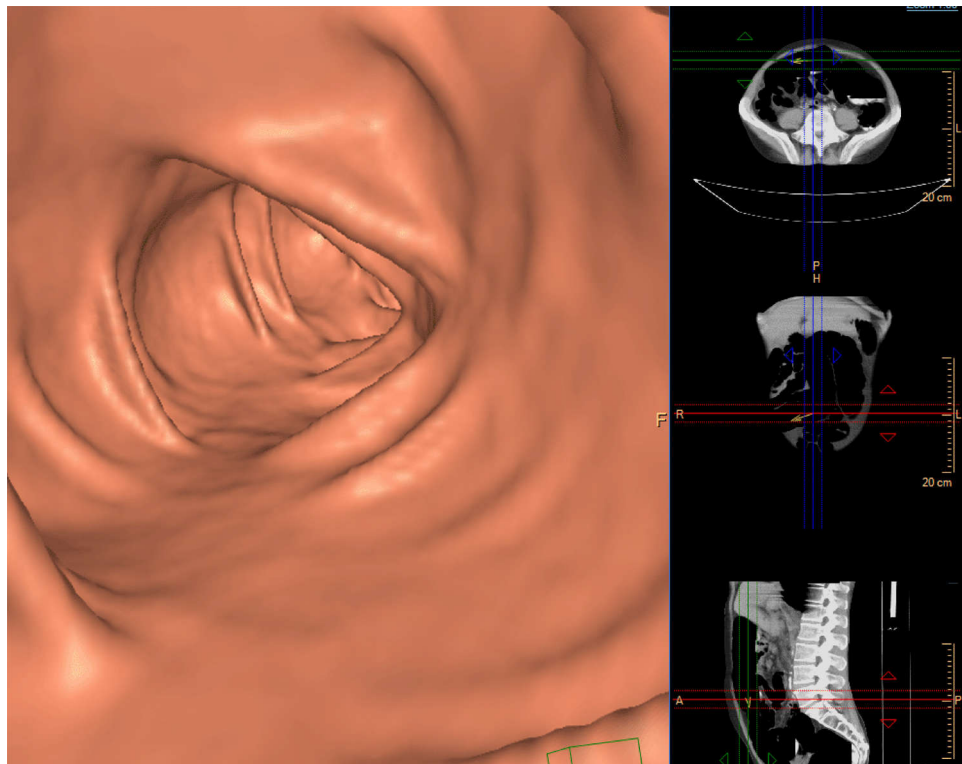# CT Viewer Endo Mode

The CT Endo viewer is a review function that allows you to perform a general flythrough of structures filled with contrast or air, including general vessels, cardiac vessels, the bronchus, and the colon.

You can look for calcium, plaque, occlusions and stenosis in vessels, nodules in the bronchus and polyps, and occlusions in the colon.

If you find an object you want to examine, you can stop the flythrough and use the reference viewports to view the object in detail.

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About Flythrough

- **Flythrough Manually.** You can flythrough the structure manually, guiding the path with the mouse. See section "Flythrough without Active Curve" on page 59.

- **Flythrough Along Curve.** You can create one or more flythrough paths for the Endo viewer using the Curve function found in the Slab and Volume viewers. After saving the curve, you can use it in the Endo viewer to automatically perform the flythrough. See section "Flythrough with Active Curve" on page 60.

- You can fly forward or backward, moving either step-by-step or at a continuous rate (which is adjustable).

- You can stop and restart the flythrough with a single click in the Endo viewport.

- You can create a WMV movie (high quality or low quality) of the flythrough by creating and saving a batch of the flythrough images.

When you load a study into the Endo viewer, there is a delay while the application processes the volume. Then the window shown above is displayed. The default viewing mode is Volume orientation. The alternate mode is Eye orientation.

To begin using the Endo viewer, drag the middle of the crosshair to the desired location (for example, a contrasted vessel, an airway, or the colon). The center of the crosshair represents the "eye" (the camera) from which the endo image is created.

Load Multiple Studies in Application

To load multiple studies in the application:

1. Use the **Ctrl** key when selecting studies from the Directory list.

2. Select the application from the Applications menu.

3. Confirm the studies are from the same patient.

NOTICE

When loading data into an application, ensure the orientation shown on the images is consistent with the images' appearance. This precaution is required for data that contains wrong orientation information because the data will be incorrectly presented within the application.

Locate Structure of Interest

In most cases, the application displays the Endo image from within a contrast or air filled structure, but occasionally the Endo image appears solid, as shown below.

This is usually because of a mismatch between protocols. The study may include an air filled structure, but a contrast protocol may have been applied, or vice versa.

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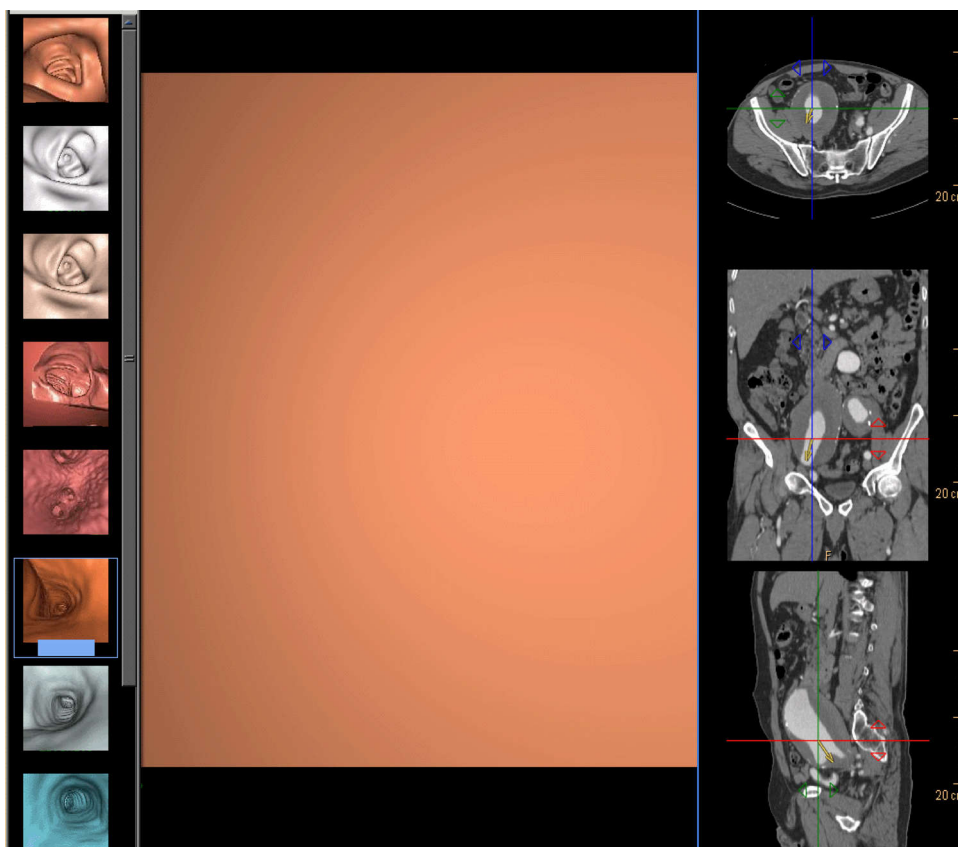
Use new Protocol to Locate Structure

To view the volume correctly, you must select the correct protocol icon from the protocol list.

You can manually position the rotation center of the viewport into the volume of interest by moving the crosshairs of the reference images. The application automatically re-evaluates the rendering protocol needed for the Endo viewport.

- When the crosshair is moved, the system determines if a different rendering protocol is needed. (Note that this protocol adjustment is not made within a protocol category. That is, one air protocol is not replaced by a another air protocol.)

- The system changes the rendering protocol if the intersection of the crosshair goes from air to contrast or contrast to air.

- Photorealistic rendering presets are also available for the Endo mode.

NOTICE

Cross sectional images might rotate around the centerline. Please note orientation annotations on images.

NOTICE

The size and shape of anatomies can change when tweaking a protocol. To prevent wrong interpretation, follow the recommended protocol modification procedure in the **Common Processes** section.

WARNING

When thick-slice Brain images are viewed in the slab mode some partial volume artifacts might occur.

In cases where the orientation annotations are not displayed on the image - you must not assume any specific orientation. For correct orientation information - use only the images which display such information.

One or more of the following image types may appear in this application: curved MPR, straightened MPR, volume images, and thick slab images. Measurements you make on such processed images can sometimes be misleading. When saving such images, make sure they are labeled properly.

Objects in thick curved MPR images may appear distorted. Use caution when making measurements on MPR images.

## Use Relate to Locate Structure of Interest

The Relate Viewports and Relate Scenes tools can help orient yourself in the Endo viewer.

To use Relate Viewports, turn off the crosshairs, select Relate Viewports, and click on any pixel in any viewport. The location of that pixel is automatically marked on all the other viewports.

To use Relate Scenes, begin by viewing the study in another viewer (in 2D, Slab, or Volume). In the other viewer, click on a region of interest, then launch the Endo viewing mode. The location you clicked in the other viewer is now marked in the Endo viewer.

Volume Orientation

This is the standard orientation for performing flythroughs.

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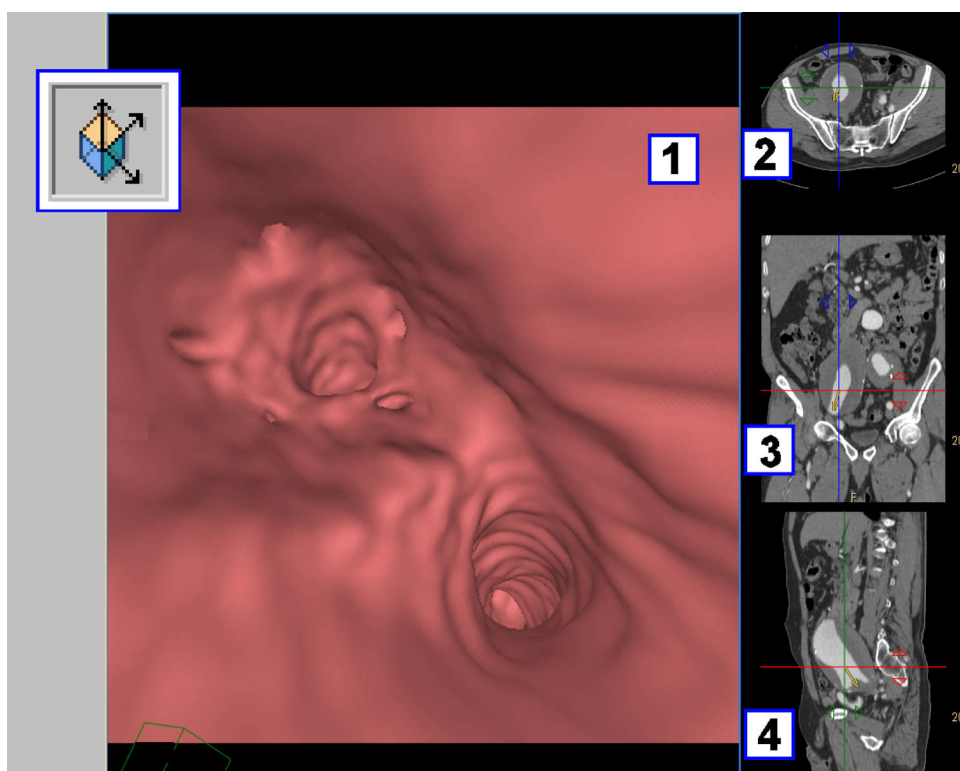
1. Endo image
2. Axial image
3. Coronal image
4. Sagittal image

Volume Orientation Options

The following condition applies to the reference viewports when you are in the Volume orientation mode:

- In the Axial, Coronal, and Sagittal viewports, using Relate viewport causes the rotation center (located at the intersection of the crosshairs) to be moved to the relate point.

- In the Endo viewport, using Relate viewport causes the point clicked on to rotate around the current rotation center into the center of the Endo viewport, changing the direction you are looking. (Relate scenes does not work in the Endo viewport.)

- Using the Relate scenes function from another scene (Slab or Volume) places the rotation center at the relate point in the Endo scene.

Eye Orientation

This orientation shows a yellow rotation bar to give you more control over the view, allowing you to move the "camera" as desired.

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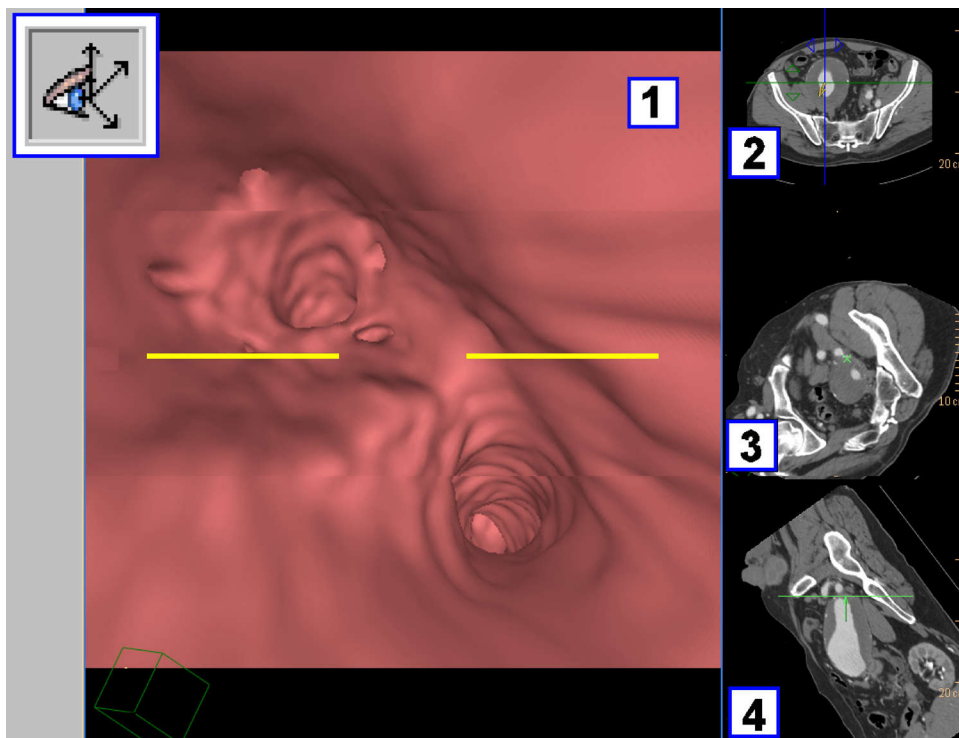
1. Endo image with rotation bar
2. Axial image
3. Eye Axial image (EA)
4. Eye Reference image (ER)

Eye Orientation Options

The following conditions apply when you are in the Eye orientation mode:

- The camera (identified by crosshairs in the reference viewports) updates to the location of the relate point.
- In the Endo viewport you can create a relate point with Relate viewport, but not with Relate scenes.
- In the reference viewports, using Relate causes the tail of the reference arrow to be placed at the relate point.
- In the Axial reference viewport, using Relate causes the center of rotation to locate to the relate point, changing the orientation of the viewport.
- In the Endo viewport, using Relate viewport causes the point clicked on to rotate around the current rotation center into the center of the Endo viewport, changing the direction you are looking. (Relate scenes does not work in the Endo viewport.)
- Using the Relate scenes function from another scene (Slab or Volume) places the rotation center at the relate point in the Endo scene.

Axial Viewport
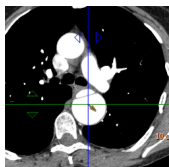
The axial viewport displays a simple axial MPR image. The center of the crosshairs represents the Camera's location. You can move the crosshairs to change the position of the camera.

The yellow arrows show the direction where the camera is looking.

This axial reference image is the same image that appears in the Volume orientation viewports, described earlier.
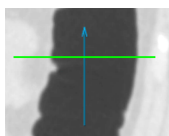
Eye Axial Viewport

The viewed axial plane is 4 cm (default) from the Endo viewport rotation center (camera).

A blue marker appears at the center of the image. This marker is the center of the viewport in most cases. However, you can pan the image so that this is not the case, but when clicking the volume image, the center of the image (center maker) returns to the center of the viewport. The center marker is not an active graphic and thus can not be moved in relation to the image (in this viewport).

When the rotation center of the Endo viewport moves, the Eye Axial viewport moves relative to it.

You can scroll, pan, zoom, and adjust window/level.

Eye Reference Viewport

This viewport contains the Eye Reference arrow (blue) and the Eye Axial Reference line (green). The Eye Reference arrow points along the line of sight of the Endo viewport.

- The center of this image is rotation center of the Endo viewport.
- The rotation center of this image is the tail (the end without the arrow head) of the arrow.

The length of the arrow cannot be changed.

You can pan, zoom, and window this image.

Reference Arrow

When you point to the Eye Reference arrow with the mouse, it turns yellow, and each end shows a control box.

Move Arrow

The arrow is an active graphic and can be dragged with the mouse to the left, right, up, and down with the body or tail of the arrow. The position of the arrow is translated (interpreted to new coordinates) in the Endo viewport.

Head of the Arrow

The head of the arrow can be repositioned radially around the tail of the arrow. When the head is repositioned the Eye Axial Reference line is updated.

The green Axial reference line remains perpendicular to the arrow so that the Eye Axial image rotates to the plane of the green line.

Double clicking on the Eye Reference Arrow causes the Reference viewport to adjust itself so that:

- the arrow's tail is in the center of the viewport; and

- the head of the arrow is pointed straight up.

During navigation of the Endo viewport or adjustment of the crosshairs, the different Eye views maintain the orientation of the tail of the arrow centered in the viewport with the arrow's vector pointing straight up.
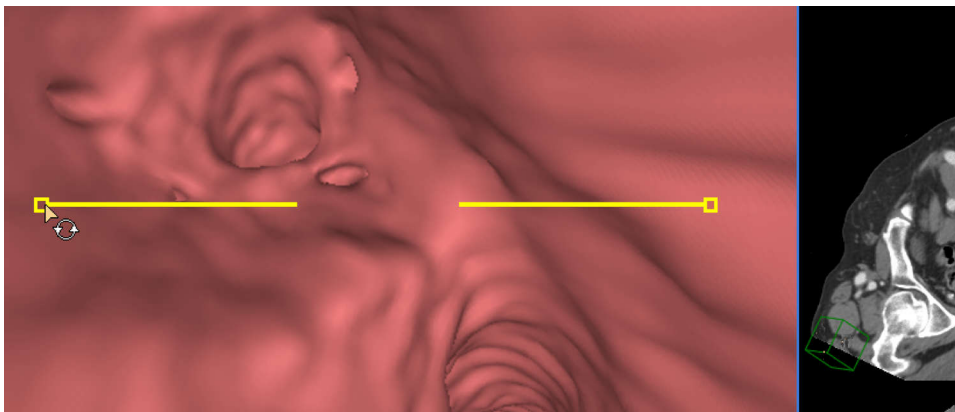
Eye Axial Reference Line

The Eye Axial Reference line is represented by a green line. The line shows where the Eye Axial viewport intersects the Eye Reference viewport. The line is always perpendicular to the Eye Reference arrow.
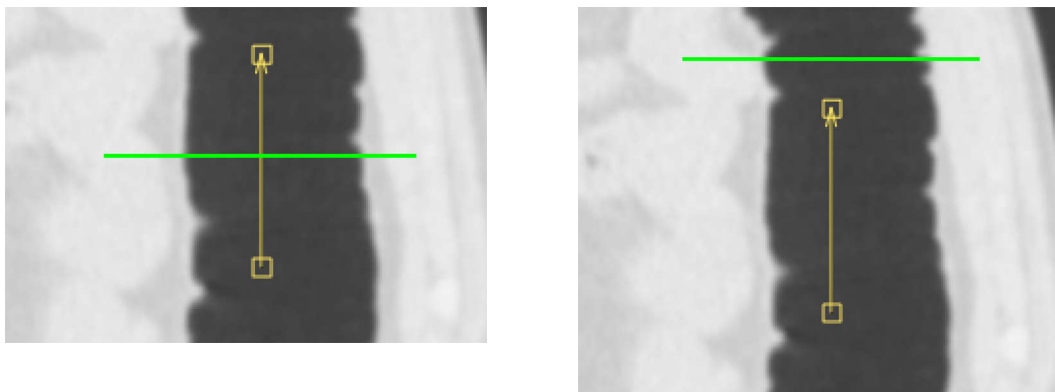
Rotation Bar

Control boxes appear on the ends of the rotation bar when the mouse cursor approaches.

You can grab these handles and rotate the bar around the center of the Endo viewport.

The center of the rotation bar in the Endo viewport is the rotation center. Rotating the rotation bar rotates the Eye Reference.

Endo Viewer Tools

Use the Endo Viewer Tools to review images.

Flip

Click the Flip button to rotate the endo image 180 degrees around the rotation center. The reference images update accordingly. The Flip button is always enabled, regardless of which viewport is active.

Flipping the viewports has no effect on the direction of navigation travel. Play Forward always navigates away from you, "into" the display. Play Backwards always navigates toward you, "out of" the display.

Endo Viewer Layout
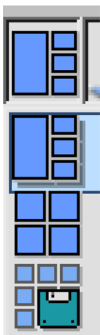
In the Volume orientation, the two available layouts are 1+3 and 2x2. (1+3 is the default.)

In the Eye orientation there are also two layouts.

Layout Manager

The Layout manager allows you to perform various layout (display) management functions.

See **Report**, **Film**, **CT Common Processes** and **CT Common Tools** for information on using common options, tools, functions, and processes.

Show Crosshair

This function makes visible all graphical overlays (crosshairs, center marks, rotation bar, and arrows). The default is to show crosshair.

In the reference images:

- Red crosshairs represent the Axial plane.
- Blue crosshairs represent the Sagittal plane.
- Green crosshairs represent the Coronal plane.

The intersection of the crosshairs is the rotation center of the Volume orientation viewport. See also section "Eye Orientation" on page 53.

High Quality

This function adjusts the rendering parameters to display a sharper image to enhance details.

NOTICE

Making High Quality active can cause processing to slow. It is best to complete all image processing before activating High Quality.

Speed

You can control the speed of navigation by selecting from the drop-down list: Slow, Medium Slow, Normal, Medium Fast and Fast.

Navigate

These arrows control the direction of flythrough. When you are at the start of the flythrough, you can only go forward. When you go backward, the camera reverses the flythrough direction, but does not reverse the image viewing direction.

Scroll

Scrolling the reference images moves the volume image camera as if you were scrolling through a slab image.

Scrolling the volume image changes the crosshair's intersection point (rotation center) on the reference images.

Scroll along Centerline

This function is only enabled when a curve is loaded (active).

1. Select **Load Curve**.

2. Select path from the Curve Selection Dialog box.

3. Click **OK**.

Now when you scroll, the image moves along the active curve.

Select Viewing Angle

The viewing angle is displayed in the lower right corner of the Endo viewport.

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To change the viewing angle:

1.   Right click on the Endo viewport. The context menu appears.

2.   Select **View Angle**. A list of available view angles appears.

3.   Select the desired View Angle.

Flythrough without Active Curve

1.   Using the cross hairs on the reference images and using image scrolling, bring the cursor to the desired starting point.

2.   Select a speed.

3.   Click **Forward.**

The mouse cursor becomes a double-ended arrow.
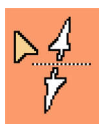
4.   Click on the Endo viewport. The flythrough begins.

5.   Navigate through the structure by moving the mouse toward the desired location in the image.

6.   To stop the flythrough, left click on the Endo viewport.

7.   To resume, click **again** on the Endo viewport.

8.   To exit the flythrough mode, click any common tool.

9.   To Save the path of a flythrough as a curve, click "Create Curve from Navigation" in the Curve Function tab to add the curve to the curve list.

Flythrough with Active Curve

If a curve exists for this study, the Activate Curve button is in full color.

If no curve has been saved (or created in another view mode, like Slab or Volume), the Activate Curve button is grayed out, and flythrough with an active curve is not possible.

1. Click **Activate Curve**.

2. Select one of the curves.

3. Select a speed.

4. Click **Forward**. (The flythrough always starts at the beginning of the curve.)
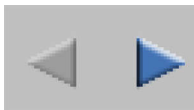
5. Click on the Endo viewport. The flythrough begins.

6. To end the flythrough, left click on the Endo viewport.

7. To continue, click **again** on the Endo viewport.

Navigate along Different Curve

1. Stop the flythrough by clicking on the Endo viewport.

2. Click another curve from the list.

3. Continue as above to fly through an active curve. The flythrough always starts at the beginning of the new curve.
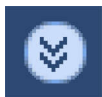
Manual Navigation

Click the **Activate Curve** button (so it appears unpressed).

Reset All

Clicking the Reset All button in the Endo viewer:

- Resets all viewing manipulations such as zoom, pan, orientation, etc., on all viewports to their defaults.

- Resets any recorded path.

- Restores the Endo viewport to its default volume rendering parameter.

Endo Viewer Functions

To access additional Endo Viewer functions, click the down arrow in the tab window, or hover the mouse over the tab window. The list of available functions displays.

Instructions for using the Series, Curve, Batch, and Tissue Management functions are provided in the Common Processes section.

WARNING

Verify correct semi-automatic volume segmentation for bed, head holder, Bone and Skull removal operations, and Volume segmentation in volume tracing.

See **Report**, **Film**, **CT Common Processes** and **CT Common Tools** for information on using common options, tools, functions, and processes.

Endo Viewer Common Tools

The common tools area provides many basic functions, including measuring, saving, panning, zooming, rotating, and windowing. Common tools are, in general, common to all the CT Viewers, and are shared with many other applications of IntelliSpace Portal. If a common tool has a special function in the Endo mode, that function is described in this section.

See **Report**, **Film**, **CT Common Processes** and **CT Common Tools** for information on using common options, tools, functions, and processes.

Relate

In the Slab viewer the relate point is positioned in the middle of the slice thickness. As a consequence, if a relate point is created on a vessel when the slab thickness is set to 10 mm (for example, the vessel might not appear in the reference ports because the vessel may not pass through the middle of the slab.

To prevent this, you can set the slab to the minimum thickness so that when you create a relate point over the vessel, the desired vessel appears in the reference images.