CIRCLE OF WILLIS CTA
Workflow

Overview:
The Circle of Willis is easily post-processed using Automated bone removal and the Vessel Grow tool. Analysis of any vessel can be accomplished using the Vessel Probe tool. This application tracks the centerline of the vessel and produces Curved Planar Reformations. The Cross Vessel view displays the lumen area and diameter of the vessel. The views can be edited, measured, captured and exported.

The Steps:
• Load the data and select the appropriate protocol Vascular COW CT.
• Automatically Remove Bone is checked.
• Pick 3D Analysis.
• Review images using 5-on-1 screen format including the Point of Interest View.
• Verify Segmented Vessels are displayed.
• Add vessels using Vessel Grow.
• Edit the Vessel Grow Area.
• Select the Vessel Probe tool and deposit a point inside the vessel.
• Add additional vessels by depositing a point using the Vessel Probe tool.
• Use the Extend tool to extend the internal carotid or vertebral arteries.
• Name the vessels.
• Check for accuracy and Edit Centerline.
• Select Native thickness MPR to view a VR MIP image.
• Create 3D Batch Rotations of vessels.
• Create and Export snapshots and batch reformats.
Launch VES

Double-click the Circle of Willis Application thumbnail.

OR

Select the Series tab and choose a specific data set. Click Advanced Viewer.
Circle of Willis - Bone Removal

Select Protocol **Vascular COW CT**.
Ensure **Automatically remove bone** is checked.
Select **3D Analysis**. Click **Pick**.

**Tip:**
Preview image from the Gallery Tab. If the contrast is not dense enough the vessels will not display well. Clear the box next to **Automatically Remove Bone** to restore bone to the image.
The POI view shows the volume surrounding the current crosshair.

Select the 5:1 format. Select the **Point of Interest Box**.

Click crosshair on anatomy of interest in the 2D. The **POI** view jumps to the crosshair.

In the POI view **roll the wheel** to trim or expand the point of interest. Take snapshots.
Circle of Willis - Segment Vessels

You will need to verify if the segmented vessels are correctly displayed.
Click **Vessels**. Click **Tint MPR**.

Scroll through the data set and identify missing vessels.

Click **Vessel**. Click **Grow**.

Click and **hold** on the **vessel**. Watch the blue selection “grow”:
Repeat for the other vessels.
Click **Add to Vessels** or **Keep Vessels**.
Circle of Willis - Edit Vessel Grow

The steps below will help edit the blue selection area and remove unwanted anatomy.

- **Click and move** the transparency bar. The blue area will decrease.
- **Click Dilate or Erode.** Each click changes edge detection by a one pixel.
- **Add To** Vessels or Keep Vessels.
Vessel Probe is an option for COW to isolate and analyze the vessels.

Click **Select**. Click on the vessel in the **2D** or **3D** image.

**Vessel Probe** will generate a centerline.

Click **Extend**. Click **proximal** or **distal** on the **2D** or **3D**. This extends the visualized vessel.

Extend will not go beyond the point you select.

Use this process to add any additional vessels.
Circle of Willis - Rename the Vessel

Select Vessel Management. Verify **Show Vessel** is selected.

**Right-click** on Vessel Segment. Select **Rename**. The Rename dialog box displays.

Type a New Name. Click **OK**.
Circle of Willis - Centerline Edits

**Right-click** in the CPR view. Click **Edit Centerline**.

Click and **deposit red points** to adjust the center line in either longitudinal view.

Click **Apply** to save the edits. Click **Close** to end.

The yellow line is the center line.

Click and drag the red corrected line to edit.
Circle of Willis - Snapshot

Click Snap.

Move the camera into the 3D or 2D image and Click to capture the image.

**Tip**: It is important to remember to take a snapshot. Only a snapshot can be restored at a later date. Once a snapshot is restored, you will be able to continue post processing your image.
Circle of Willis – Native Thickness MPR

Tip: This tool provides the capability to view the COW in a VR MIP projection. The MIP values can be increased or decreased as you rotate the image.
Circle of Willis – Native Thickness MPR

- **Hold down** Right-click and two arrows display.
- **Continue** to hold Right-click and **move** the mouse.
- Move **up** and **down** scrolls through the data set.
- Move **side to side** to increase and decrease the MIP values.
- Hold **left** to rotate the data set.

**Tip:** Locate the ROI. Press the wheel to display the yellow crosshairs. Center the ROI on the crosshairs. This will lock the ROI at the centerpoint and allow you to rotate the surrounding vessels.
Circle of Willis - 3D Batch Rotation

Select **Batch** to create a **3D Batch** rotation.

Select the **degree of rotation** and select the **direction** of the rotation.

Move the **slider bar** to the desired number of images or degrees between images.

Click **Batch** for PACS. Click **Movie** to create an **.avi file** for presentations.

As you increase number of images the step size decreases.
Circle of Willis - Export

Select **Report** tab.

Each Snapshot and Batch displays in the Findings tray. Click and hold **CTRL** to add additional images.

Click **Export** to transfer to PACS.
**Circle of Willis - Export**

**Export to** displays the available PACS destinations. Click the appropriate one. Click **Export**.
Circle of Willis - Workflow

Summary:

Selecting the Vascular COW Application Protocol you can:

- Select Auto Bone removal.
- Verify Segmented Vessels are displayed.
- Add vessels using Vessel Grow.
- Select the Point-of-Interest mode to investigate surrounding vessels.
- Select the Vessel Probe tool to interrogate vessels.
- Select Extend to continue the artery down to the internal carotid arteries or vertebral arteries.
- Name each vessel in the Vessel Management area.
- Edit the Centerline of a vessel probe.
- Create Batch Rotations of the Circle of Willis.
- Select Snapshot and capture images for documentation.
- Select Native thickness MPR to view the VR MIP image.
- Export to PACS or other destination on the Report Page.