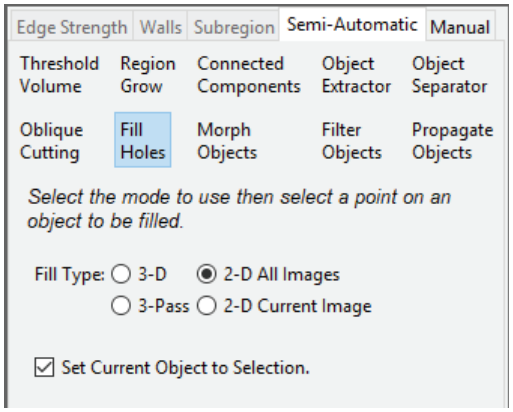
Fill Holes

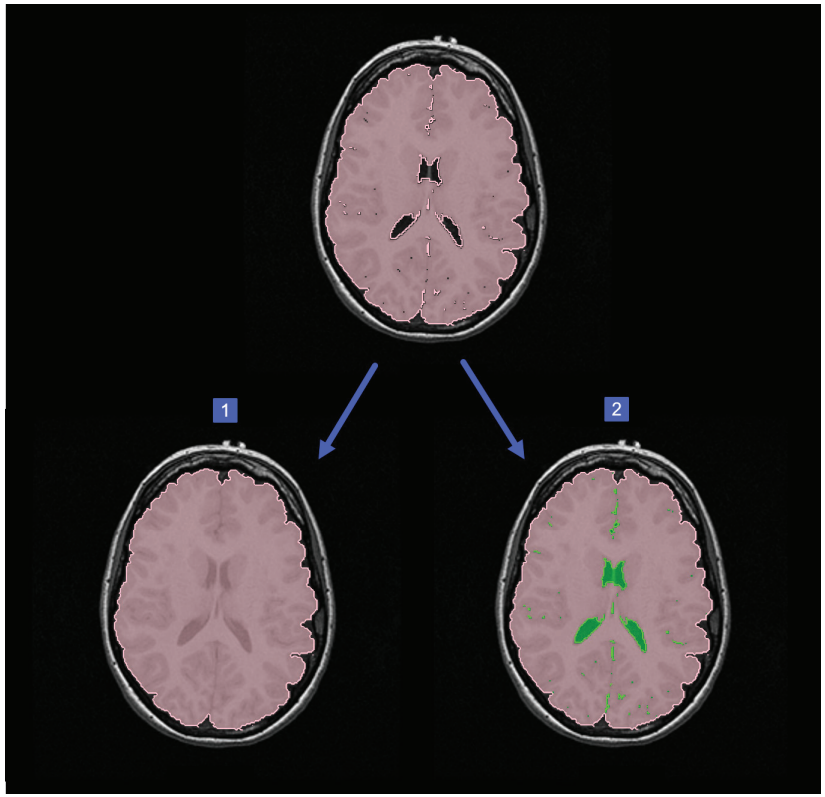


The Fill Holes function performs a flood-fill operation on the selected object. The operation reassigns voxels belonging to other objects to the selected object. The fill operation stops when it reaches the boundary of the object.

Fill Type: The fill type option allows users to select from the following fill type operations:

- 3-D: Fills three dimensional holes in the volume. This option is useful for filling small holes in the image data.
- 3-Pass: This option fills holes by process the volume, image by image in all three orthogonal directions.
- 2-D All Images: Conducts a 2D region fill on all 2D slices in the selected orientation.
- 2-D Current Image: Conducts a 2D region fill on the current 2D slice.

Set Current Object to Selection: Allows users to enable (default) or disable setting the filled region to the same object as being filled. Keep this option enabled if you wish to fill holes in an object and have them assigned to the same object [1], uncheck and disable this option if you wish to have the voxels that fill the holes in the object assigned to a different object, an object that is selected from the object list [2].



Filling Holes in Objects

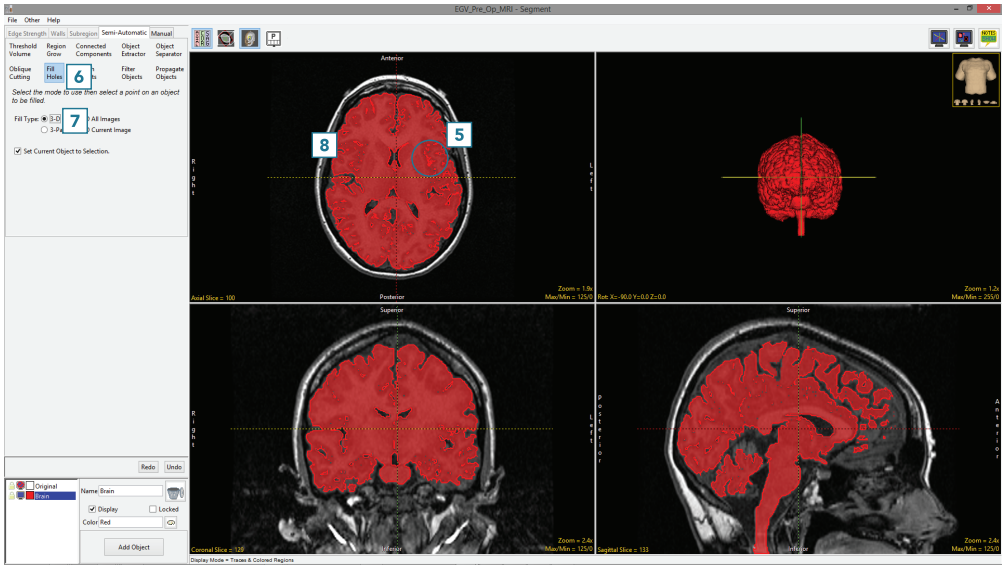
After the initial segmentation, an object may contain holes, which are voxels belonging to the Original object. To obtain an accurate volume measurement and to ensure the object is whole, it may be necessary to apply a fill holes operation on the object.

To follow along, download the data set EGV_MRI from analyzedirect.com/data and load into Analyze using Input/Output.

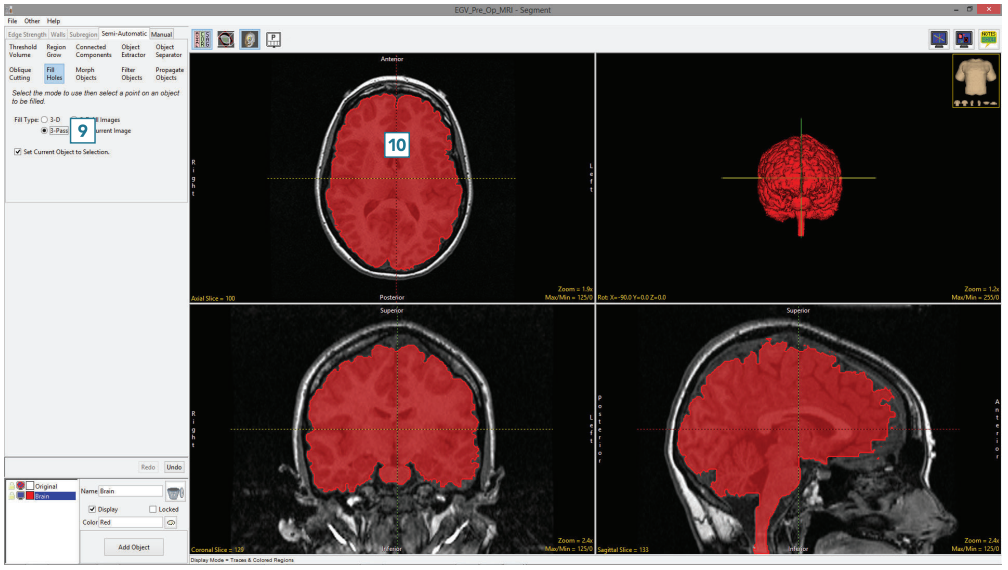
- Select the data set and open Segment.
- Select Semi-Automatic [1] and choose Object Extractor [2].
- Click on the image data to set a seed point.
- Adjust the minimum and maximum threshold values [3] to define the structure and select Extract Object [4].

Filling Holes in Objects (continued)

- To remove small holes in the object [5] which are a result of the segmentation parameters, select Fill Holes [6].
- With the Fill Type set to 3D, [7] click on the object to fill smaller holes in the object [8]



- To fill larger holes, such as the ventricular CSF, use the 3-Pass Fill Type [9] and click on the brain [10]. All larger holes will be filled and assigned to the object.
- Select File > Save Object Map to save your work.

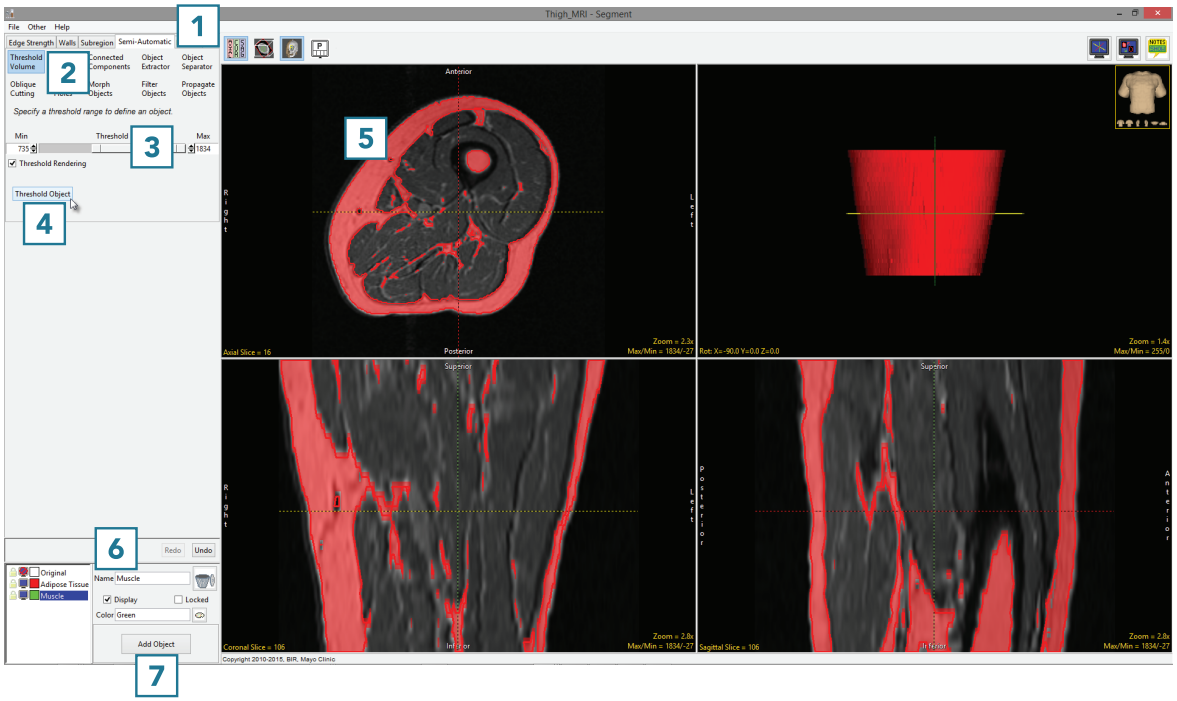


Using Fill Holes for Segmentation

The fill holes option can also be used as a strategy to segment multiple objects. In this example we isolate the adipose tissue via threshold-based segmentation from a water-suppressed MRI data set. We will then use fill holes to create the muscle object and the intramuscular adipose tissue object.

To follow along, download the data set Thigh_MRI from analyzedirect.com/data and load into Analyze using Input/Output.

- Select the data set and open Segment.
- Select Semi-Automatic [1] and choose Threshold Volume [2].
- Set a threshold range [3] to globally segment the adipose tissue and click Threshold Object [4].
- The adipose tissue will be segmented [5].
- Rename the object [6], add a new object [7] and name it Muscle.



Using Fill Holes for Segmentation (continued)

- Select Fill Holes [8] and set the Fill Type to 3-Pass [9].
- Uncheck the Set Current Object to Selection [10] checkbox.
- Ensure that the Muscle object is selected [11] and click on the Adipose Tissue object [12]. The voxels inside the Adipose Tissue object currently assigned to the Original object will be reassigned to the Muscle object [13].
- To assign the voxels labeled as Adipose Tissue within the Muscle object to Intramuscular Adipose Tissue (IMAT).
- Add a new object [14] and name it IMAT.
- Click on the Muscle object to fill it [15]. The voxels inside the Muscle object currently assigned to the Adipose Tissue object will be filled and assigned to the IMAT object [16].
- Select File > Save Object Map to save your work.