CT Liver Analysis - Resection
The CT Liver Resection application provides tools to perform the following tasks:

- Segment the liver for volume measurements
- Segment the portal and hepatic veins
- Segment the hepatic artery
- Resection planning
- Segment liver into remnant and resected volumes
- Probe liver tumors
- Multi-phase volume fusion
Liver Resection Workflow

The Steps:

• Open Vitrea® software and select patient
• Load multiple phases into Liver Resection planning
• Label the phases
• Segment the liver and create volume measurements
• Segment the portal and hepatic veins-edit as needed
• Segment the hepatic artery-edit/grow the artery branches
• Segment liver into remnant and resected volumes
• Probe liver tumors using tumor probe
• Show tumor margins for resection
• Create multi-phase volume
• Create batches
• Take snapshots
• Export
Liver Resection-Select Study

Launch Vitrea®

Click to select the patient.

Select the Applications tab.
Right click on Liver Resection Planning and chose Select Application Data

Tip: Load a multi-phase liver study with two or three phases
Liver Resection

**Hold** down **ctrl** and select the series.

**Click Start** to launch the application.
Liver Resection - Multiphase

Change the layout to 6 on 1 when loading three phases.

Optional - click on the blank box to label each phase.
Liver Segmentation

Click on Liver Segmentation.

The liver will be highlighted blue.

Click on liver parenchyma (portal venous phase is recommended).

Tip: use the – or + on keyboard to decrease or increase the size of selection.
Liver Segmentation

Use **EDIT** to make any adjustments to the liver segmentation.

Add to Liver.

The **liver volume** is automatically displayed.

Take a **Snapshot** to save your work.
Portal and Hepatic Vein Segmentation

In Liver Segmentation, Click Portal Vein.

Tip: When selecting the portal vein, Vitrea software will also segment the hepatic vein.

Click on Vessel.
Portal and Hepatic Vein Segmentation

Click in the **portal vein** root (phase with contrast in the portal vein is recommended).

Segmentation of the **Portal** and **Hepatic Veins** are displayed as separate Anatomy Regions.
Portal and Hepatic Vein: Edit Segmentation

To Edit: click on the region to be segmented.

The segmentation will display the tree to be edited. Click on Edit.

Right click on tree to: Add a point Delete a point Switch to other tree (portal or hepatic vein).
Hepatic Artery Segmentation

In the Liver segmentation box: Click on Hepatic Artery. Select Vessel.

Click in the common Hepatic Artery.

Tip: Use Vessel Grow to “add to” hepatic artery.
Liver - Virtual Resection

Click on Resect.

Drop points starting outside the patient and end posteriorly through liver.

Scroll through data and move points as needed.

Vitrea software adds **Resected** and **Remnant** liver to the Anatomy Segmentation box.
Liver - Virtual Resection

From the **Options** dropdown select **show volumes**.

Take a **Snapshot** to save volumes.
Tumor Probe

**Click on Select under Tumor Analysis.**

- Chose the approximate size of the tumor:
  - Small
  - Medium
  - Large

- Select RECIST or WHO measurements.

**Tip:** By checking Show Tumor Margin, Vitrea software will display a 10mm margin around the tumor.
Tumor Probe

Click on the tumor to display tumor measurements.

The tumor margin appears blue if Show Tumor Margin has been checked.

Tip: Use the Edit tool to edit tumor margins if needed.
Multiphase Fusion

In the Anatomy Segmentation box, check Fusion.

In the Show column, check each phase you want to fuse together.

In the Show column, check which segmentation from each phase you want to fuse.
Multiphase Fusion Results

The fused 3D data will be displayed and labeled as **Fusion**.

3D images can be batched and exported.

Tip: Make any segmentation semi-transparent by using the slider bar to better visualize other fused data.
All measurements of tumor probes will be entered into the Report.

Reports can be Exported and/or Printed.
CT Liver: Report

To Add Images to report:
Click on the Images tab under Templates.

Chose an image format to add to the Report.
Click ADD.

Tip: This will add a second page to the report.
CT Liver - Report

To Add Images to the report:

In the Image Findings section, Left mouse drag and drop images onto the Report page.

Tip: Add as many images as needed by holding the `ctrl` key down and selecting multiple images.
Click on the blue question mark. This opens a quick help guide.

Liver Analysis - Liver and Vessel Segmentation

Segment the liver:
- Select the portal phase using the phase buttons at the bottom of the viewer. (Fig. 1)
  ![Fig. 1]
- TIP: To rename the phase buttons, click in the Rename field at the bottom of the viewer. (Fig. 2)
  ![Fig. 2]
- Click Liver Pick then click on the liver in an MPR view. (Fig. 3)
  ![Fig. 3]
- To add to the liver segmentation, hover on a missing part in an MPR view so it turns green, then click where the cursor is hovering.
- To remove from the liver segmentation, hover on the part to take out in an MPR view so it turns purple, then click where the cursor is hovering.
  - TIP: Press the + or - key to increase or reduce the size of the area you wish to add or remove.
- Click Add To to create the Liver region. (Fig. 4)
Liver Resection: Additional Procedures

Click on the blue question mark. This opens a quick help guide.

Click on Swap Side to switch Remnant and Resected Liver.