5 3D Modeling

Philips Medical Systems' 3D Modeling application is an image processing, visualization and segmentation software that supports export of mesh surface files created from DICOM volumetric images. The 3D Modeling application allows the user to view images of anatomical structures, perform segmentation, edit and combine segmented elements (tissues) into a 3D model. The user may determine the information related to the exported elements of the 3D model such as transparency, smoothness, output mesh size and color.

The 3D Modeling application allows the creation of batches for export in standard industry formats such as STL, and/or to render the mesh surface file in a 3D PDF format which can be used for communication. The output of the 3D modeling application can be used to create a physical model with a 3D printer, which may be used for education, communication with patients, and treatment pre-planning.

The application offers a suite of clinician focused rendering and editing tools from across ISP applications to optimize a model for printing to help assure that the model reflects true patient anatomy.

3D Modeling incorporates the advanced Philips segmentation tools into one environment with an intuitive workflow.

The application includes tools to create hollow structures, edit wall thickness and preview meshes within the application, making adjustments in real time.

3D modeling application supports importing tissues created by preprocessing or other applications in ISP.

The Mesh preview mode allows the user to preview the model in SSD format and to change the smoothing of each tissue separately, while the mesh contours are displayed on top of the tissue overlay on the MPR images.

The application supports the use of multiple sequences (series) for creating a model, while gaining the advantage of using different series for different parts of the model, based on optimal display.

An advanced export dialog allows previewing the model, inspecting accuracy, changing smoothness and data reduction. The Export dialog allows direct export and preview from any application that supports creation of volumetric models.

Benefits

If the device is used as specified in the Intended Use under the circumstances and conditions as specified in the Indications for Use. the expected patient benefits are:

- The created physical model provides a base for communication with the patient’s surgeon or physician.
- Improved visualization of the patient’s pathology.
- Improved understanding of planned procedures.
- Possibility to visualize expected (aesthetic) result of reconstructive surgery.

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Indications for Use

The 3D Modeling application is intended for use as a software interface and image segmentation application for the transfer of DICOM imaging information to an output file. The 3D Modeling application output file can be used for fabrication of physical replicas using additive manufacturing method. The physical replicas can be used for treatment planning, surgical planning, training and education.

The 3D Modeling application should be used in conjunction with other diagnostic tools and expert clinical judgment.

NOTICE

3D models are not cleared for diagnostic use in the United States.

Viewing Modes

The application includes the following viewports.

- Volume viewport (#1) - When no tissue is edited, displays the whole volume rendered with the selected volume rendering, and the displayed tissues. When a tissue is edited, only the edited tissue is displayed until the “Accept” or “Cancel” button is pressed.
- Model viewport (#2) -Shows the tissues that are included in the model. The tissues can be displayed in their “bit volume “ rendering, or as meshes with the selected smoothness.
- MPR viewport (#3) - Planar views of the volume. The user can work on the MPRs to segment volumetric tissues. The segmented tissues are displayed as overlays on the MPRs.

  In single layout mode, all viewports display the same series from different ortientations, the MPRs are displayed in Planar mode. In multiple layout mode, each viewport shows another series. The Planar viewing mode displays the volume in three orthogonal plane images. Each viewport can be manipulated independently, while the axes remain oriented at 90 degrees to each other. Changing the rendering in one Planar viewport affects all viewports. Crosshairs appear on all three planar viewports. The crosshairs form the rotation center, around which the views can be rotated (see section “Viewing Tools” on page 233) . To disable crosshair display, click the  icon on the toolbar. Crosshair viewing preferences can be configured in the Context menu .

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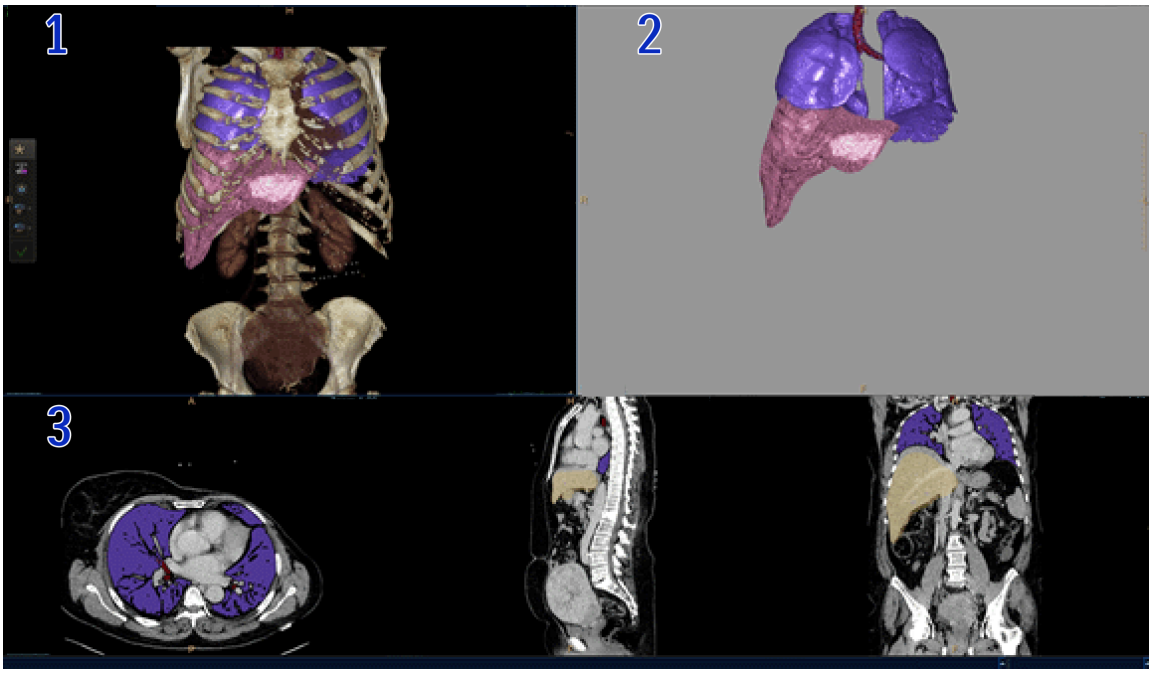

Single Series Layout Mode

- In single mode the user views one series at a time, while reviewing the volume and the MPRs of the same volume.
- To switch between the series, click the series name at the top of the volume image and select another series.
- The tissues created on one series remain and appear on other series of the same study, as long as they are acquired with the same FOR.

Multiple Series Layout Mode

- When launched with multiple series (either of the same study or two studies), by default, the application starts in "Multiple mode", showing the different series side by side. The application selects the series displayed in each of the viewports, but the user can change the series.
- The application selects one series as the *Underlay*; when CT and MR are involved the underlay will typically be the CT series.
- The registration between the series is applied automatically between all the series to the *Underlay* and the progress bar displays the registration progress.
- Once registration is completed, images are aligned according the registration results.
- In multiple mode the user can select up to three series that can be viewed simultaneously.

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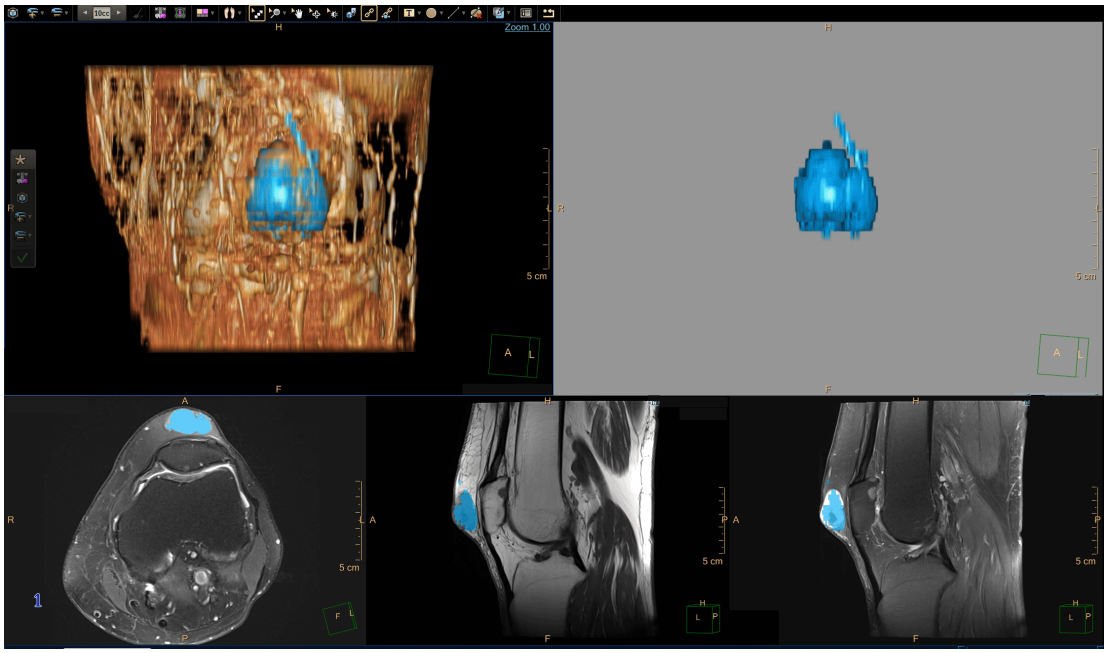
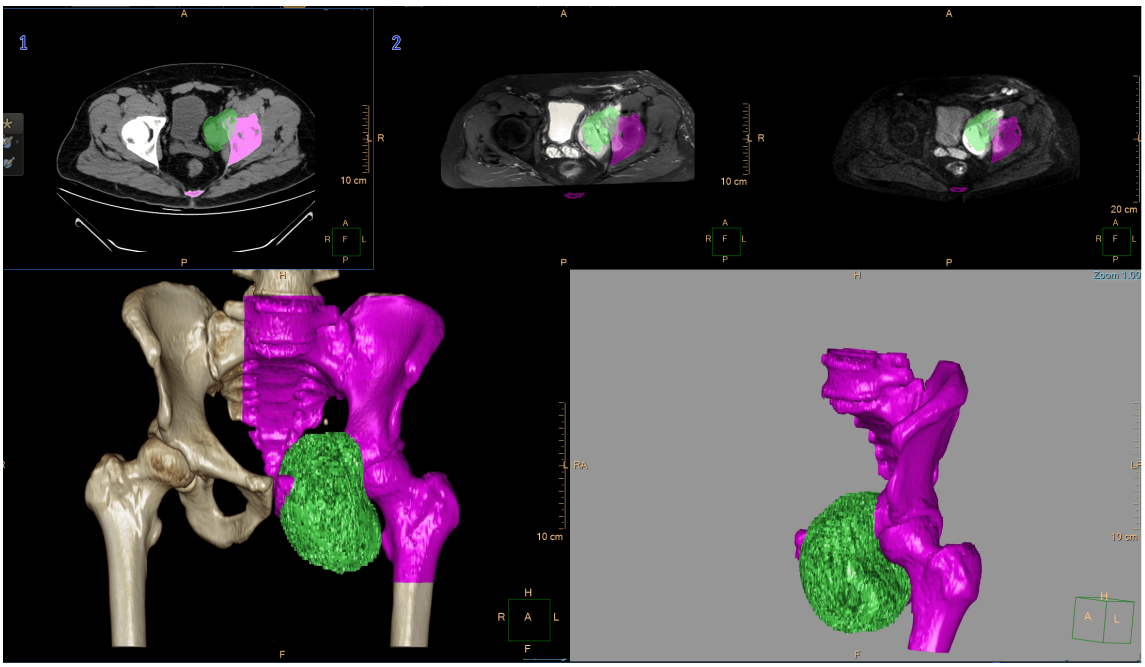


- The segmented tissue is projected on all of the series but can be edited only on the series where it was created
- The user can select which series to review in each of the MPR viewports. In the volume viewport the volume belongs to the series displayed in the first MPR (left most).

The image below is an example of multiple series from different studies with #1= CT volume (Main) and #2=MR series.



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Layouts

The application provides layouts that can be used in each mode. The colored squares on the layout icon represent viewports, with yellow representing the volume viewport and pink representing the tissue viewport.

Layouts are designed to fit horizontal and vertical monitors. Only the relevant set of layouts is suggested based on the monitor dimensions.

In single mode, images can be dragged between viewports. This is not available in multiple mode.

Viewing Tools

Icon	Description
	Axial Viewing Orientation
	Coronal Viewing Orientation
	Sagittal Viewing Orientation
	**Enable/Disable Links** - When **Link** is clicked, viewport navigation is linked between all displayed data (relevant only in Multiple Series Layout mode).
	**Align Volumes** - Used to bring both volumetric viewports (Volume & Model) to show the volume using the same presentation state.
	**Show Crosshair** - Shows/hides crosshairs on all reference images (relevant only in Single Series Layout mode).
	**Relate Viewports** - Allows relating a location on one viewport to the same location on other viewports.

General Viewing

Icon	Description
	Scroll (see above warning)
	Continuous scroll
	Pan

Icon	Description
	Zoom
	Zoom to Point
	Change Window Level
	Roll/rotate
	Invert Gray Level

Windowing Options

A windowing option is available in the Control Area via a dropdown.

- For CT data, any of the default windowing options that are defined for all CT applications can be selected.
- For MR data, either **Default** or **Automatic** windowing can be selected.

Segmentation and Editing Tools

The 3D Modeling application contains a set of segmentation and editing tools that can be used together for creation of the 3D model.

When clicking on a viewport, the valid tools per the active viewport are shown in a tool bar.

The top of the tool bar provides an indication of the mode that you are in:

New tissue mode - If no tissue is selected, you are in **New Tissue** mode once a segmentation tool is selected.

Edit tissue mode - Once a tissue is selected or after creating a tissue, you are in **Edit Tissue** mode. The background color of the icon indicates the selected tissue color.

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MPR Segmentation Tools

Icon	Tool Name	How to Use	When to Use
	Smart/Automatic Threshold	When activated, the cursor changes to a small circle. When locating the circle on the image, a mask is calculated automatically out of the ROI covered by the circle. The mask is shown on the MPRs and the outcome volume is displayed in the volume viewport. Tissue is created only when user clicks the left mouse button. Circle size can be modified with the <Shift> key.	Use for initial segmentation based on a threshold mask. It is recommended to first clip the volume by cube or sculpting, and then use the smart threshold Once the initial mask is defined by clicking, you can modify the Lower and Upper threshold range in the **Smart Threshold Range** dialog (or via windowing on the volume image).
	Drag Edit Mode	Select the tool to edit tissues. Click to drag. When the tool is active, the **Contour Editing - Parameters** slider appears and can be used to control the adaptiveness of the tool. There are three adaptiveness levels available: Min, Mid and Max with Max the more exact level.	Use to edit a tissue by modifying its contours. This is optimal for masses with a relatively smooth shape.
	Smart ROI	Traditional smart ROI tool.	General purpose tool: for lesions, organs. Based on contrast change between tissue and surrounding organ.
	Draw Smartbrush 3D	Traditional smart brush tools.	

	One Click Segmentation	Select the tool and position the mouse on the tissue that should be segmented. The volume is shown as preview on all orientations. Use **<Control>**+ wheel to modify the limiting box size. Move the cursor until the optimal segmentation of the tissue is shown and click.	For segmenting lesions, tumors and organs with a clear contrast between the area of interest and its background.
 	Subtract ROI/Brush	This is an editing tool used to remove parts of a selected tissue.	Used for general purpose editing of a tissue.
	Inject	Select the injector and position it on a vessel (or other tissue) , press the left mouse button and “inject” to the vessel. Use all three orientations as needed.	Used for segmenting vessels and for filling holes on an existing tissue. The user can modify the rate and viscosity of the tool.
	Define slice by slice	Select the tool and scroll and add contours between slices or edit already drawn contours.	Used to segment a tissue on one of the MPRs using slice by slice contours, connecting between the contours to create a volume. Users have full control of the contours without smart image processing.

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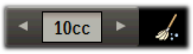
	MR Segmentation tool	Select the tool and locate the mouse on the tissue that you want to segment. The borders of the segmentation are previewed. Click when acceptable. Use the **<Control>** + wheel for changing the limiting sphere size. Use the threshold tool to modify the threshold. Note: This tool cannot be used as an editing tool. It is just used for creating a new tissue. **Note**: This tool cannot be used as an editing tool; it can only be used only to create new tissues. **Note**: Once the tissue is accepted, the threshold cannot be modified.	Used on MR bright lesions or tissues.
	Spherical Eraser tool	Choose the appropriate eraser size and click on the image to be removed. A fixed size sphere will be erased.	Used to remove pieces at the edge of tissues that lack a clear contour/ contrast between the pieces and the tissue.
	Tissue separation	This tool allows separating two tissues. See section “Tissue Separation” on page 247.	• For separation between adjacent bones. • For separation between tissues with the same threshold (i.e Bones and Aorta).

Volume Segmentation Tools

Icon	Tool Name	How to Use	When to Use
	Bounding box	Click on the tool – A bounding box is displayed on all viewports. Modify the bounding box dimensions to include the region of interest.	Can be used on a volume for creating a new tissue with the Volume Threshold tool or as an editing tool on a selected tissue.
	Volume Threshold	Click on this tool to create a volume out of the visual volume based on volume rendering. Once the volume is shown, pixels that were almost transparent might appear. Use the “windowing” with the middle mouse button to clean the created tissue.	For creating tissues based on volume rendering. Useful for organs that have dedicated rendering (bones, lungs etc).
	Sculpting Tools (include and exclude)	Select the proper sculpting tool – There are several options. Use the tools for isolating the region of interest, either by include or exclude.	For preparation of the volume before using the threshold tools; or as an editing tool on a created tissue.
	Remove Residuals	Select the maximum residual size and click on the Remove Residuals tool.	For removing residuals from segmented pixels. Useful after using the threshold tools for creating an initial tissue.
	Remove/Keep Piece	When a tissue contains several unconnected components, to remove a piece or keep only one piece: When **Keep** is selected, clicking on a piece of tissue results in a tissue with only the clicked piece. When **Remove** is selected, clicking on a piece of tissue removes the clicked piece.	To remove or keep unconnected parts of a tissue.

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Verify/Edit Registration Mode

Registration mode is available from Multiple series mode, by clicking the  Registration Mode button.

- The Registration mode is used for reviewing and refining alignment between the series for the combined mode.
- The registration model is the series that was defined as the underlay, while all other series are overlays. Tissues that are segmented on an overlay are transformed to fit the underlay according to the registration matrix between the overlay to the underlay.
- In registration mode, the application provides layouts that show the underlay, overlay and fusion between them in three orientations.
- The underlay and overlay can be changed via the series selector above the viewports.
- When an underlay is changed by the user, the application re-calculates the registration between all the other series to the new underlay.
- The user can manually pan/rotate the overlay series over the underlay series in any orientation and improve the registration between them.
- The underlay orientation can be selected (Axial/Coronal/Sagittal) while the overlay will always display the correlating slice according to registration.
- If there are tissues on the images, the tissues are shown on top of the overlay. The tissues can be hidden (see section “Operations on Tissues” on page 243).

Registration Mode Tools

Tool	Icon	Description
Registration Mode		Enter registration mode (from Multiple series mode only) by clicking the Registration Mode button.
Verify/Edit Registration Exit		Exit registration mode by clicking the exit button.
Help		Clicking on the help button opens the Registration Guidelines.
Overlay color		Use the overlay color tool to modify the color map.
Blending		Use the Blending slider to modify the alpha blending between the underlay and overlay.

Tool	Icon	Description
Reset Registration		Use the Reset Registration button to reset registration.
Pan		Use to drag the overlay to any direction. When panning, the tissues disappear until motion ends.
Rotate		Use to rotate the overlay in any direction. When rotating, the tissues disappear until motion ends.
Up/Down/Left/Right arrows		Pressing these buttons pans the overlay to the direction of the arrow by one pixel.

Creating a New Tissue

A new tissue can be created from either the MPR or volume image.

Creating a New Tissue on an MPR

1. Verify that no tissue is selected.
2. Choose one of the segmentation tools (Injector, Smart ROI, One Click) on the MPR and begin segmenting. See section “Segmentation and Editing Tools” on page 234.

   A new tissue is added to the tissue list and also appears in the tissue viewport. The volume image disappears and only new tissue is displayed on the volume viewport.
3. Continue editing the tissue with the editing tools. section “Segmentation and Editing Tools” on page 234.
4. Press  **Accept** (on either the tool bar or the Control Area) to accept the tissue (or  **Cancel** to eliminate it).

   Once a tissue is accepted, the volume re-appears and all the other tissues as well, and the tissue is no longer “selected” in the list.

   If the  **Accept** is not clicked, the tissue is created and remains selected; but editing stops and volume and other tissues re-appear. If another tool is picked , the same tissue is edited.

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Creating a New Tissue on a Volume

1. Select the  Bounding Box or one of the  Sculpting tools to focus on the area of interest. See section “Segmentation and Editing Tools” on page 234.
2. Choose the Volume rendering that displays the organ that is needed.
3. Select the  Volume threshold tool to create a tissue.
4. Use windowing to clean the needed tissue.
5. If necessary, use the **Remove Residual** tool.
6. Click  **Accept**.

OR

1. Select the  Bounding Box or one of the  Sculpting tools to focus on the area of interest. See section “Segmentation and Editing Tools” on page 234.
2. Select the  Smart Threshold tool and position the circle on the needed tissue.

   The mask is displayed on the MPRs and volume as a preview. The tissue is not created until clicking on the mouse.
3. Click on the mouse.

   The Threshold range is defined and tissue is created based on the area of interest and the threshold range. You can still modify the range using the manual values.
4. Accept/Cancel

Tissue List

The Tissue List is displayed in the Control Area.

Each tissue in the list displays the tissue name, the color and its “inclusion” state which is symbolized with the  eye icons.

The tissue overlay opacity is controlled by a slider which appears when clicking the  opacity button.

- To select a tissue, click on the tissue in the Tissue List. To select multiple tissues, use the mouse and <**Control/Shift**> keys.
- To deselect a tissue, click on the selected tissue and then click a different location in the tissue list.

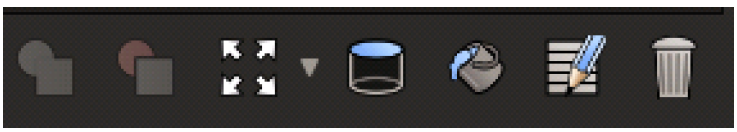
- **Renaming** - To change the name of the tissue, right click on the tissue and select  **Rename**. Double click on the name and type a new name.
- **Changing the Color and Opacity of a Tissue** - To change the tissue color of a tissue, press the color drop down and select a color from the **Available Colors** list (in the **Standard Colors** tab that opens by default). Use the slider to change to change the Opacity if relevant . Tissue opacity only impacts viewing and does not impact the tissue itself. Note: The opacity level impacts only the volume display of the tissue.

To select a customized color, press the color drop down and select the **Custom** tab. Use the sliders or choose a color from the color map. Once the color is acceptable, click outside of the color window. The new color is applied to the selected tissue.

- **Show/Hide Tissues** - The **Display and include tissues in model** icons allow you to hide or display a tissue. When a tissue is selected, the eye changes to “show” automatically. The  indicates that tissue is displayed on the image. The  icon indicates that a tissue is not displayed.

Operations on Tissues

A set of operation buttons is available below the tissue list.



-  Merge between selected tissues
-  Subtract between two selected tissues
-  Expand or  Erode selected tissue
-  Create hollow tissue from selected tissue
-  Fill holes
-  Tissue Properties
-  Delete selected tissues (also available from context menu)

In addition, the following operations are available from the Tissue List context menu:

-  Rename (valid only for single tissue selection)
-  Delete (valid on any number of selected tissues)
-  Merge

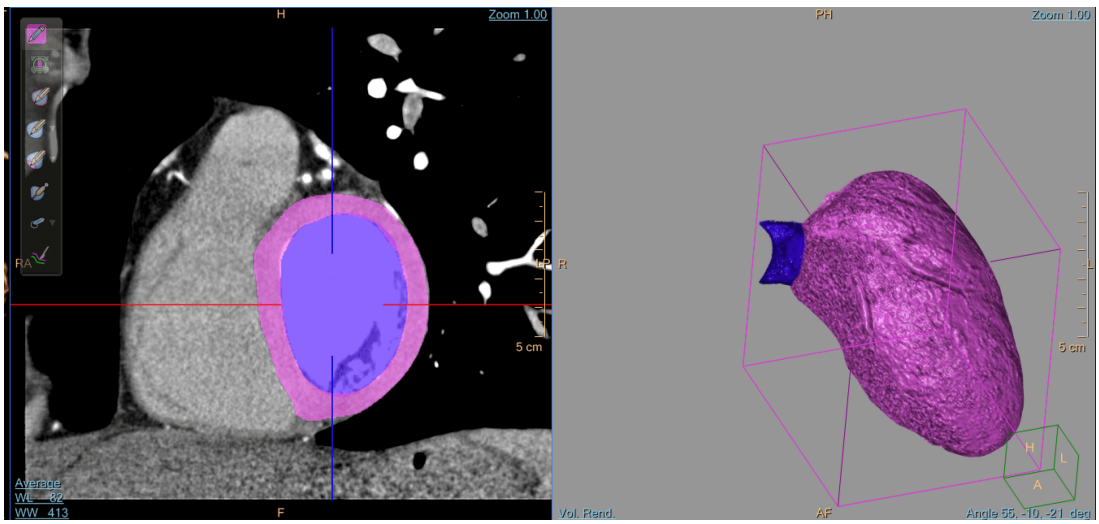
-  Subtract (valid if more than one tissue is selected), for CT (Valid if exactly two tissues are selected)
-  Duplicate (valid only for single tissue selection)
-  Tissue Properties (displays different properties for single and multiple tissue selection)
-  Display only selected tissues (valid on any number of selected tissues)

NOTICE

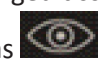
The Undo / Redo option is available within the floating toolbar shown on the viewports, in the Control Area and using the key board short cuts (CTRL+Z and CTRL+Y).

Merge

1. Select two or more tissues (the examples below display the merging of the LV and the Myocardium LV).



2. Press the  **Merge** icon.

   A new tissue is created with the merged results. A new Merged tissue appears in the Tissue List. The original tissues remain in the list but are marked as  hidden. The new tissue is automatically named **Merged Tissue1 Tissue2**.

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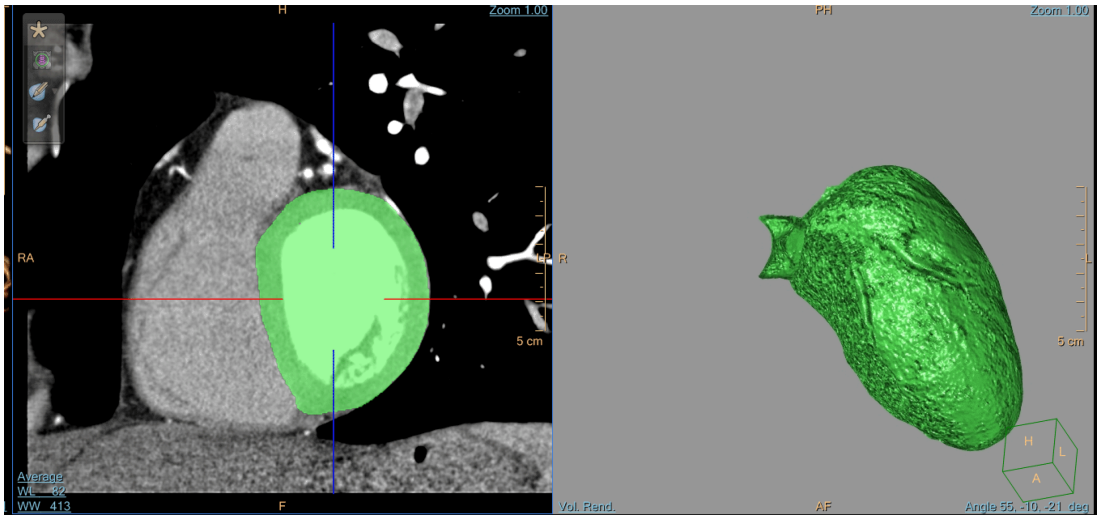
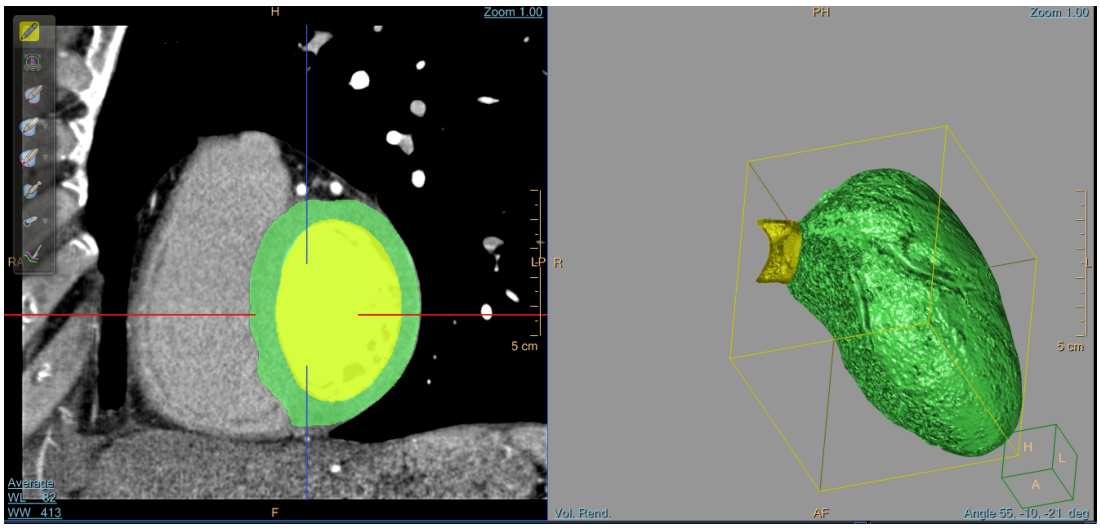


Subtract

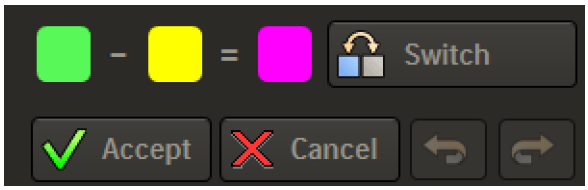
Subtract is important for 3D printing to avoid overlapping of tissues.

1. Select two tissue that are overlapping.

   In the example below the Left ventricle will be subtracted from the Myocardium LV (which is filled). The result is the Left Ventricle including the wall and Left Ventricle cavity.

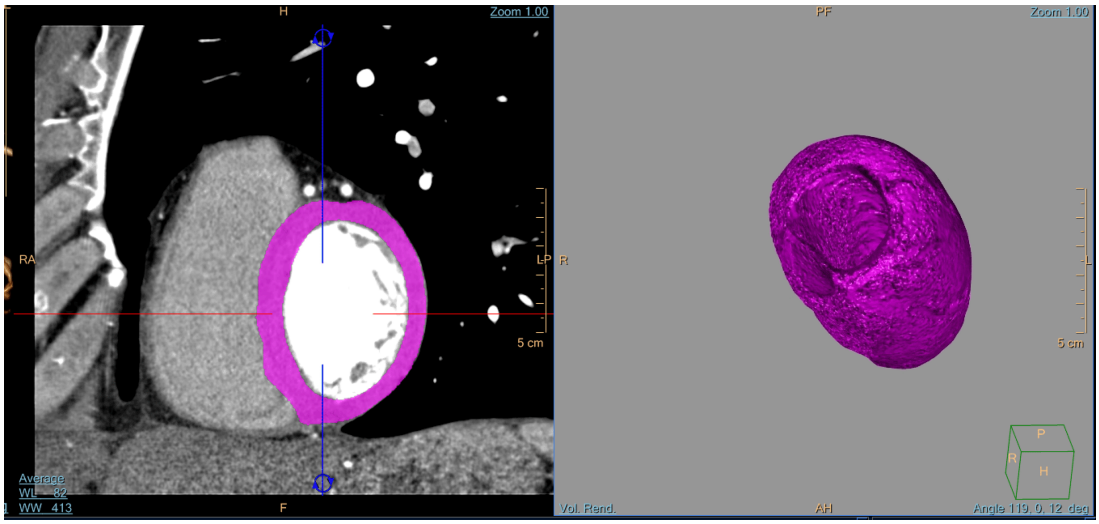


2. Press the  **Subtract** button.
3. A new tissue is created and the following appears below the Tissue List buttons.



4. If necessary, switch the subtraction order using the **Switch** button.

   The tissue is displayed on the volume viewport and on the MPRs. The name of the subtracted tissues started with the word "Subtracted".



5. Once the result is acceptable, select the **Accept** icon below the Tissue List buttons. If the result is unacceptable, select the icon.

Expand

Select a tissue and press **Expand**.

The tissue expands (one pixel at a time).

Erode

Select a tissue and press **Erode**.

The tissue erodes (one pixel at a time).

Make Hollow

1. Select a tissue and press the **Make hollow** button.

   A new tissue is created. This is the wall around the selected tissue. The initial wall thickness is one pixel – a parameter dialog opens.

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2. If necessary, change the wall thickness using the **Wall Thickness** slider.
3. Press  . The hollow tissue is displayed.

Fill Holes

1. Select a tissue and press the  **Fill holes** button.

   The fill hole algorithm is applied to the selected tissue, all the cavities inside the volume will be filled (not dependent on size).

Delete

1. Select one or more tissues and press  Delete.

All selected tissues are deleted.

Tissue Properties

The Tissue Properties window includes the following parameters:

- Tissue name and color (opens the tissue color window)
- Tissue type - Includes the following options for selection: Bone, Vertebra, Disc, Cartilage, Vessel, Organ/Soft tissue, Tumor, Lesion, Calcium, Blood Pool, Adult Heart, Pediatric Heart, Connective Tissue, Instruments, Other (default).
- Tissue characterization - Options are dependent upon the tissue type.
- Print hardness - Options include Rigid or Soft.
- Tissue Transparent - Options include Yes or No.
- Tissue volume - information only.
- Comments (includes checkbox to **Include comments in PDF**)

Volume and HU Information for Tissues

If more than one tissue is selected in the Tissue list, when the Tissue Properties is selected (via icon or context menu), the application displays a table for the selected tissues with the Volume and Mean intensity (HU for CT) and the total volume.

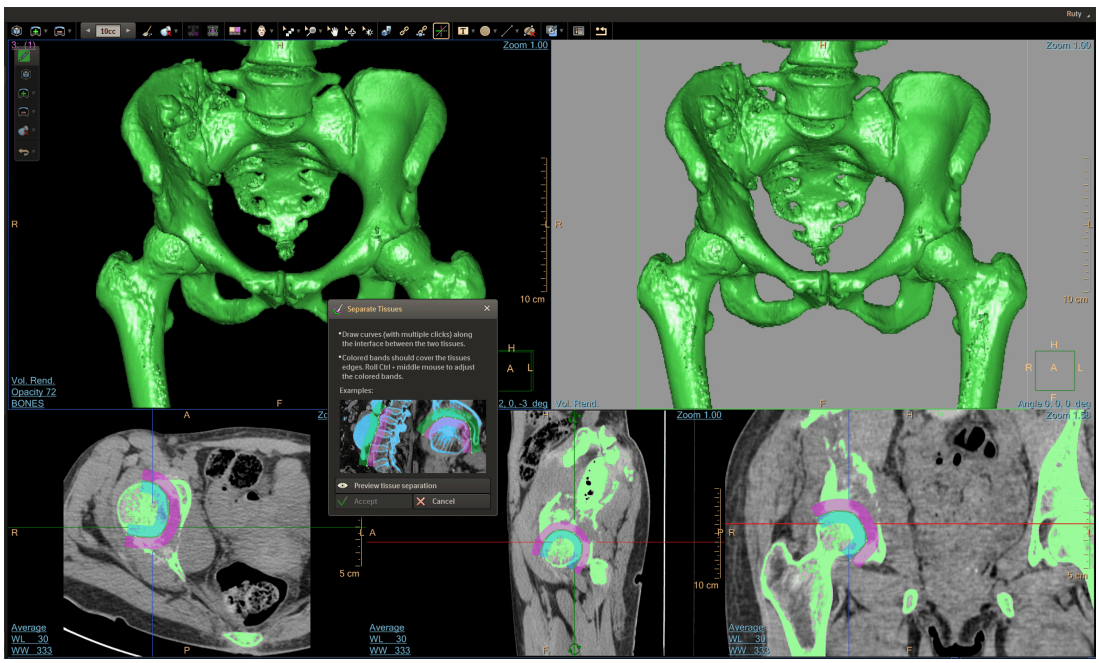
Tissue Separation

The Tissue Separation Tool is a smart algorithm that can separate between adjacent parts that have a similar intensity. The tool is available on CT and on MR tissues, and it is enabled only in the Single Layout mode. It is useful in situations, such as, separating a femur from a pelvis, or separating between vertebras. It can also work on tissues other than bone.

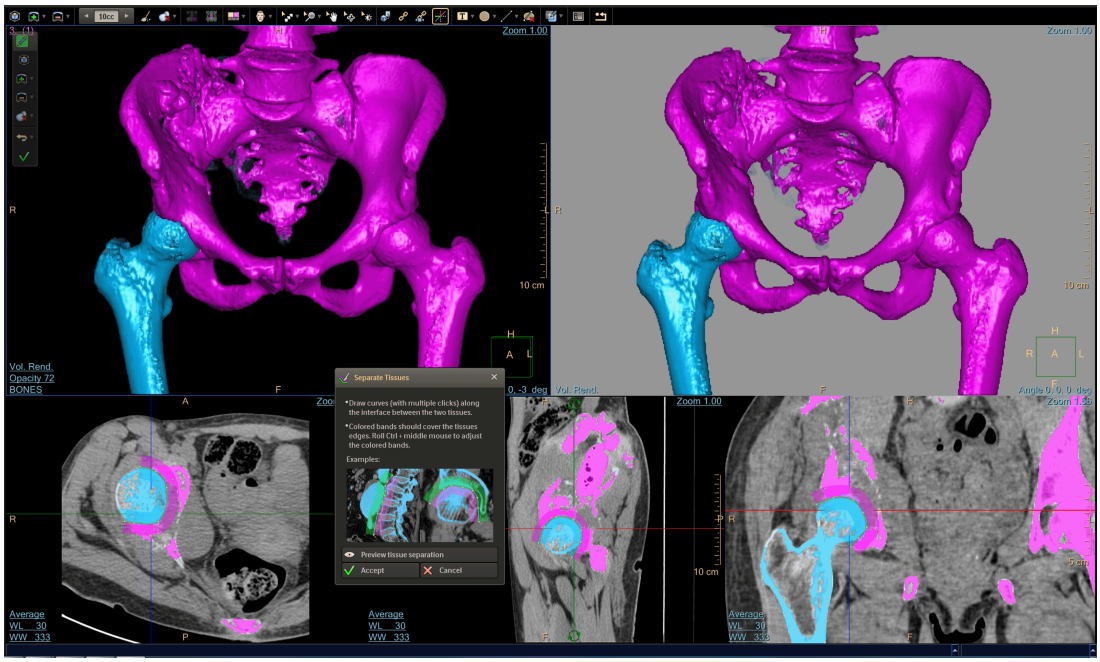
The recommended work flow is as follows:

1. Use the  cube or  sculpting tool to focus on the area of interest.
2. Create a tissue using either  Volume threshold or  “Smart threshold”.
3. Click  to accept the tissue.
4. Select the created tissue from the Tissue List.
5. Scroll the MPRs and find a slice where the separation line is shown clearly. If possible, review in more than one orientation.
6. Select the  separate tissues tool and draw a line between the parts that need to be separated.

   There will be two thick lines with different colors on the two sides of the central lines. Each side will create a tissue.
7. Draw another separation line on the other orientation (if relevant). Check that the colors are consistent with the tissues, if not –right click and switch between sides. Using the mouse wheel when drawing the separation line can change the thickness of the colors.



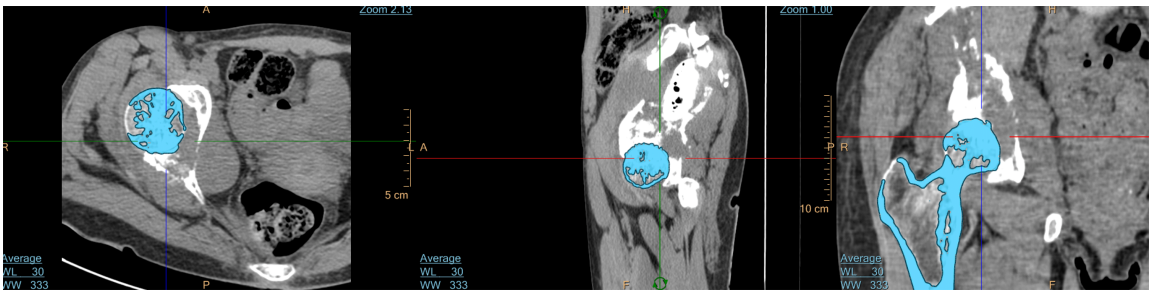
8. In the Separate Tissues parameter dialog, click the  Preview button. Note: The  Accept button is enabled only after preview is applied.
9. The algorithm calculates the separation and displays the results – see below.



10. If results are acceptable, select  to accept. If further changes are necessary, continue editing the separation lines – you can add, remove or modify them. For complex separations –several lines may be needed on different slices.

Mesh Preview and Quality Control

Once the model is created, select  **Preview as mesh in the model viewport** in the control area to preview the calculated mesh and refine parameters. Use the **Show mesh contours** button to display mesh contours on top of the tissue overlay.



The application calculates the tissue surface and displays them on the model viewport with default smoothness (Medium) unless modified by the user.

- When in Mesh Preview, in order to also display the mesh contours on top of the tissue overlays on the MPRs. These contours can be used to inspect if any inaccuracy occurred due to “over smoothing”. Scroll through the slices and zoom to verify that mesh is acceptable.

- Clicking on the model viewport while in “Mesh Preview” opens the **Mesh Attributes** floating tab. This allows the user to modify tissue smoothness. User can also modify the level of size reduction from the same floating toolbar. There are three levels of smoothing available:
  - **High** – Maximal smoothing provides a very smooth surface, This mode is optimal for smooth organs, such as Livers, since the resolution derived artifacts are removed form the surface. When used on small fragmented surfaces, this may lead to a reduction in accuracy.
  - **Medium-High Between Medium and High**
  - **Medium** – Smoothing with improved accuracy.
  - **Medium-Low Between Medium and Low**
  - **Low** – Minimal smoothing keeps close track of the original contours of the segmented tissue. For very small detailed tissues, such as blood vessels, it is recommended to use low.
- **Mesh size** – Allows the user to control the size of the output data.

NOTICE

The size is presented with a number of “faces”. The actual size of the file is also impacted by the selected format. Size reduction is calculated by using smart polygon size according to the curvature level of the surface. When exporting only 3D PDF for communication, it is recommend to reduce the file size significantly.

-  **Show polygons on mesh** – Allows the user to display mesh polygons on the surface for advanced inspection. This feature is for viewing only.

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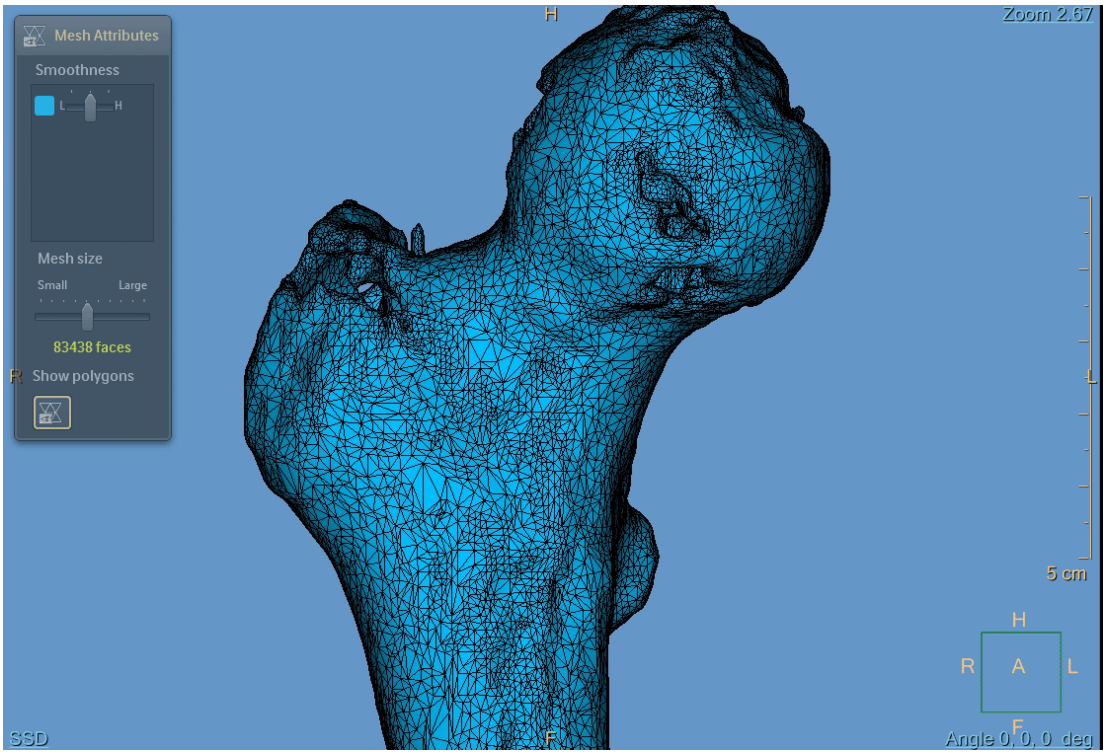


- For all changes, the mesh is re-calculated, which may take time.

Batch Creation

The **Create Movie or Series** button is provided to create batches from each of the viewports.

Import 3D Model

This feature imports STL files created for the same series and enables viewing their contours on the MPR. This assists for verification purposes if the tissue STL was modified after export.

- Imported tissues are visible only when **Preview** and **Show contours** are activated. They appear as surface only and do not have “bit volume”, meaning that they can be viewed, but not edited and smoothness cannot be changed.
- Meshes from STLs can be imported.
- This option is enabled in single series mode (disabled if multiple series were launched).

Importing a 3D Model

1. Select the  **Import 3D Model** button.

   The **Import Tissues** window opens.

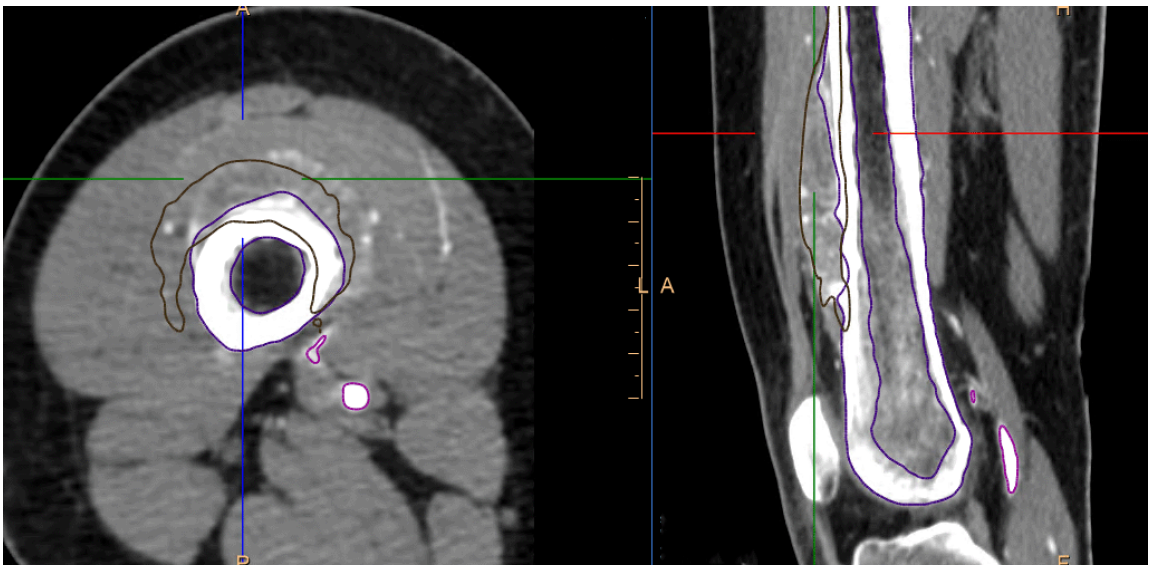
2. Select the **Browse Files** button and select the STL files (one by one) to be imported.

   Imported tissues are listed in the **File list**.

   If necessary, use  to remove unwanted tissue from the **File list**.

3. Review the tissue in the **File Preview** window and select the **Import** button to import the tissue.

   The Imported tissue name appears below the preview image. The name starts with the word **Imported**. Imported tissues are displayed as contours.



Export to 3D Model

When this button is selected, the Export to 3D model window opens. This is a preview of the model.

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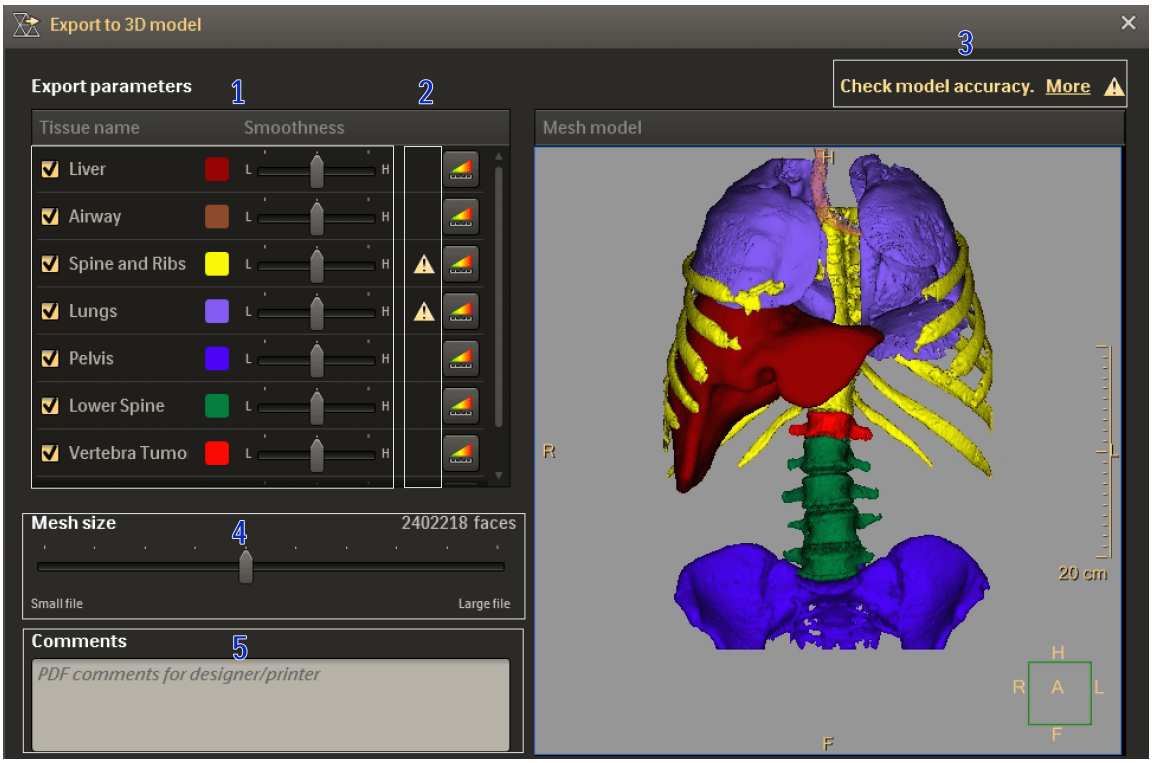


In the model preview panel all of the tissues that were included when the export dialog was invoked are displayed. The user can zoom, pan and rotate the model to review how it looks.

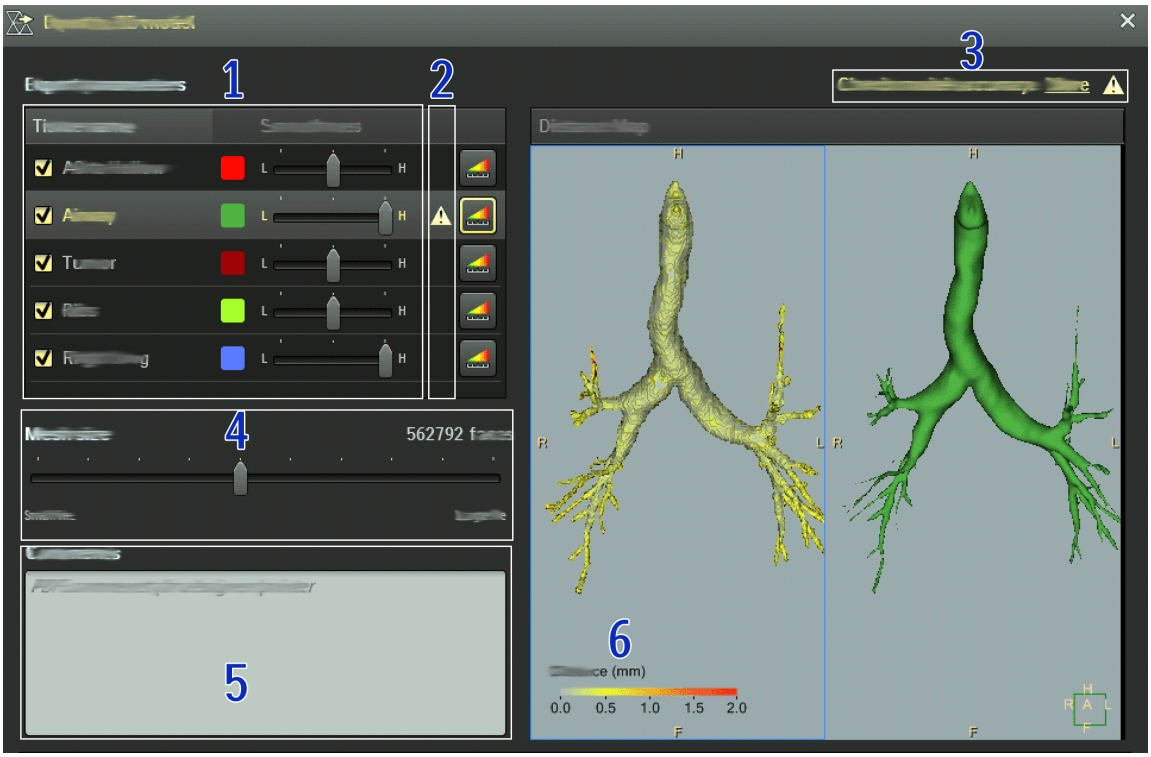
Tissue List

The included tissues appear in the list (#1) with their colors and names. The tissue color or name cannot be changed from this dialog, but can “hide/show” each of the tissues by clicking on the eye icon and can change the smoothness of each tissue by moving the slider. For all changes in Smoothness, the mesh is re-calculated and displayed again.

Check Tissue Accuracy

When smoothing is used, the application checks the accuracy level of the smoothed tissue by calculating, for each pixel, the distance between the location of a point on the unsmoothed surface to the smoothed surface. If the application suspects that there might be an accuracy loss, it will show a warning indication near the tissue (#2) and also on the top of the dialog (#3). Pressing on the **More** button will display the rationale for the warning.

The user can press on the  **Display distance map** button near the tissue in order to see the following comparison image.



On the left side of the image, the color map represents the distance of each pixel displayed on the unsmoothed image, while on the right viewport, the smoothed image is displayed. This allows the user to inspect the potential inaccuracy and modify the smoothness based on the user's understanding.

Mesh Size

To reduce the output size (image compression), move the slider (#4) to the right. For all reduction actions, the entire model is recalculated with the new compression value and is displayed on the tissue model viewport.

Comments

Free text can be added in the Comments section (#5). This text is included in the 3D PDF.

Identifier and De-identify

- **Identifier** - Define a prefix identifier for the saved model. This will be used as the folder name for the saved model.
- **De-identify**- De-identify the patient details in the exported STLs and PDF.

WARNING

This option will not de-identify the exported DICOM data.

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File Output

Select a file output type. Options include:

- File per tissue
- Single combined file
- 3D-PDF Only

Format

User can select the following export setting file formats:

- Binary STL
- ASCII STL
- Binary VTK
- ASCII VTK
- OBJ

Additional Output

Checkmarks can be placed in the following boxes:

- **3D-PDF** - Creates a 3D PDF file in the same folders as the STLs with the same prefix.
- **DICOM** - If check, the DICOM file is saved to the destination.
- **Backup on server** - If checked, an additional copy of the mesh file will be saved on the ISP server (primarily for backup purposes).
- **Save results** – The corresponding results (tissues) will be saved in the study with the identifier string

Destination

Select the **Browse** button to select any destination that is provided by the station currently in use. The output files are saved under the defined destination, under a folder that is created automatically by the application, which includes the patient name and study name. All the exported file names are constructed from the prefix, tissue name + date and time.

The application remembers the last destination used by the user and displays it the next time the application is used.

Saving Results for Later Use

The following save functions are available in Common Tools:

-  **Save selected image(s) as...** - Used to save currently selected viewports as different file formats.

-  **Save results as...** - When saving the results of an operation, the results are saved in DICOM format, with an identifying description. To restore all the work that was done within the application, select the saved results Series together with the original Series and open the application.

  When exporting 3D modes, there is an option to save results. This option is enabled by default.

-  **Save tissues as RT Structures** - Results are saved in DICOM standard RT STRUCT format (Radio Therapy structure format). This format provides the tissue volume as a set of contours.

-  **Save bookmark** - Opens the **Save Bookmark** dialog, with options to save the bookmark (or to save and email). The bookmark is saved to the default device and is associated with the patient study.

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