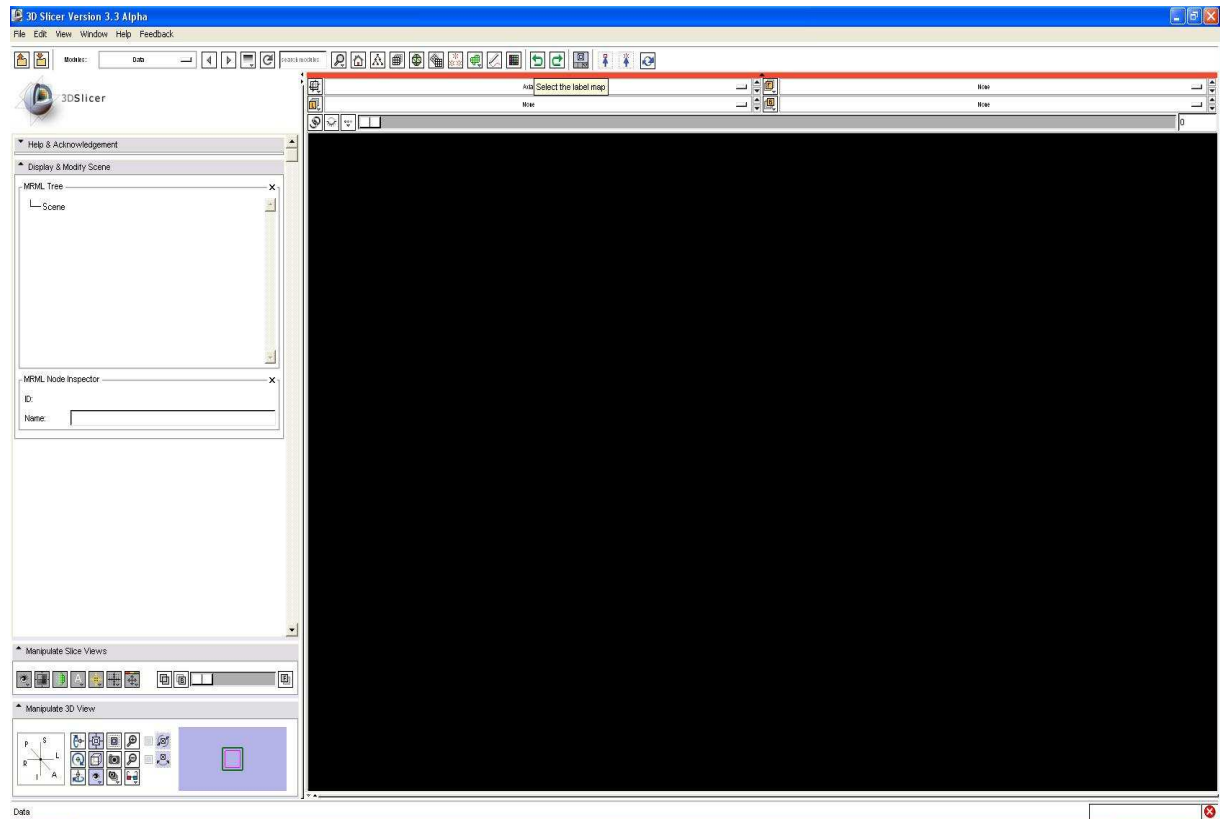
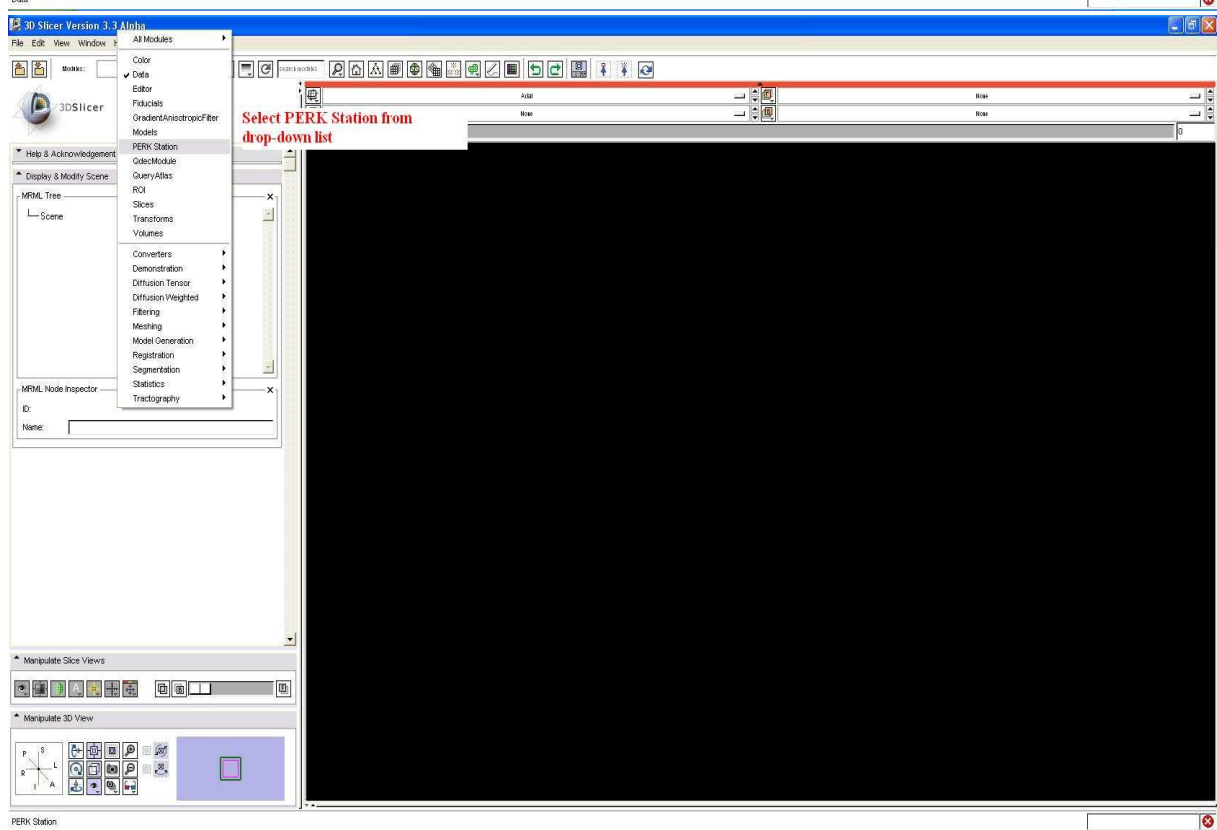
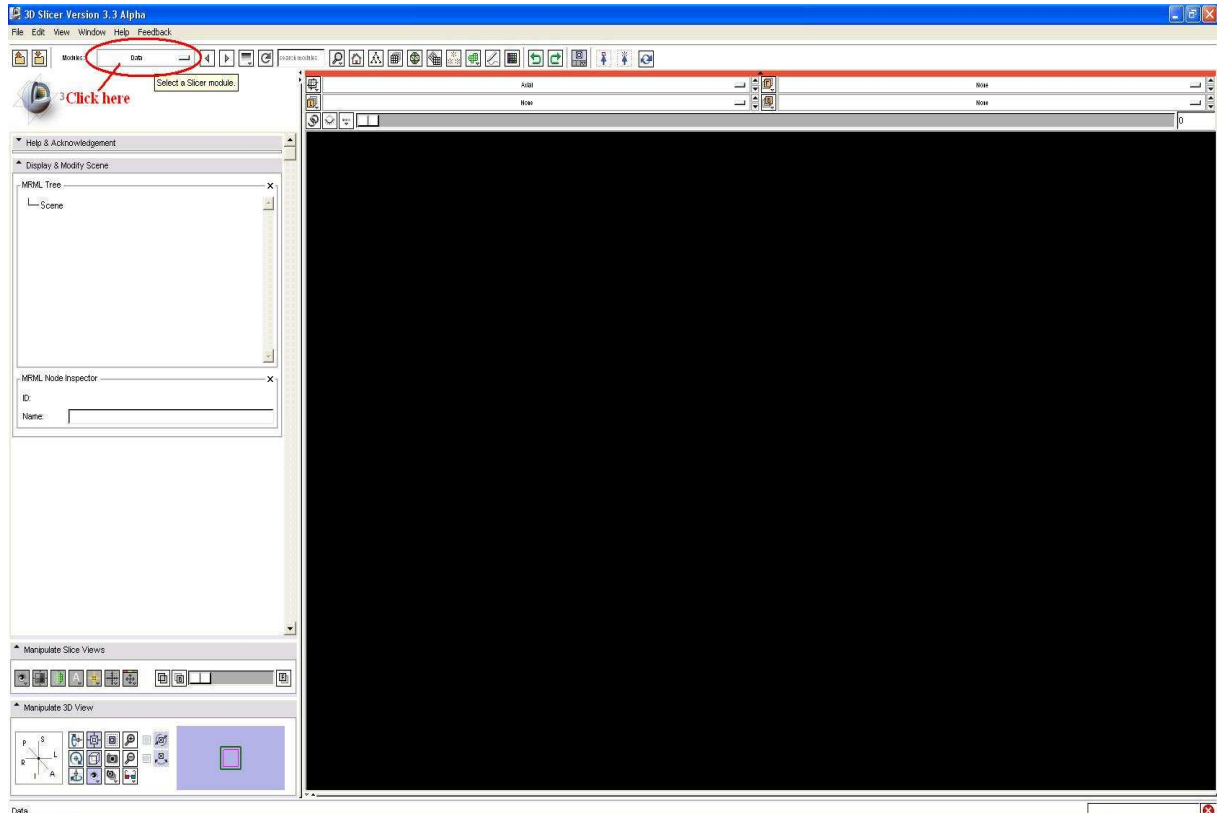


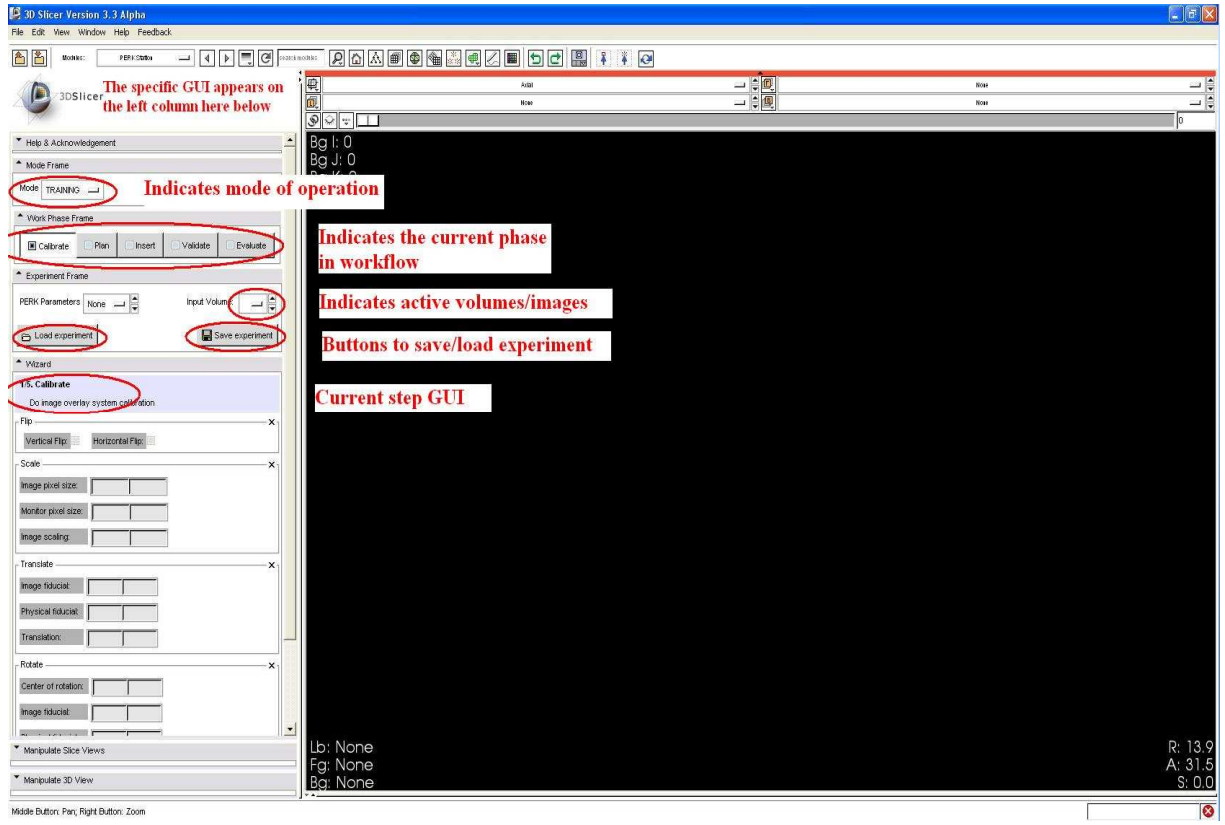
PERK STATION Workflow/Usage Tutorial

1. Before start, make sure:
 - 1.1. Secondary monitor is powered on, and is connected to the laptop via DVI/VGA cable
 - 1.2. Set up multiple monitors (laptop screen and secondary monitor) in 'Dual view' (independent) mode
 - 1.3. External keyboard is plugged in
2. Start SLICER by double clicking exe file. SLICER will load, will take a couple of minutes, and when it is loaded up, it should look like Snapshot 1 below:

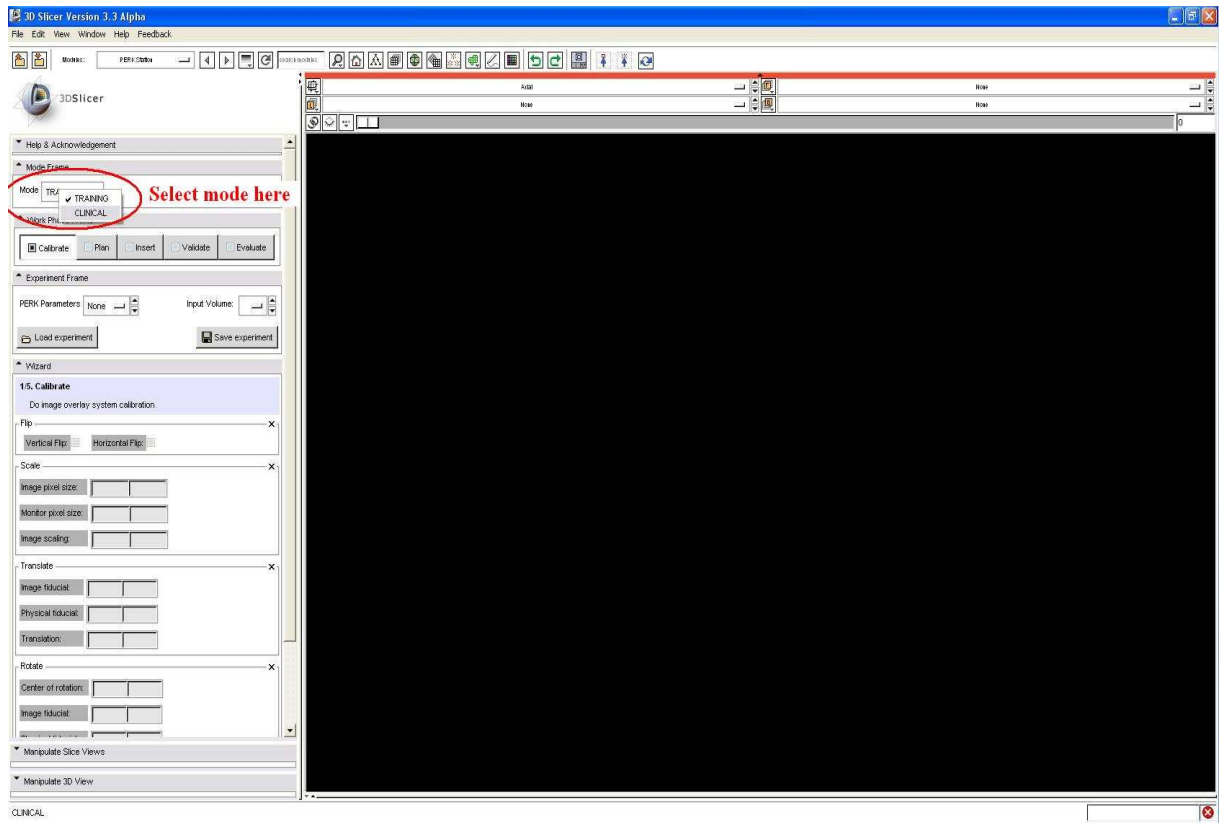


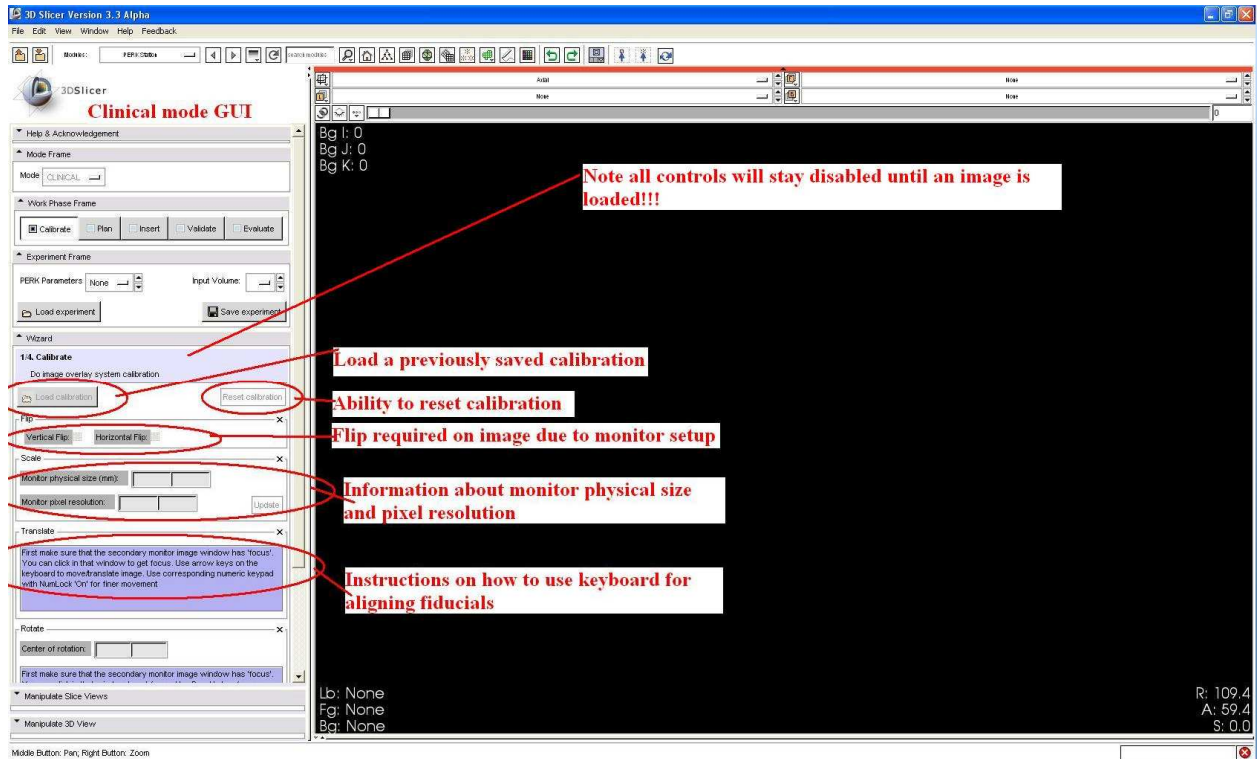
3. Select 'PerkStation' module from module drop down list, as shown in next three snapshots



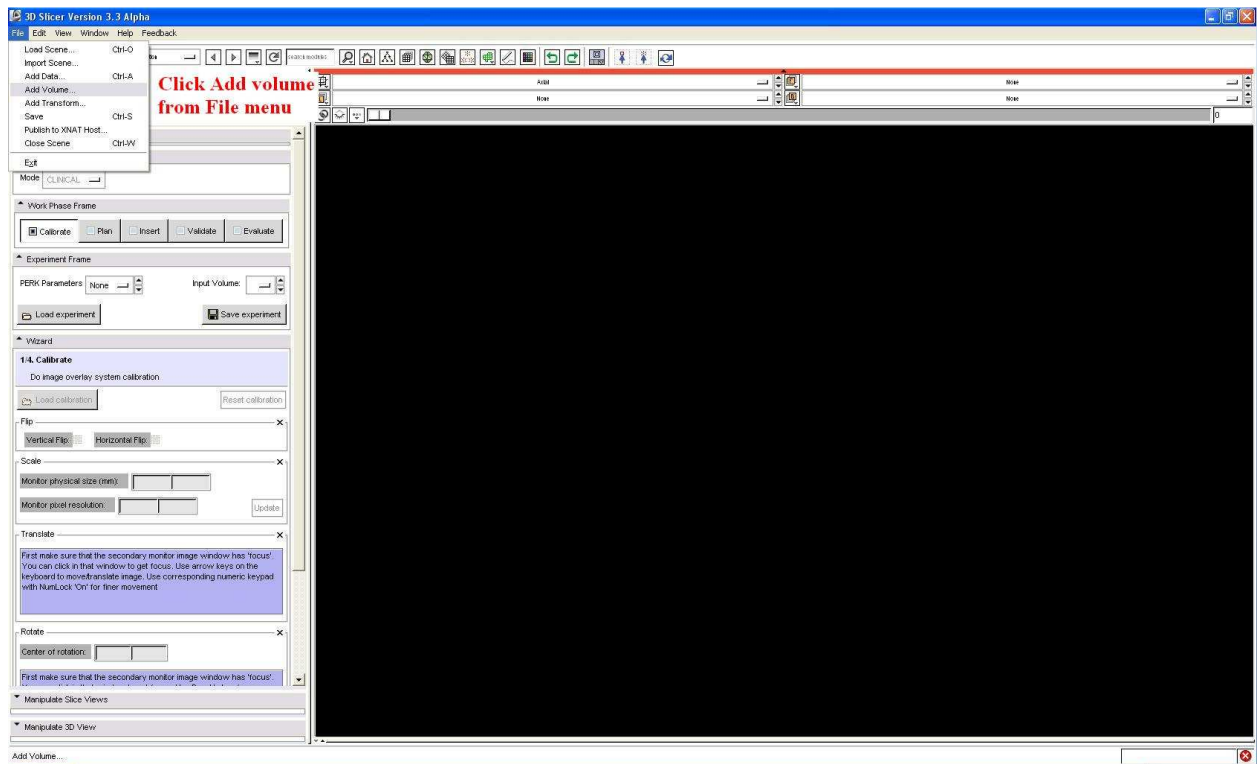


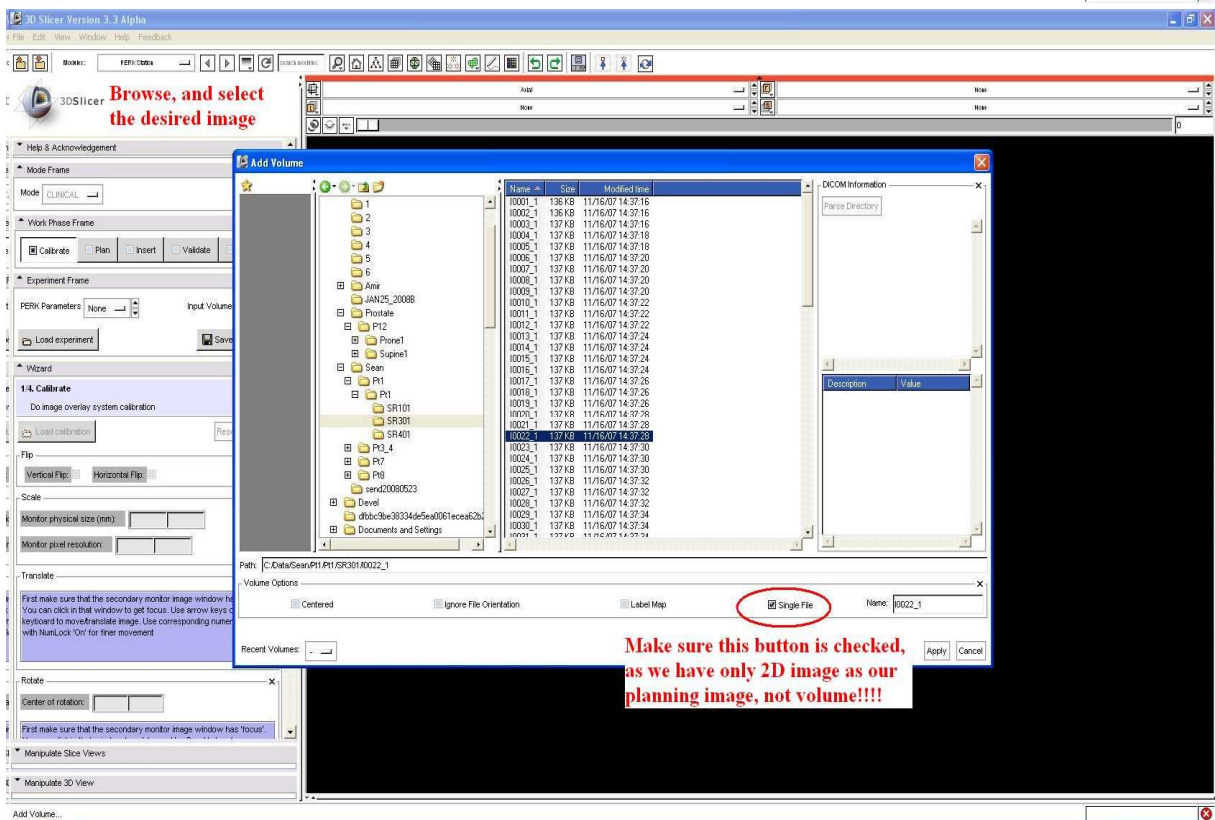
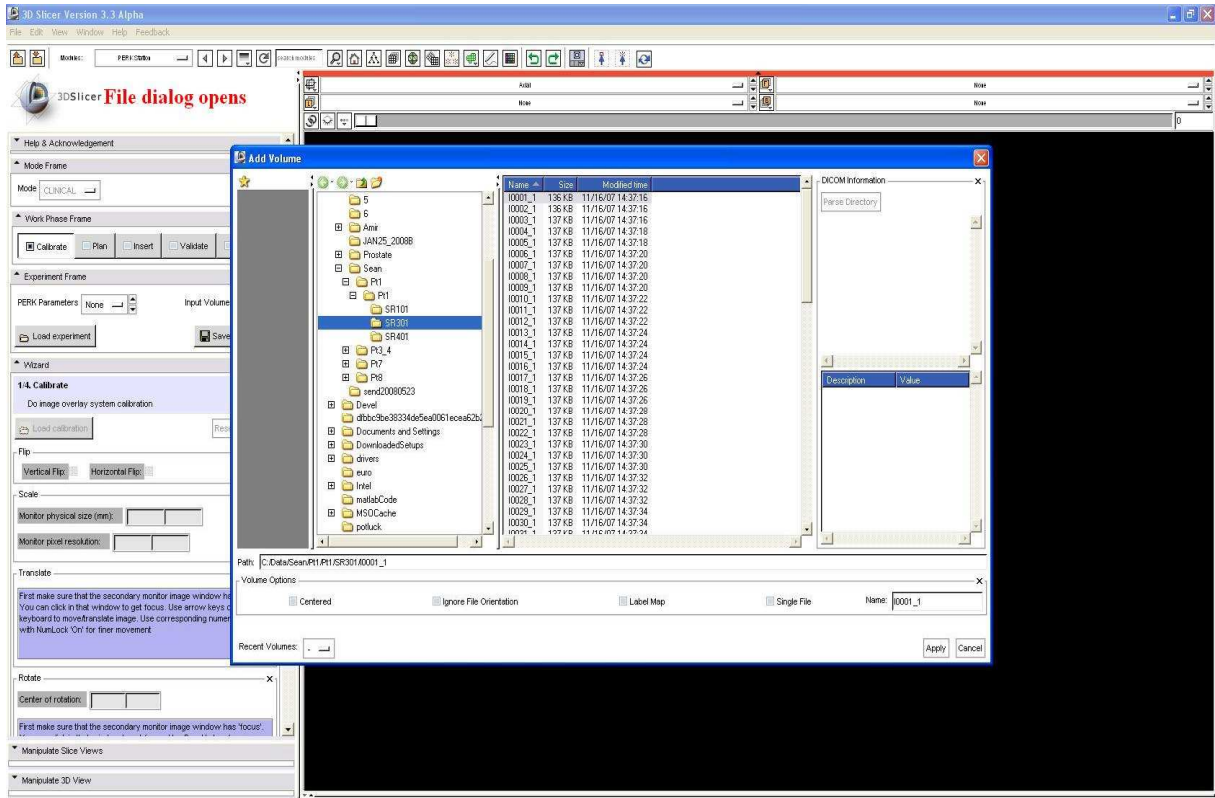
4. Select 'Clinical' mode from mode drop down list, as shown in next two snapshots below

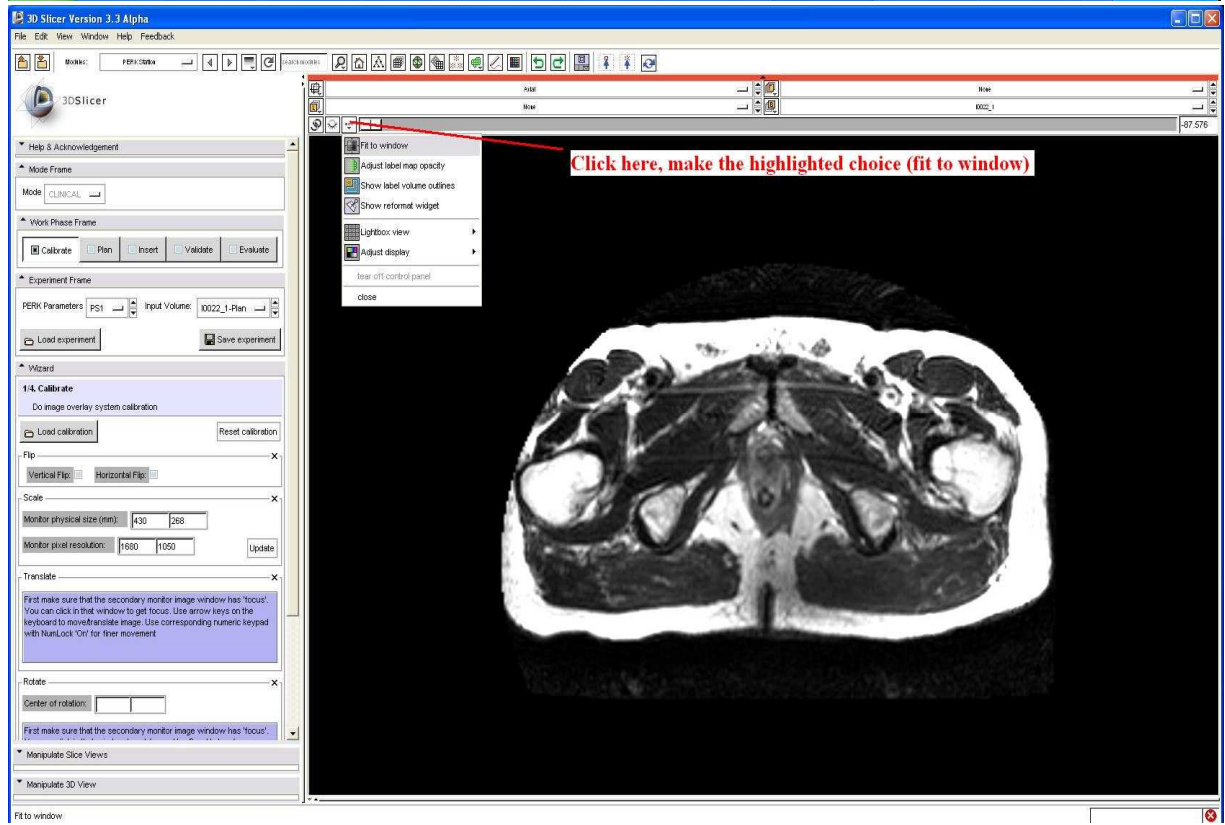
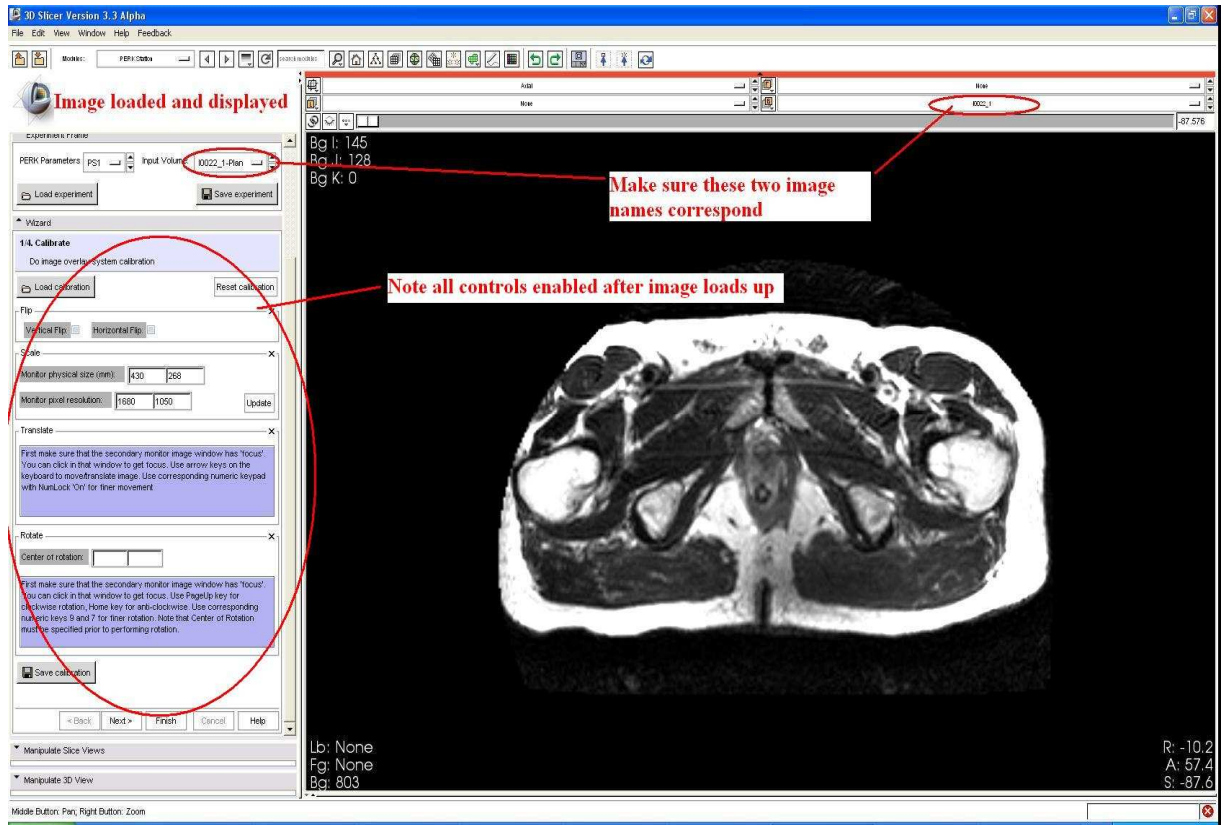




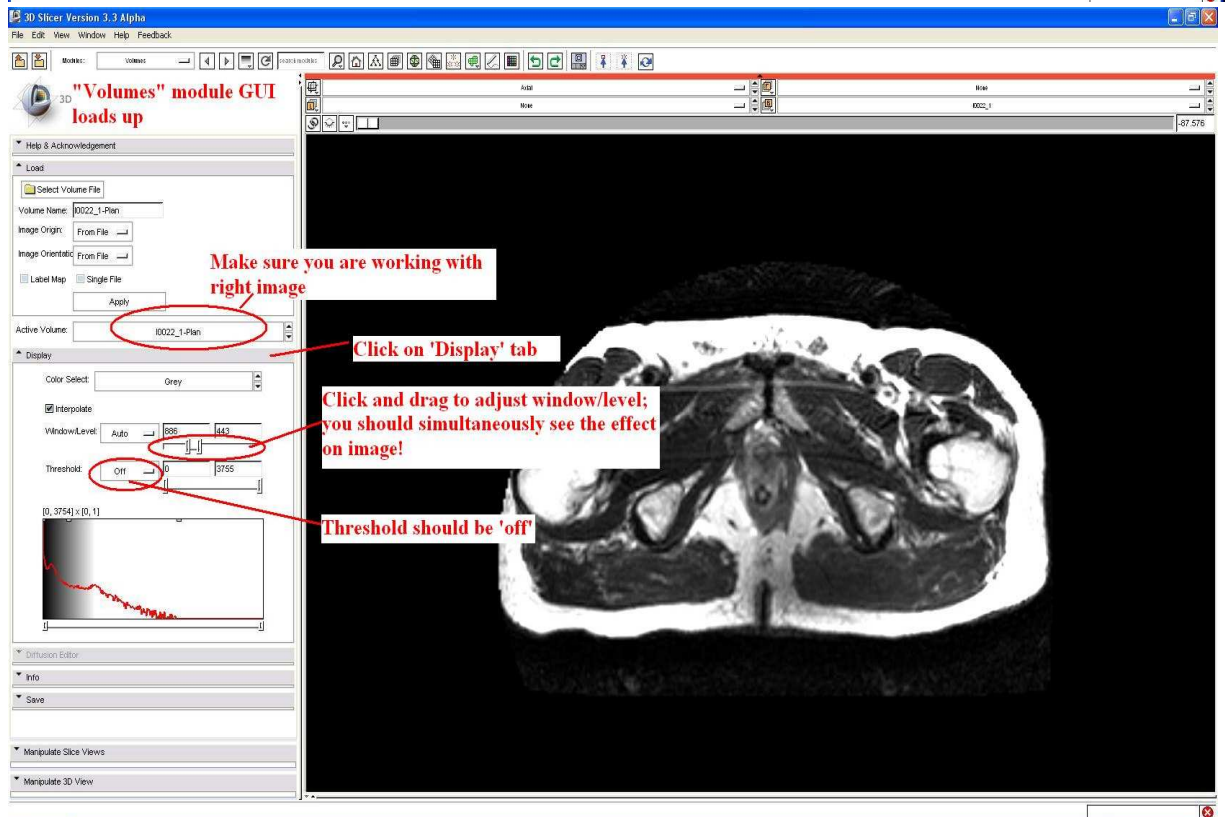
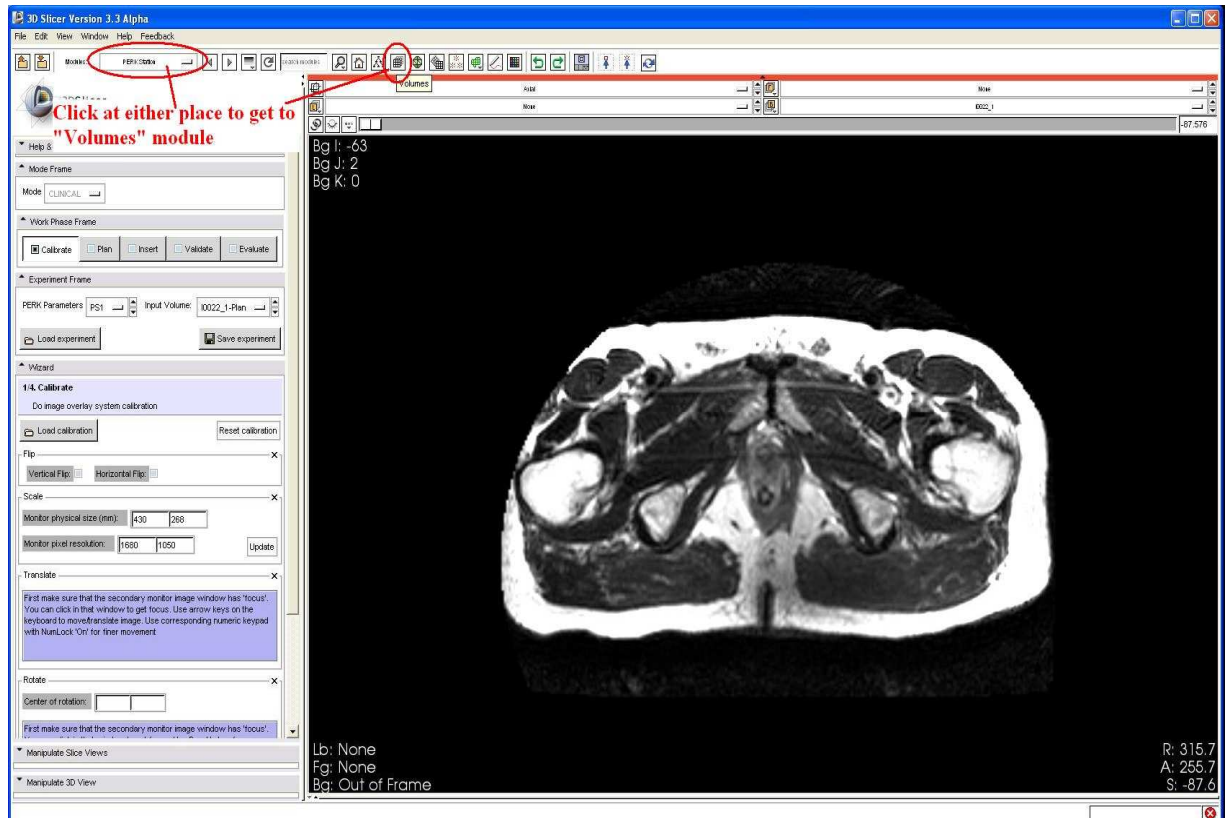
5. Add 'Planning' image to software, as shown in next five snapshots. Note, at the end of this step, the secondary monitor should have corresponding image displayed!! If it doesn't then try switching off/on the monitor!!

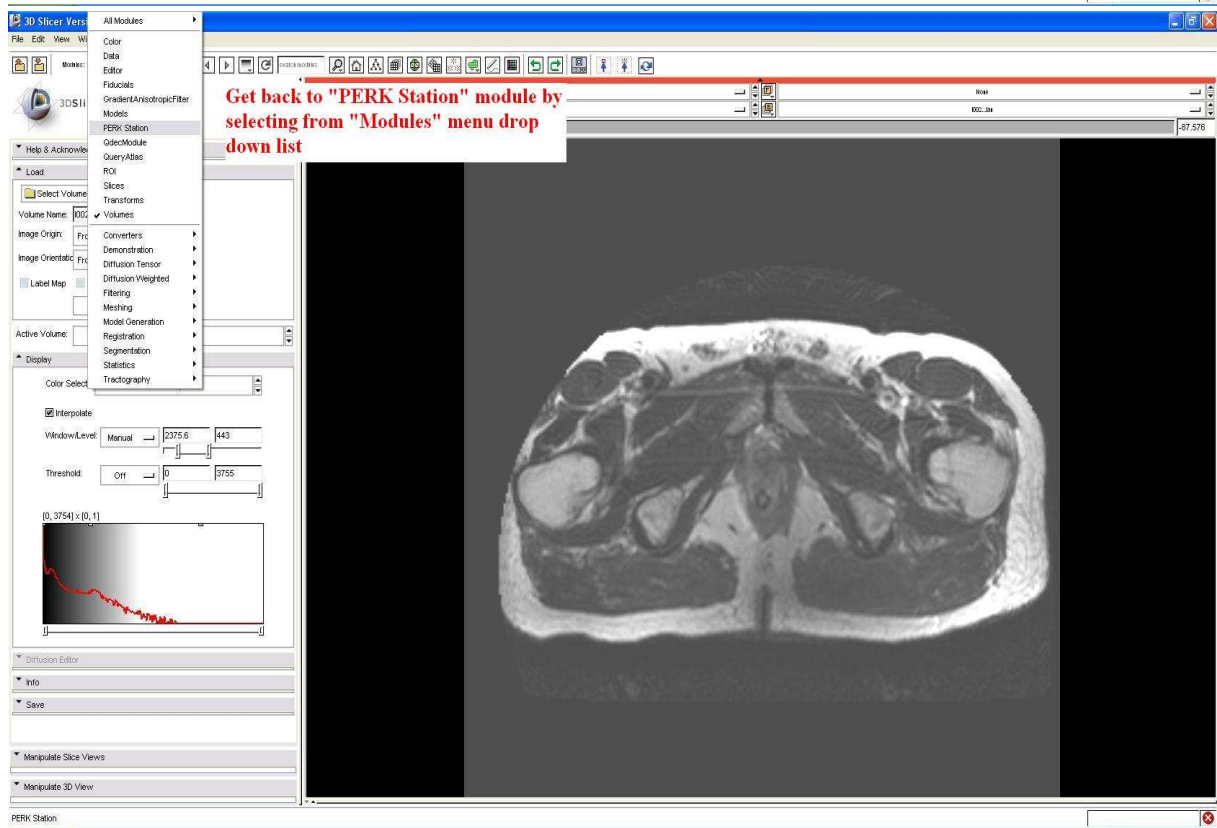
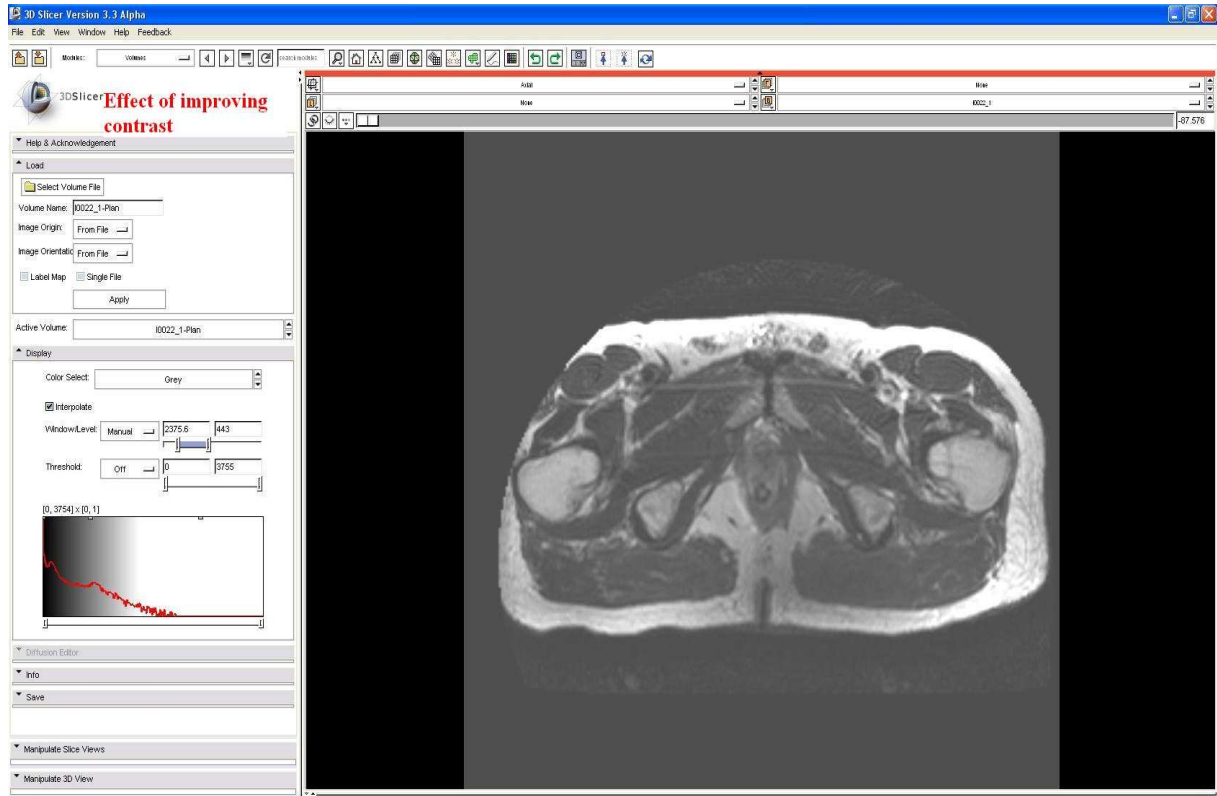






- Adjust 'Contrast', if you can't see the image properly, as explained in following four snapshots. Adjusting contrast here should reflect both in laptop, and on the secondary monitor inside scanner room.





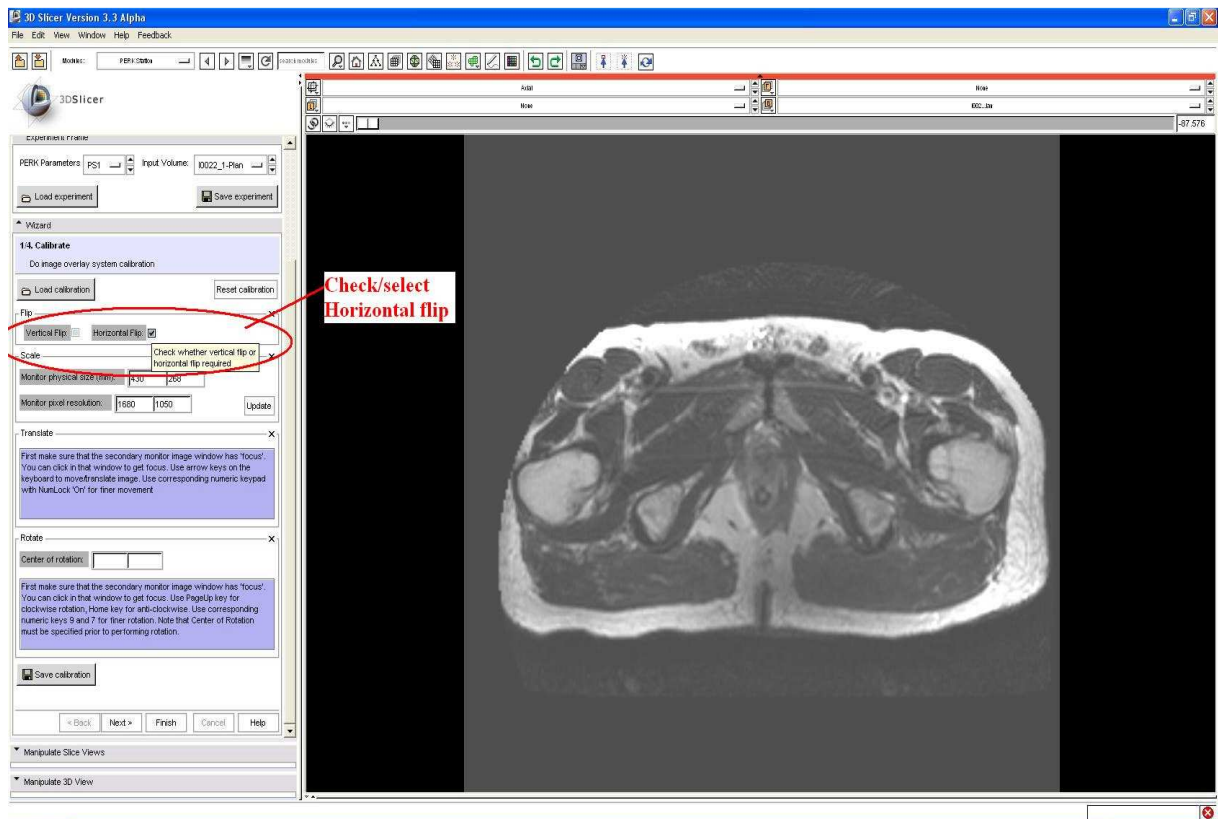
7. Start experiment!!

7.1. First step, calibration:

Note, here one person is required to work on laptop outside scanner room, and the other person should be inside the MR scanner room to do system calibration.

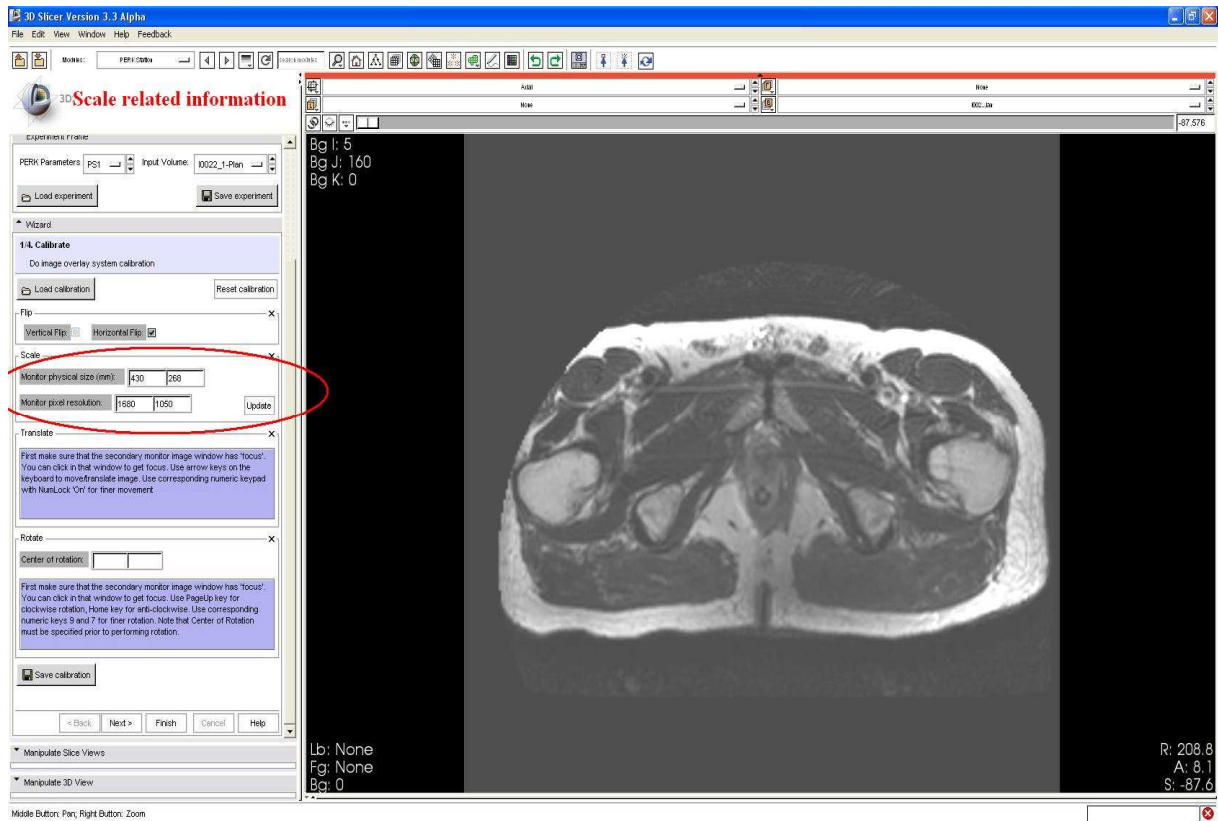
7.1.1. Flip: Compensate for monitor arrangement! In our setup we need “Horizontal” flip, see snapshot below.

This step is done by the user working on laptop outside scanner room! After performing this step, this person should communicate with person inside the scanner room, to verify that Up/Down and Left/Right is correct as seen through the mirror!. To both users, the image should look identical in terms of axis, as seen on laptop and as seen through mirror.



7.1.2. Scale related: Make sure, all the information about the secondary monitor, its' physical size in millimeters, and its' pixel resolution is correct. This information is used to calculate correct scale needed to display image in correct physical dimensions. If the information is not correct, edit it, and press “Update”. See snapshot below

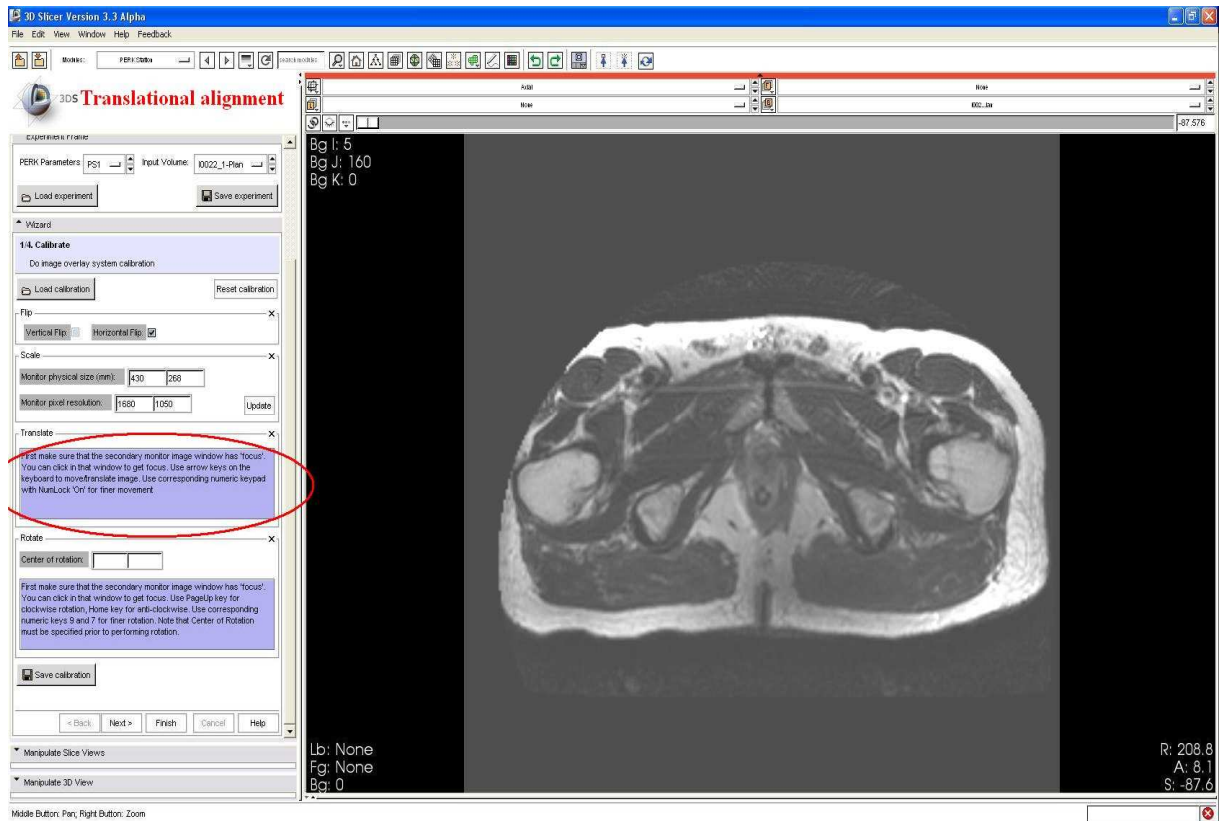
This step is done by user on laptop outside the scanner room. After this step, the image should be displayed in correct scale, and should be verified by communication with person inside the scanner room!



7.1.3. Translational alignment: To align fiducials on image, and fiducials as seen through mirror, translation may be required. Read the instructions carefully. I print them again here: “First make sure that the secondary monitor image window has ‘focus’; you can click anywhere in that window to get focus. Now, use arrow keys on the keyboard to move the image in four possible directions. Use corresponding numeric keypad keys for finer movement”. See snapshot below

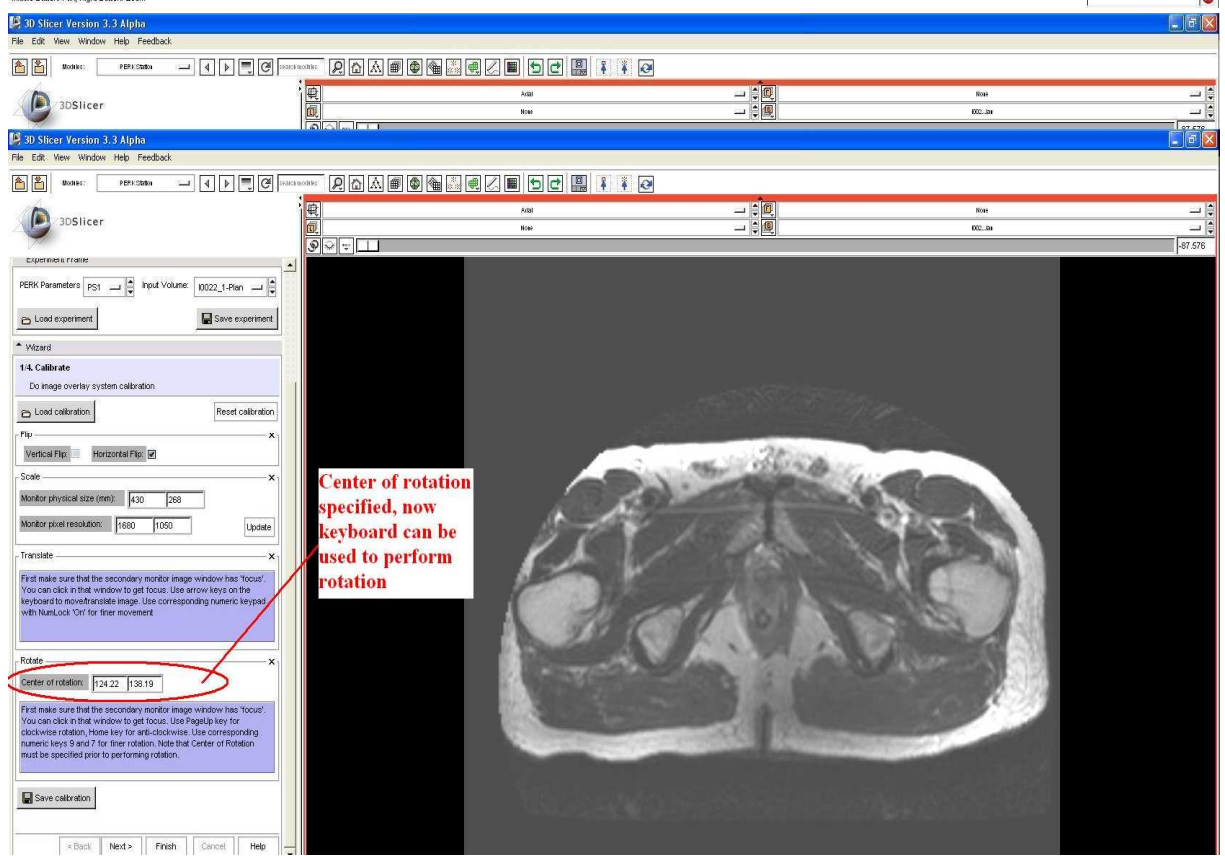
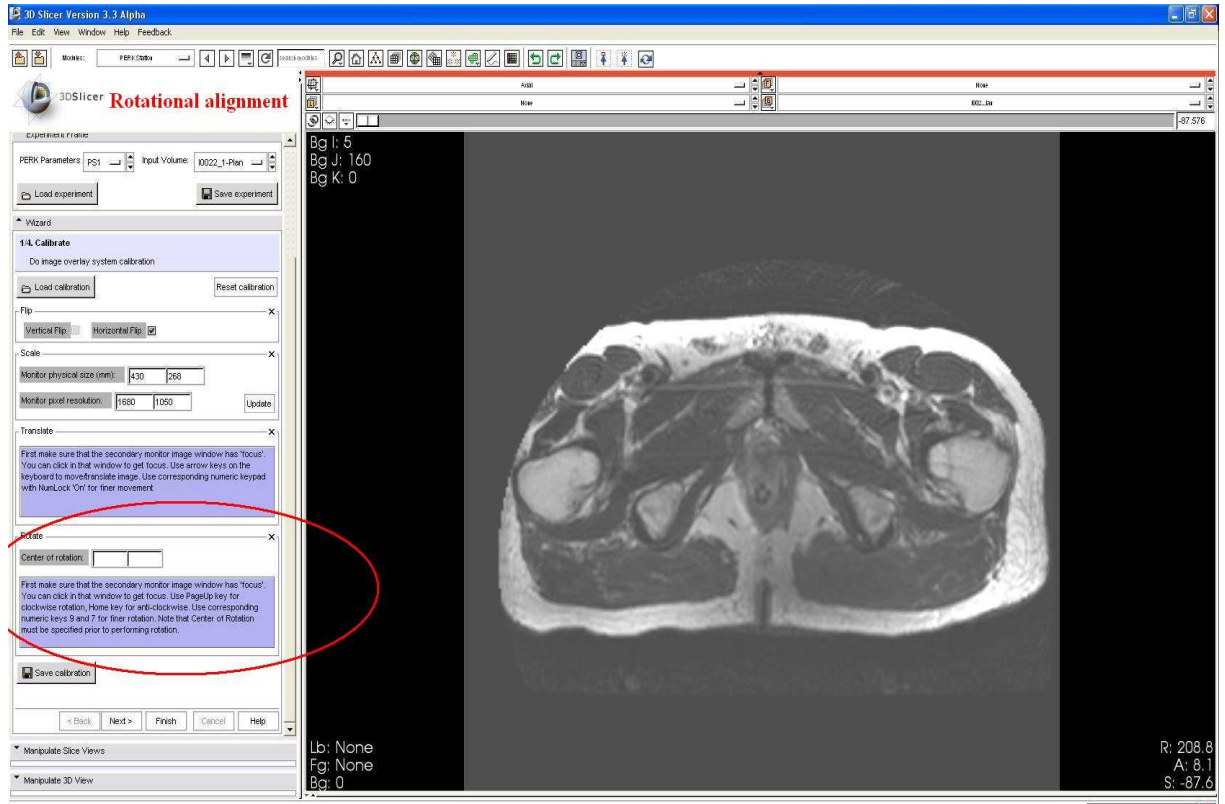
In this step make sure at least one fiducial is very-well aligned; in the next step, this fiducial will be used as hinge point for correction of rotational mis-alignment.

This step is performed using external keyboard, by the person inside the MR scanner room looking through the mirror.



7.1.4. Rotational alignment: To align fiducials on image, and fiducials as seen through mirror, further minor rotation may be required. Read the instructions carefully. I print them again here: "First make sure that the secondary monitor image window has 'focus'; you can click anywhere in that window to get focus. Use Page-up key for clockwise rotation, and Home key for anti-clockwise rotation. Use keys 9 and 7 correspondingly for finer rotation. Note that the center of rotation must be specified prior to performing rotation". See two snapshots below

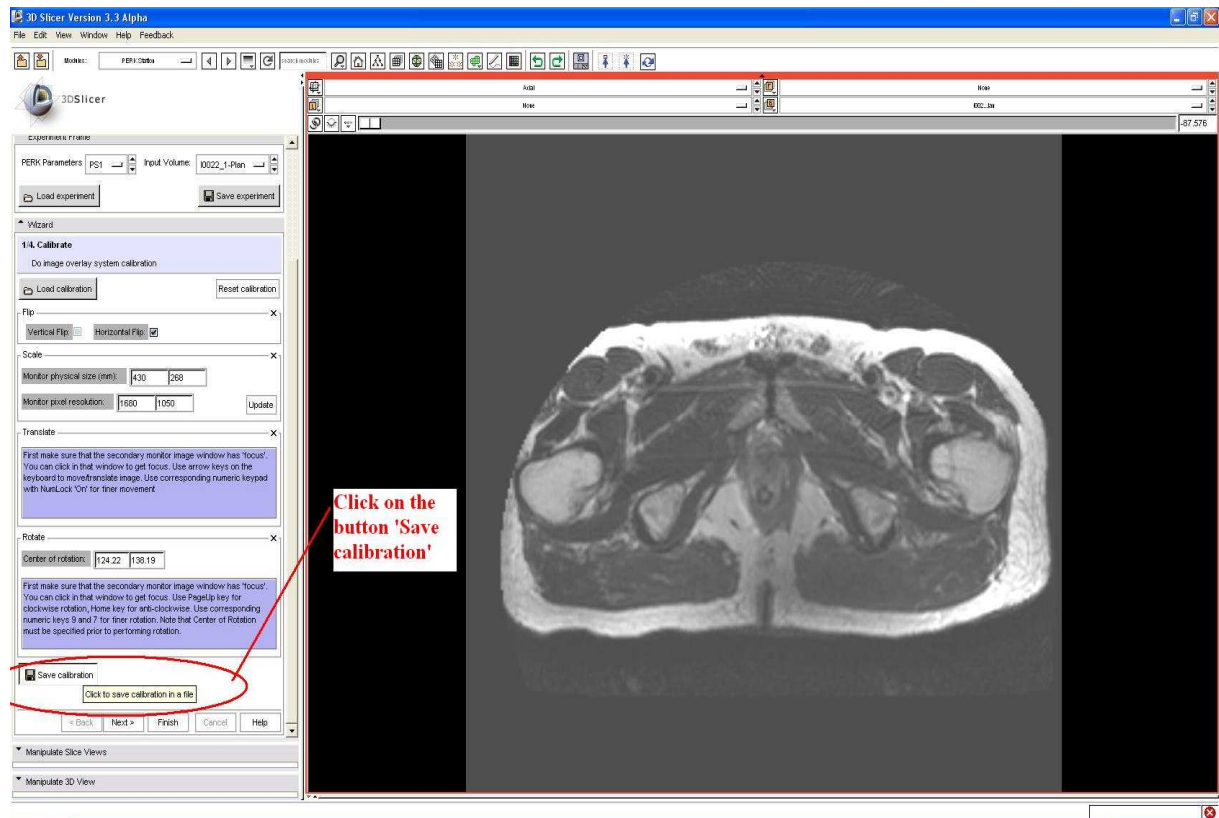
This is actually two steps: First, the person in MR scanner room communicates to person outside working on the laptop, the fiducial best aligned after translation e.g. 3rd fiducial from left. This fiducial will be used as hinge point for rotational alignment. The person outside the scanner room, working on laptop, clicks on the corresponding fiducial in the image on the laptop screen to mark it as center of rotation. The corresponding GUI control should be populated. Subsequently, the laptop user clicks back in secondary monitor window to give it focus. The second step: the person inside the scanner room can now use the external keyboard to perform rotational alignment looking through the mirror.

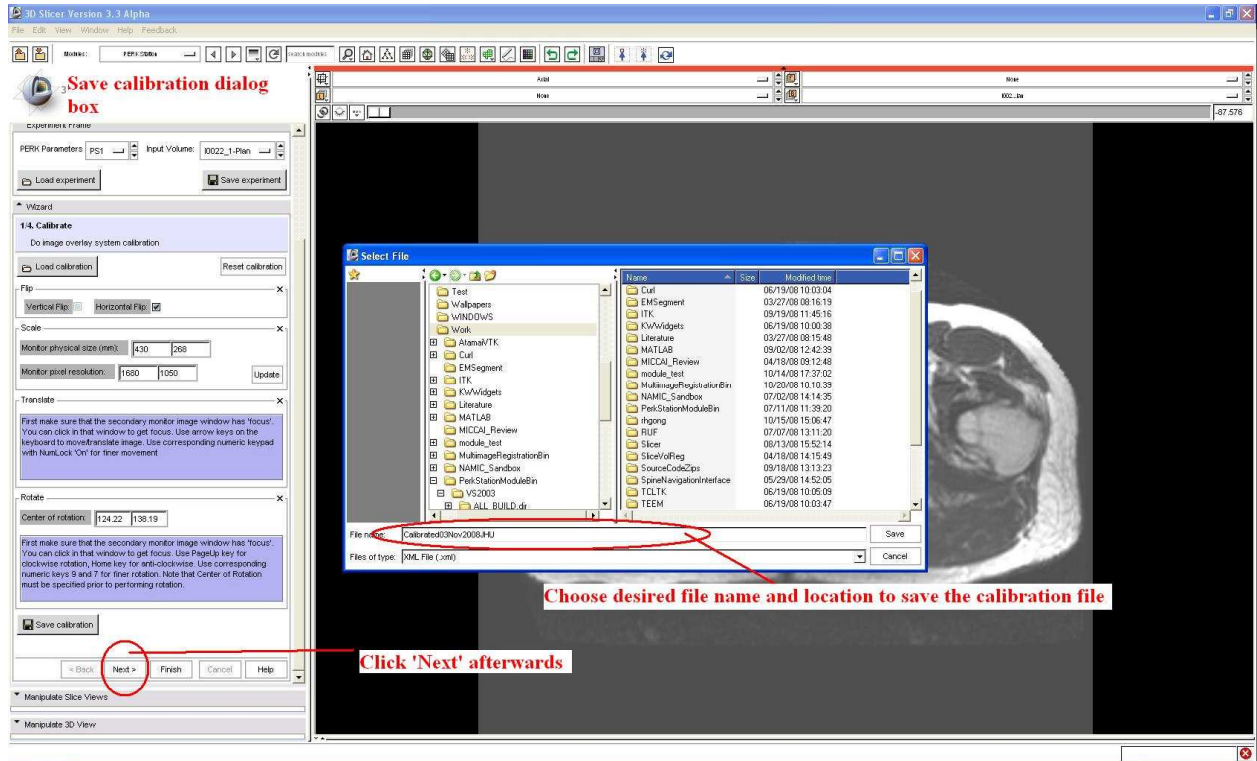


7.1.5. Save Calibration (optional): Now the system has aligned very well, you might want to save the calibration settings of the system. This might be very useful, in case you wish to perform multiple entry-target insertions on same planning image. You can save the calibration (above 4 steps) you just did on a file, which can later 'loaded' back using 'Load calibration'. See two snapshots below

This step is performed on the laptop outside MR scanner room.

After saving the calibration file, press 'Next'. Otherwise too, if you don't want to save calibration, press 'Next' to move to planning step.





7.2. Planning/Targeting:

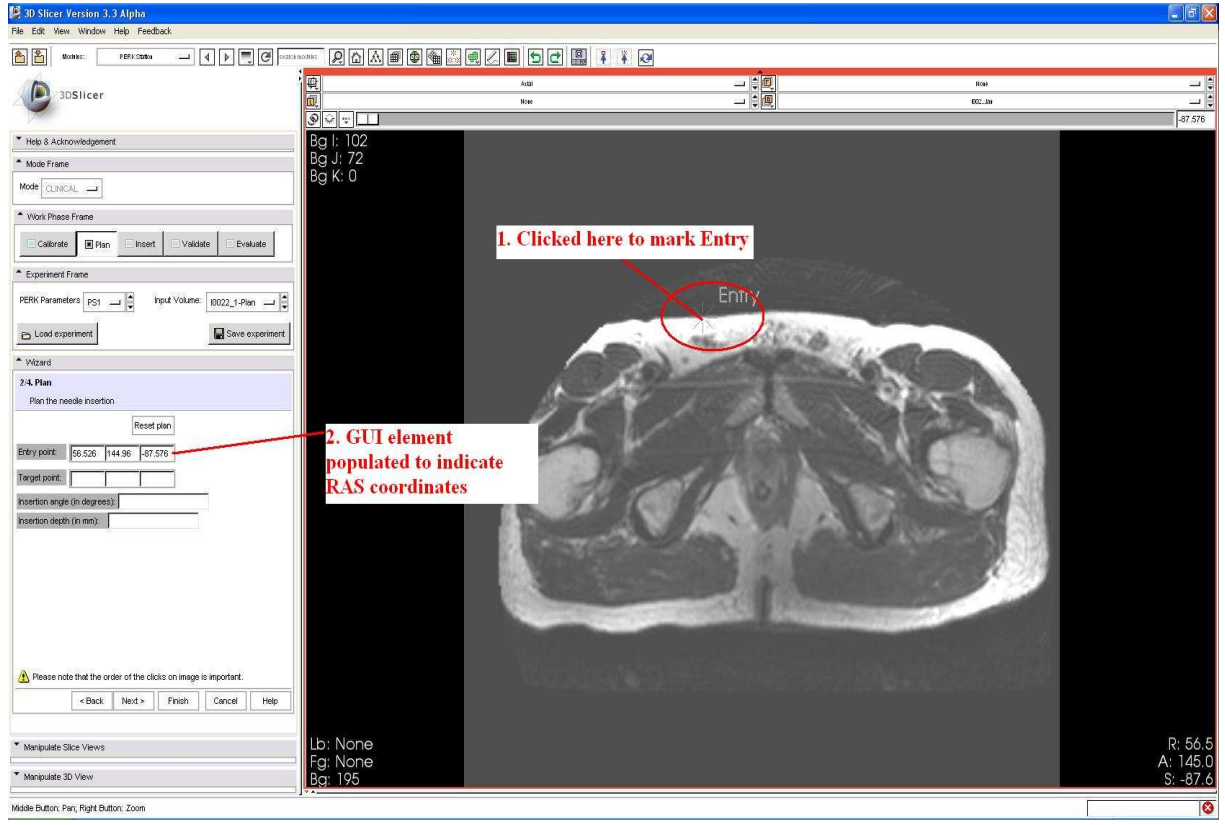
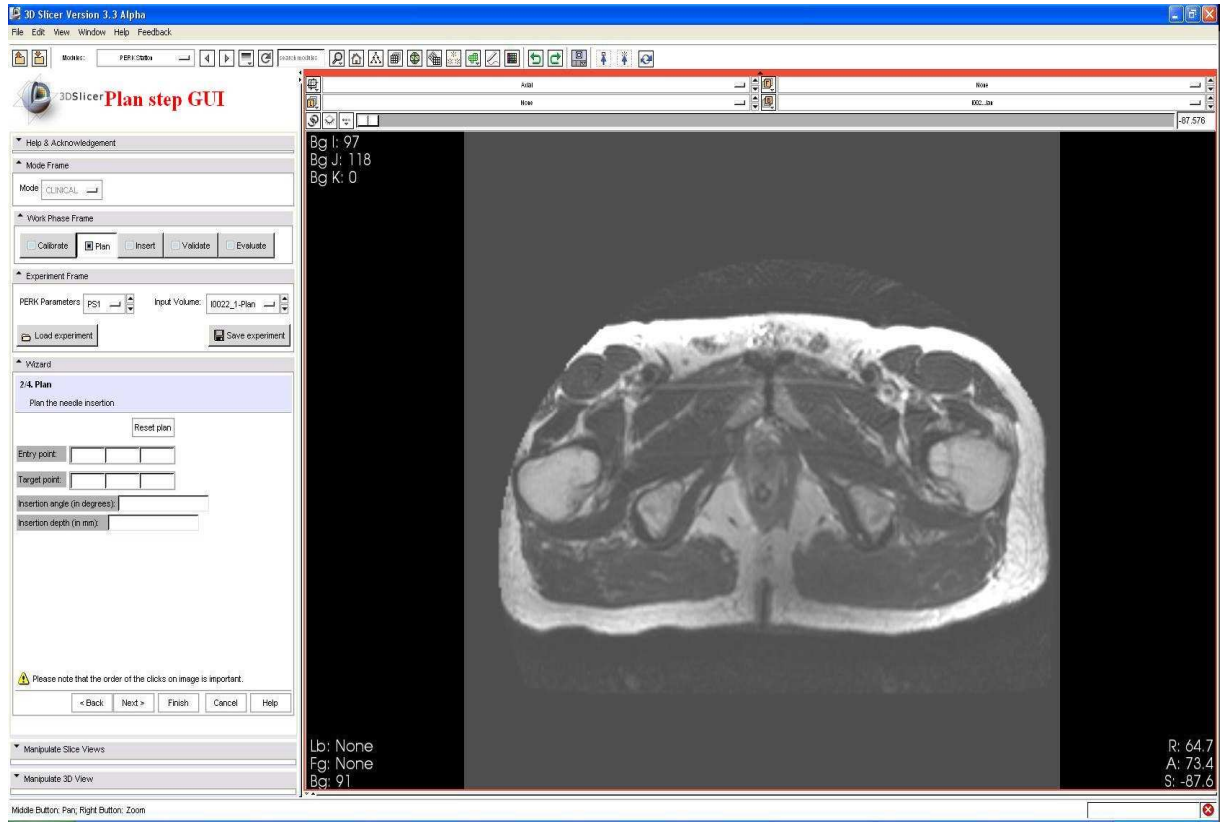
In this step, the person on laptop specifies the desired entry point and target point. The laptop user can zoom in/out to have better look at the image, without affecting/changing the display on mirror inside the MR scanner room.

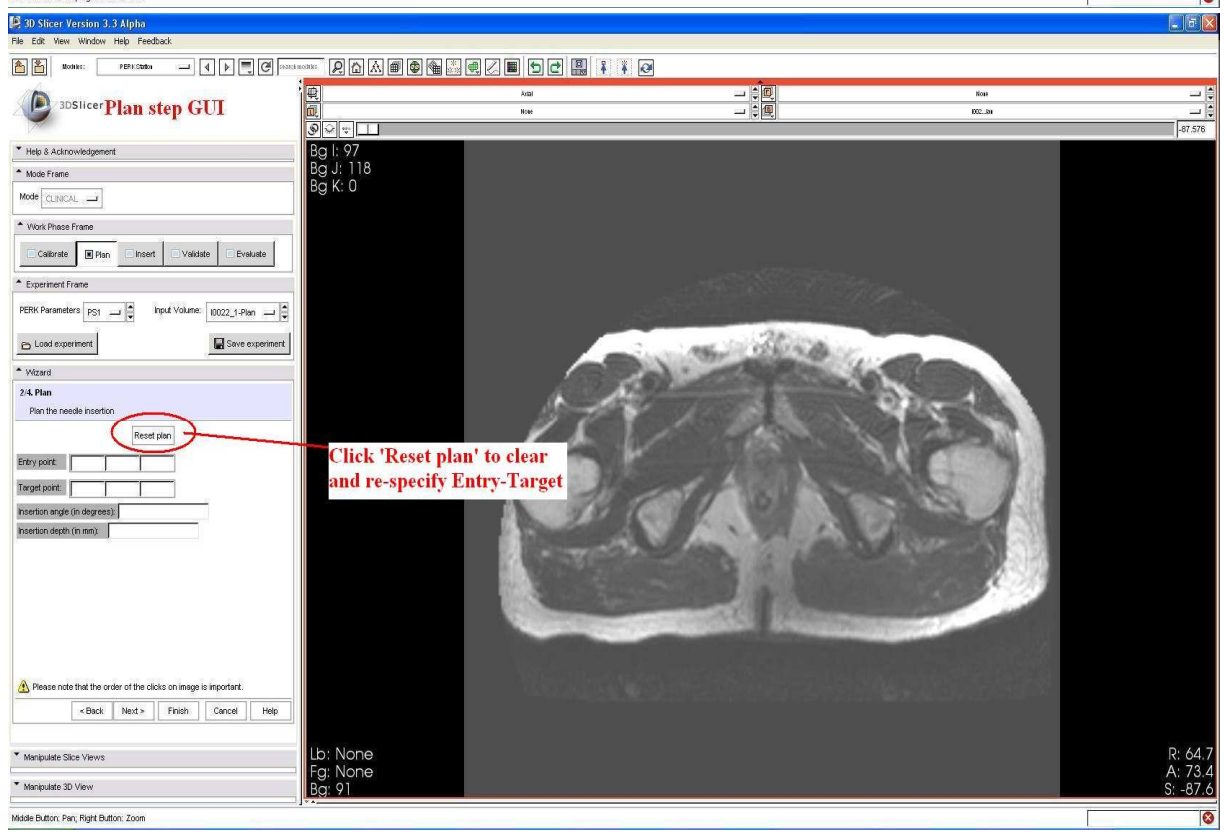
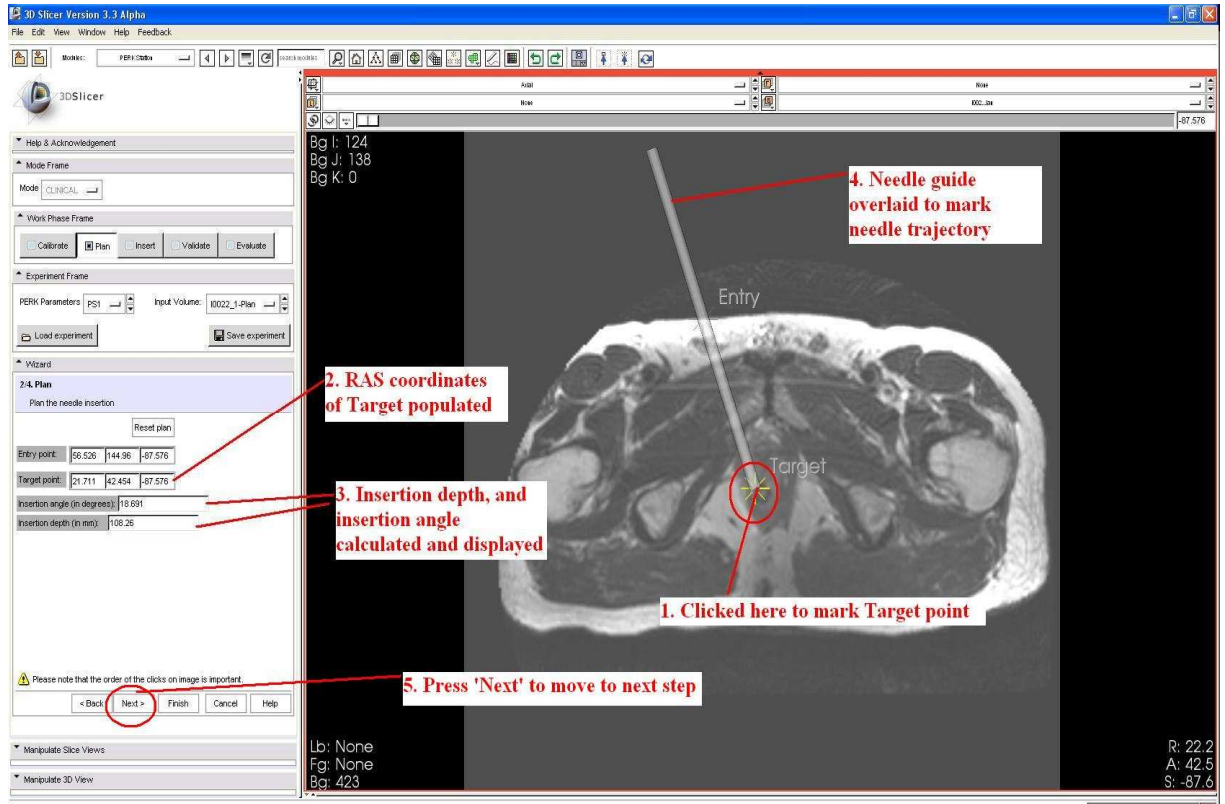
First click specifies the 'Entry', second click specifies the 'Target'. At the end of second click, the software calculates and displays the insertion depth and insertion angle w.r.t. vertical. Also, a visual needle guide is overlaid on the image, both on laptop screen and on the mirror inside the scanner room.

The user can do 'Reset' in case, he/she changes his/her mind on entry and target points. And after reset, can re-specify those points.

After the user is 'happy' about planning, he can click 'Next' to move to 'Insert' step.

See four snapshots below



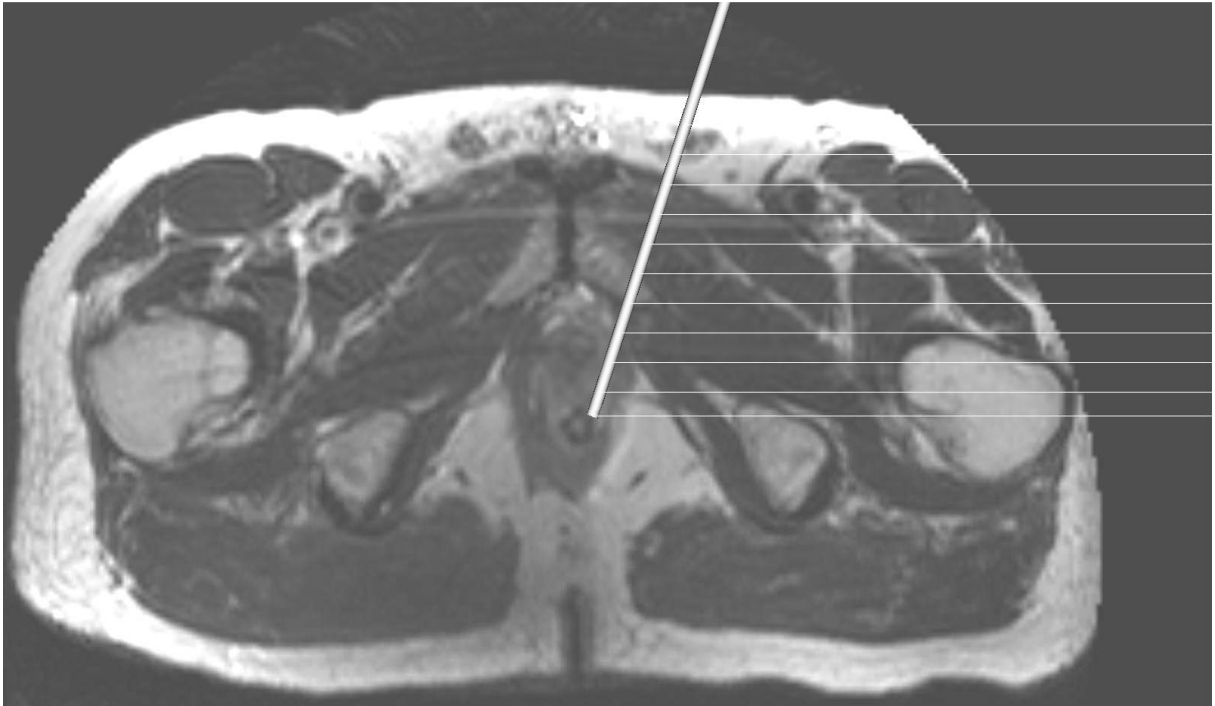


7.3. Insert:

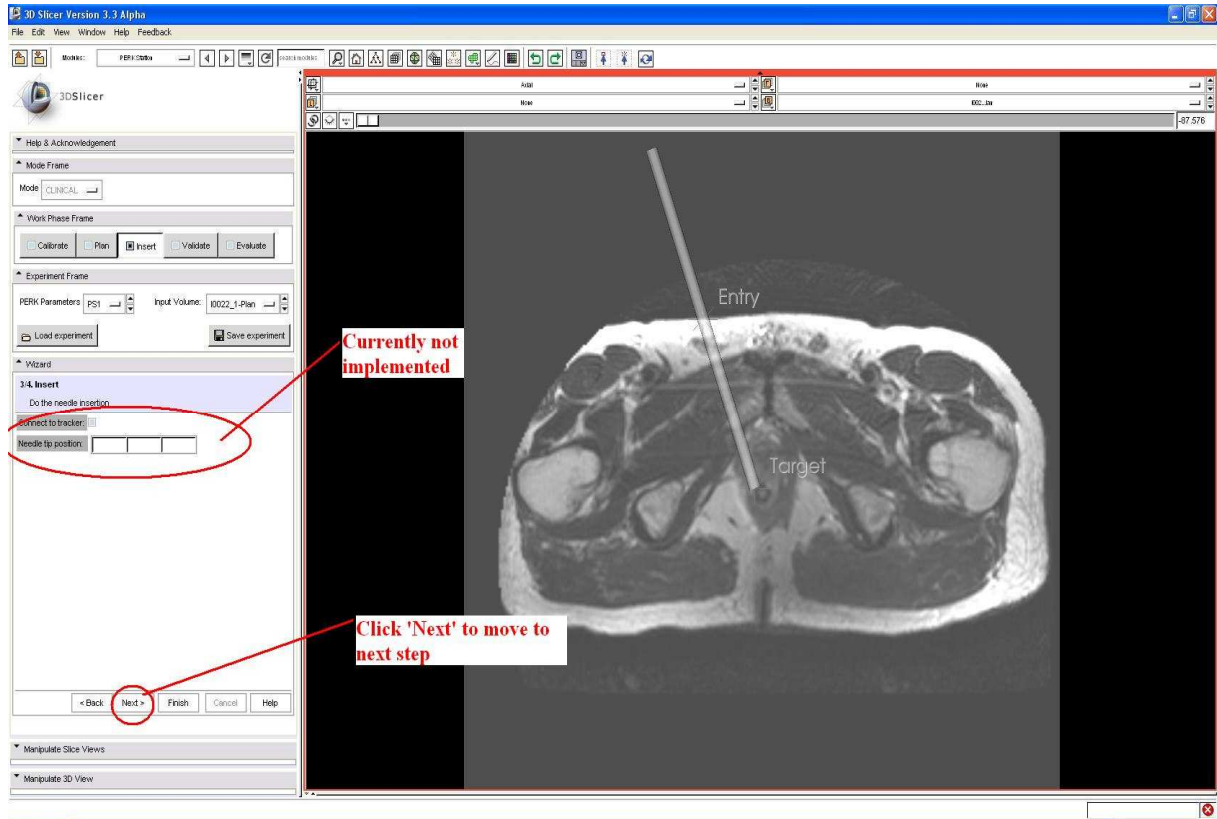
When you enter this step, additional depth perception lines are overlaid on the mirror along with the needle guide overlay. The person inside the MR room, uses the visual cues to perform the needle insertion.

After the insertion is complete, press 'Next' to move to next step.

See two snapshots below



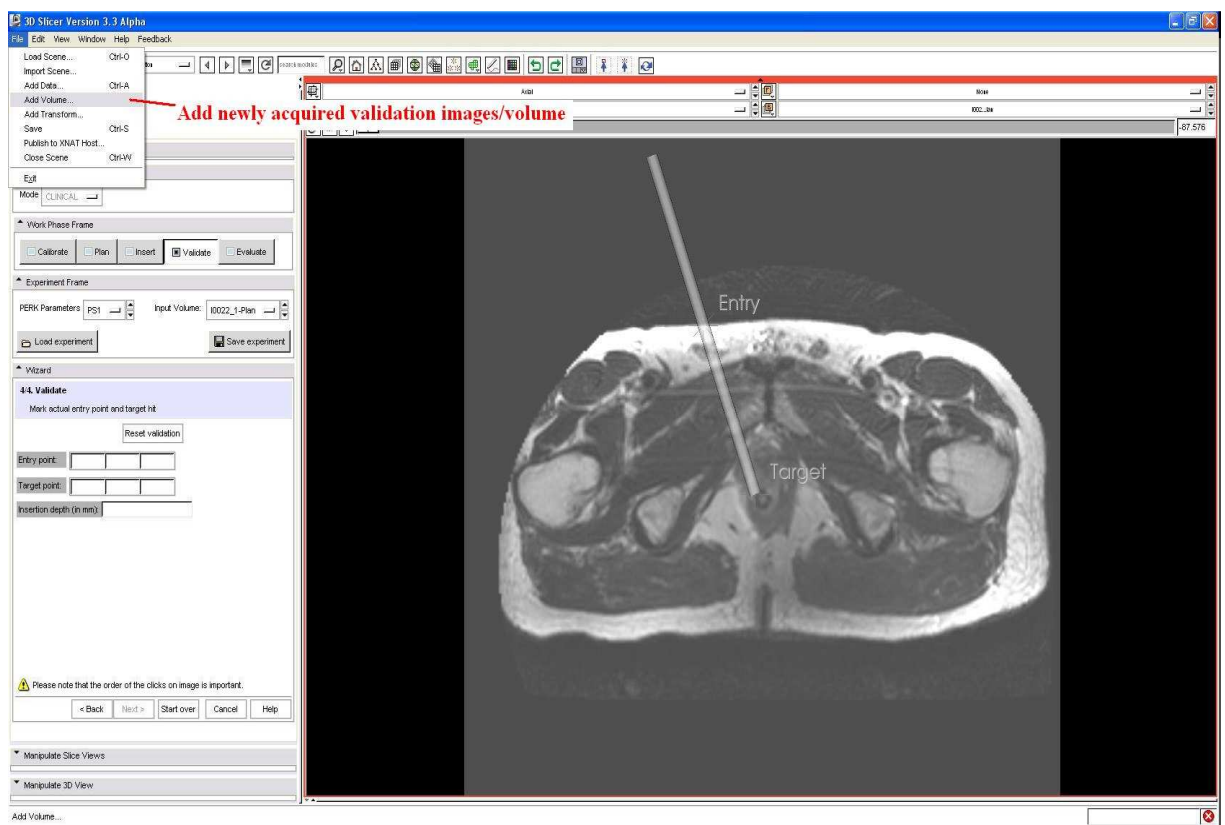
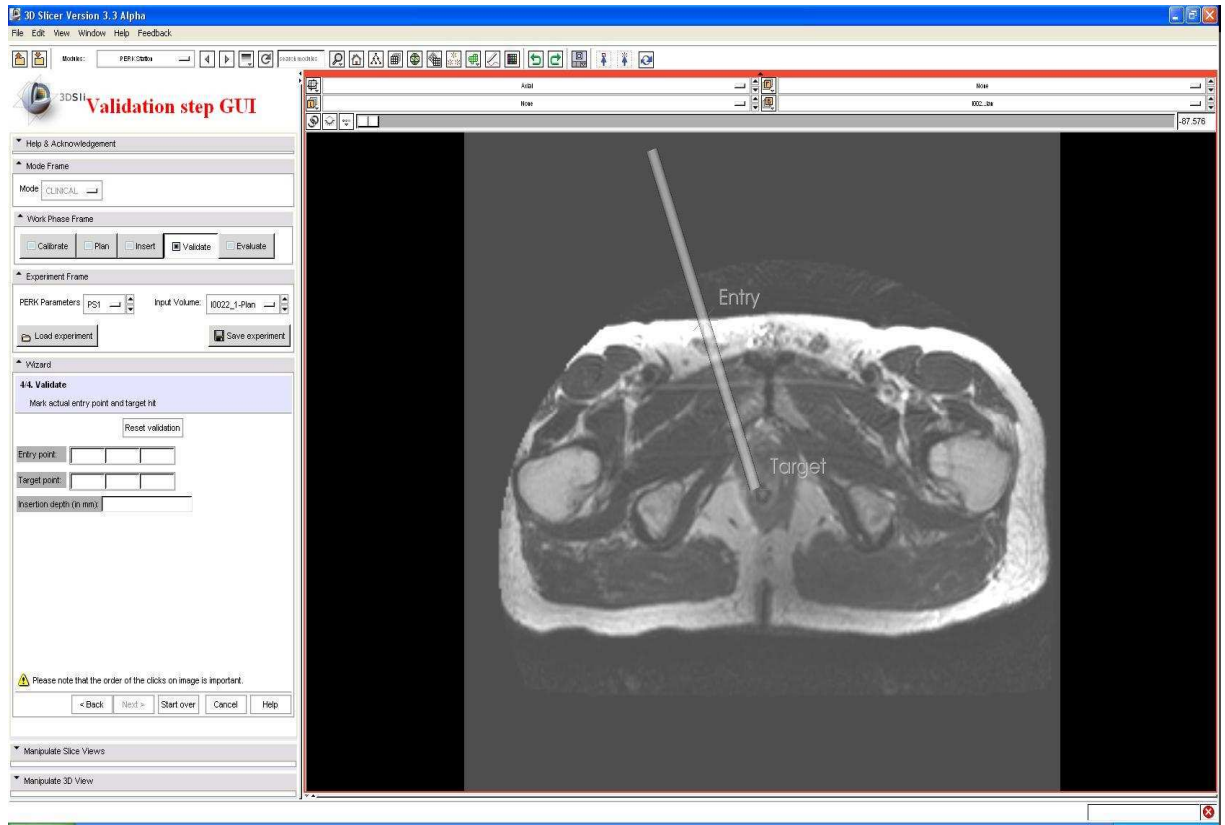
Secondary monitor/mirror display, showing overlay of needle guide and depth perception lines

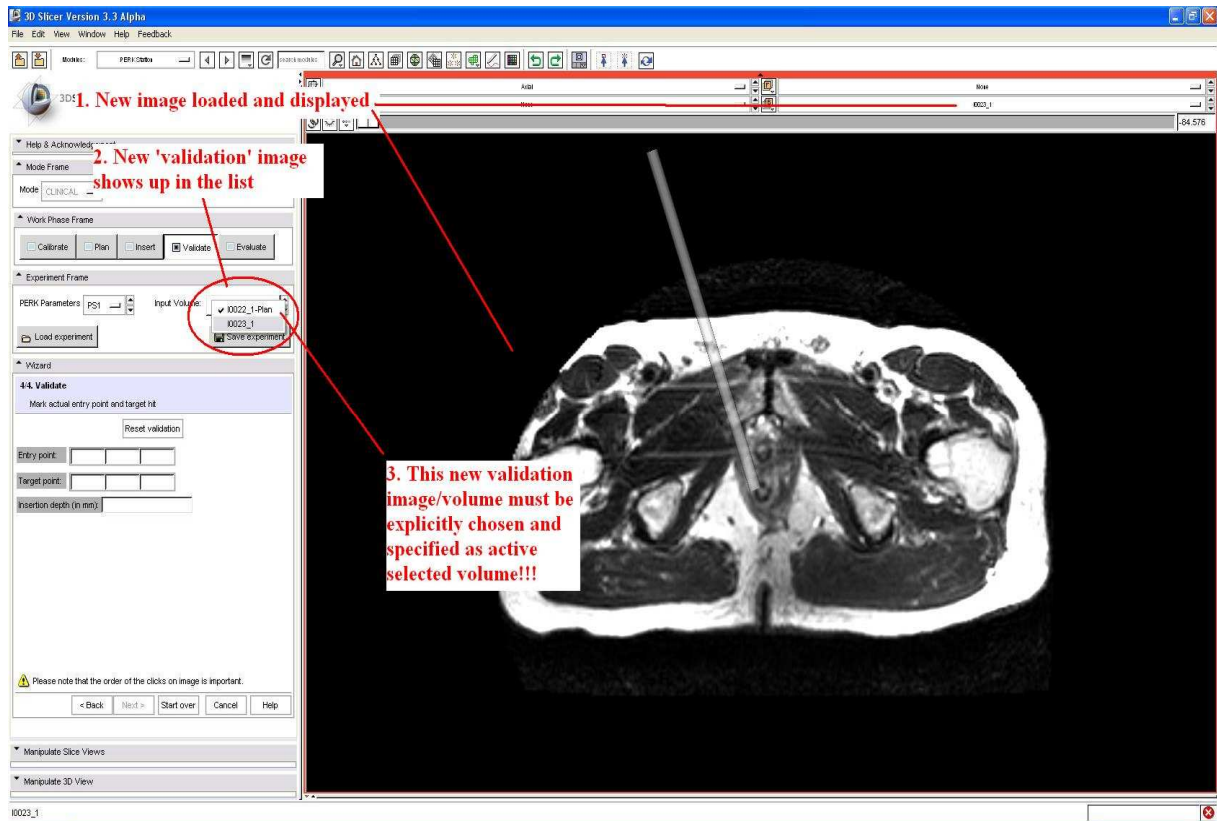
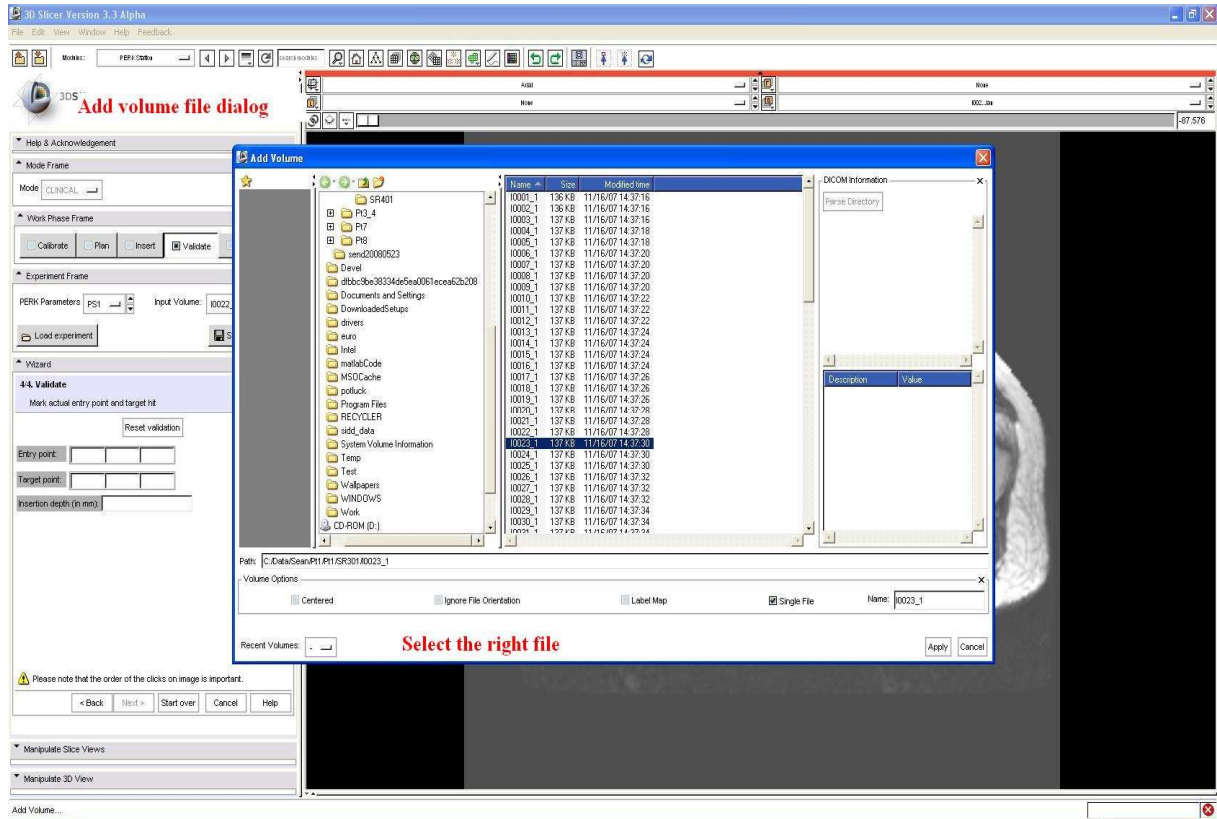


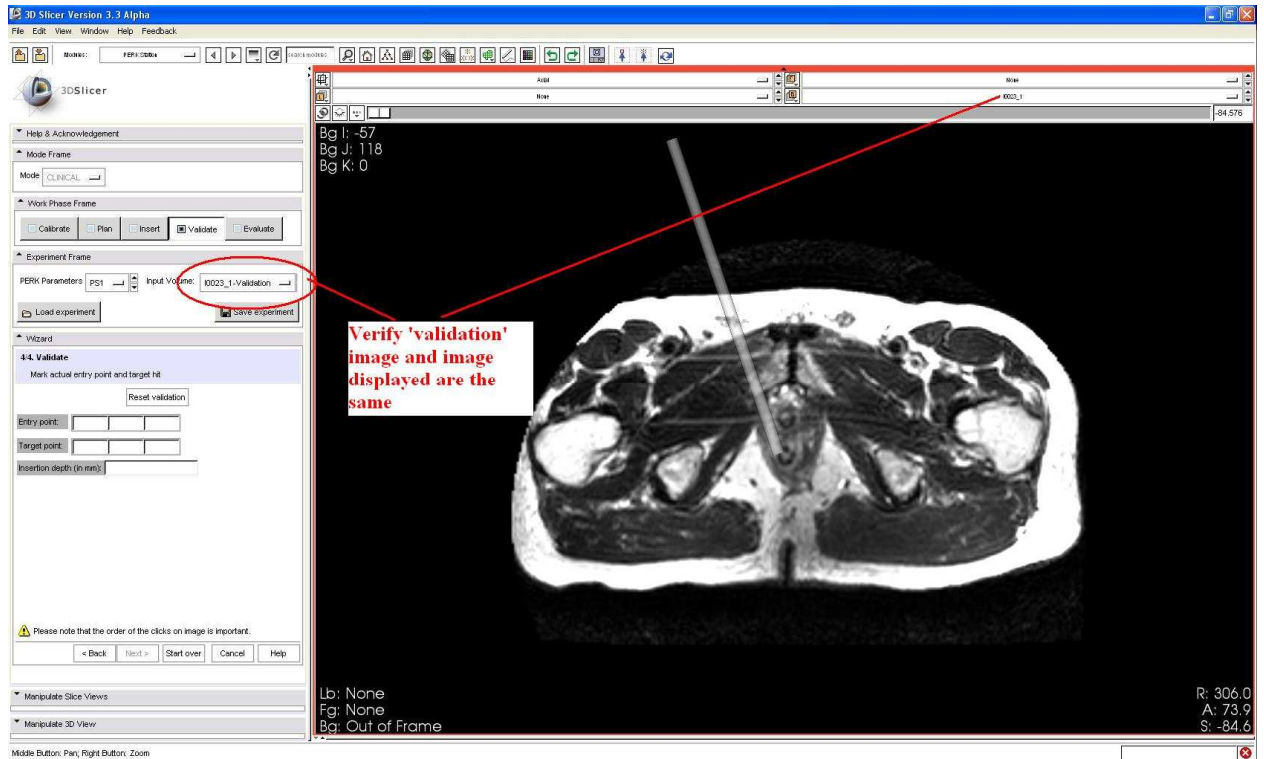
7.4. Validate:

After insertion is complete, confirmation/validation images will be acquired with needle inside the phantom/patient.

In this step, performed outside the scanner room on the laptop, first, the 'Validation' image/volume should be loaded using 'Add Volume' as shown in next five snapshots.

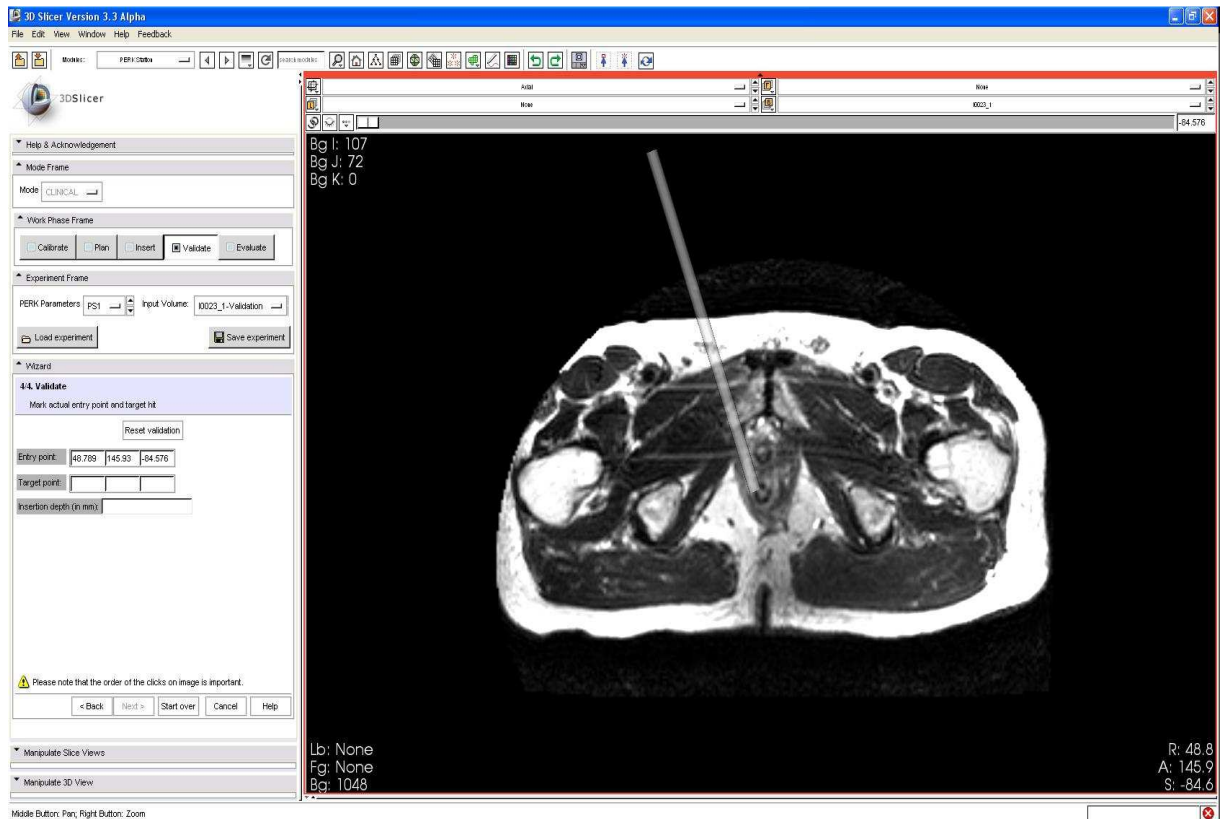


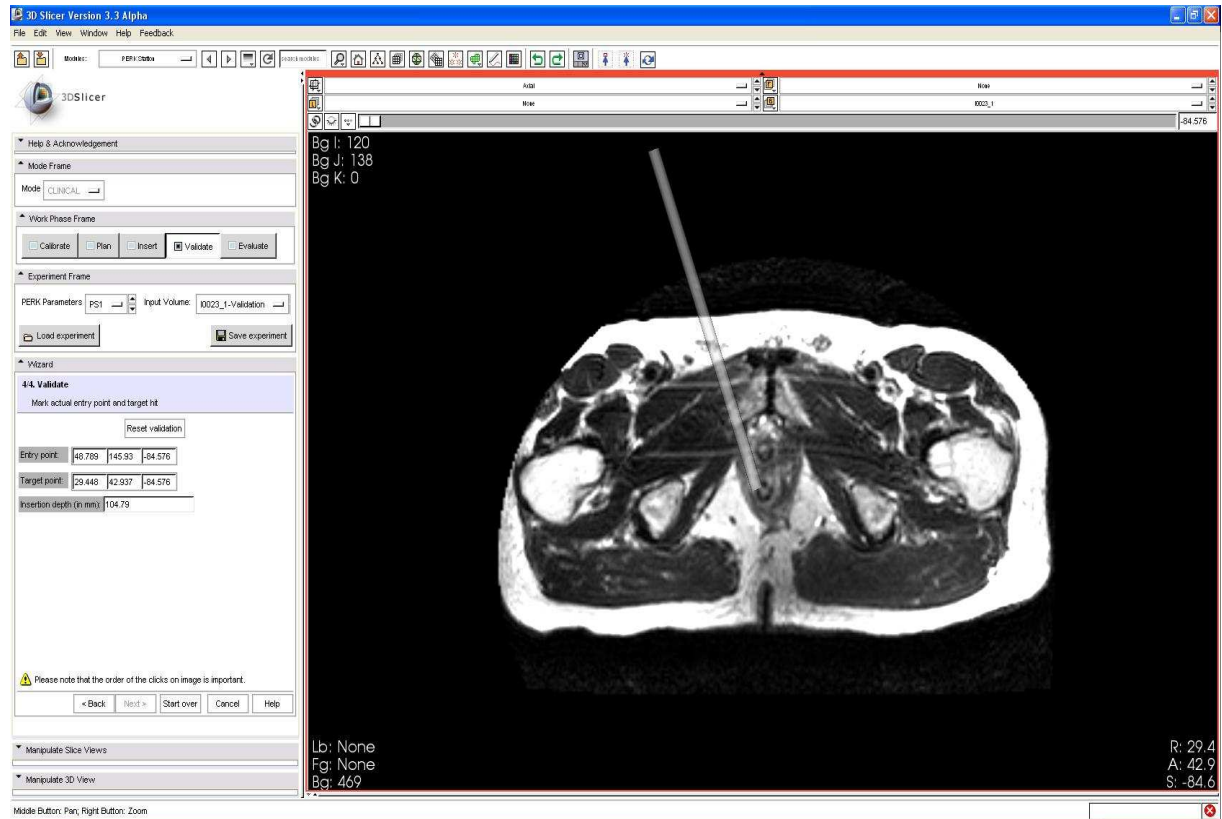




After the 'Validation' image/volume has been correctly added, now the user can click and specify actual entry point, and target point as seen in validation image.

See two snapshots below



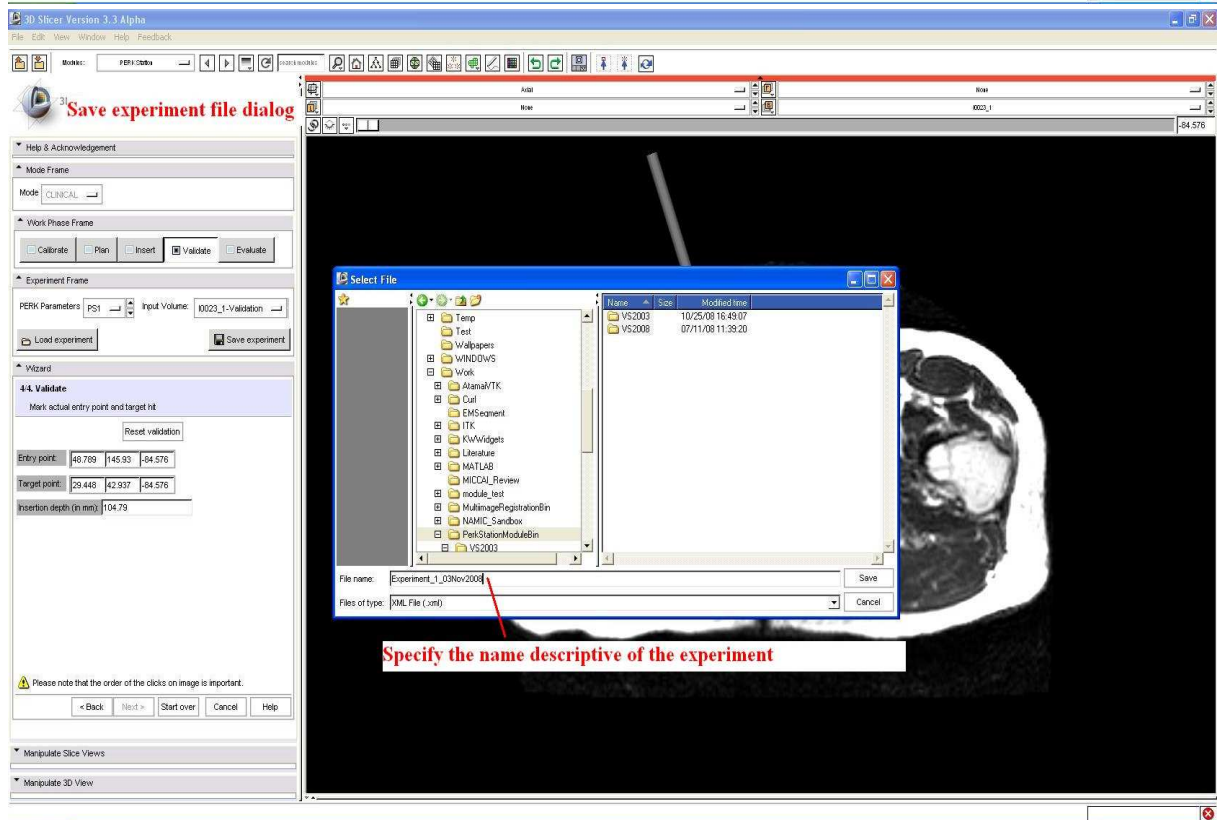
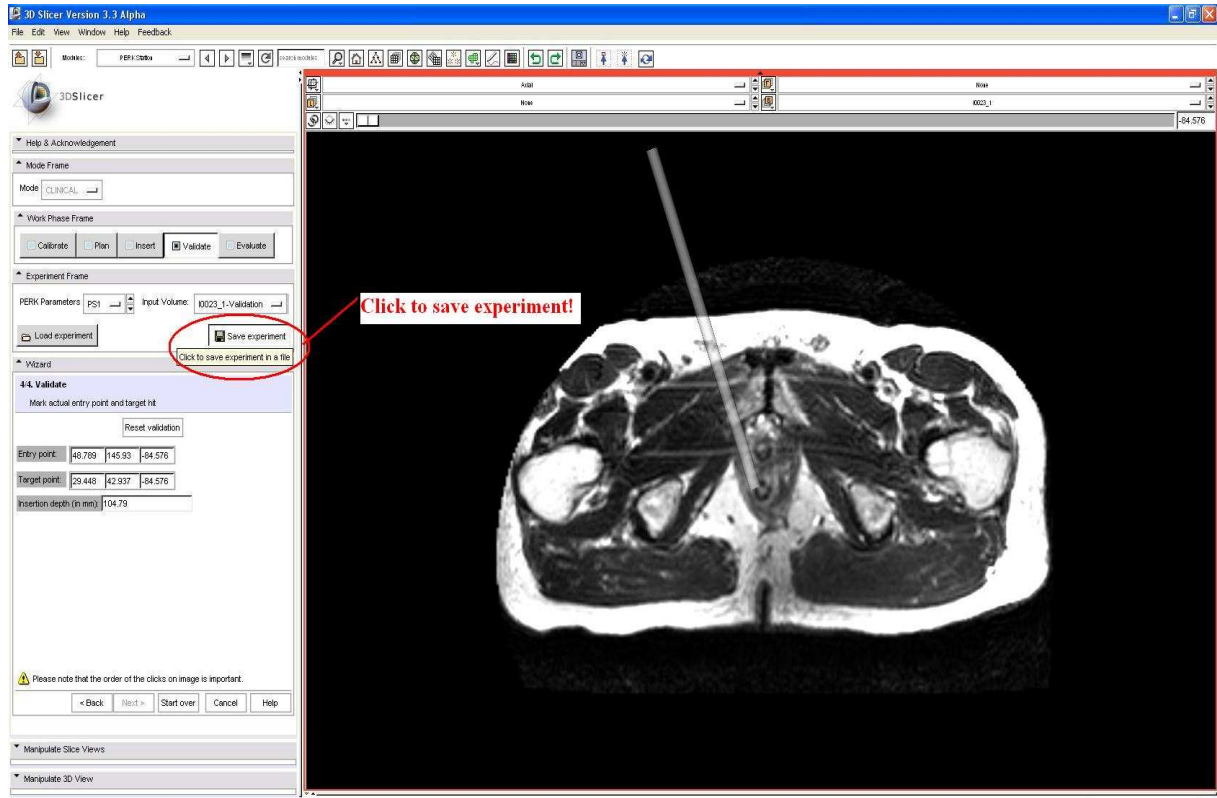


7.5. Save experiment!!!

This is very important and mandatory step, which must be performed after each insertion/validation.

This step is again performed at the laptop. The person clicks 'Save experiment' button, and specifies the file name, descriptive of the experiment. A text file is saved consisting of image information, calibration, planning, and validation.

See three snapshots below.



```

1 PlanVolumeFileLocation=""
2 PlanVolumeSeriesNumber="301"
3 PlanVolumeSeriesDescription="T2 TSE Axial"
4 PlanVolumeFORUID="1.3.46.670589.11.0.0.11.4.2.0.5728.5.5764.2006101908134278000R000"
5 PlanVolumeOrigin="216.578 258.113 -87.4858"
6 PlanVolumeSpacing="1.5625 1.5625 3"
7 ValidationVolumeFileLocation=""
8 ValidateVolumeSeriesNumber="301"
9 ValidateVolumeSeriesDescription="T2 TSE Axial"
10 ValidateVolumeFORUID="1.3.46.670589.11.0.0.11.4.2.0.5728.5.5764.2006101908134278000R000"
11 ValidateVolumeOrigin="216.578 258.112 -84.4858"
12 ValidateVolumeSpacing="1.5625 1.5625 3"
13 VerticalFlip="0"
14 HorizontalFlip="1"
15 PhysicalSizeMm="430 268"
16 PixelResolution="1680 1050"
17 CenterOfRotation="124.22 138.19 -87.5762"
18 Rotation="0"
19 Translation="0 0"
20 PlanEntryPoint="56.5261 144.964 -87.5762"
21 PlanTargetPoint="21.7112 42.4339 -87.5762"
22 PlanInsertionDepth="108.263"
23 PlanInsertionAngle="-18.6911"
24 ValidateEntryPoint="48.7894 145.931 -84.5762"
25 ValidateTargetPoint="29.4478 42.9367 -84.5762"
26 ValidateInsertionDepth="104.795"
27 EntryPointError="7.79678"
28 TargetPointError="7.7517"
29

```

8. New experiment!!

Two options:

8.1. First option: Do another entry/target insertion with current calibration and same 'planning' image

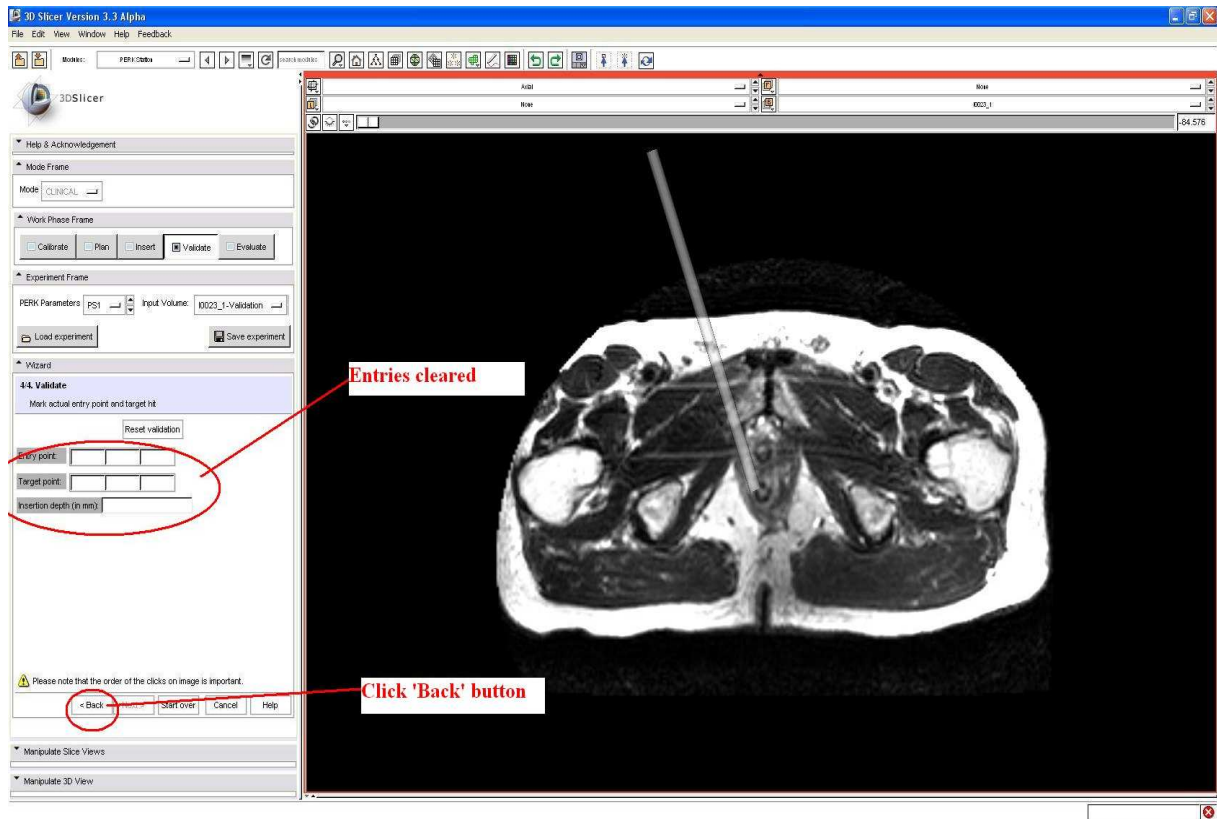
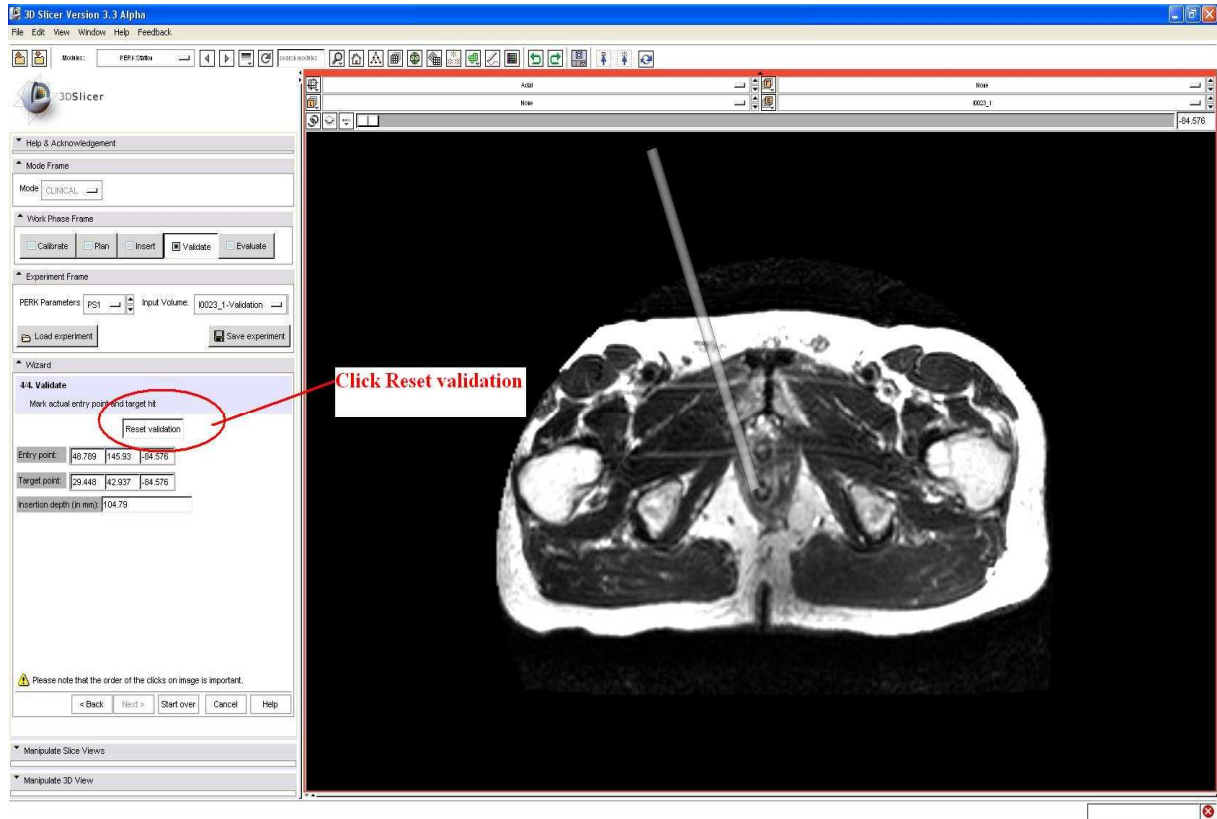
This is done in three steps:

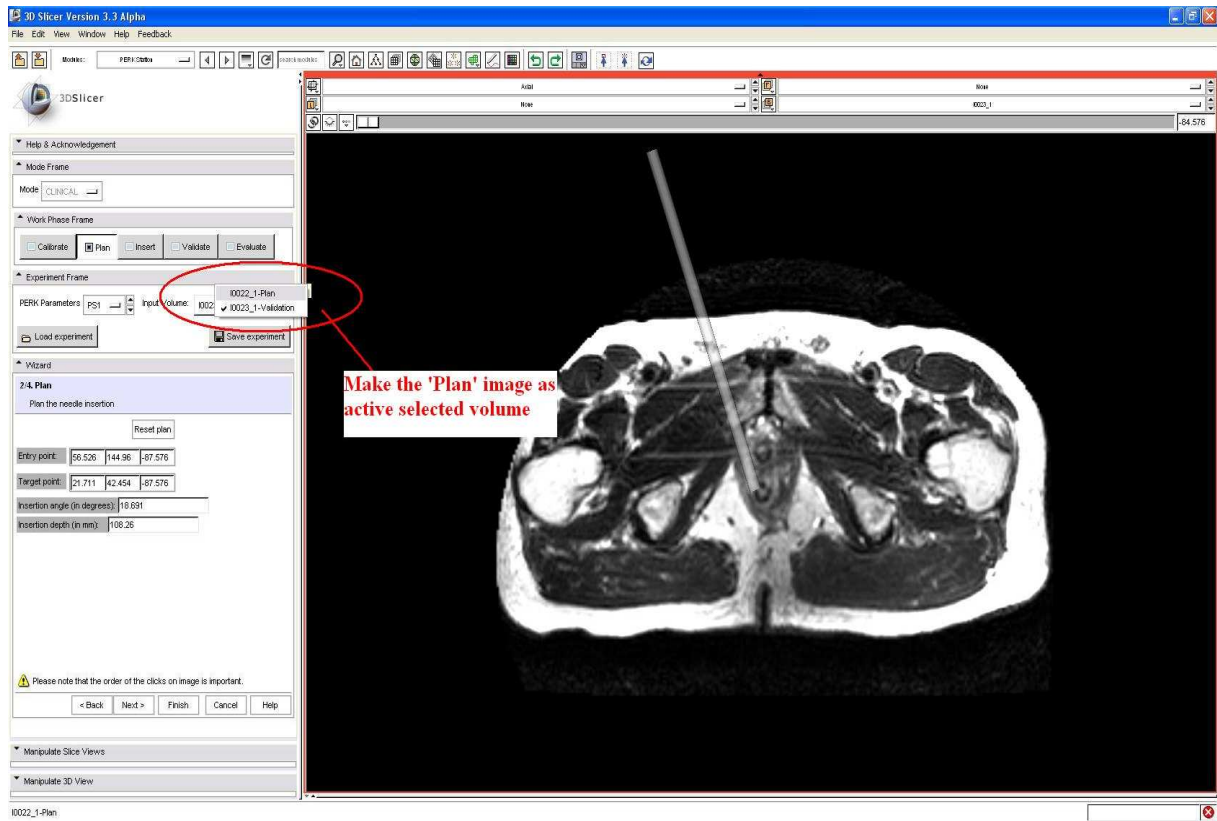
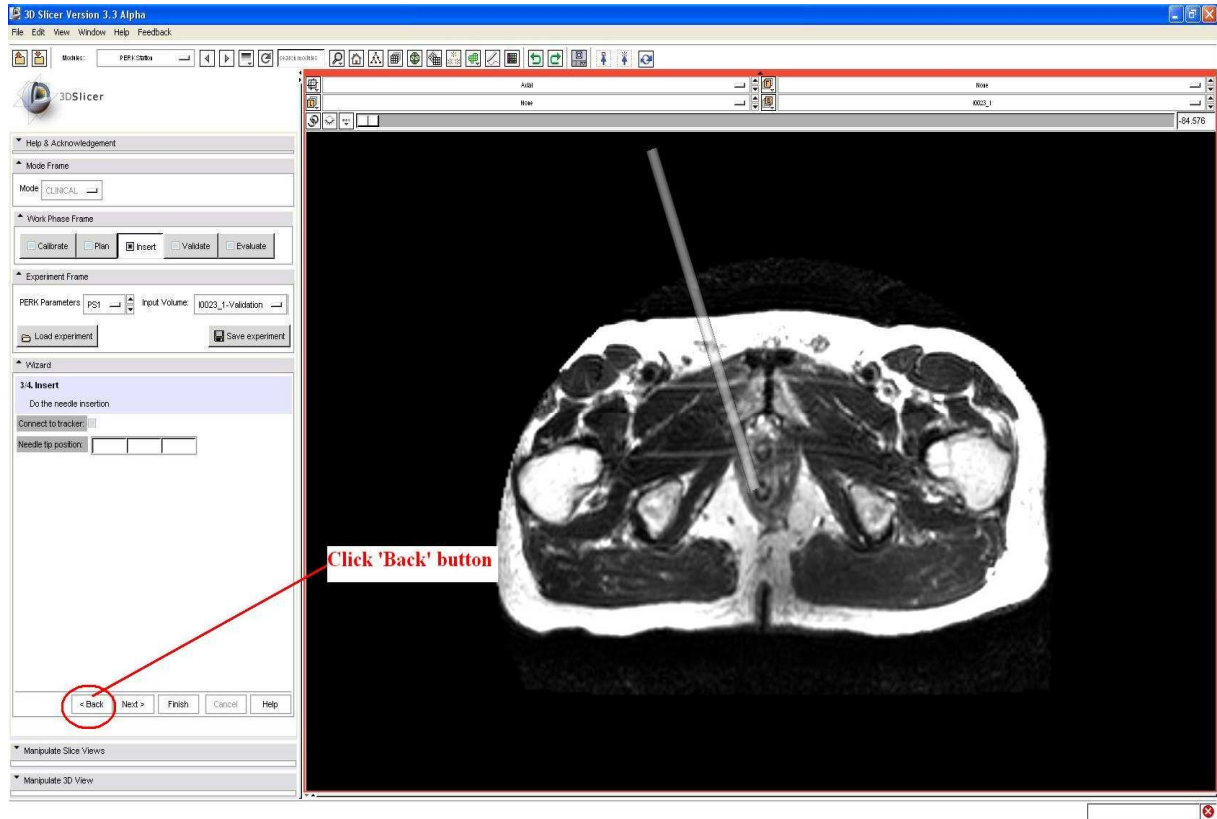
8.1.1. Reset Validation, click 'Back' to go to 'Insert' step, click 'Back' to go to 'Plan' step

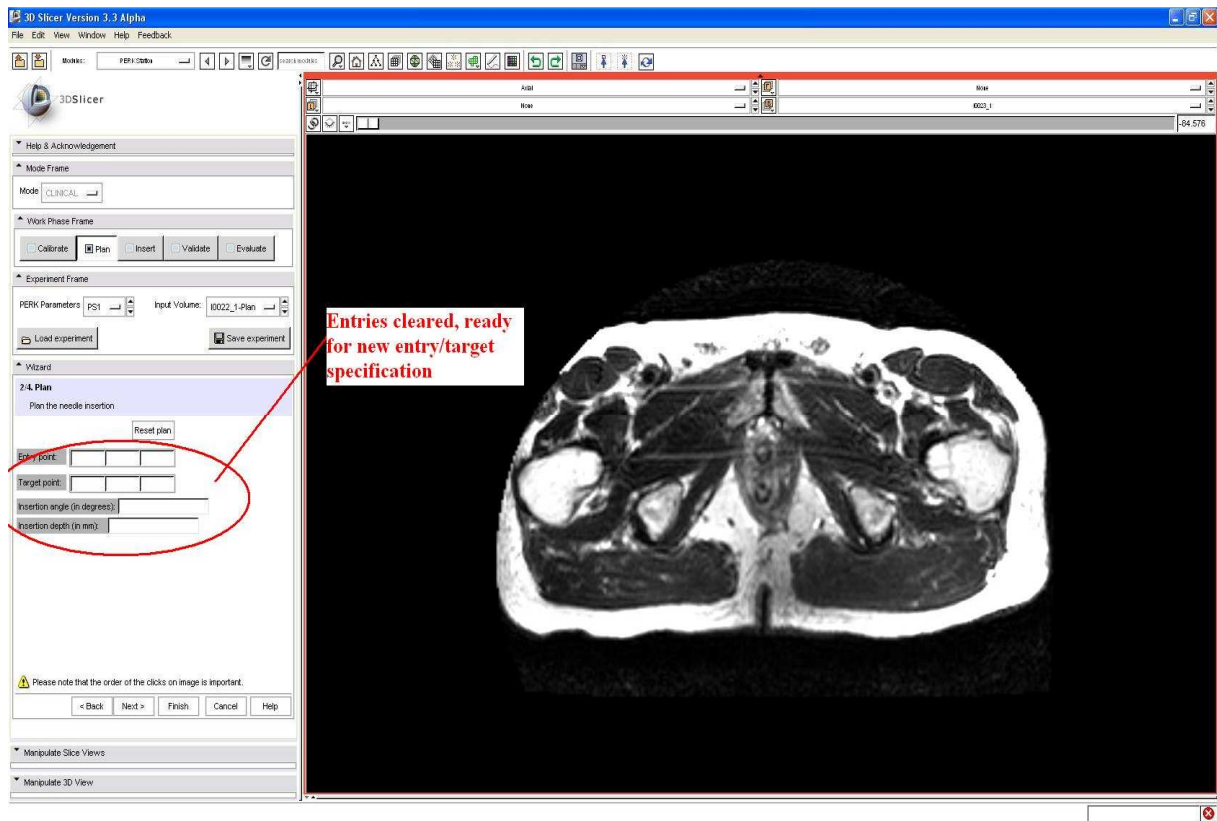
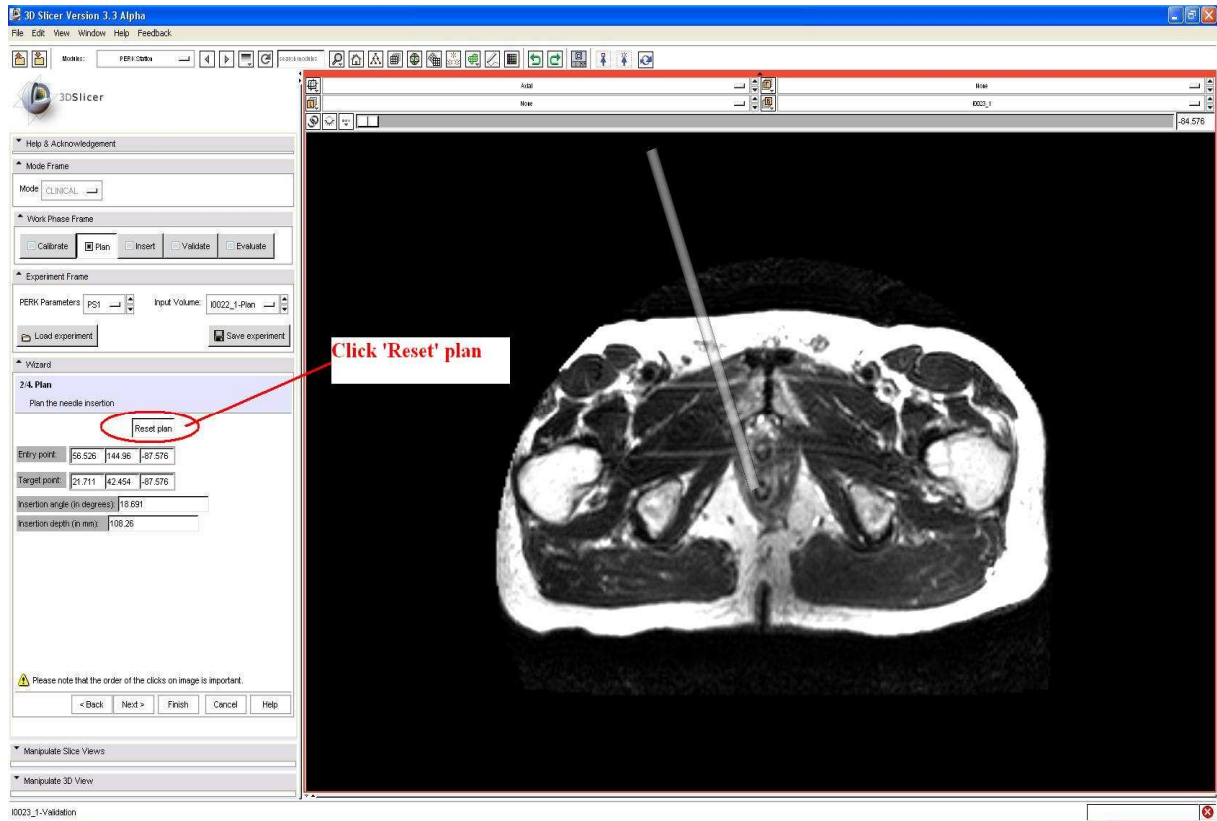
8.1.2. In 'Plan' step, make 'Plan' image as active selected

8.1.3. In 'Plan' step, do 'Reset plan', and now you are ready to specify Entry/Target again!

See six snapshots below







8.2. Second option: New planning image, hence new calibration, and completely new everything!

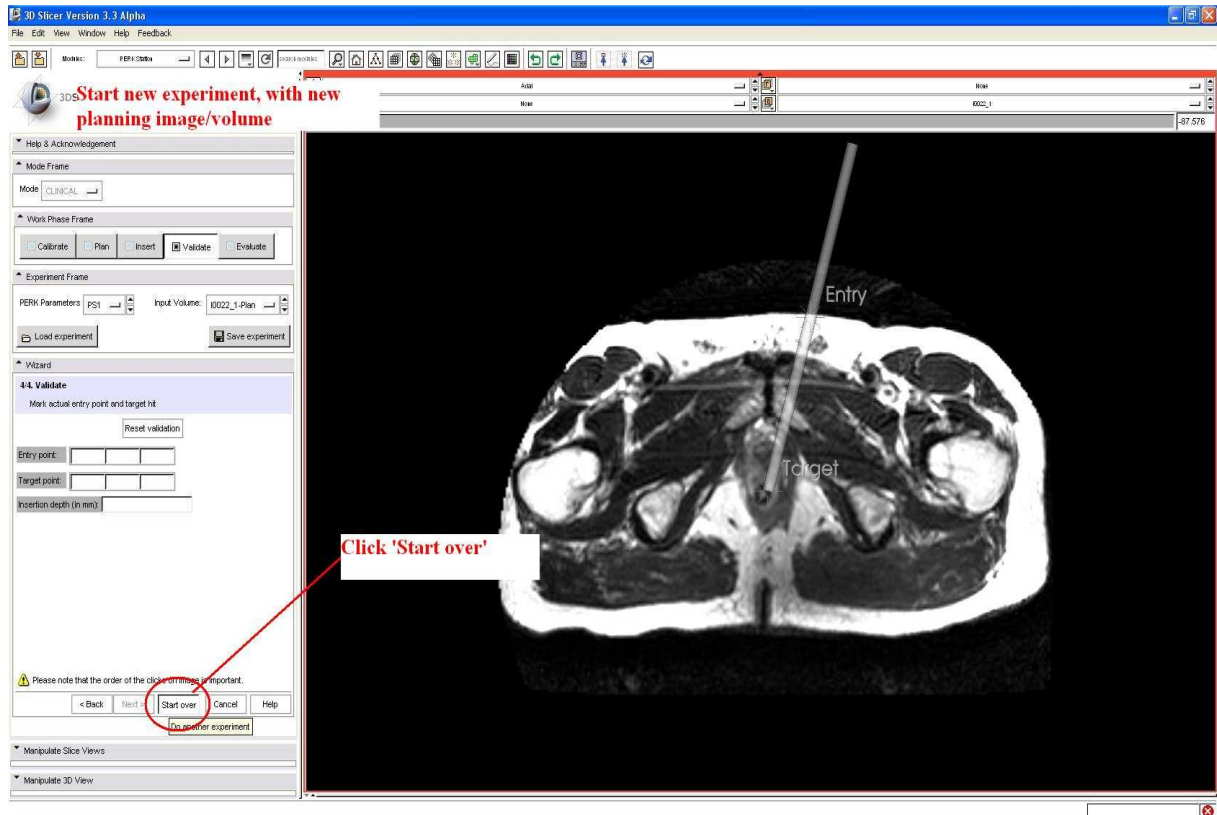
This is done in following steps:

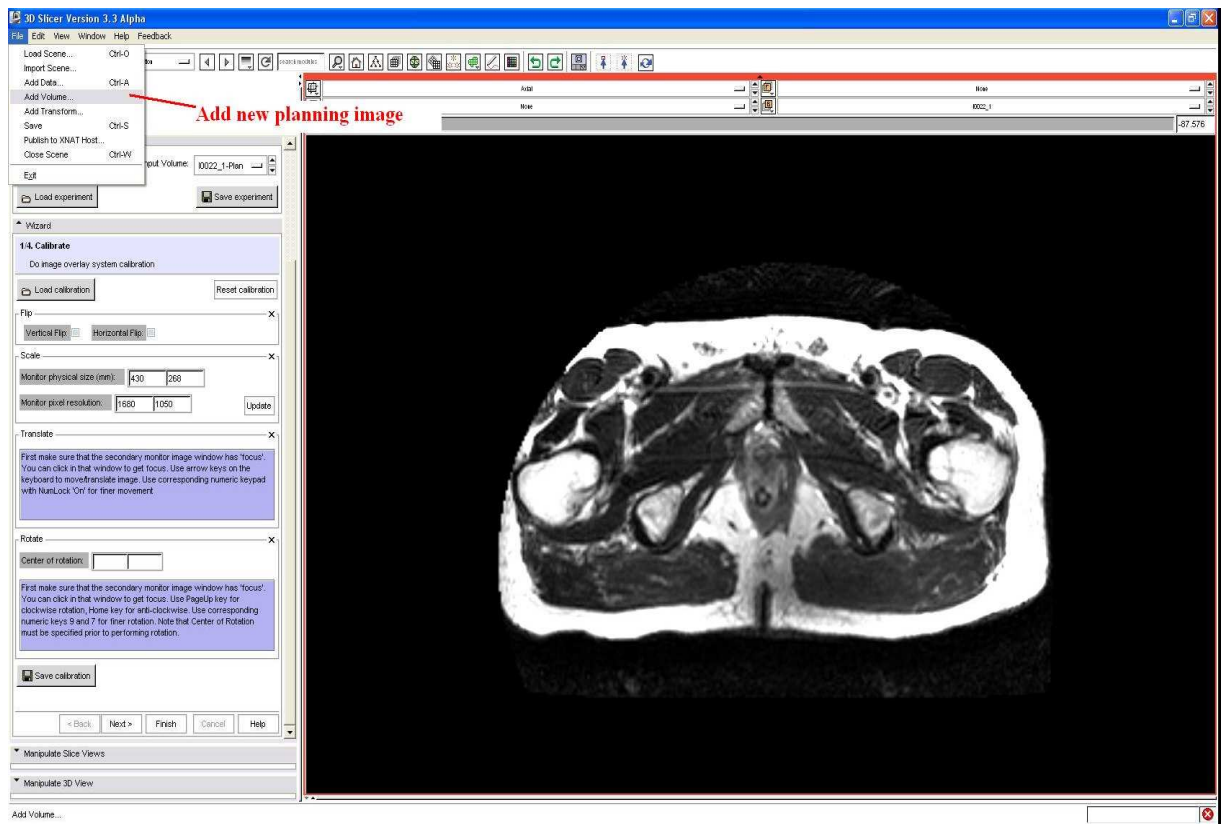
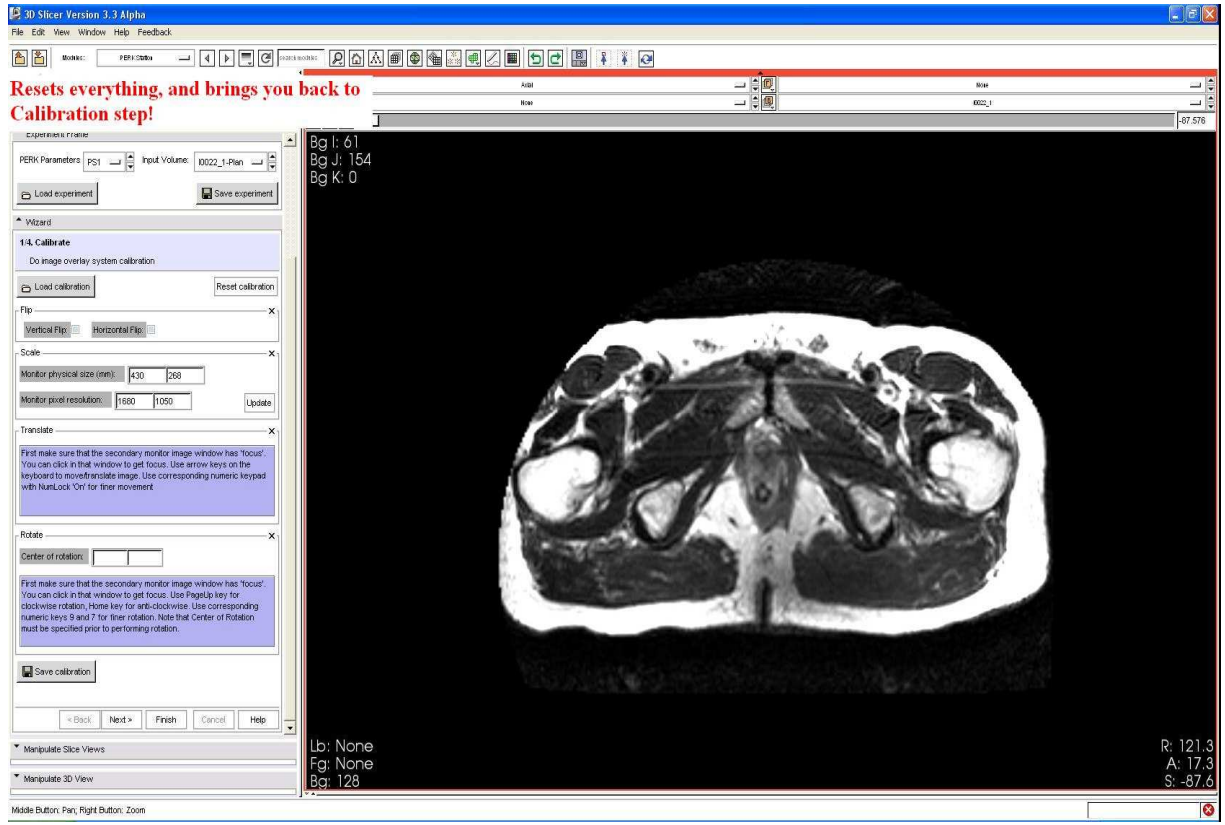
8.2.1. Click 'Start over' in Validation step, will reset everything, and bring you back to Calibration step

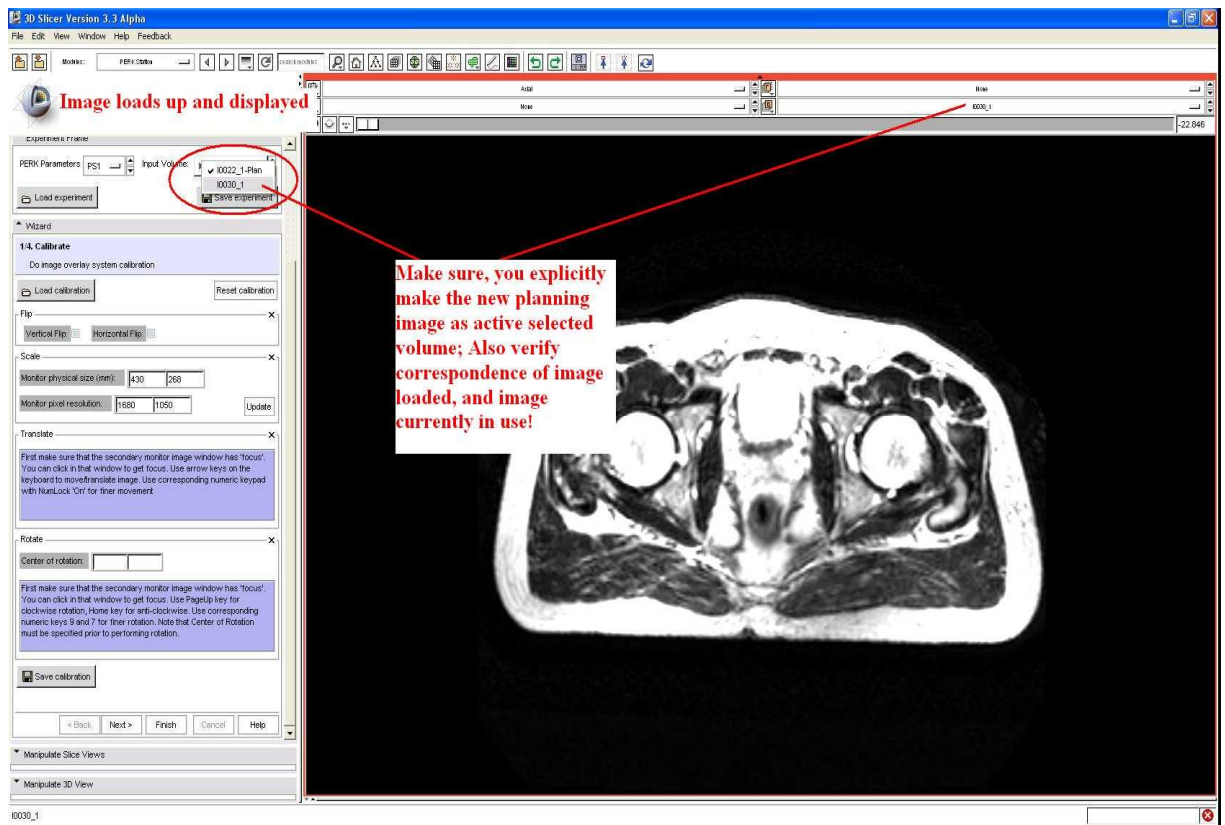
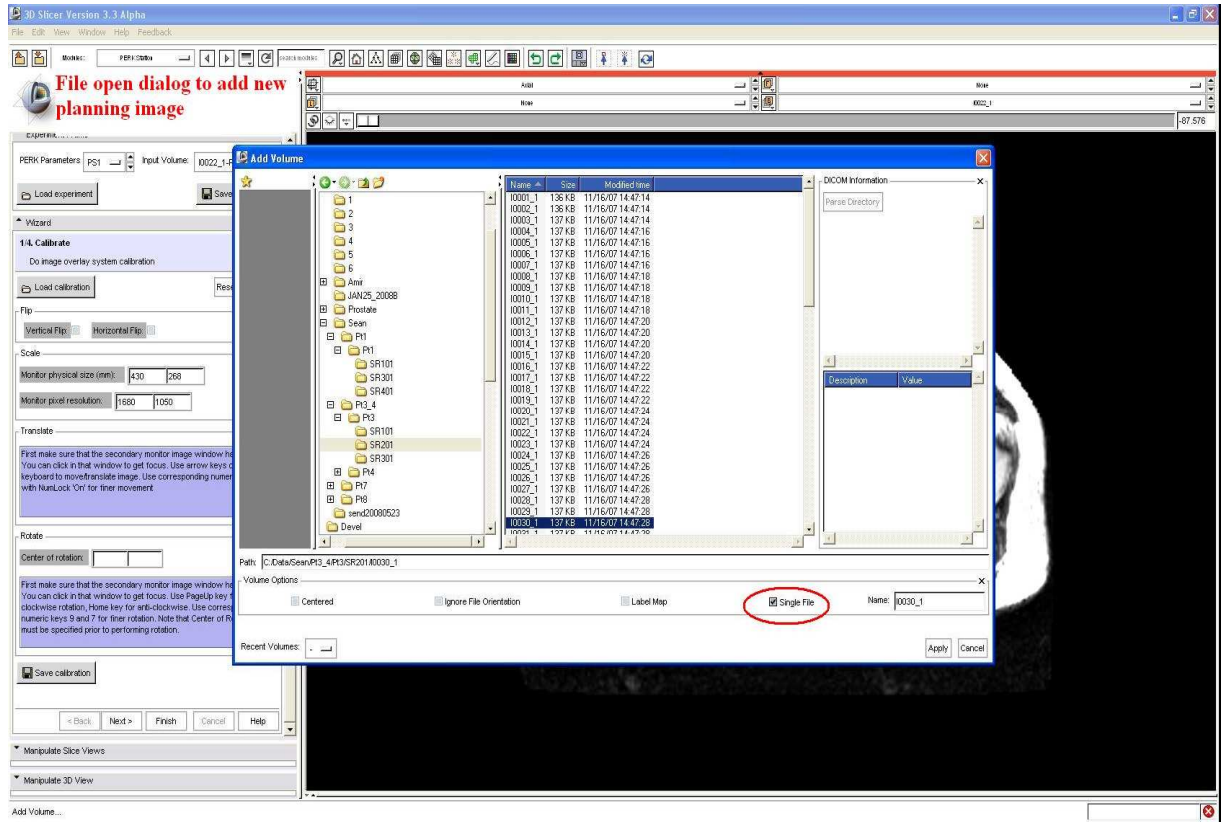
8.2.2. Now add new planning image, using Add volume from file menu

8.2.3. Make this planning image as active selected planning image, and perform your experiment!

See six snapshots below







3D Slicer Version 3.3 Alpha

File Edit View Window Help Feedback

PERK Data

03 Ready to start again!

PERK Parameters PS1 Input Volume: 00030_1-Plan

Load experiment Save experiment

1.4. Calibrate

Do image overlay system calibration

Load calibration Reset calibration

Flip Vertical Flip Horizontal Flip

Scale

Monitor physical size (mm) 430 258

Monitor pixel resolution: 1980 1050 Update

Translate

First make sure that the secondary monitor image window has 'focus'. You can click in that window to get focus. Use arrow keys on the keyboard to move/translate image. Use corresponding numeric keypad with NumLock 'On' for finer movement.

Rotate

Center of rotation:

First make sure that the secondary monitor image window has 'focus'. You can click in that window to get focus. Use PageUp key for clockwise rotation, Home key for anti-clockwise. Use corresponding numeric keys 9 and 7 for finer rotation. Note that Center of Rotation must be specified prior to performing rotation.

Save calibration

Back Next Finish Cancel Help

Manipulate Slice Views

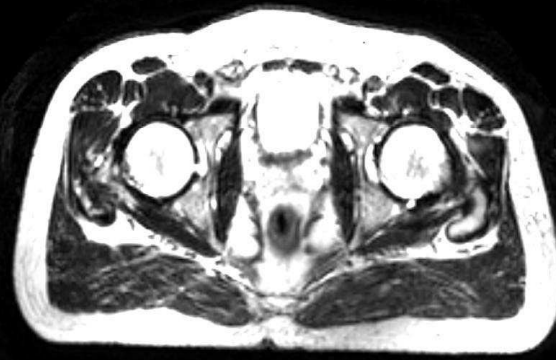
Manipulate 3D View

Middle Button: Pan, Right Button: Zoom

00030_1

Bg I: -53
Bg J: 117
Bg K: 0

Correspond!



Lb: None R: 278.8
Fg: None A: 72.8
Bg: Out of Frame S: -22.8