



2ª edición  
Curso 2017/2018



Especialización en  
**Ultrasonografía  
Endoscópica Avanzada**

Título propio  
Universidad  
de Alcalá

## TECNICA DE EXAMEN Y ECOANATOMIA: ECOENDOSCOPIO LINEAL

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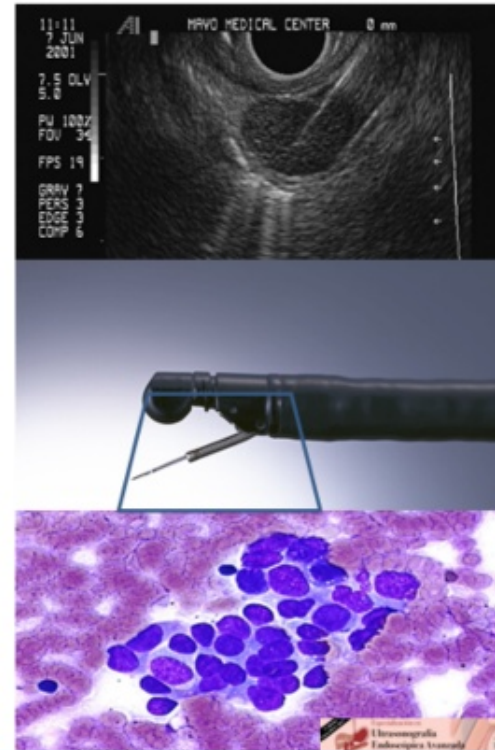
 Hospital Universitario  
Ramón y Cajal  
Instituto de Investigación Biomédica en  
Madrid

# Diferencia ecoendoscopio

## Radial



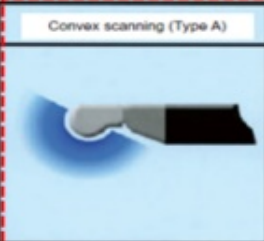
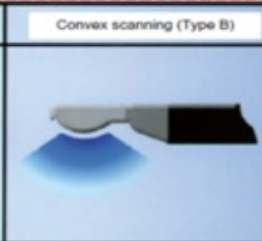
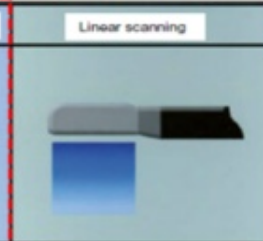
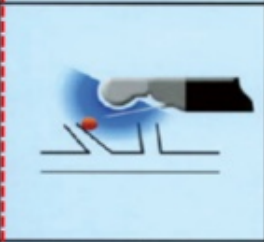
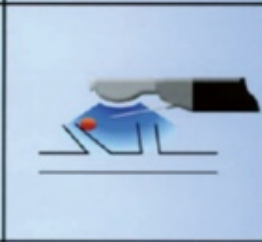

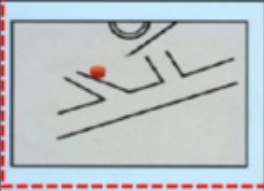
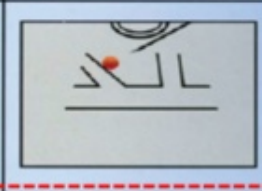
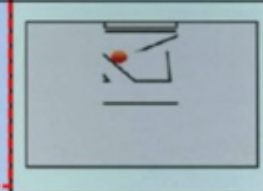
## Lineal



# Ecoendoscopio lineal

## ■ Convex scanning and linear scanning

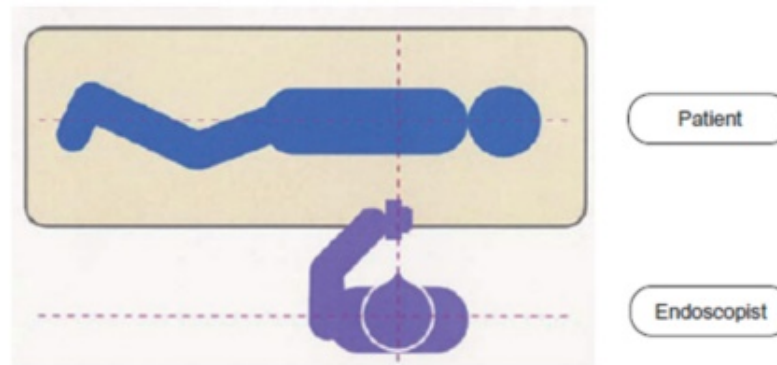
This section describes the difference in views depending on the scanning method. Presently, ultrasonic endoscopes from various manufacturers are capable of fine-needle aspiration. The scanning methods used can be divided into the following three types.

	Convex scanning (Type A)	Convex scanning (Type B)	Linear scanning
Structure			
View of ultrasound images			
			

# Principios exploración USE lineal (1)

## ■ Positioning of the endoscopist and orientation of the echoendoscope

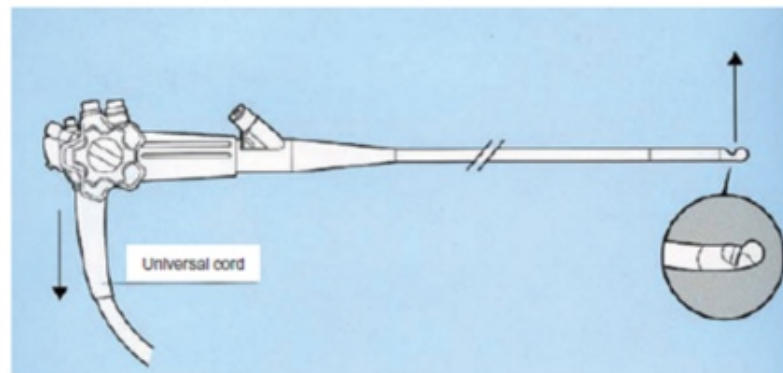
The orientation of the images in this handbook are with the endoscopist facing the patient, and with the scope handle oriented orthogonally to the patient's body.



## Principios exploración USE lineal (2)

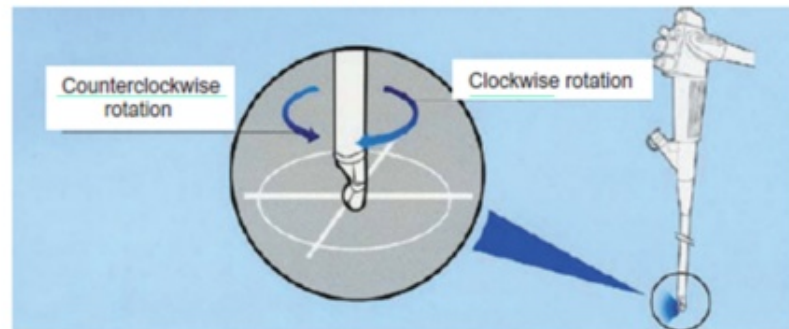
### ■ Rotating the curved linear array echoendoscope

To correctly identify the position relationships of the surrounding organs, observation should generally be performed while the scope is straightened. In the stretched condition, the transducer is oriented towards the direction opposite to the universal cord.



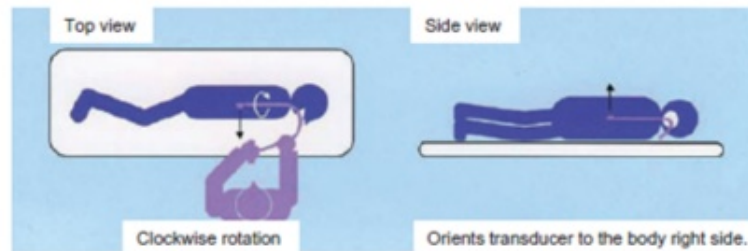
## Principios exploración USE lineal (3)

Rotation of the curved linear array echoendoscope is the key maneuver for complete imaging of targets. The illustrations below show the effect of clockwise and counterclockwise rotation of the scope.

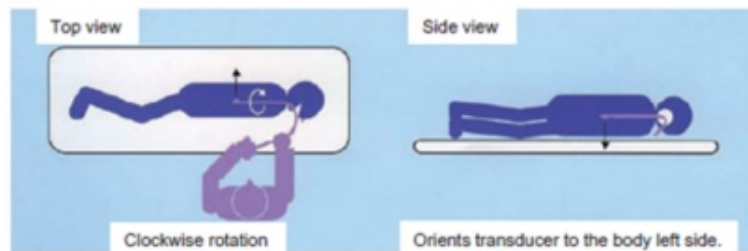


# Principios exploración USE lineal (4)

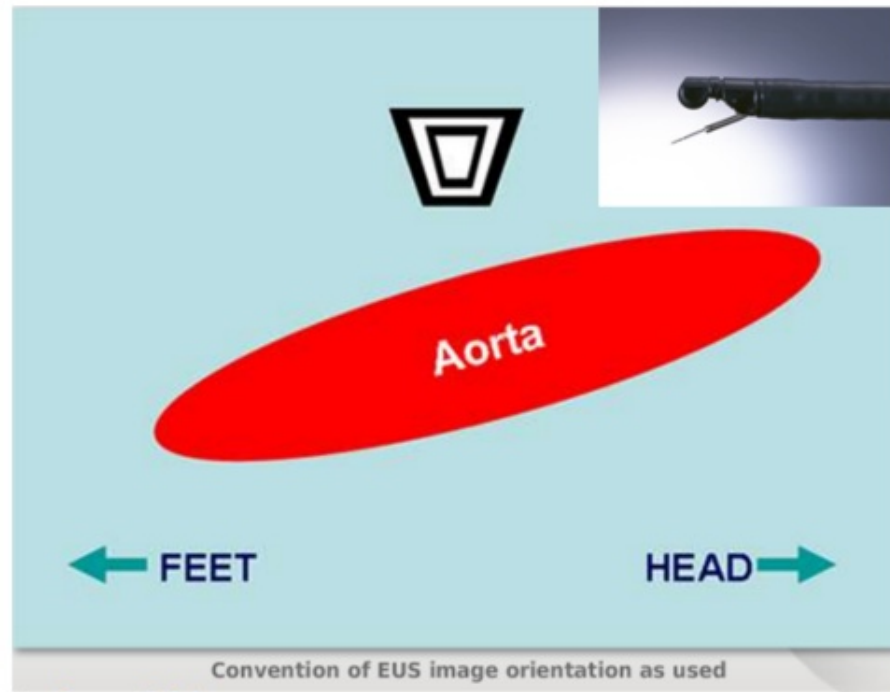
When the transducer is oriented anteriorly toward the abdominal wall, rotate the scope clockwise to observe the right side of the body or counterclockwise to observe the left side.



When the transducer is oriented toward the back, rotate the scope clockwise to observe the left side of the body or counterclockwise to observe the right side.



## Principios exploración USE lineal (5)

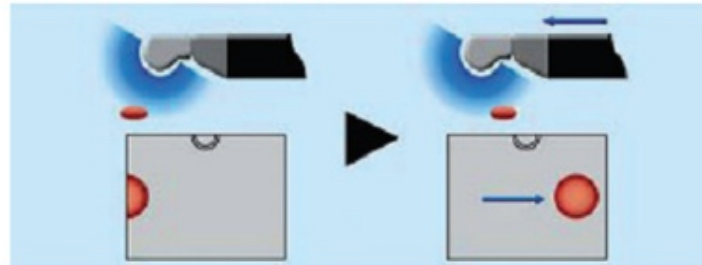




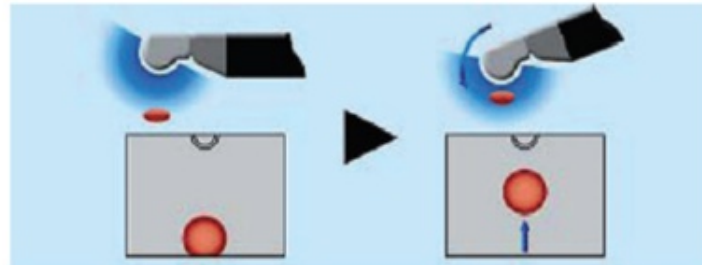
## Principios exploración USE lineal (6)

### ■ Optimizing position for target puncture

When the scope is advanced toward the left, the puncture target in the ultrasound image moves toward the right.



The transducer is attached at the scope's distal end so that the transducer orients toward the upward angulation direction of the scope (i.e. on the opposite side to the universal cord). When the scope is angulated upward, the transducer approaches the puncture target and the target in the ultrasound image moves upward.



## Principios exploración USE lineal (7)

- 1.) No es necesario saber USE radial para aprender lineal
- 2.) No es necesario balón
- 3.) Visión endoscópica oblicua
- 4.) Ligera presión mando *"up/down"* contra la pared
- 5.) Movimientos de rotación de la caña del endoscopio
- 6.) Frecuencia de 5 MHz de inicio; ajustar foco de imagen
- 7.) Emplear estructuras vasculares para orientación
- 8.) Uña elevadora



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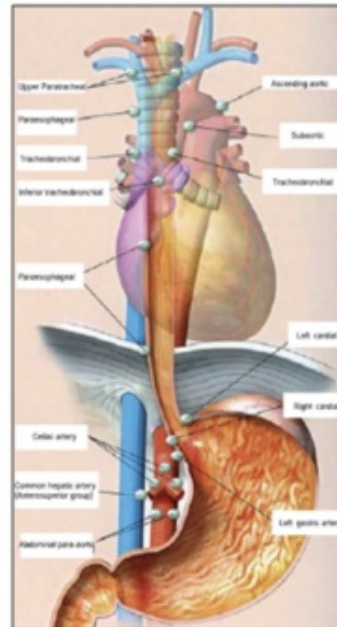
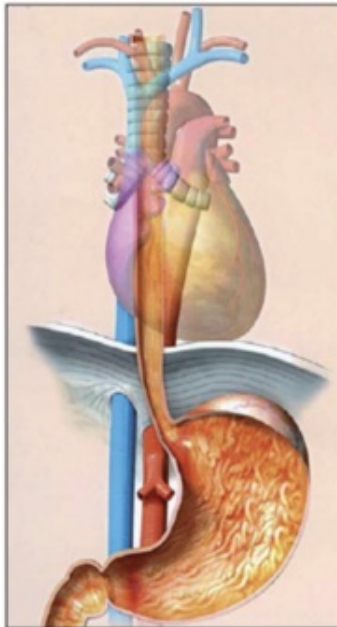
## TECNICA DE EXAMEN Y ECOANATOMIA: ECOENDOSCOPIO LINEAL

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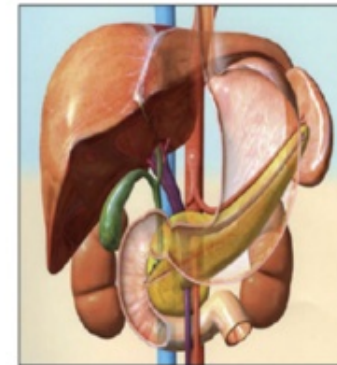
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# Anatomía USE lineal

■ Esophagus



■ Stomach, duodenal bulb and descending part of duodenum





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# Anatomía USE lineal: Esófago (1)

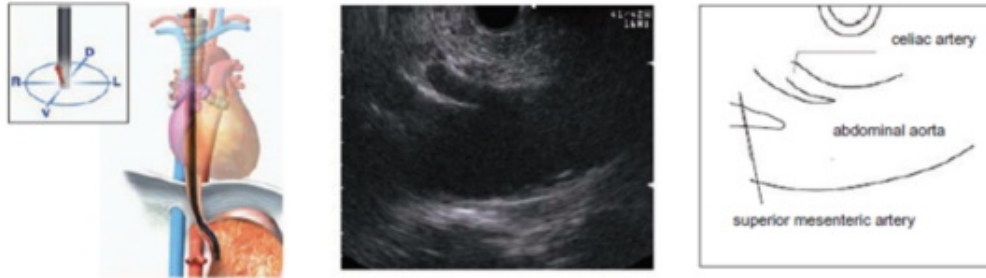
## ■ Step 1



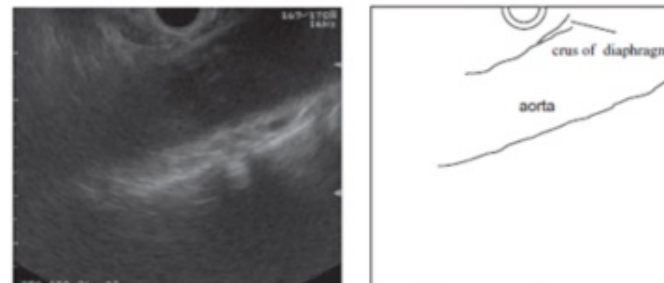
When the scope is inserted into the stomach past the EG junction with the controls free, the left lobe of the liver is visible on the screen below the scope. Now rotate the scope clockwise to visualize the hepatic vein and the IVC.

# Anatomía USE lineal: Esófago (2)

## ■ Step 2



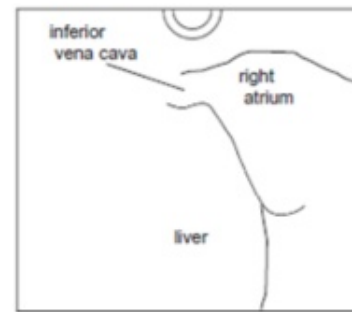
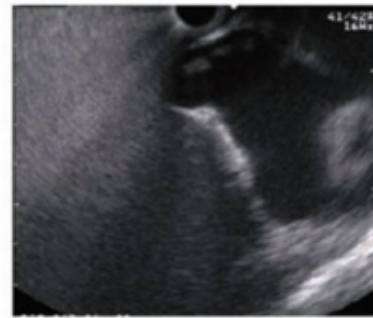
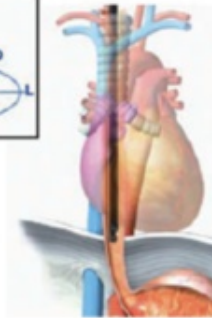
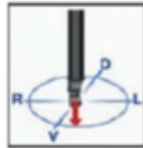
After observing the liver, rotate the scope clockwise to observe the abdominal aorta. Then advance the scope slightly until the celiac artery bifurcation and superior mesenteric artery are recognized. Observe the lymph nodes around the celiac artery from this position.



While observing the aorta, withdraw the scope slightly while rotating it counterclockwise, until a long triangular hypoechoic structure is seen in front of the aorta. This is the crus of the diaphragm, which is an important landmark for defining the boundary between the abdominal cavity and mediastinum. After evaluating this region, withdraw the scope while viewing the aorta to observe the surroundings of the thoracic aorta. When the scope is rotated counterclockwise after observing the crus of the diaphragm, it returns to the positioning in Step 1.

# Anatomía USE lineal: Esófago (3)

## ■ Step 3

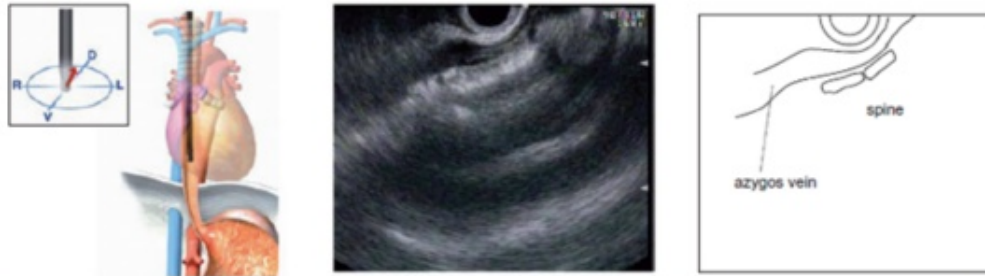


After observing the IVC, withdraw the scope to observe the right atrium.



# Anatomía USE lineal: Esófago (4)

## ■ Step 4



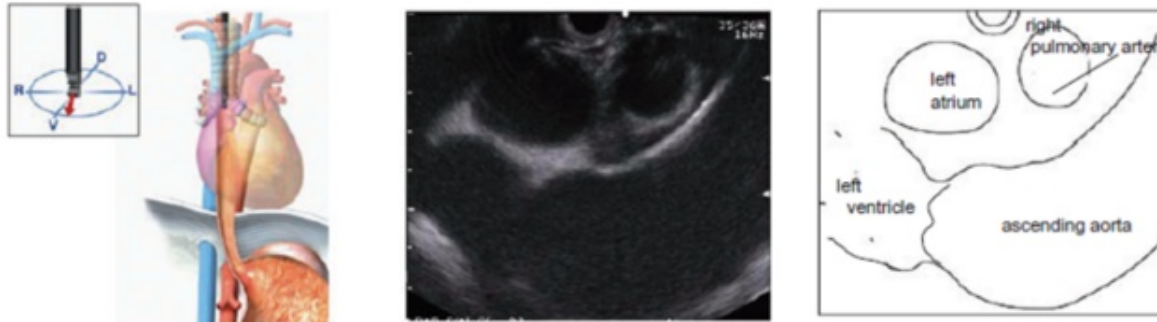
Rotate the scope clockwise to observe the entire surroundings of the esophagus. Then withdraw the scope slightly until the azygos vein is identified. Trace the azygos vein in both longitudinal directions toward the caudal and oral sides, and look for any adjacent lymph nodes.



Rotate the scope further clockwise to observe the descending aorta also. Trace the descending aorta longitudinally towards both the caudal and oral directions, and look for any adjacent lymph nodes.

# Anatomía USE lineal: Esófago (5)

## ■ Step 5

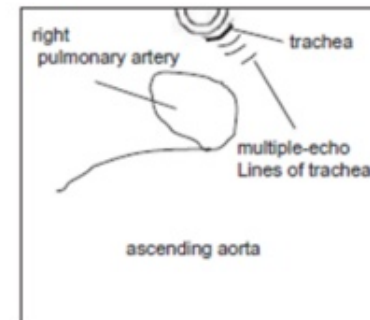
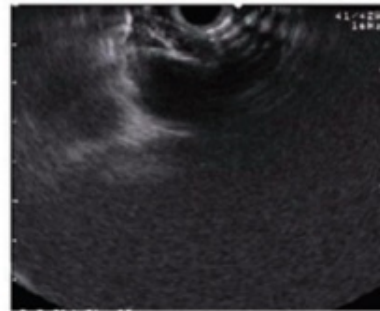
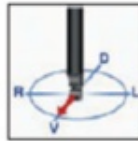


Rotate the scope counterclockwise to return to the positioning in Step 3, and withdraw the scope while rotating it further counterclockwise to visualize the left atrium, left ventricle, ascending aorta and right pulmonary artery.



# Anatomía USE lineal: Esófago (6)

## ■ Step 6



While watching the right pulmonary artery, withdraw the scope while rotating it slightly counterclockwise to visualize the trachea or main bronchi. The point towards the oral side (right in the image) where the multiple-echo lines end, is the tracheal bifurcation into the left and right main bronchi. If imaging of this point is difficult, trace the multiple-echo lines from the oral side to the point where these are interrupted.

# Anatomía USE lineal: Esófago (7)

## ■ Step 7

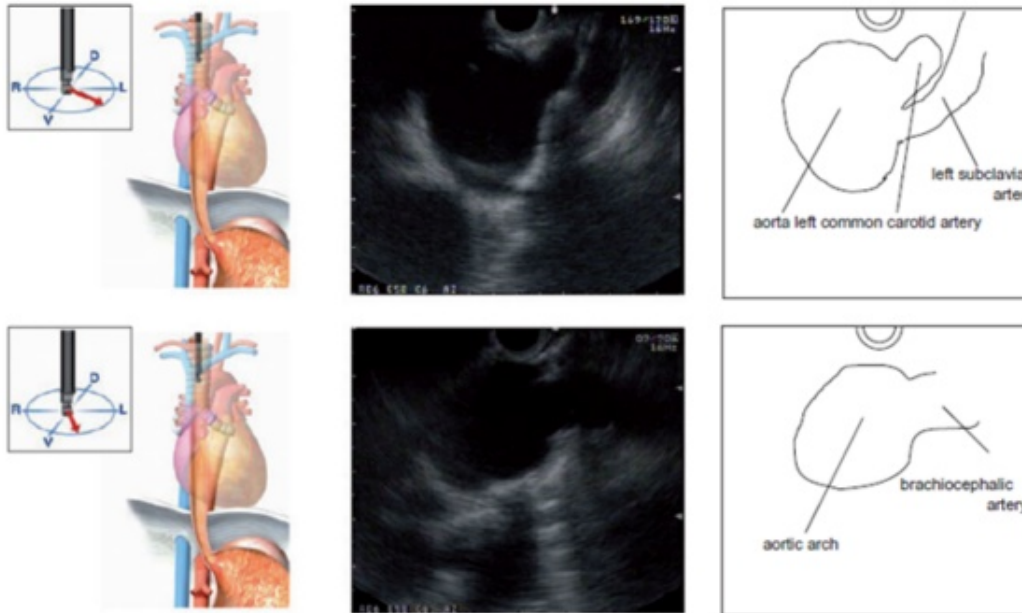


Visualize the right pulmonary artery again, and withdraw the scope while rotating it counterclockwise to visualize the right pulmonary artery on the left side in the image and the cross-section of the aortic arch on the right side. The region between the two blood vessels is the aorto-pulmonary window (AP window).



# Anatomía USE lineal: Esófago (8)


## ■ Step 8



While observing the aortic arch, withdraw the scope while rotating it counterclockwise to visualize the left subclavian artery and left common carotid artery. Rotating the scope further counterclockwise at this level makes it possible to observe the brachiocephalic artery.



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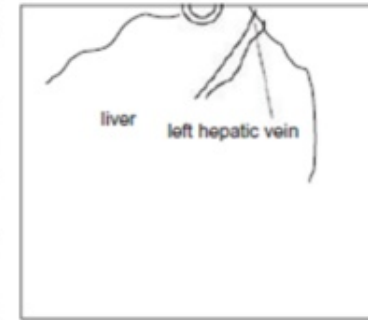
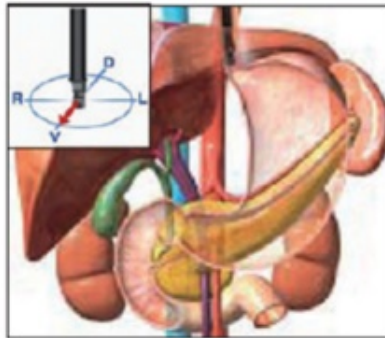
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# Anatomía USE lineal: Estómago (1)

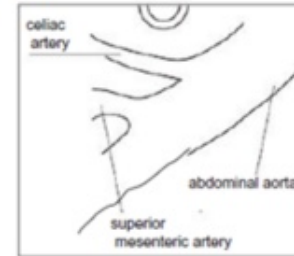
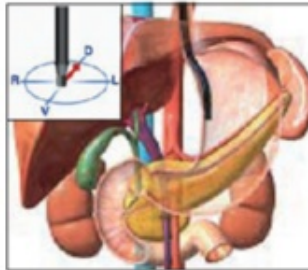
## ■ Step 1



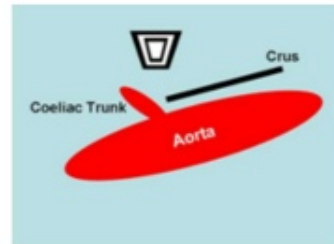
With the patient lying in the left lateral position, the (outer region of the) left lobe of the liver is imaged after the scope has passed the diaphragm. The transducer is now oriented anteriorly toward the abdominal wall of the patient. The left hepatic vein is also observed from this position.

## Anatomía USE lineal: Estómago (2)

### ■ Step 2



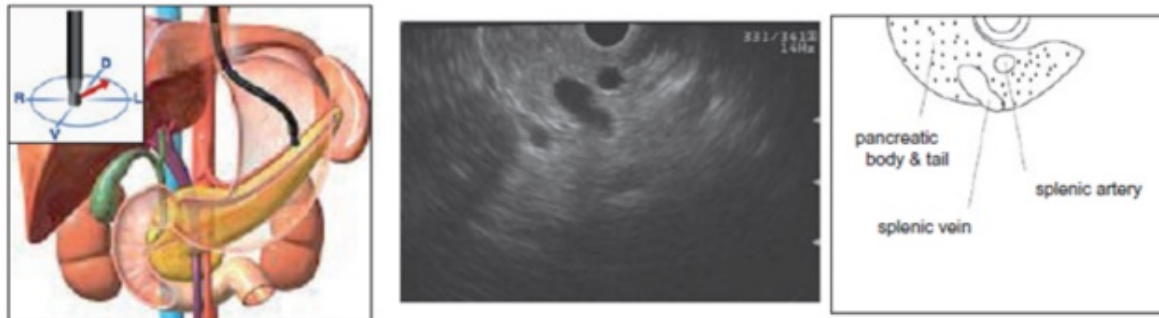
Rotate the scope clockwise to visualize the abdominal aorta. When the scope is advanced caudally from this position along the abdominal aorta, the celiac artery and superior mesenteric artery are imaged. Note that the celiac artery and superior mesenteric artery are not always imaged simultaneously. The celiac artery is usually easier to image. It is therefore recommended to visualize the celiac artery first and then rotate the scope slightly clockwise or counterclockwise to identify the superior mesenteric artery.



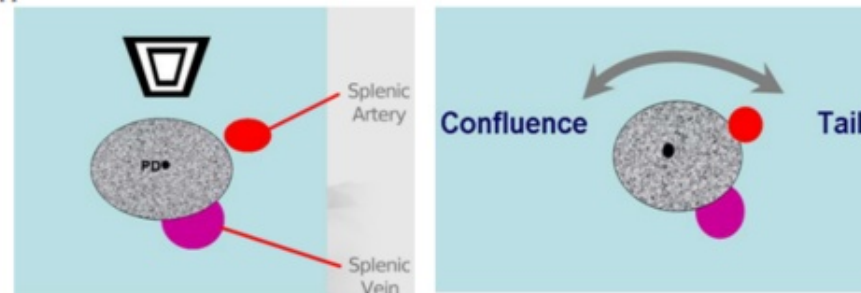


# Anatomía USE lineal: Estómago (3)

## ■ Step 3

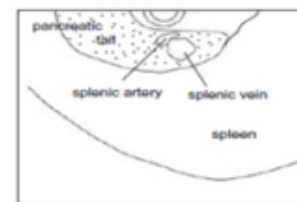
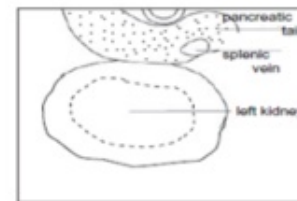
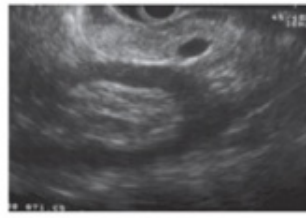
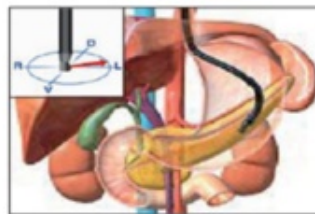


Advance the scope slightly and rotate it clockwise to visualize the pancreatic body and tail. In general, the splenic artery is imaged nearer and splenic vein farther from the transducer. The splenic artery and vein can be discriminated by means of color and pulse Doppler.

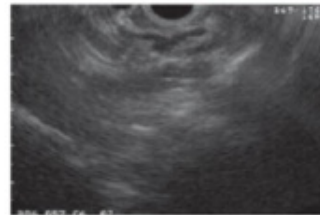


# Anatomía USE lineal: Estómago (4)

■ Step 4



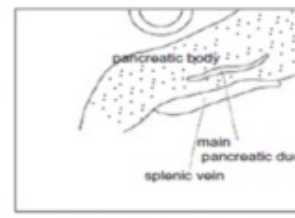
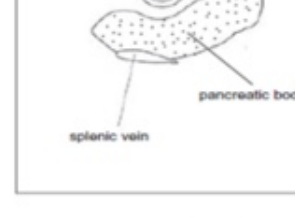
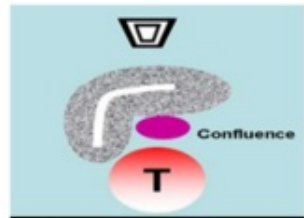
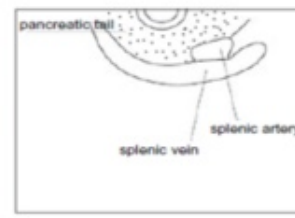
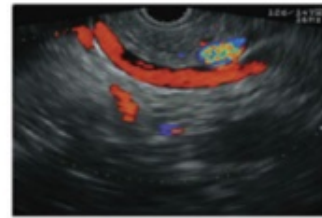
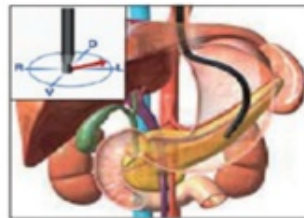
While imaging the spleen by using the splenic vein as the landmark, rotate the scope to visualize the pancreatic tail and left kidney. Rotate the scope further to observe the pancreas until the splenic hilum.



From the above position, advance the scope to observe the left adrenal gland, which is located between the abdominal aorta and upper pole of the left kidney.

# Anatomía USE lineal: Estómago (5)

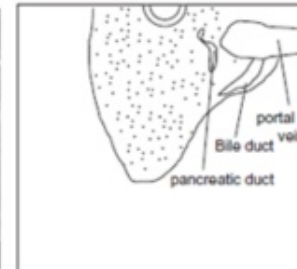
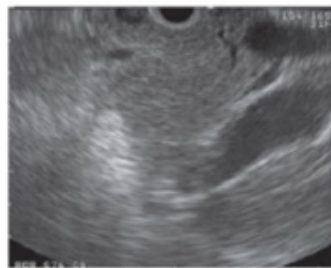
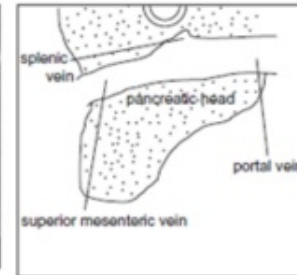
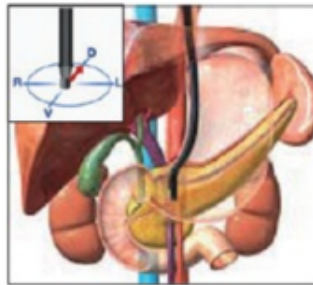
■ Step 5



After identifying the splenic hilum, advance the scope while rotating it counterclockwise little by little to observe the pancreas from the tail toward the body. If distinguishing between the splenic artery and splenic vein is difficult, the Doppler mode should be used. Observe the pancreas continuously from the tail to the body.

# Anatomía USE lineal: Estómago (6)

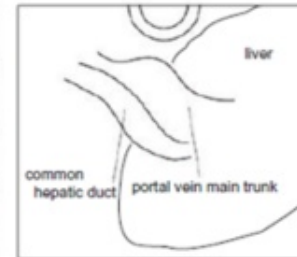
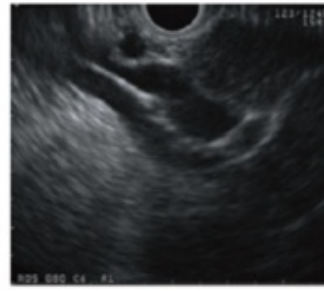
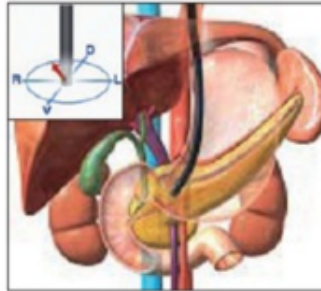
## ■ Step 6



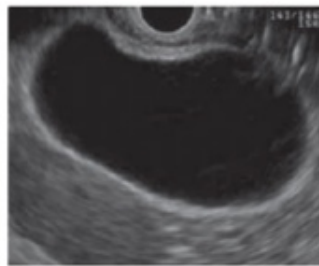
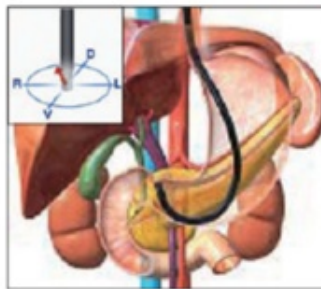
When the splenic vein is traced, the confluence between the superior mesenteric vein and portal vein can be observed. In this position, part of the pancreatic head is also imaged. When the scope is rotated counterclockwise at the portal confluence, the junction between the pancreatic head and body, the main pancreatic duct, and the bile duct can also be observed.

# Anatomía USE lineal: Estómago (7)

## ■ Step 7



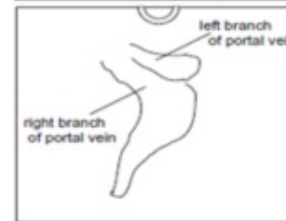
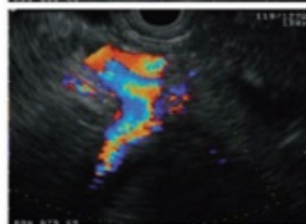
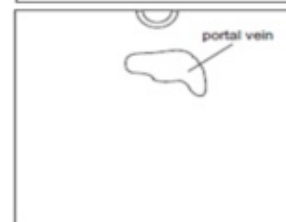
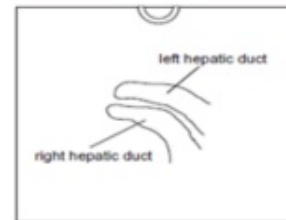
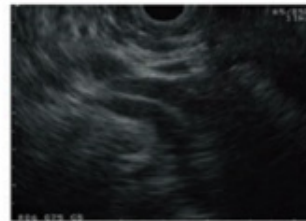
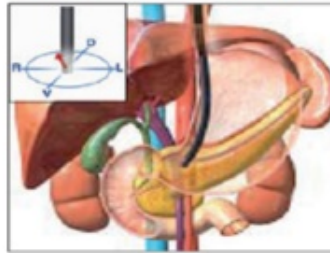
After imaging the main trunk of the portal vein, withdraw the scope to trace the portal vein toward the liver. This makes it possible to observe the hilum of the liver.



When the scope is pushed in, the gallbladder can be imaged from the antrum.

# Anatomía USE lineal: Estómago (8)

\* Imaging of the hilum of the liver



When the scope is withdrawn from the position in Step 7, the left and right hepatic ducts are imaged. Turning the scope counterclockwise may sometimes move the right hepatic duct image to the bottom and turning it clockwise may sometimes visualize the left hepatic duct.




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## TECNICA DE EXAMEN Y ECOANATOMIA: ECOENDOSCOPIO LINEAL

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# Anatomía USE lineal: Bulbo duodenal (1)

## ■ Step 1

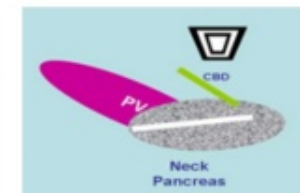
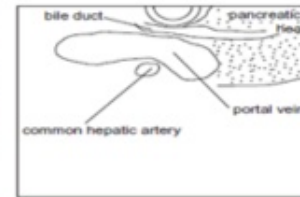
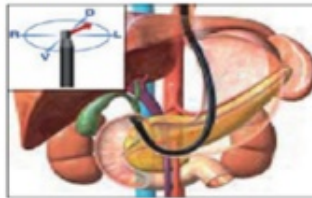


Insert the scope into the duodenal bulb and rotate the scope counterclockwise to visualize the gallbladder. The neck lies on the left side of image and the fundus lies on the right side.

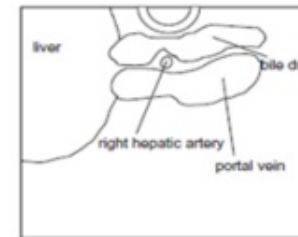


## Anatomía USE lineal: Bulbo duodenal (2)

■ Step 2



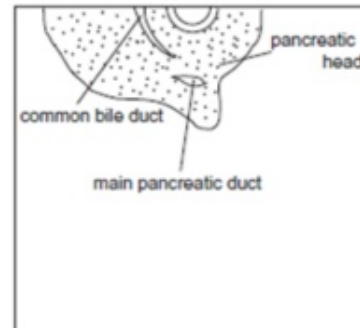
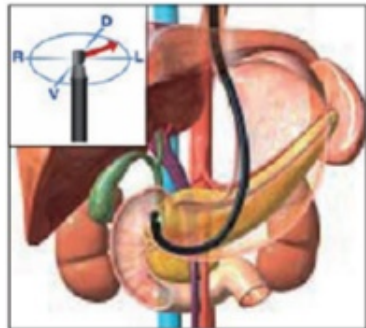
Rotate the scope clockwise to visualize 3 luminal structures. The portal vein, bile duct and common hepatic artery can be identified using Doppler as required.



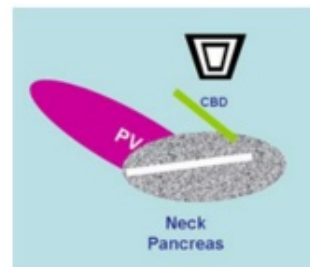
Advance the scope slightly from this position and rotate it counterclockwise to visualize the portal vein, bile duct and right hepatic artery. At this time, the transducer is directed cranially.

# Anatomía USE lineal: Bulbo duodenal (3)

## ■ Step 3

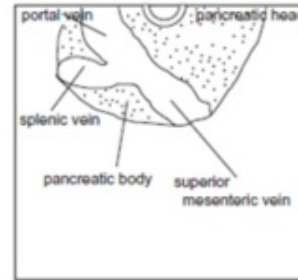
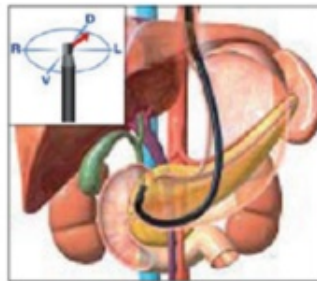


While rotating the scope clockwise, trace the imaged bile duct toward the papilla to visualize the bile duct and main pancreatic duct near the papilla.

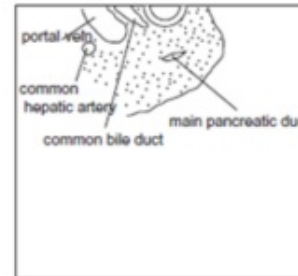
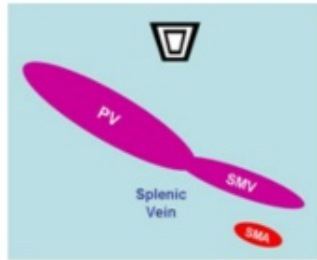


# Anatomía USE lineal: Bulbo duodenal (4)

## ■ Step 4



Continue imaging along the portal vein to visualize the confluence between the portal vein, splenic vein and superior mesenteric vein. The pancreatic head and body can also be observed from the duodenal side.



Rotate the scope counterclockwise to visualize the pancreatic head and body.




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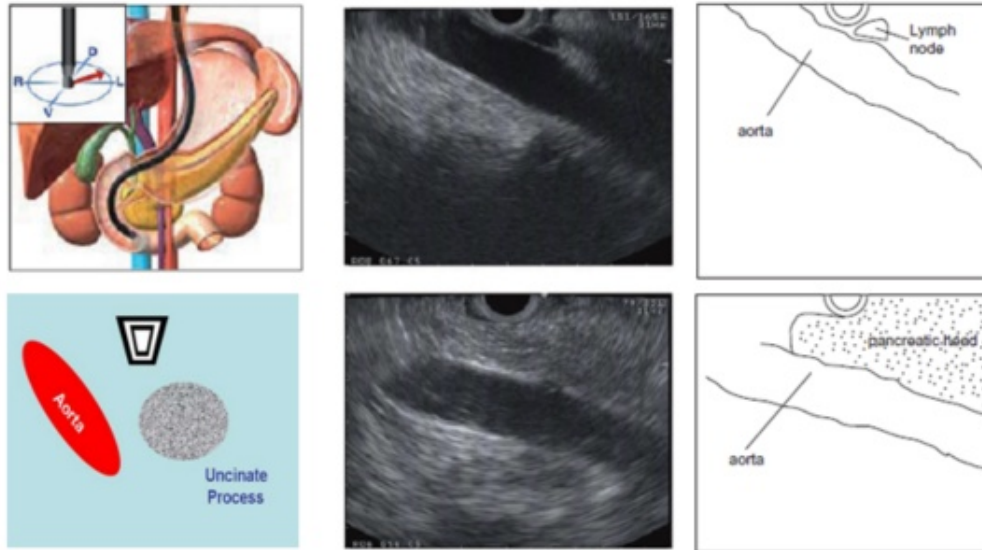
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# Anatomía USE lineal: 2ª Porción duodeno (1)

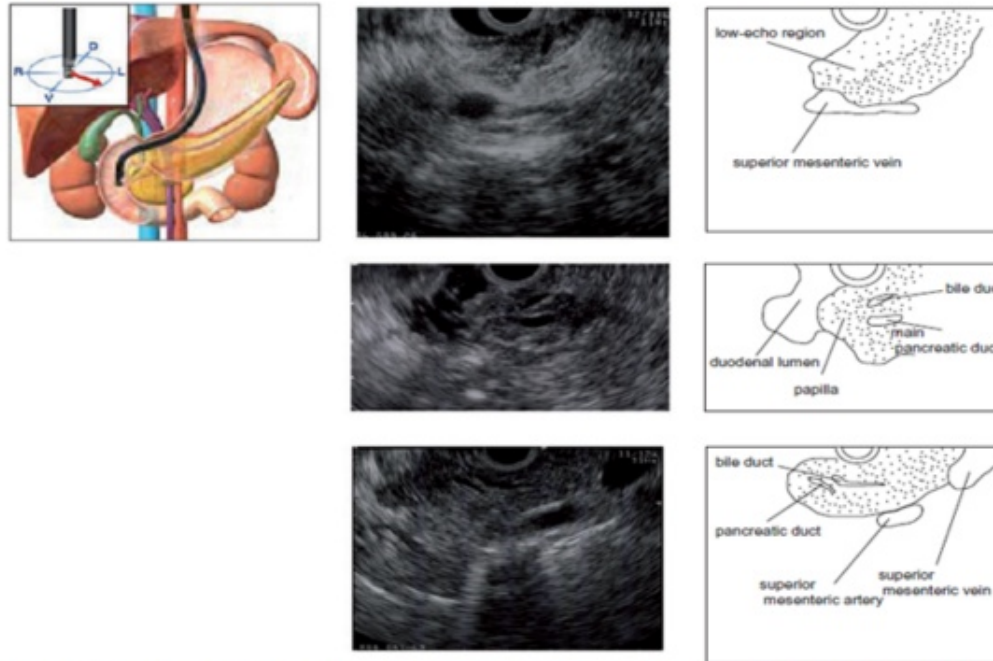
## ■ Step 1



Insert the scope into the descending part of the duodenum and straighten it before starting observation. Rotate the scope clockwise to visualize the aorta and IVC. While imaging the aorta, withdraw the scope slowly to visualize the lower part of the pancreatic head. The aorta gradually lines up parallel with the image, and the pancreatic head will be imaged between the aorta and transducer.

# Anatomía USE lineal: 2ª Porción duodeno (2)

## ■ Step 2



While observing the pancreatic parenchyma, withdraw the scope slowly to image a low-echo region near the transducer. Rotate the scope slightly clockwise and counterclockwise to identify two luminal structures in the low-echo region. The bile duct is imaged near the transducer and the main pancreatic duct is imaged on a farther point.

Note: For detailed observation of the papilla, inject de-aerated water into the duodenum.

## Anatomía USE lineal: 2ª Porción duodeno (3)

\* Imaging of right kidney



The right kidney may sometimes be imaged from the descending part of the duodenum.



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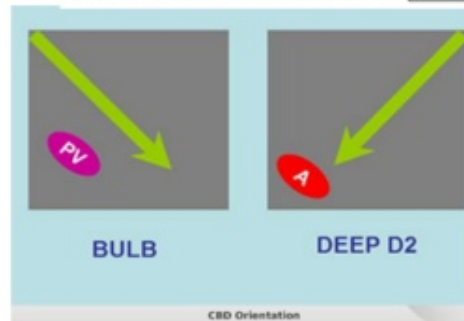
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# Anatomía USE lineal: Colédoco





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