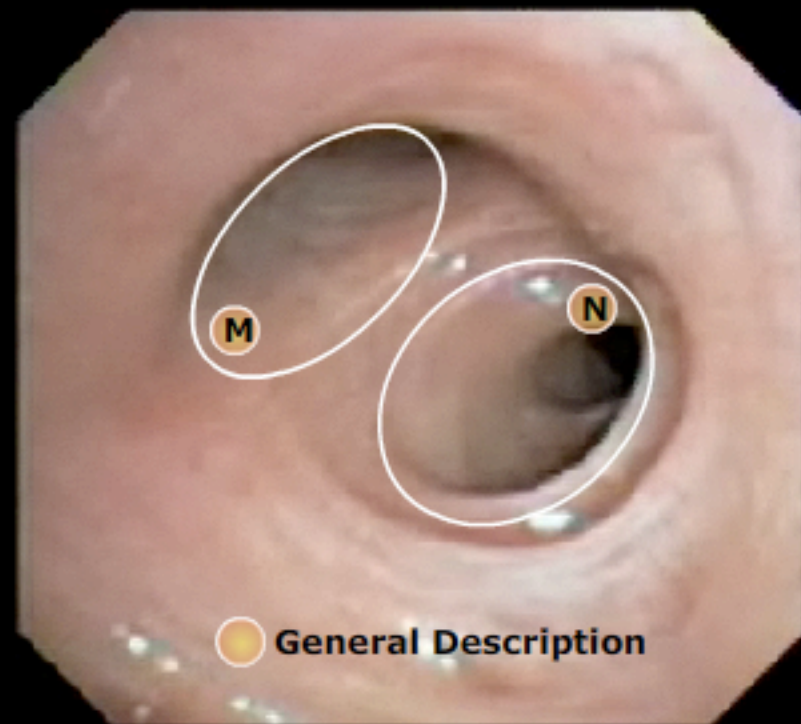
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(M)

Upper division, or left upper lobe proper. Divides into the fused apical-posterior segments and the anterior segment, for a total of 3 segments (none of which are visible here).

BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

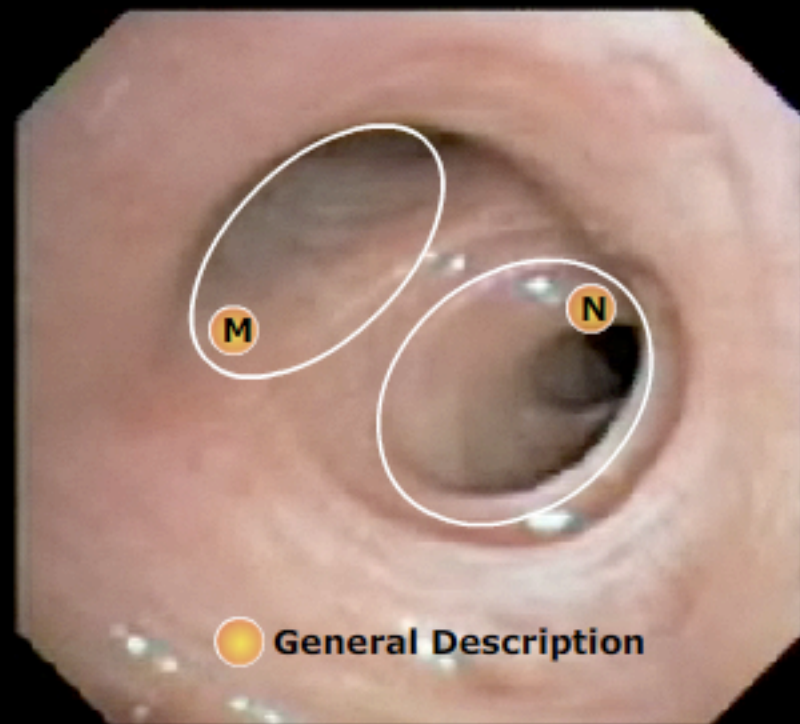
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(N)

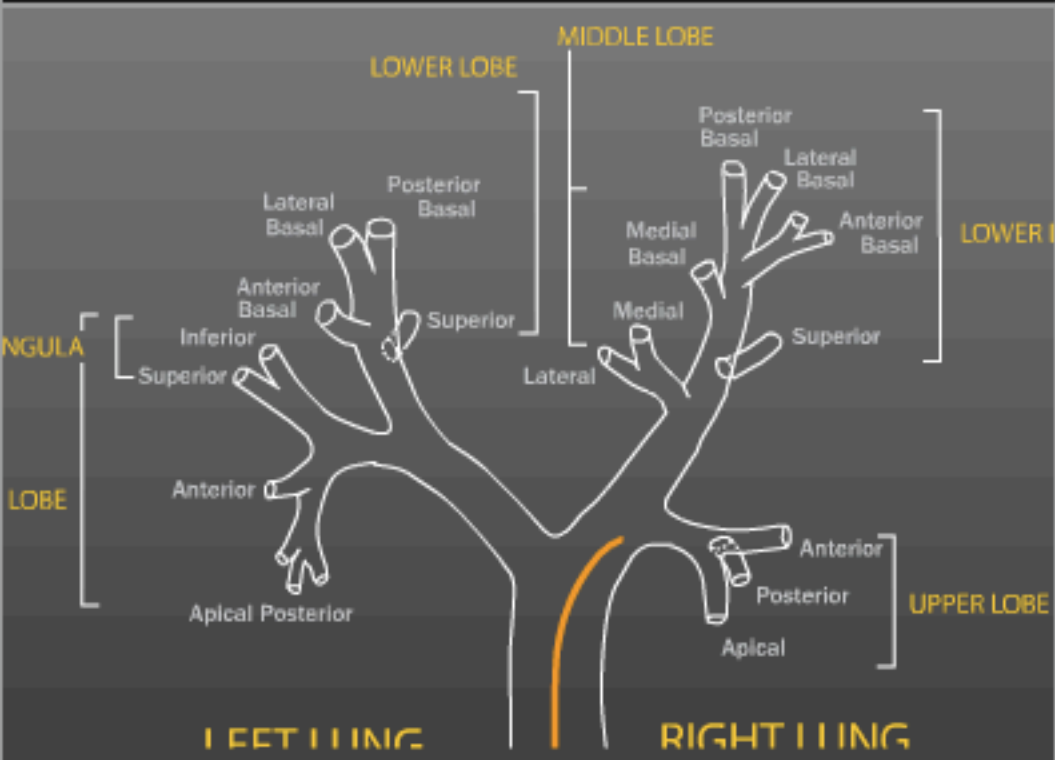
Lower division (or lingula). It divides into superior and inferior segments, easily seen here. The lingular bronchus is easily identifiable by its 1) rightward direction and 2) two bifurcations immediately visible (prior to those of the upper lobe proper).

BRONCHOSCOPE VIEW

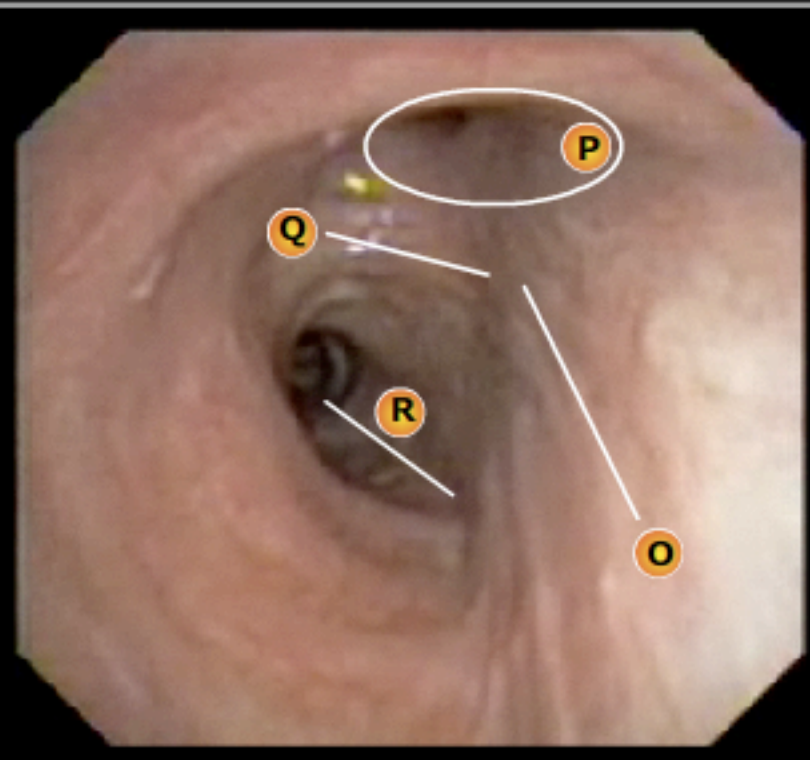


Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

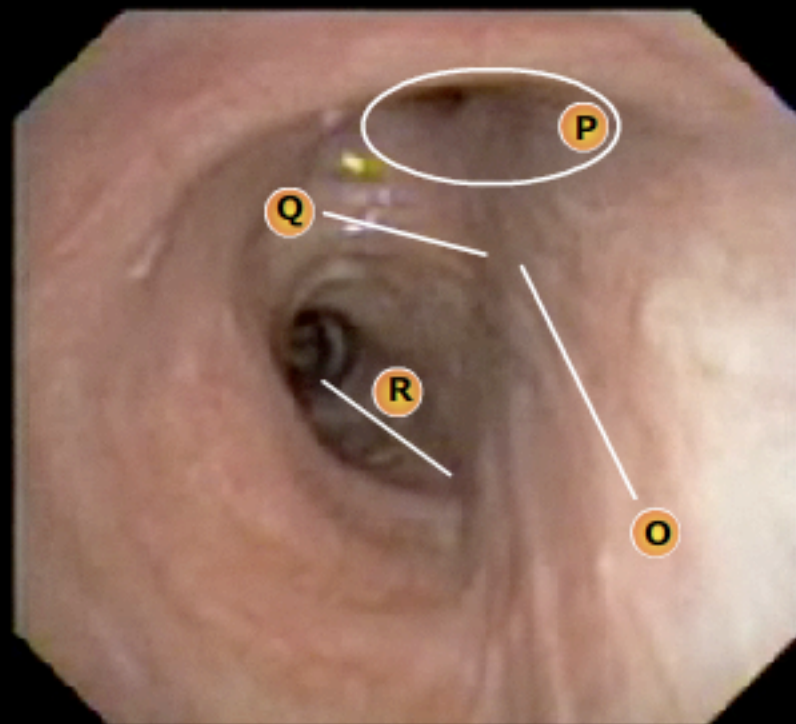
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(O) Right Mainstem Bronchus (RMB)

It's average length is short, being only 2.5cm.

BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

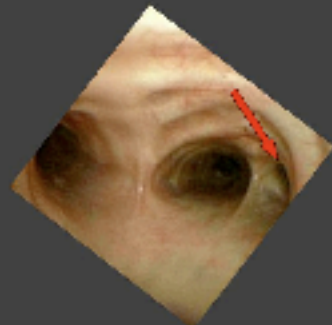
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

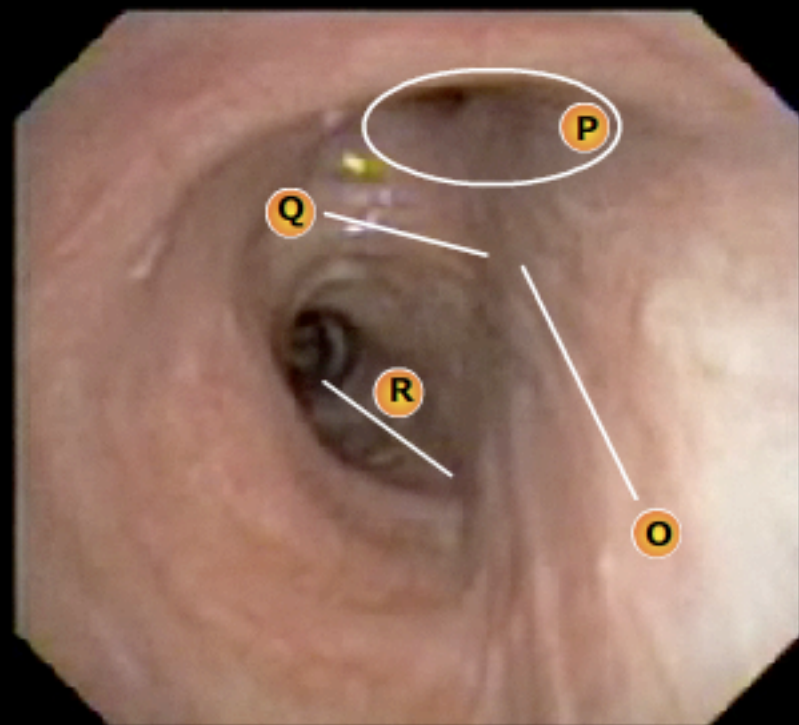
(P)

Immediately visible is the right upper lobe bronchus. The location of the RUL is probably the most important anatomical feature to the anesthesiologist in order to achieve right sided lung isolation.

In a small percentage of patients (~10%), the RUL bronchus can be found extremely proximal, at the level of the carina.



BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

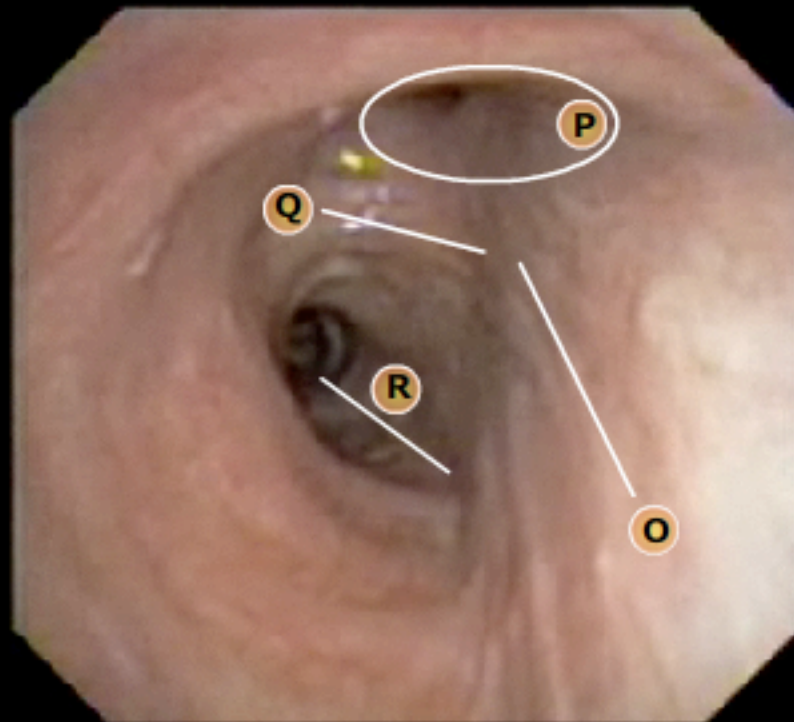
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(Q)

Secondary carina separating the right upper lobe bronchus and the bronchus intermedius. It marks the starting point of the bronchus intermedius.

BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

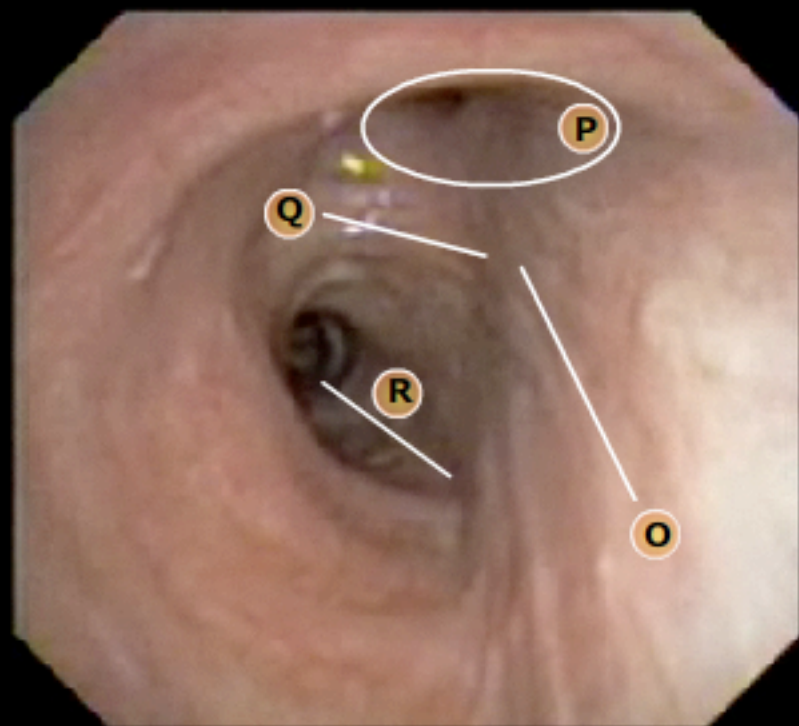
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label ☒

(R)

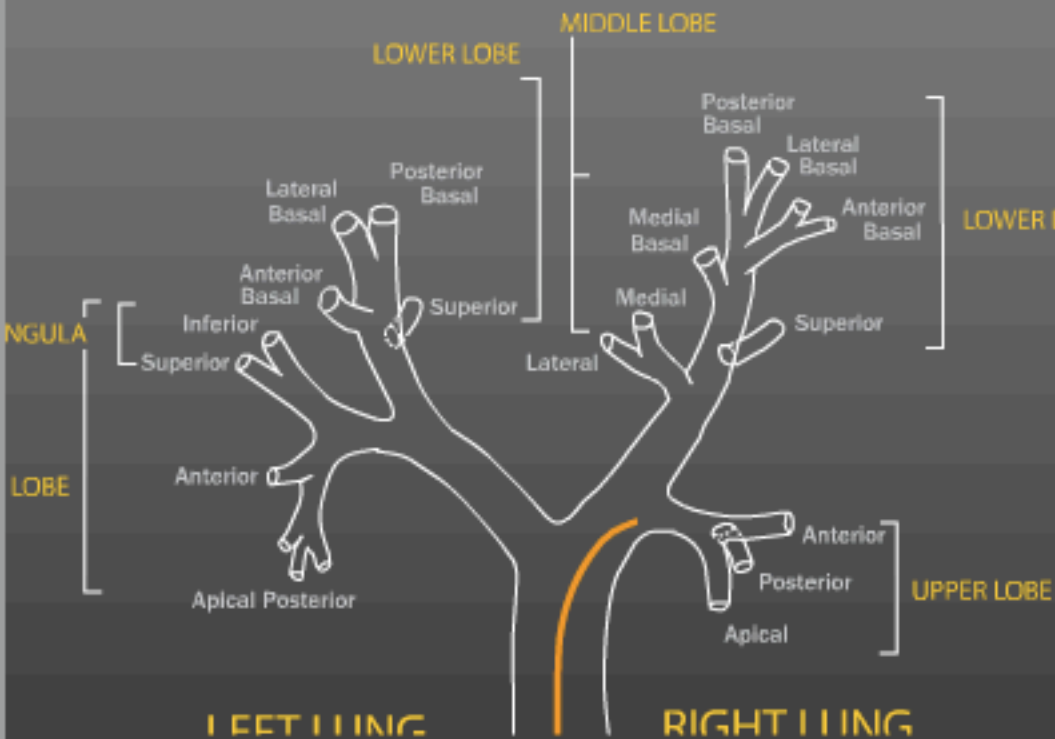
Distal to the RUL, the significantly longer right bronchus intermedius begins. It leads to the bifurcations of the right middle and lower lobes, which are usually visible from a distance. If the angle of the carina separating the RML and RLL is followed proximally along the right bronchus intermedius, it almost always lines up with the opening of the RUL. This is a useful anatomic landmark when attempting to properly place a right-sided double lumen tube. The RUL opening of the DLT can be more easily directed when this landmark is used as a guide.

BRONCHOSCOPE VIEW

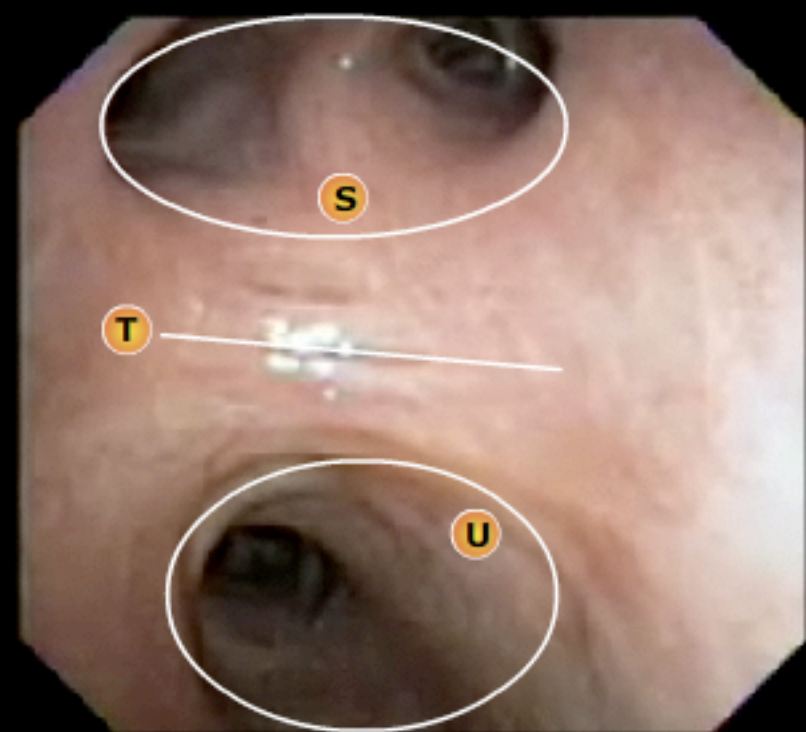


Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

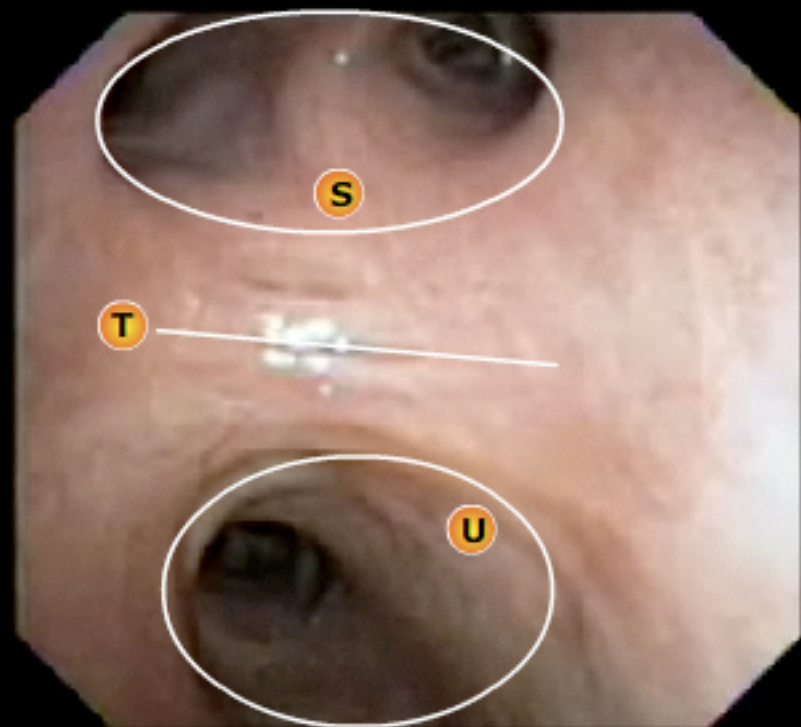
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(S)

Bronchial opening to right upper lobe. The angle here off the RMB is usually close to 90°. In this picture, all the segments are not visible.

BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

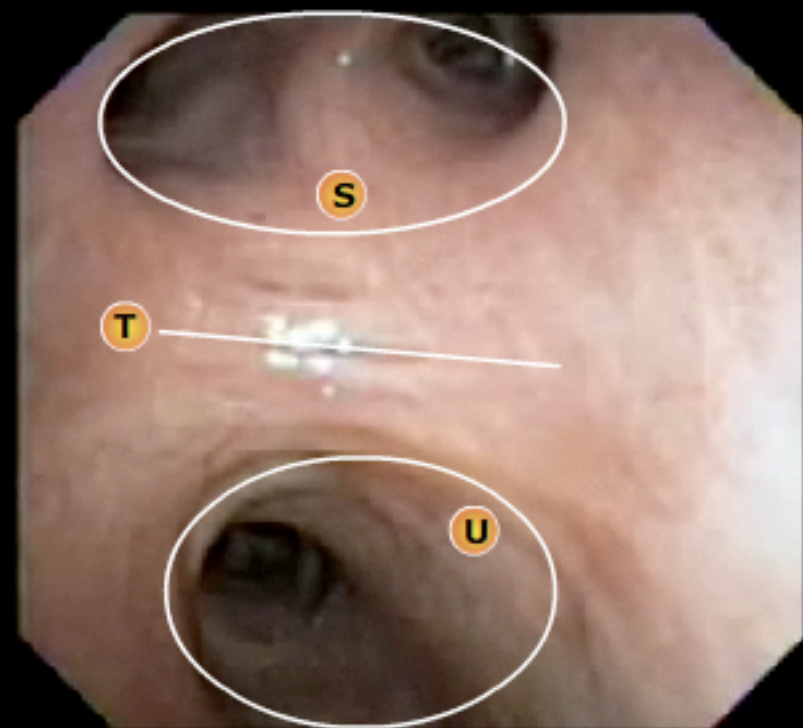
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(T)

Carina separating the right upper lobe and the bronchus intermedius. It marks the starting point of the bronchus intermedius.

BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

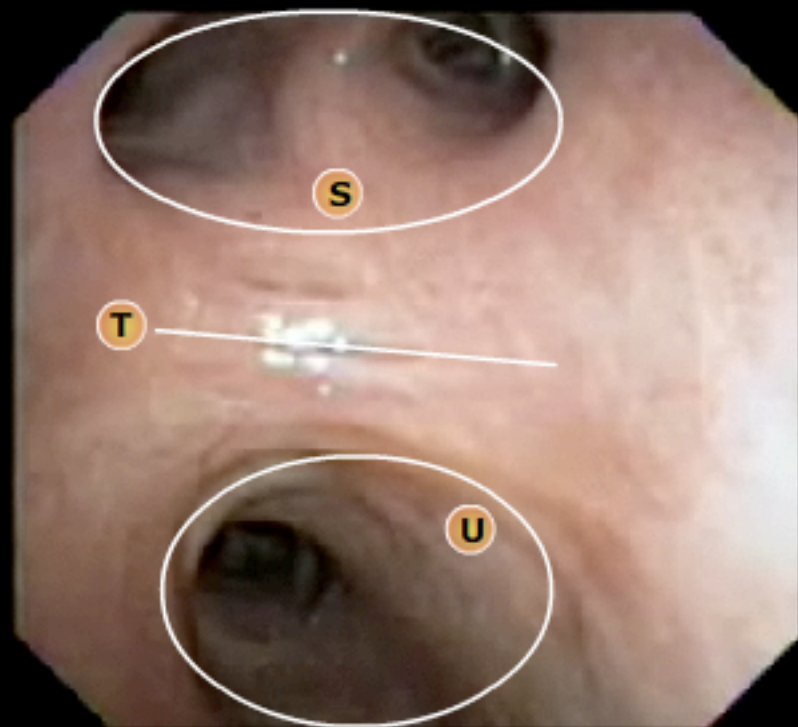
BRONCHIAL TREE NAVIGATION MAP VIEW

(U)

Right bronchus intermedius.

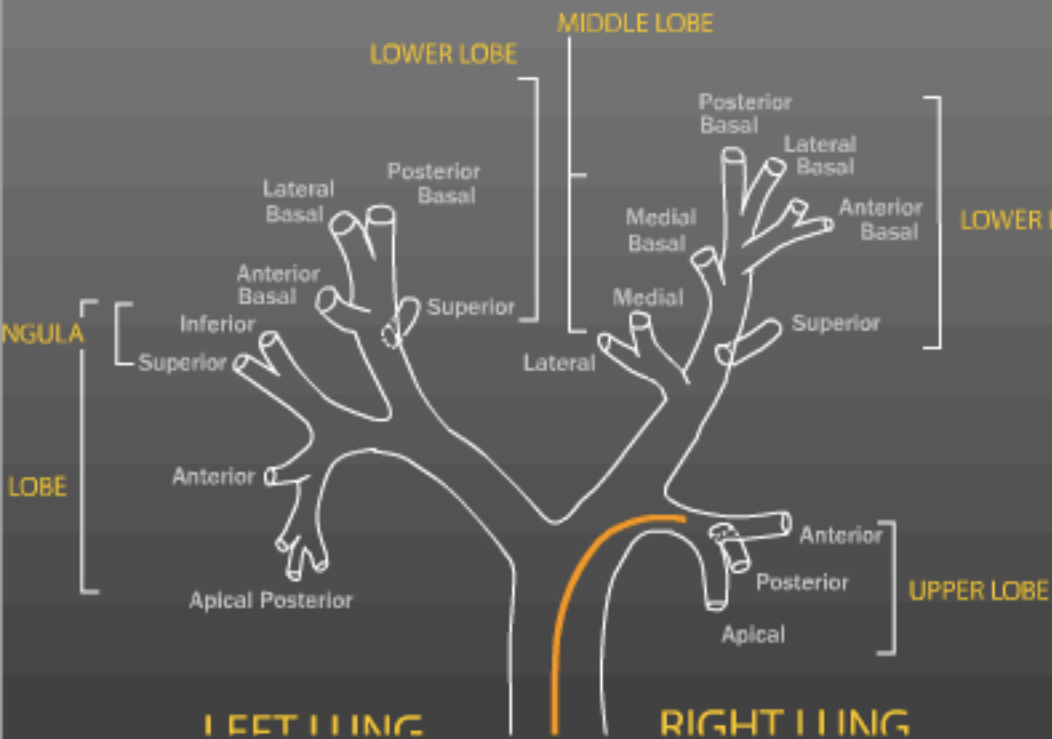
Close Label

BRONCHOSCOPE VIEW

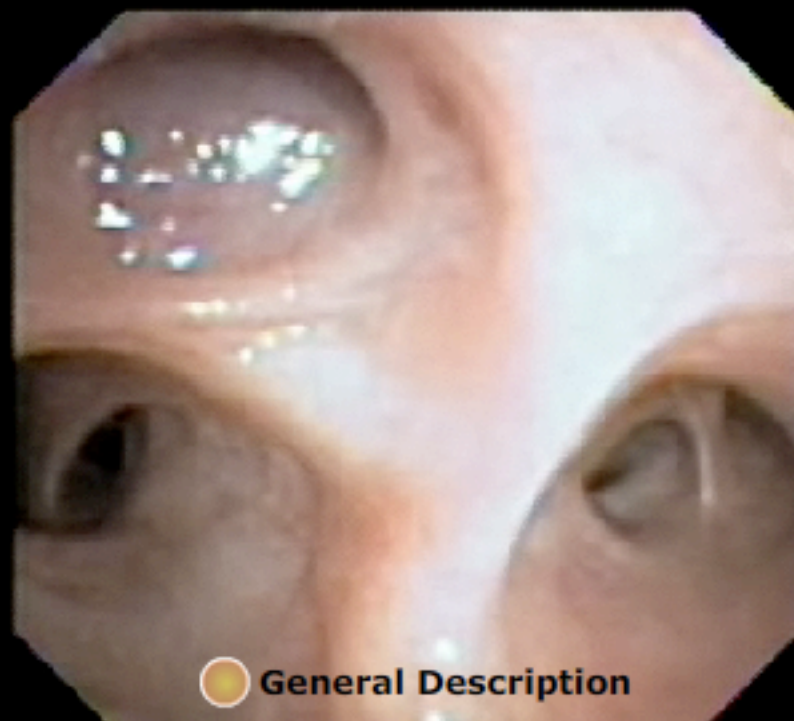


Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW



Thoracicanesthesia.com Bronchoscopy Simulation

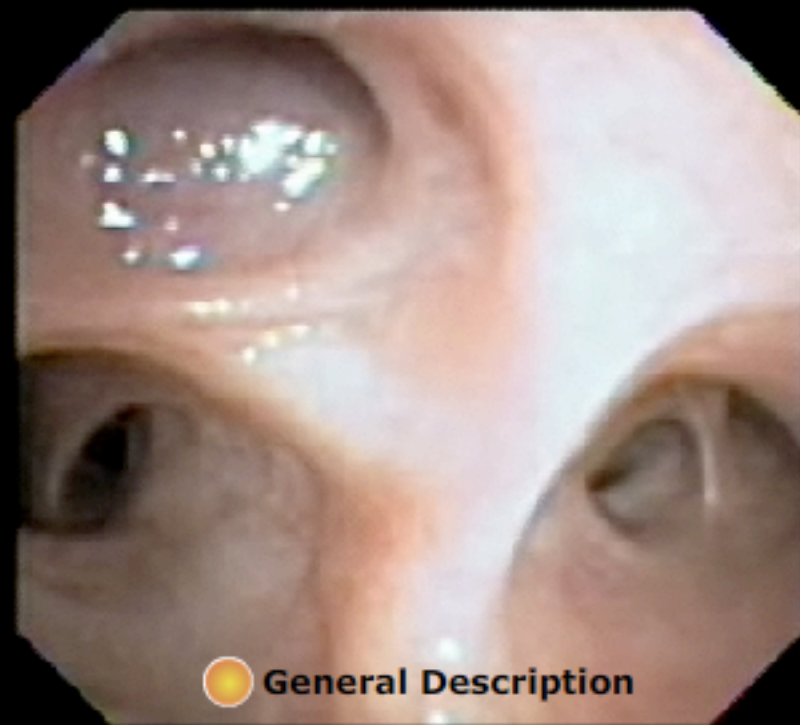
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

Right Upper Lobe (RUL)

It is extremely common to see a trifurcation of the segmental bronchi, the only main bronchus that has this arrangement. This pattern can be an important clue when attempting to identify or isolate the RUL. The three bronchial segments are: apical, anterior and posterior.

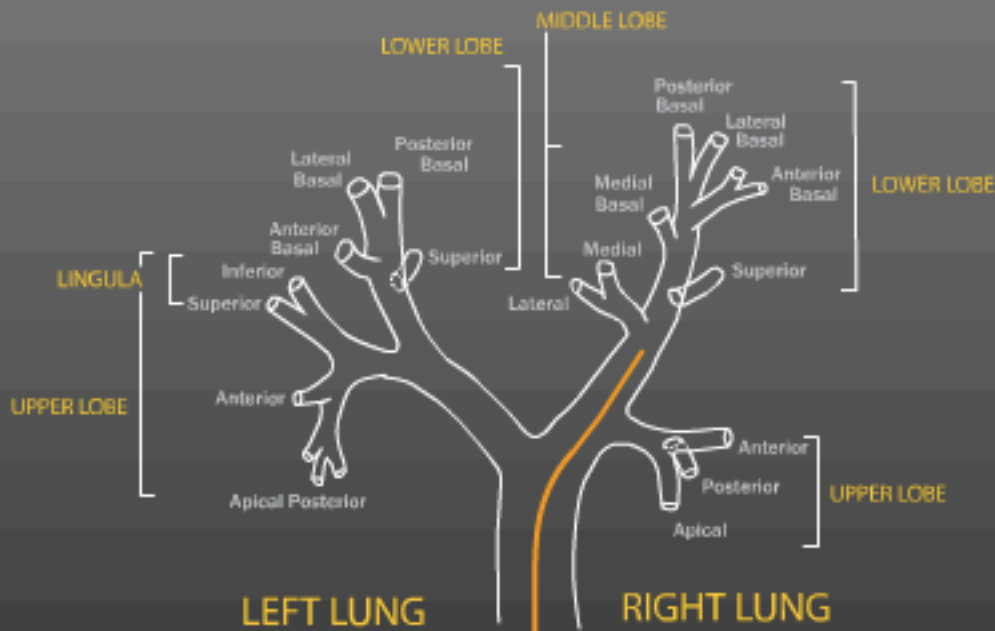
BRONCHOSCOPE VIEW



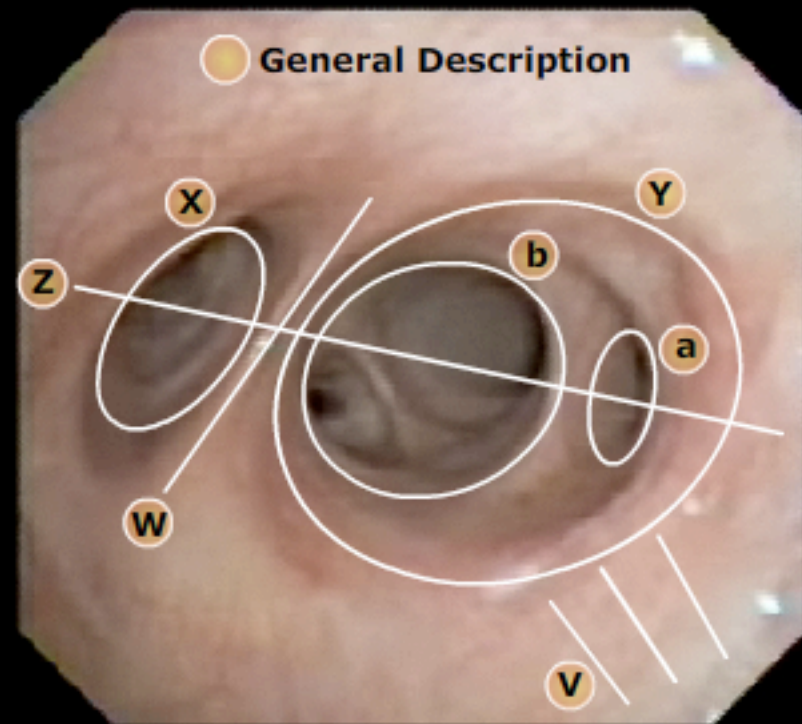
General Description

Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW

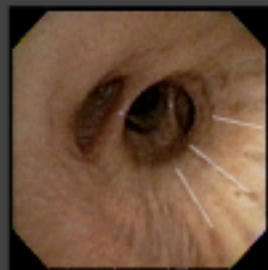


Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

(V) Distal end of Right Bronchus Intermedius (RBI)

The RBI leads to the remaining two lobes of the right lung: the right middle lobe, RML (X) and right lower lobe, RLL (Y). In contrast to the left lung, this bifurcation does not exhibit a 50:50 proportional split in bronchial diameter size.

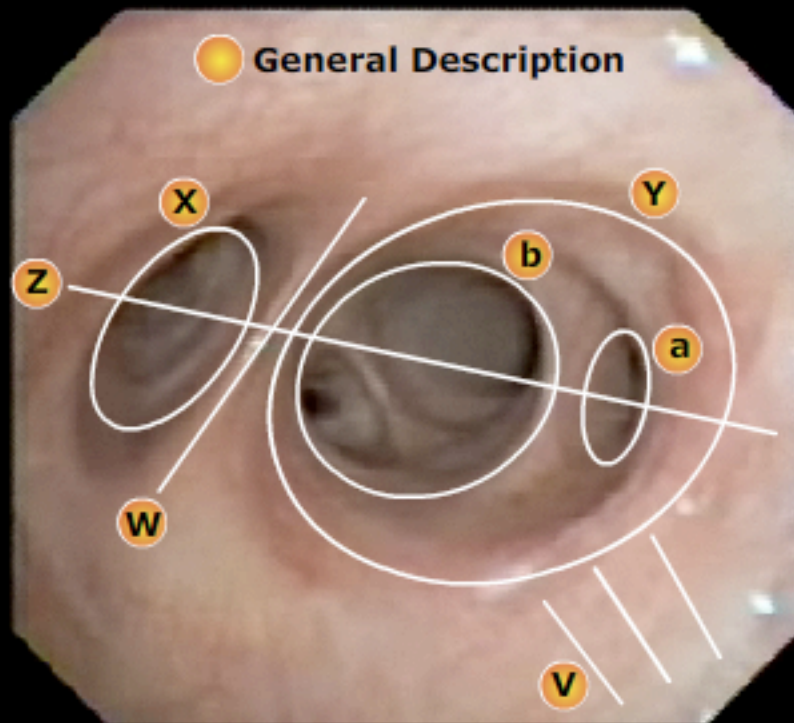


The RML is significantly smaller, leading to a 40:60 split with the RLL. Similar to the left lower lobe, the longitudinal muscular bundle lines (V) that appear along the posterior wall of the bronchus intermedius are usually more prominent entering the right lower lobe (Y). In this video the lines

Close Label

BRONCHOSCOPE VIEW

General Description



Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

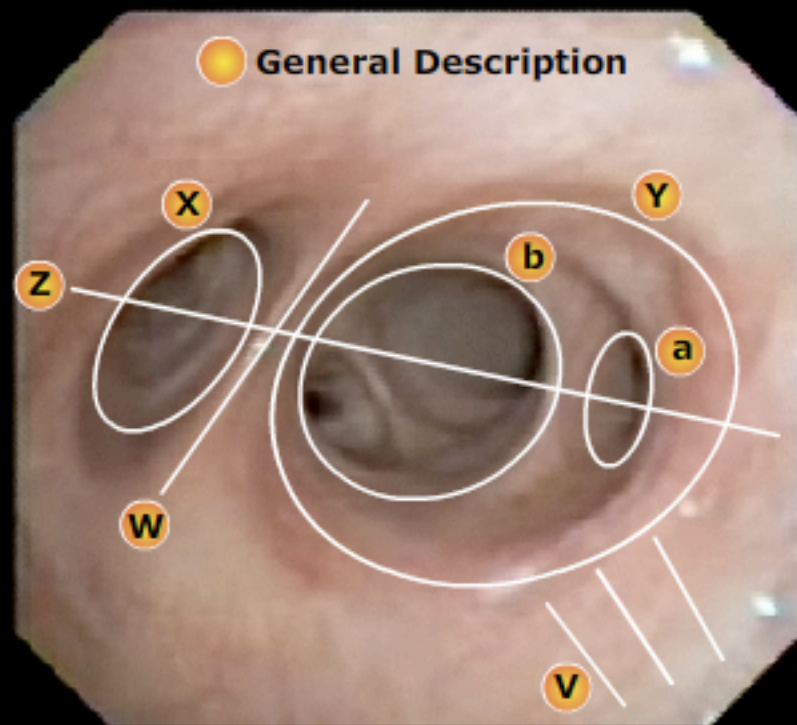
Close Label ☒

(X) Right middle lobe (RML)

Significantly smaller in diameter than the opening of the RLL (40:60 split). Segmental bronchi are not usually visible until the bronchoscope is advanced more distally.

BRONCHOSCOPE VIEW

● General Description



Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

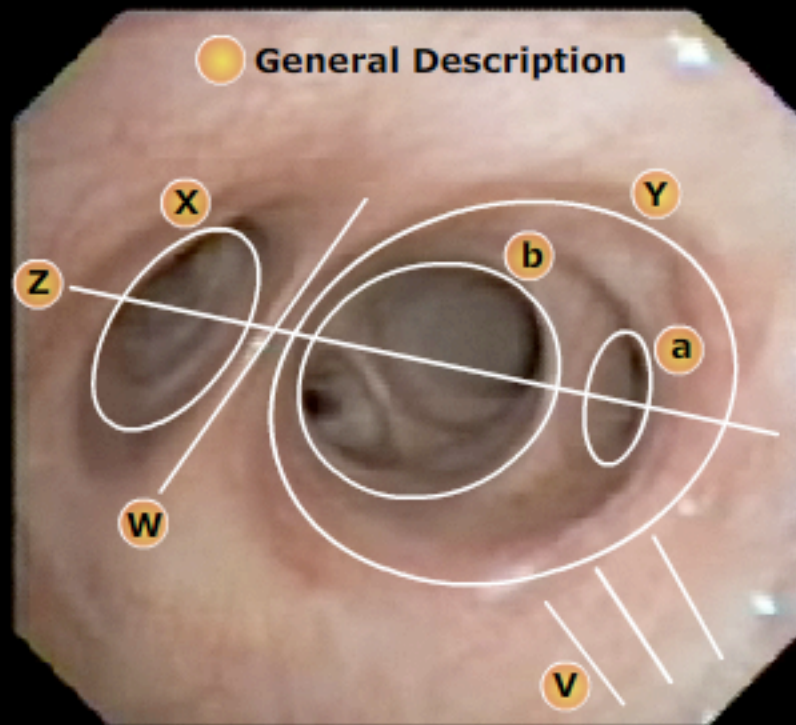
Close Label ☒

(Y) Right Lower Lobe (RLL)

Similar to the LLL, bronchial segments can vary significantly from person to person. Typically, the RLL divides into 5 segments (compared to 4 segments of the LLL): 1 superior segment (**a**), and 4 basal segments (**b**). The superior segment is easily identified on the right, coursing in a superior direction (**a**), similar to the superior segment of the LLL. The basal segments are usually seen straight ahead, occurring as 4 separate bronchi most of the time (not yet visible at this point in the airway).

BRONCHOSCOPE VIEW

General Description



Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

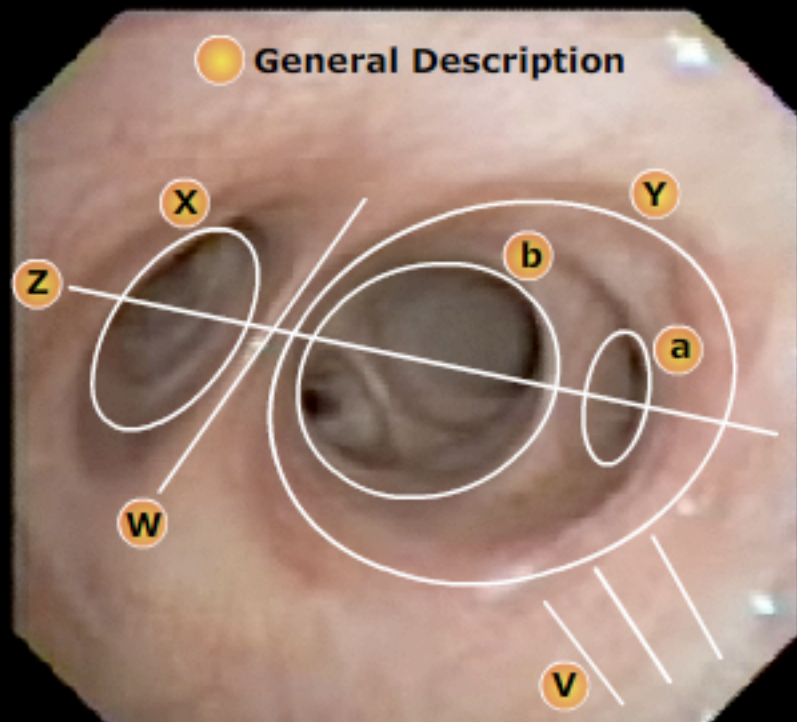
Close Label

(Z)

Notice how the RML and segments of the RLL are nearly linearly aligned with each other. This arrangement is commonly seen in this part of the airway and can serve as another marker for identifying the location of the bronchoscope within the airway.

BRONCHOSCOPE VIEW

General Description



Thoracicanesthesia.com Bronchoscopy Simulation

BRONCHIAL TREE NAVIGATION MAP VIEW

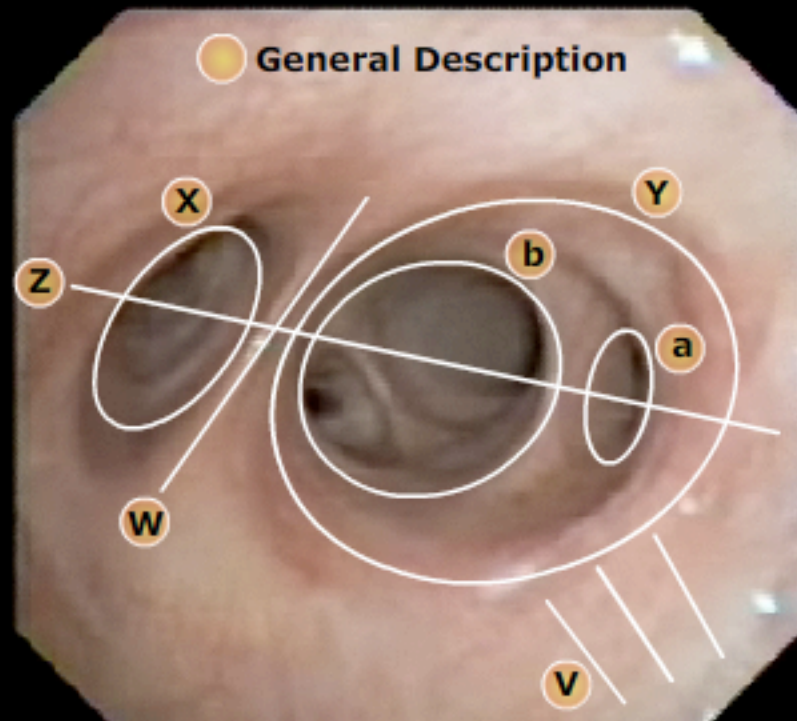
Close Label

(a)

Superior segment of right lower lobe. Anatomically, you can see its course directed superiorly. It is also the first branch off the lower lobe bronchus.

BRONCHOSCOPE VIEW

● General Description



Thoracicanesthesia.com Bronchoscopy Simulation

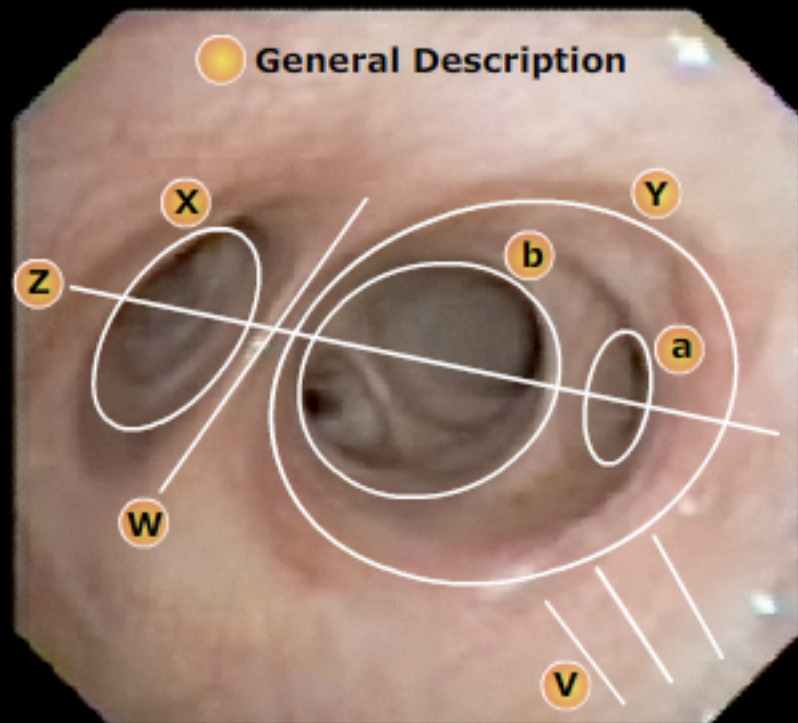
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(b)

Basal trunk of right lower lobe (RLL) containing a total of 4 basal segments. Only 1 basal segment is in view here, with the remaining segments becoming visible by advancing the scope distally. Again, there is considerable anatomic variation making identification rather difficult.

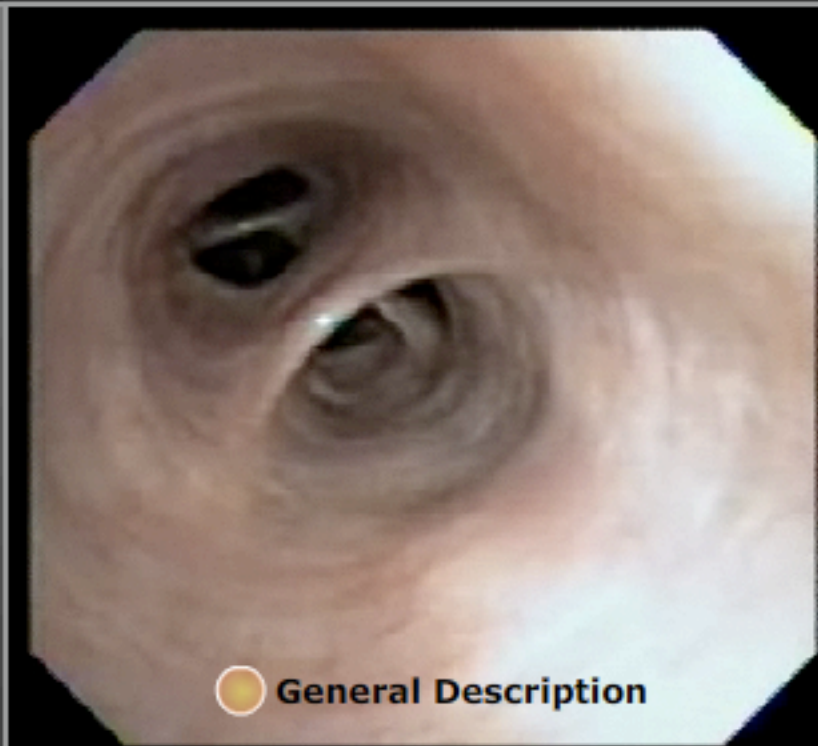
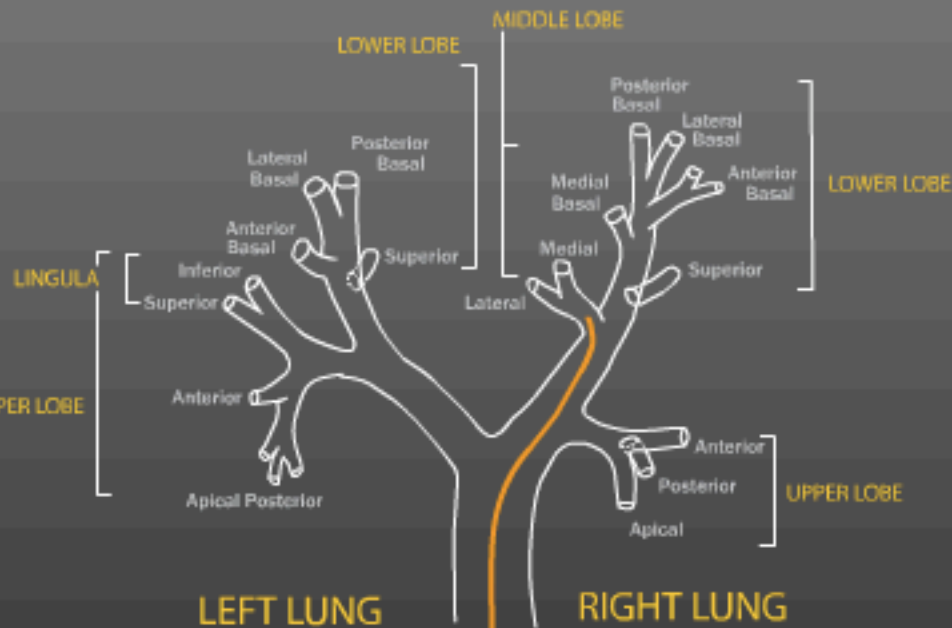
BRONCHOSCOPE VIEW



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BRONCHIAL TREE NAVIGATION MAP VIEW

BRONCHOSCOPE VIEW



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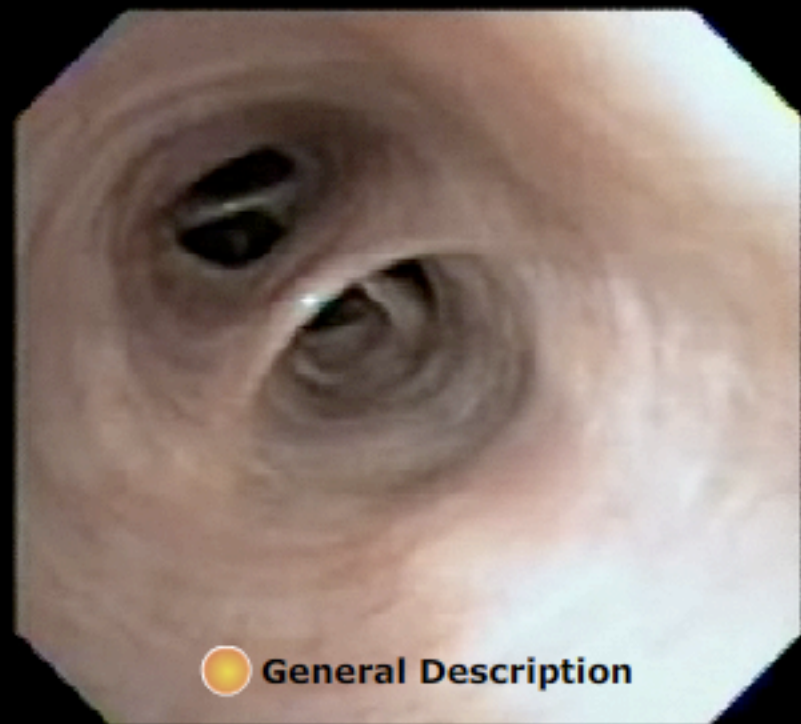
BRONCHIAL TREE NAVIGATION MAP VIEW


Close Label

Right middle lobe bronchus (RML)

The RML consists of 2 bronchial segments: medial and lateral. Endoscopically, each segment can be difficult to identify, which can only be absolutely confirmed by externally following the bronchus to its corresponding lobe. One-third of people, however, have a much larger medial than lateral segment, which can be used to facilitate identification.

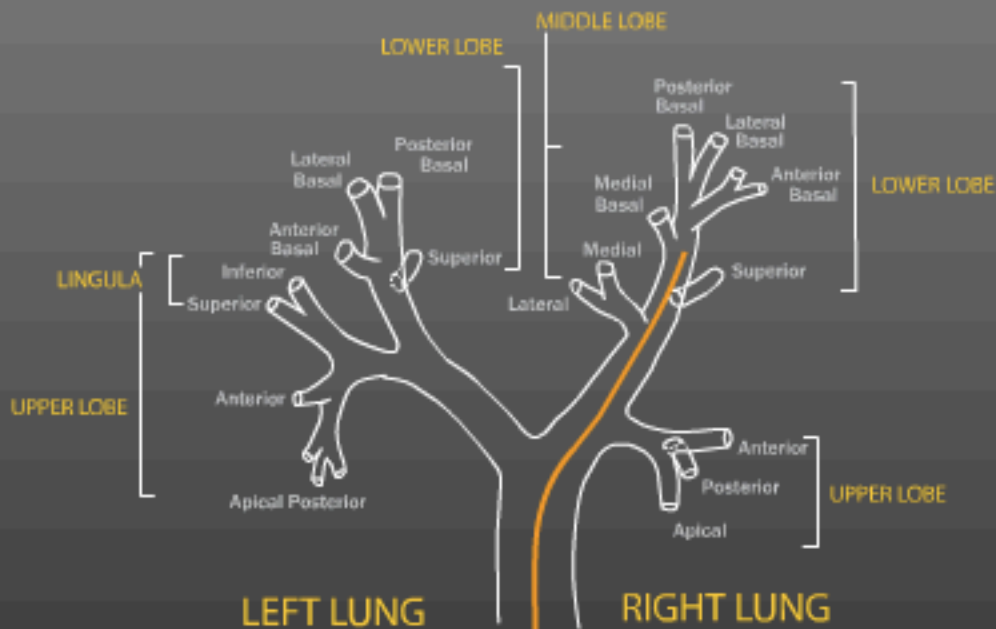
BRONCHOSCOPE VIEW



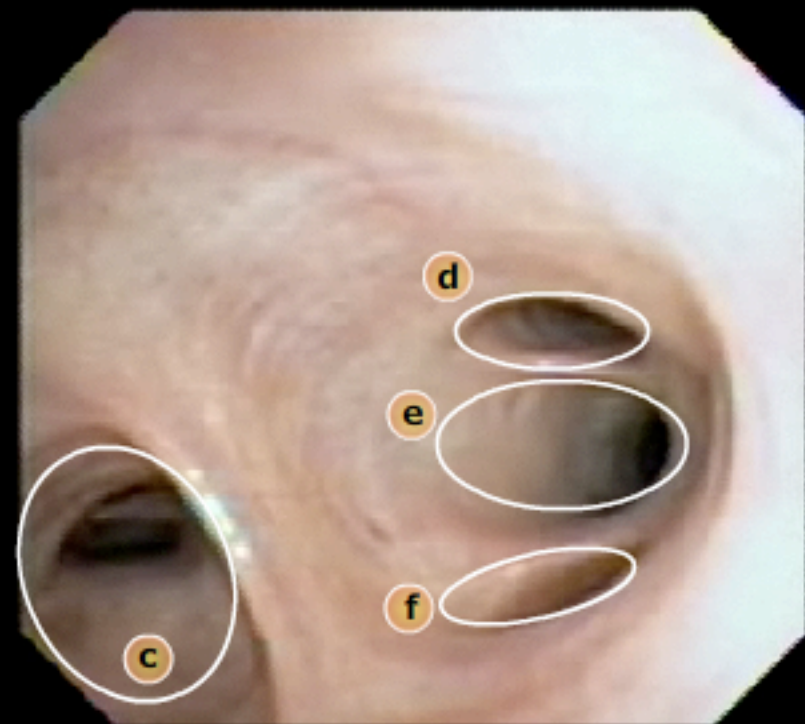
 General Description

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BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW



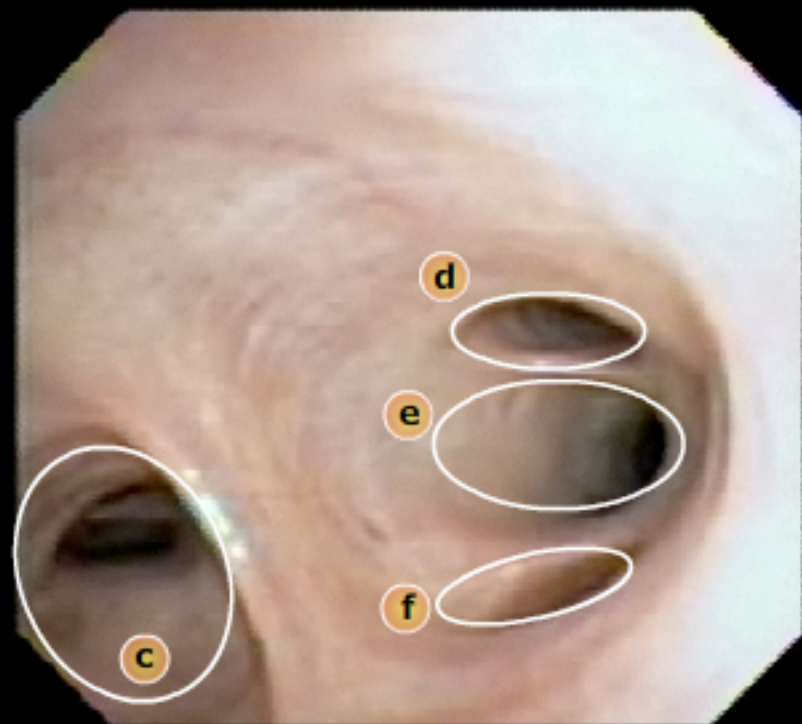
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BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(c) Medial Basal Segment

BRONCHOSCOPE VIEW



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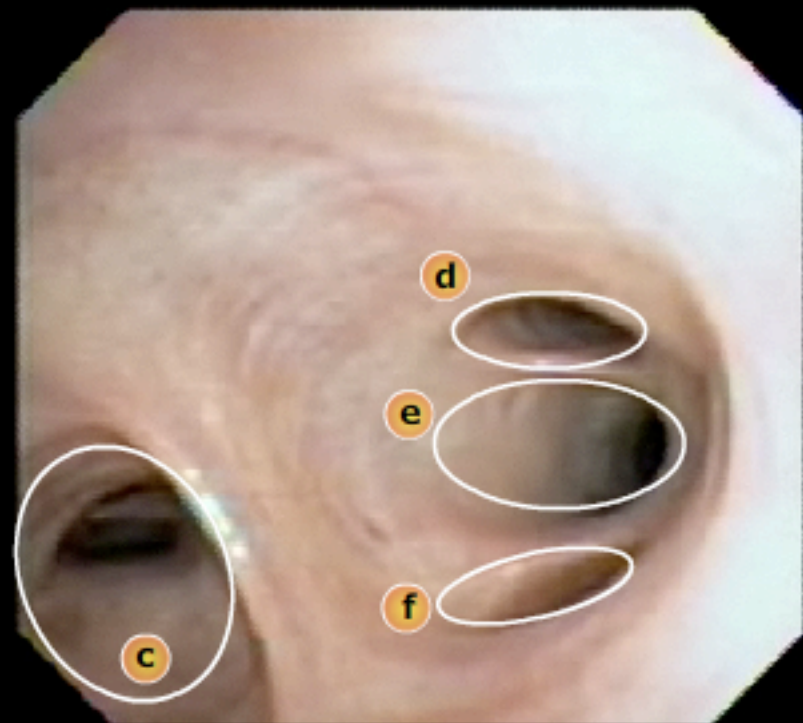
BRONCHIAL TREE NAVIGATION MAP VIEW

Close Label

(d)

Anterior basal segment.

BRONCHOSCOPE VIEW



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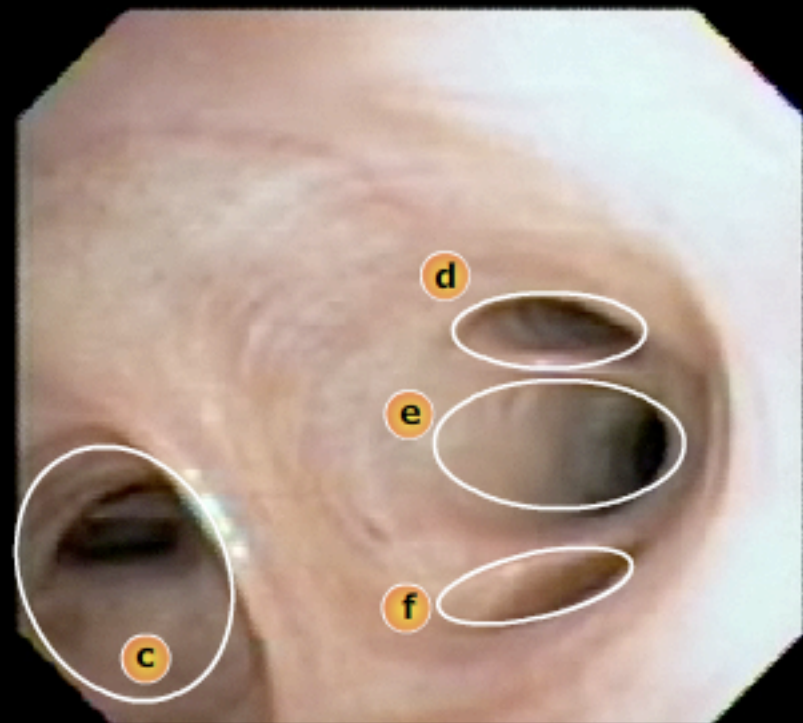
BRONCHIAL TREE NAVIGATION MAP VIEW

(e)

Lateral basal segment.

Close Label

BRONCHOSCOPE VIEW



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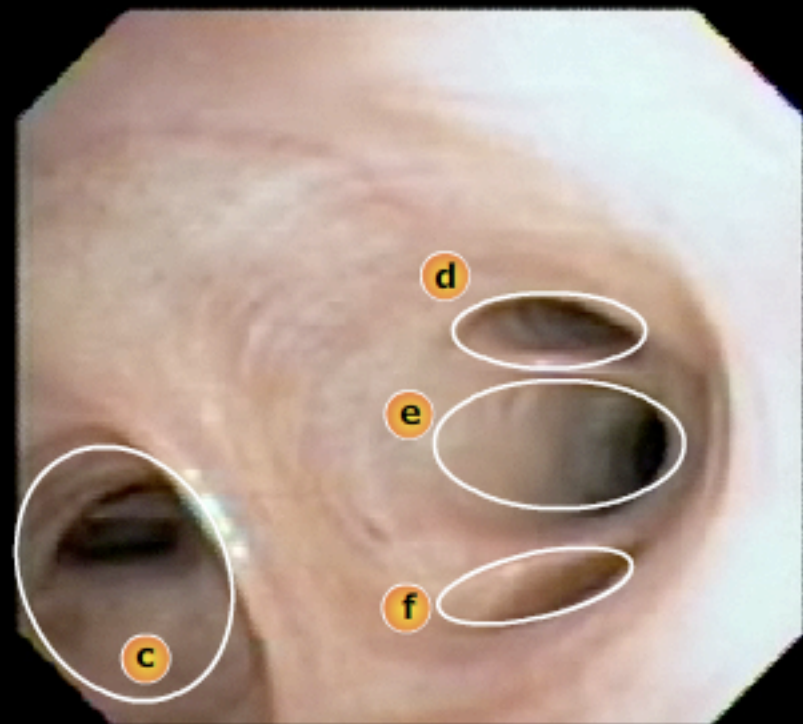
BRONCHIAL TREE NAVIGATION MAP VIEW

(f)

Posterior basal segment.

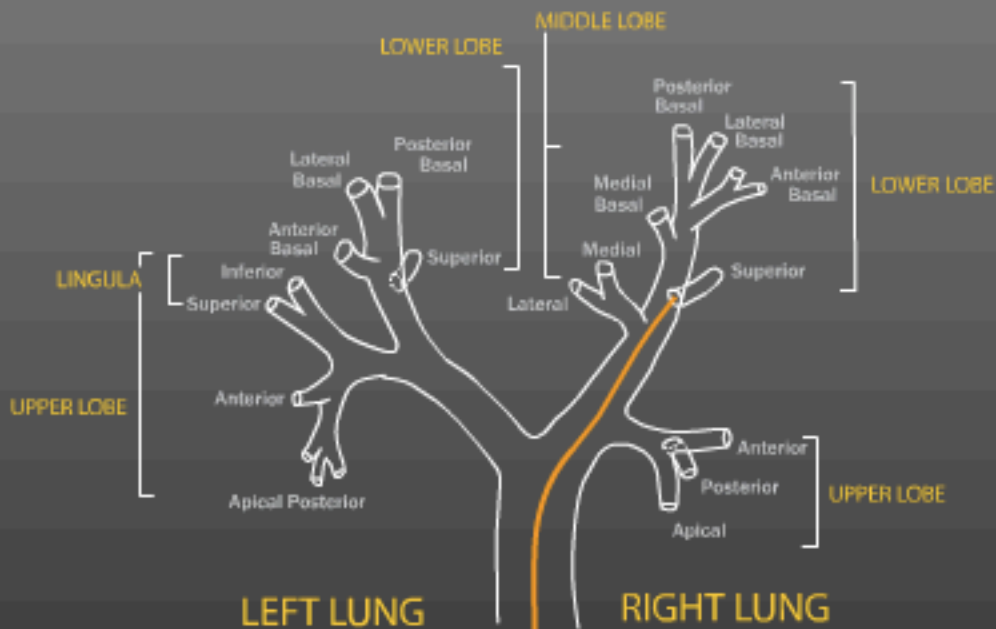
Close Label

BRONCHOSCOPE VIEW



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BRONCHIAL TREE NAVIGATION MAP VIEW



BRONCHOSCOPE VIEW

