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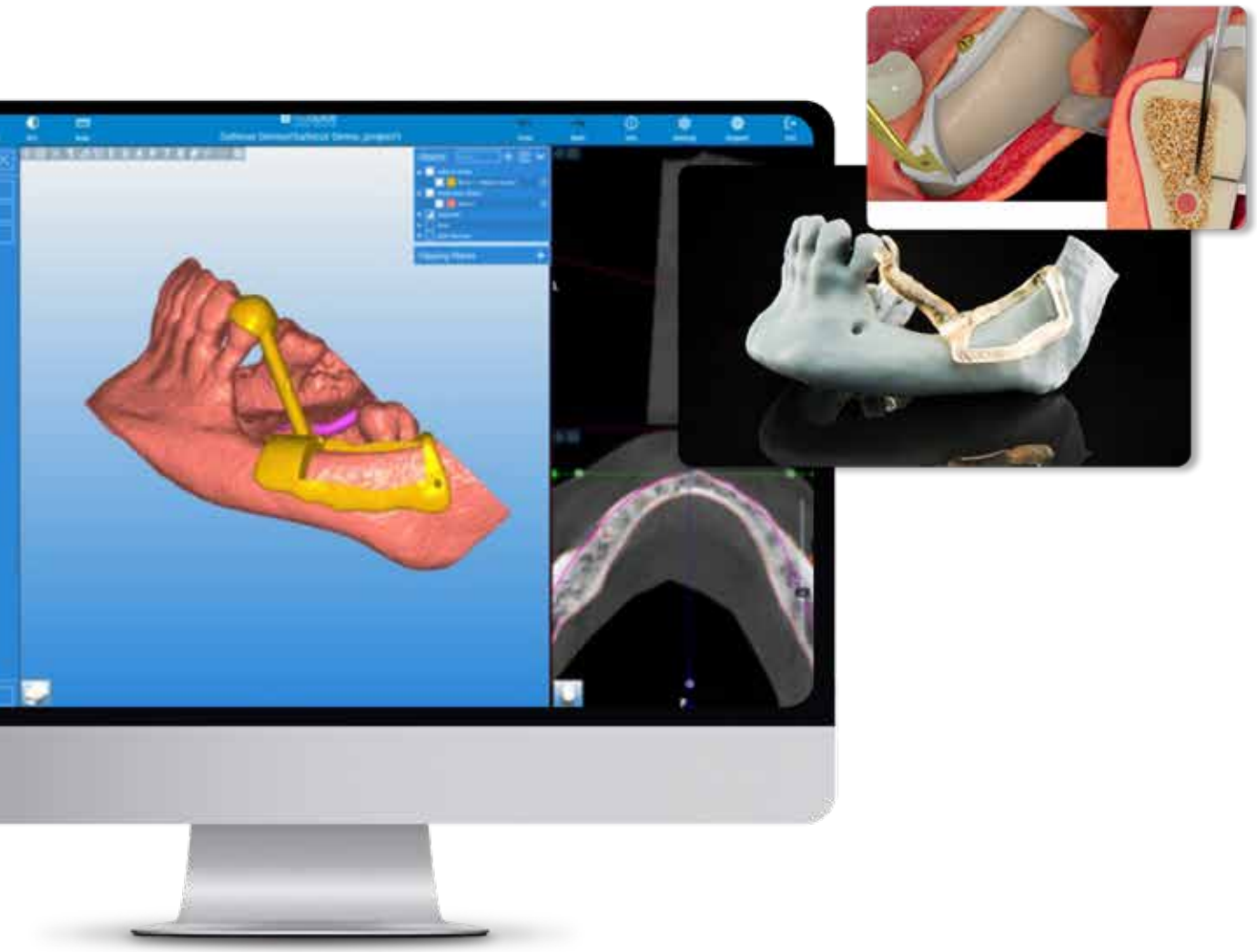
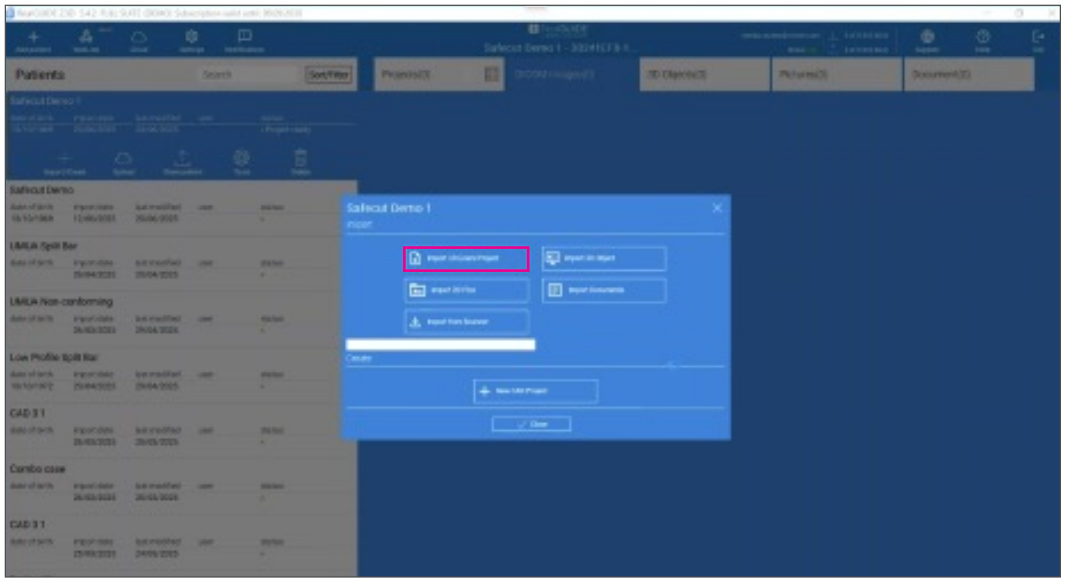
RealGUIDE®

SafeCut® Plugin Manual

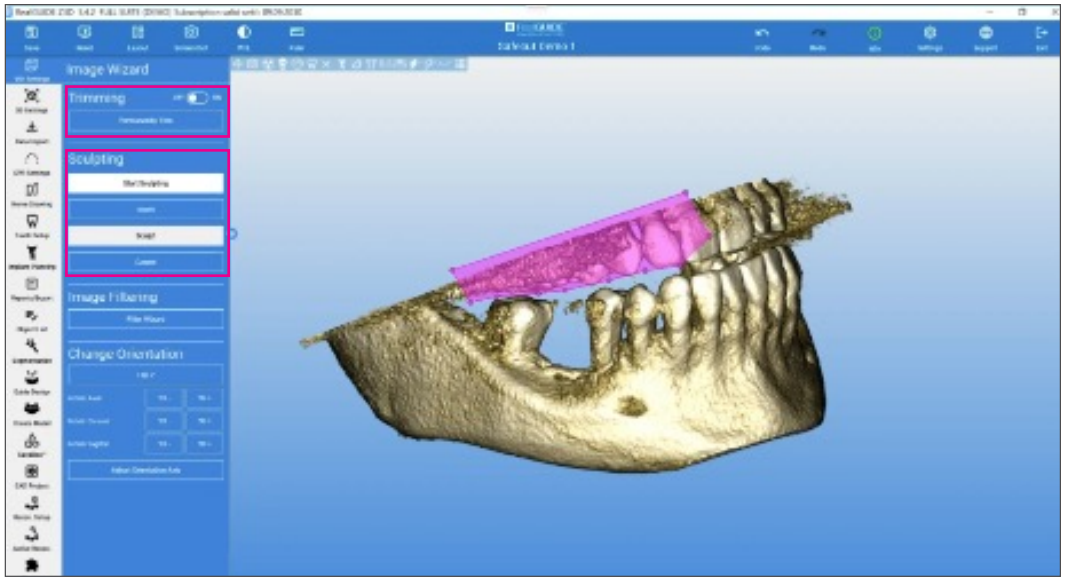


ZimVie

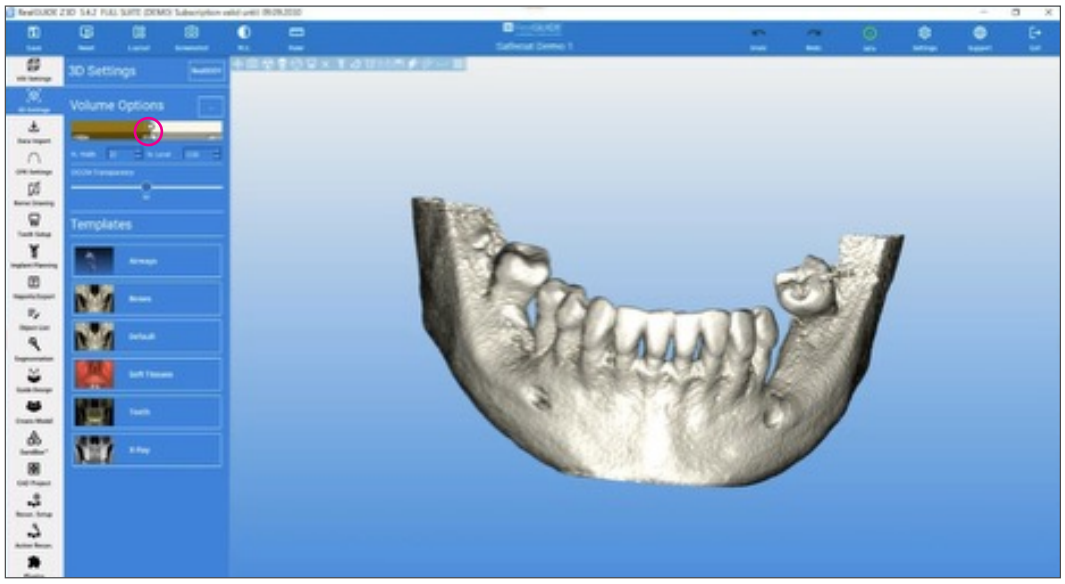
1. Open RealGUIDE Software, add a new patient and import Dicom file by clicking on Import 3d exam/project.



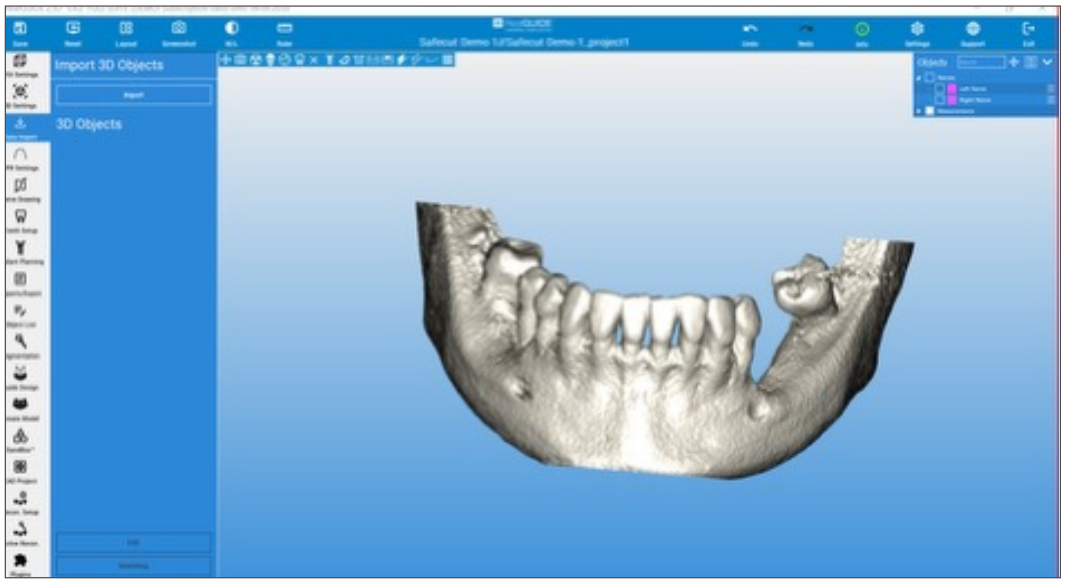
2. Open Dicom image and delete all parts of the bone which are not required using the trimming and sculpting tools.



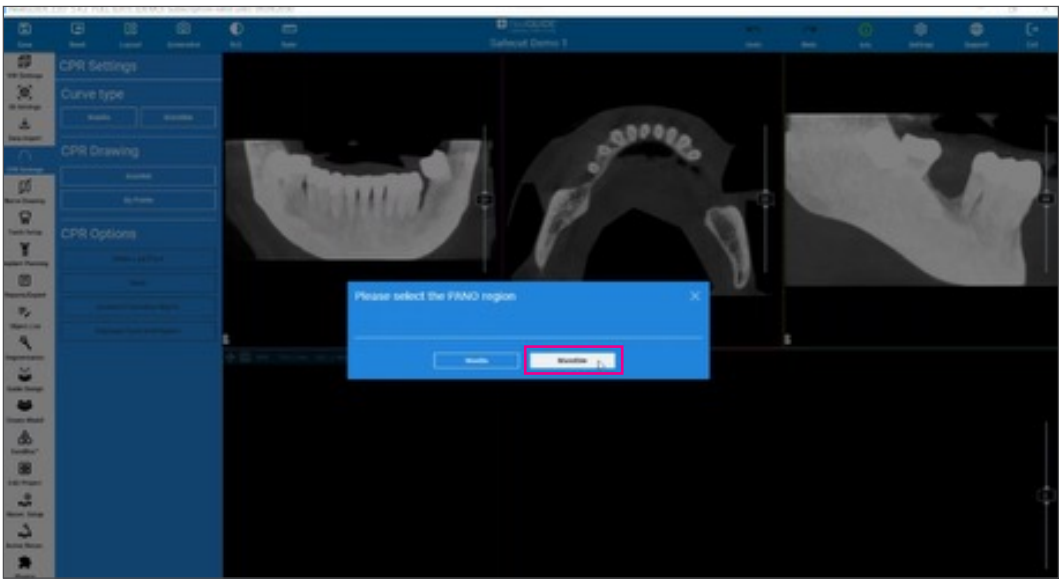
3. Click on next step and now using the volume function, change the contrast of the image to remove all remaining scatter. This is very important to remove any scatter in the area of the defect where the SafeCut guide is to be created.



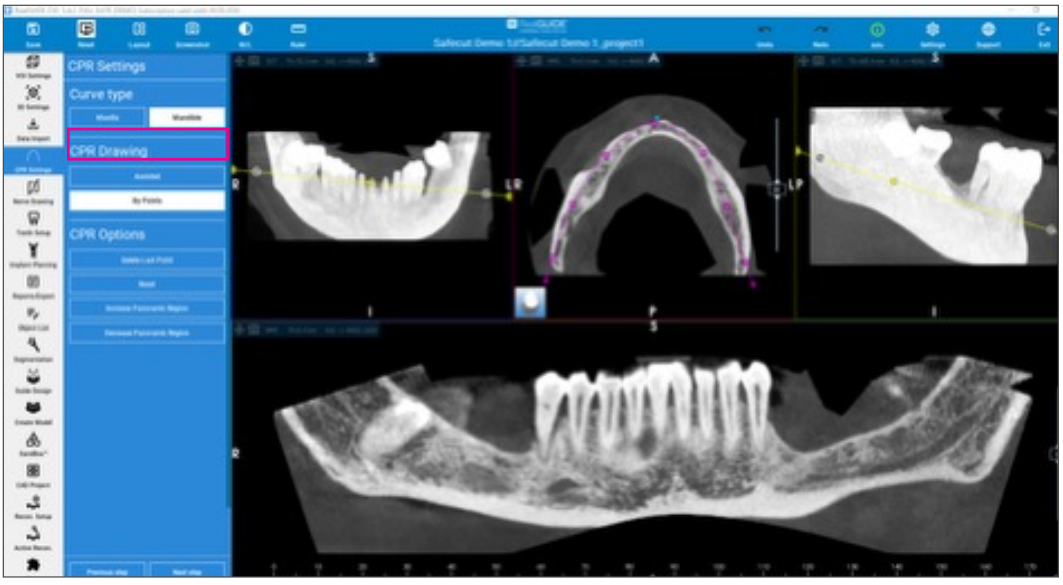
4. Click on next step, in cases where the Dicom does not contain scatter and a clear image of all remaining teeth is clear, an stl is not required. If the Dicom image is unclear, especially in the area of the adjacent tooth where the arm for the SafeCut Guide will be designed, then an stl file can be imported.



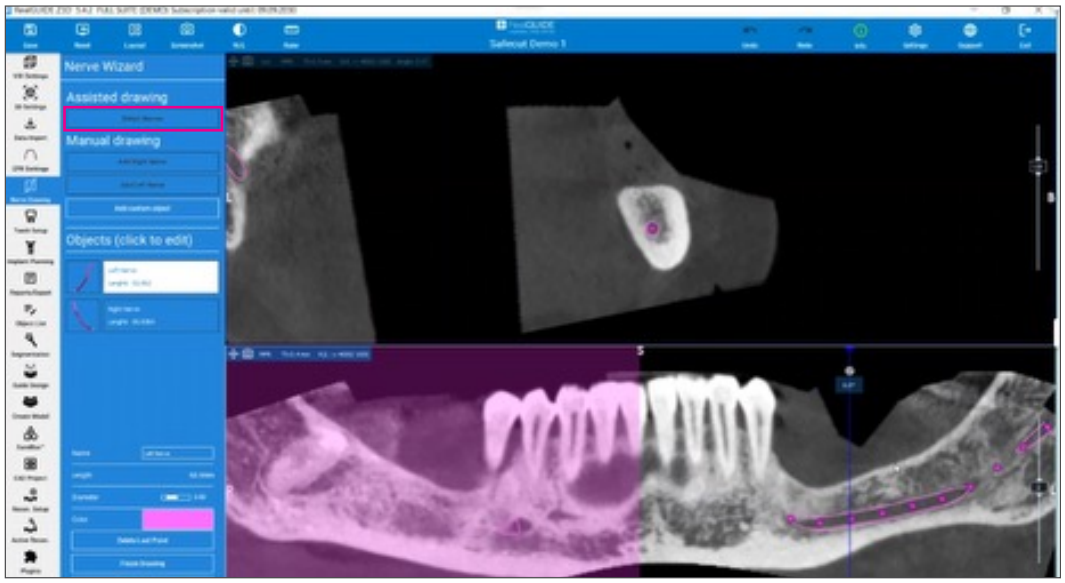
5. Click on next step, a pop up will appear to select the PANO region, you must click on the applicable jaw. On the left-hand side of the menu, under heading CPR drawing, now utilise the AI functions by choosing "**Assisted**". RealGUIDE will draw the Panoramic curve. You can also click on "**By Points**" to draw the curve manually.



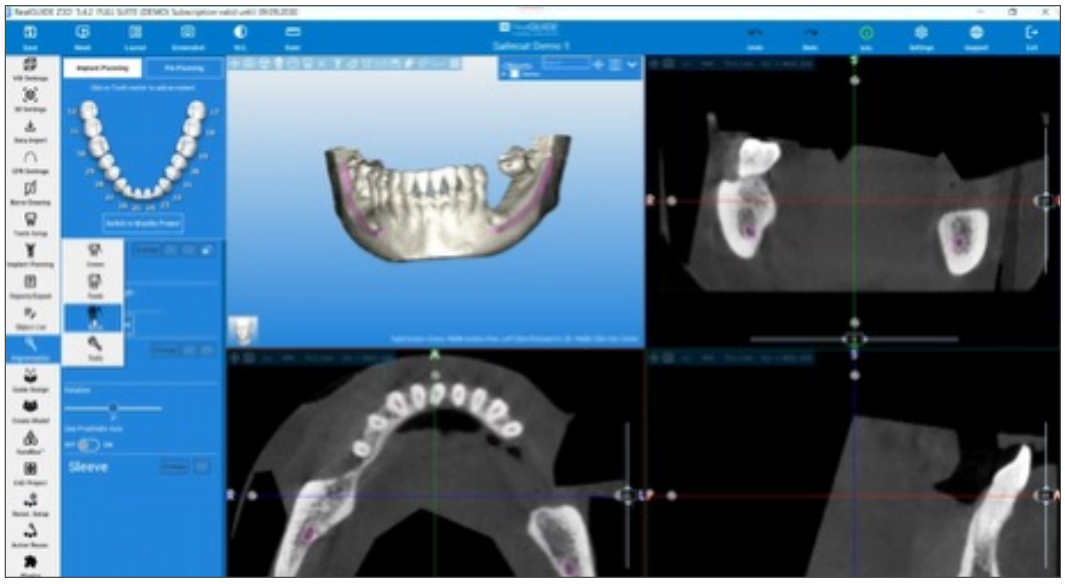
6. Click "**Assisted**" button below CPR Drawing in the tool bar, to activate AI Panoramic curve drawing.



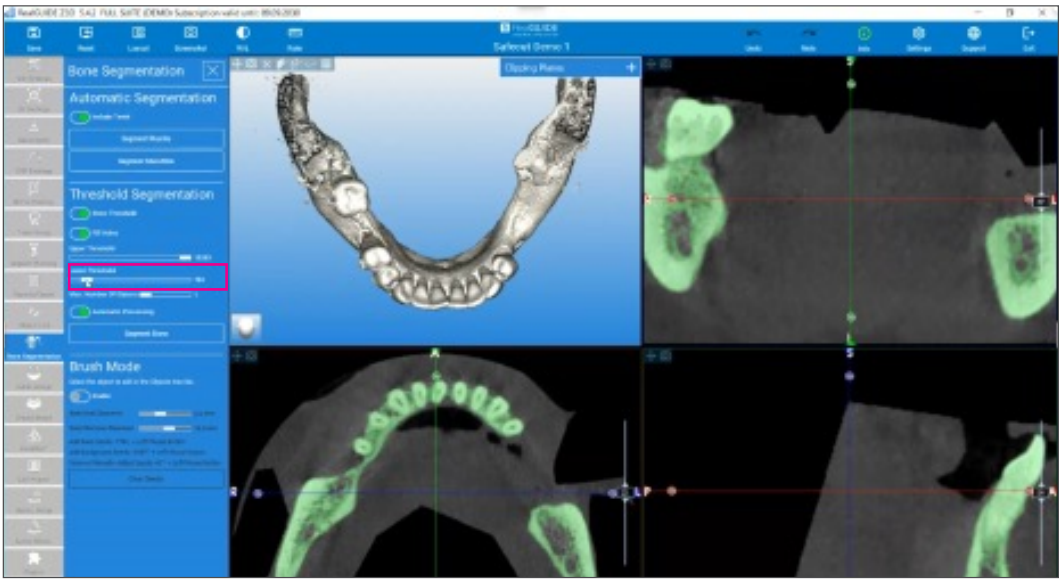
7. Click next step, to track the nerve, again using the AI functions, click on "**Detect Nerves**" on the left menu under assisted drawing.



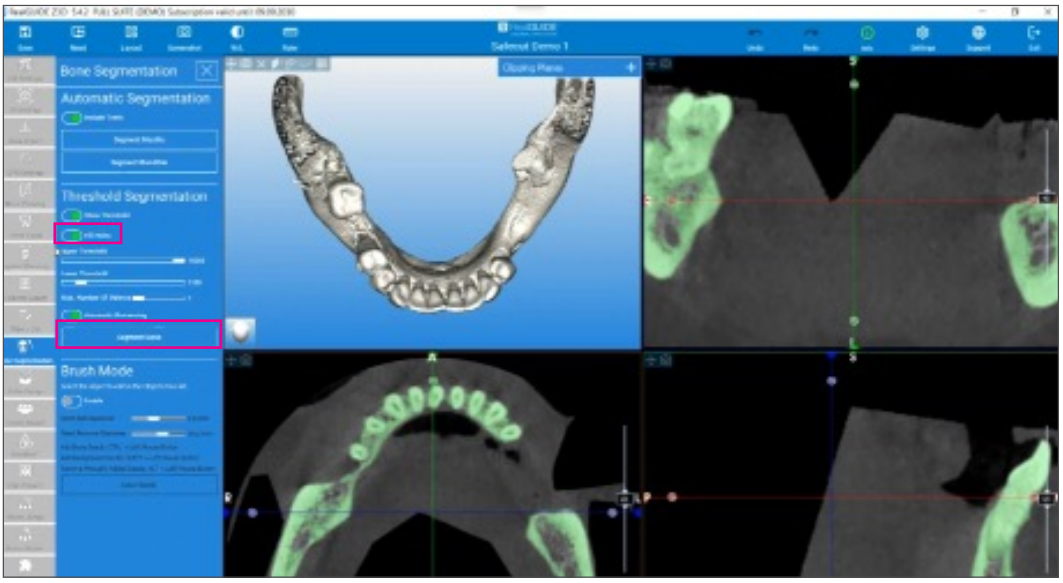
8. Click next step, the teeth set up or implant planning are not required at this stage. Move directly to the segmentation tab, there are four options, crown, tooth, bone and tools, click "**Bone**". This stage is important to convert the Dicom file into an stl file.



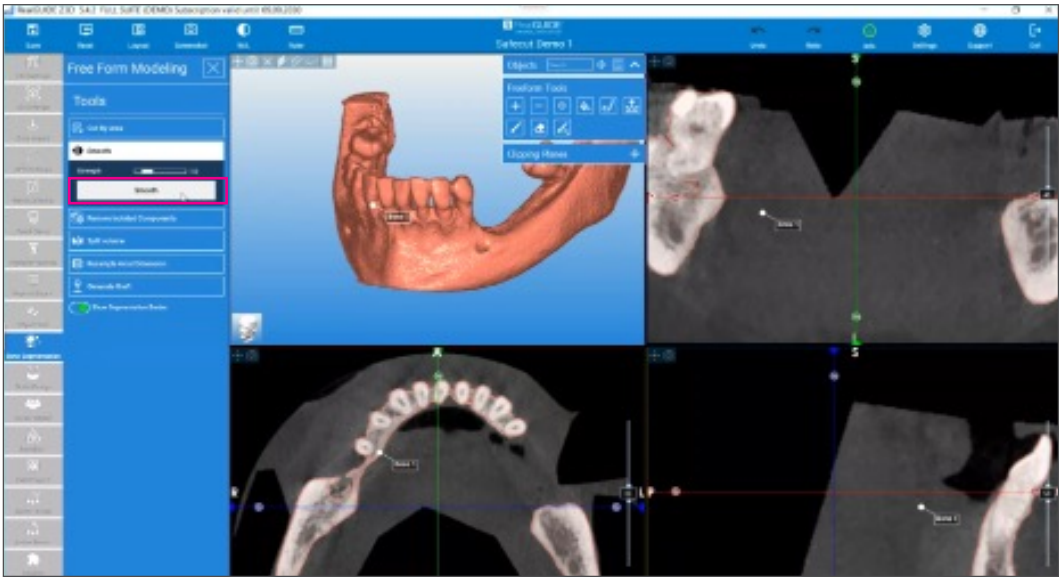
9. Once in the bone segmentation window, use the sliding tab labelled "**Lower Threshold**" on the left of the screen. Move the tab to ensure that the green colour viewed on the cross-sectional view is within the bone. The perimeter of the bone should be a solid green line with no visible grey areas. It is important that the green colour is not outside the bone as the segmentation tool will also segment the scatter which may cause inaccuracy.



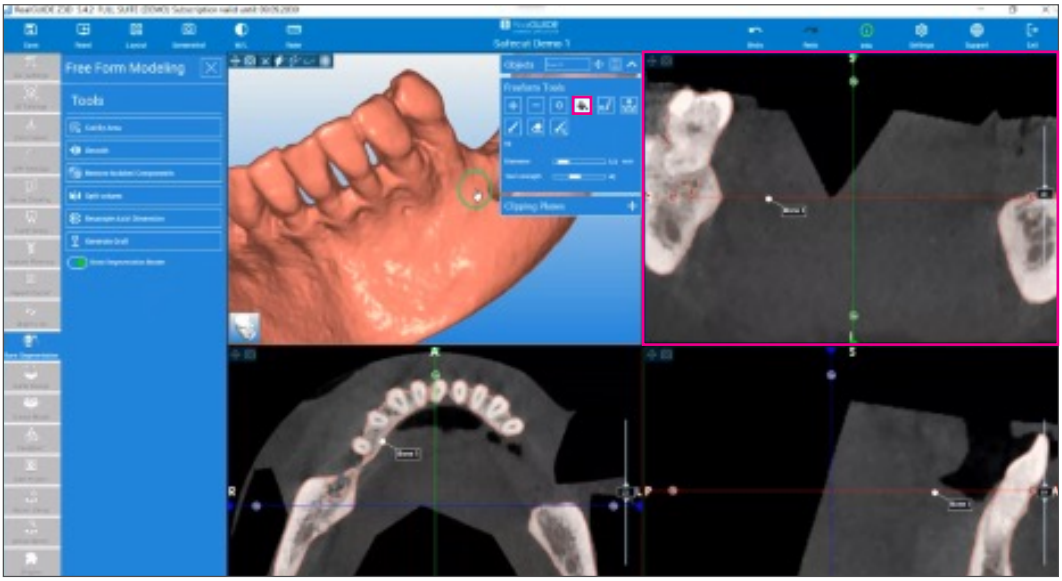
10. Before clicking on bone segmentation, first check that the "**Fill Holes**" option is activated, this ensures a complete segmentation of all the bone with no areas of discrepancies or missing data. Click on "**Segment Bone**" button.



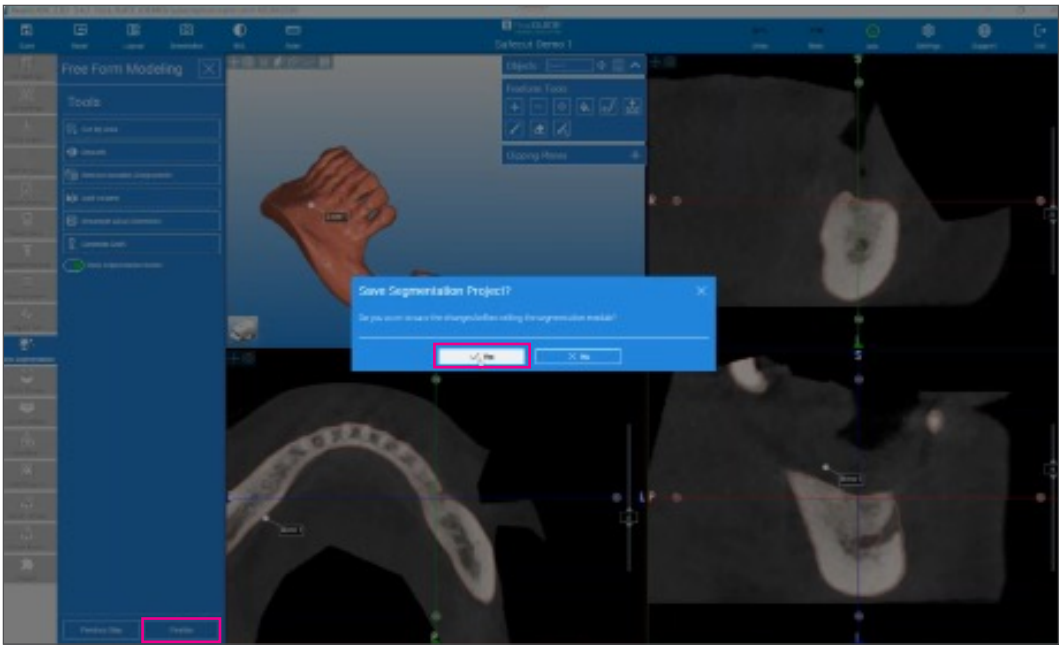
11. Click on next step in the free form modeling window. To smooth the model, click on the "**Smooth**" button on the left and leave the strength parameter on the sliding scale at 1.0.



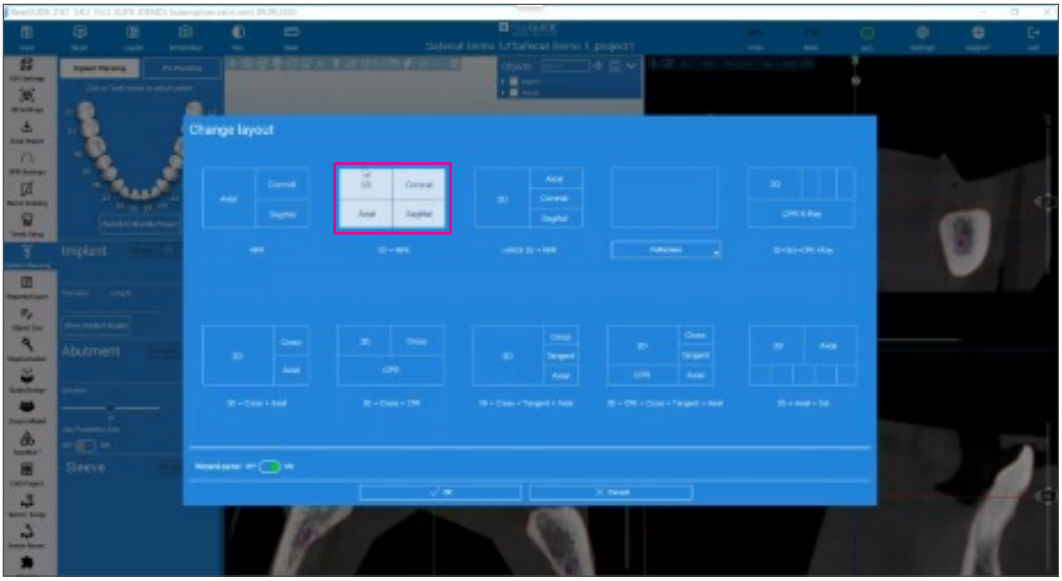
12. Using the free form tools, close any visible holes on the model, this will ensure accuracy when creating the SafeCut guide. Use the fill (paint pot) button to simply click on the defects and close the hole. Verify the using the cross-sectional view in the top right section to ensure all holes have been closed.



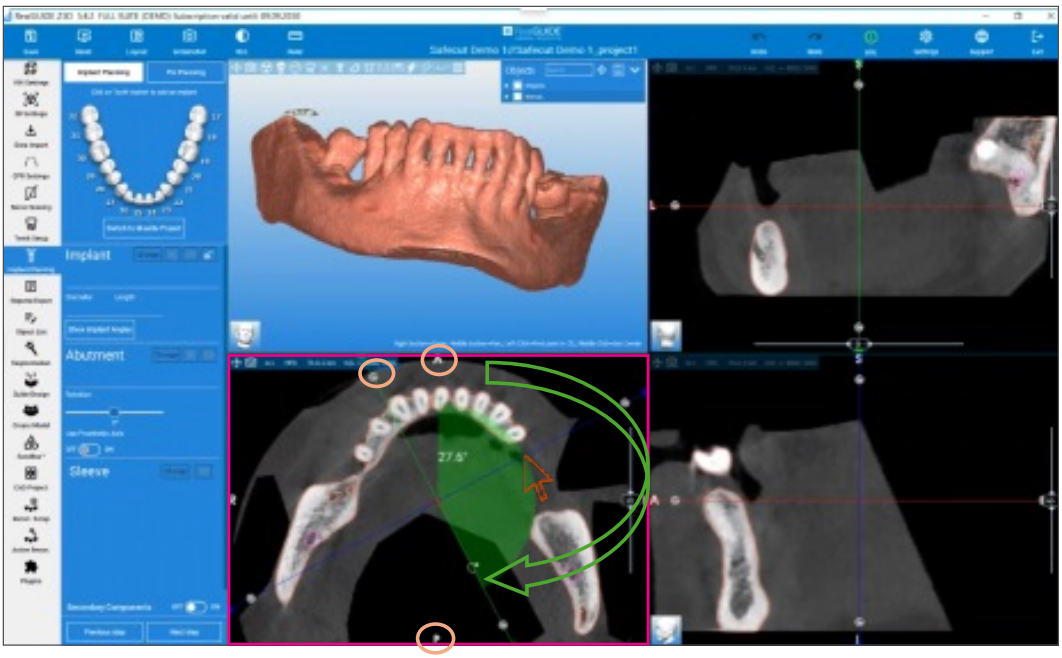
13. Click "**Finalize**" on free form modelling and save segmentation project.



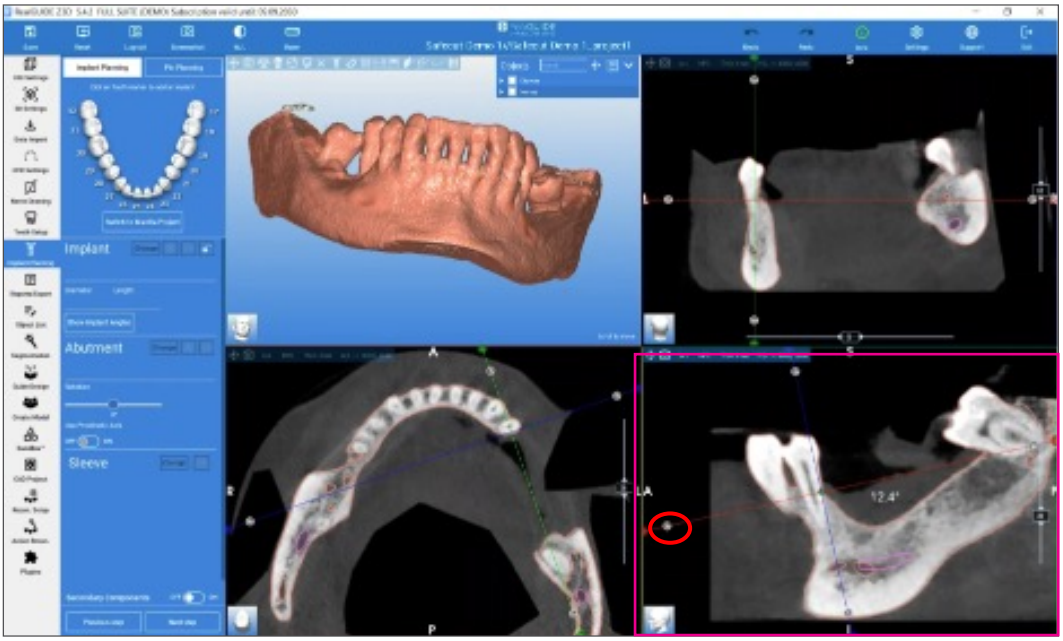
14. Move to Implant planning tab to measure the defect. To do this, change the layout using the button at the top of the tool bar and click on "**3D + MPR**" view.



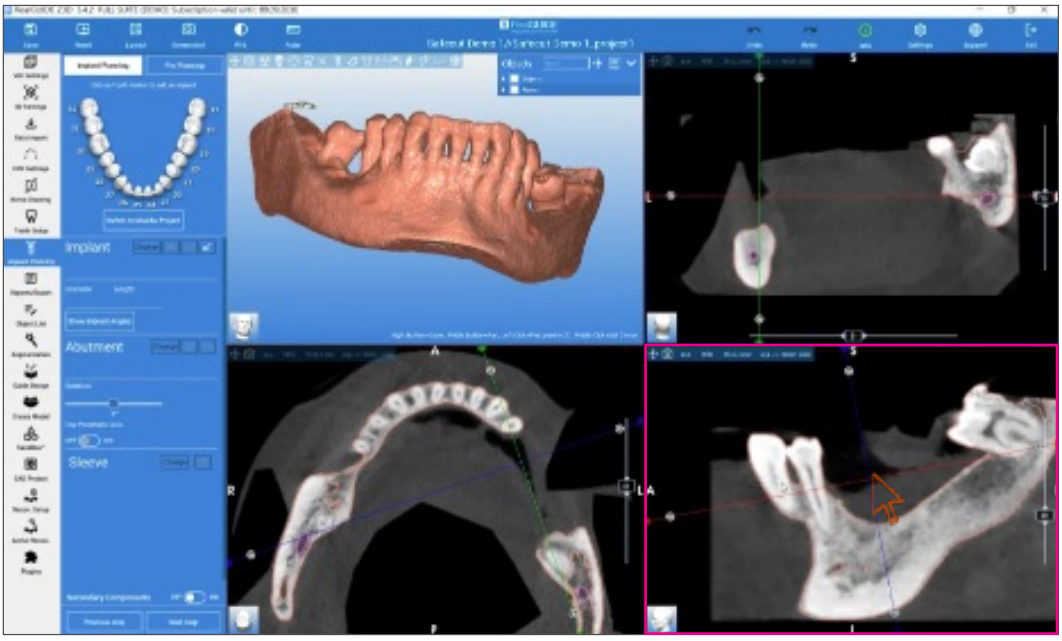
15. Working on the Axial view, move the green line (Sagittal Axis) along the defect. Move the cursor over the top clockwise arrow, labelled A, click and rotate in a clockwise direction towards the P symbol at the bottom of the view. Then click over the defect and the green line will reposition over this area.



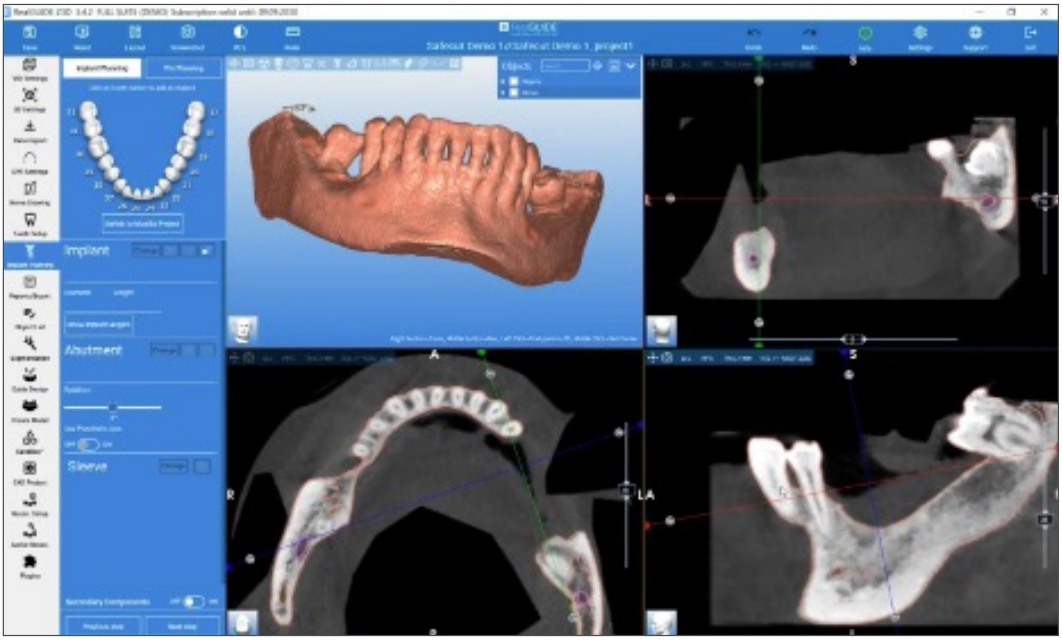
16. Next using the lateral view, move the red line to see the mesial - distal length of the defect. Move the clockwise arrows on the left and right side of the red line to align with the highest mesial and distal peaks of the bone in the area of the defect.



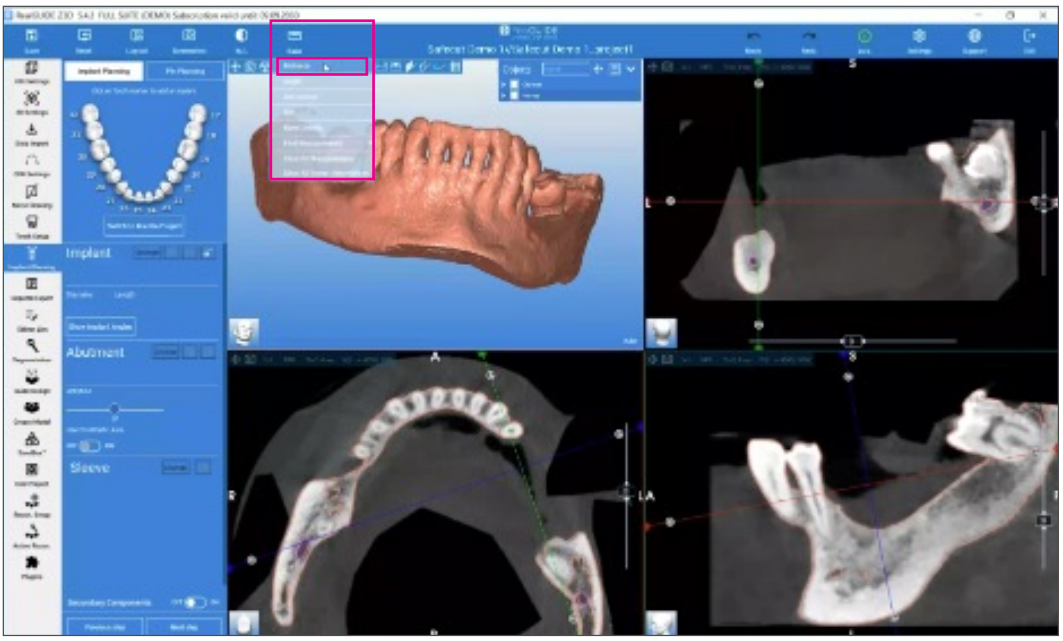
17. Move the mouse over the blue line into the deepest part of the defect.

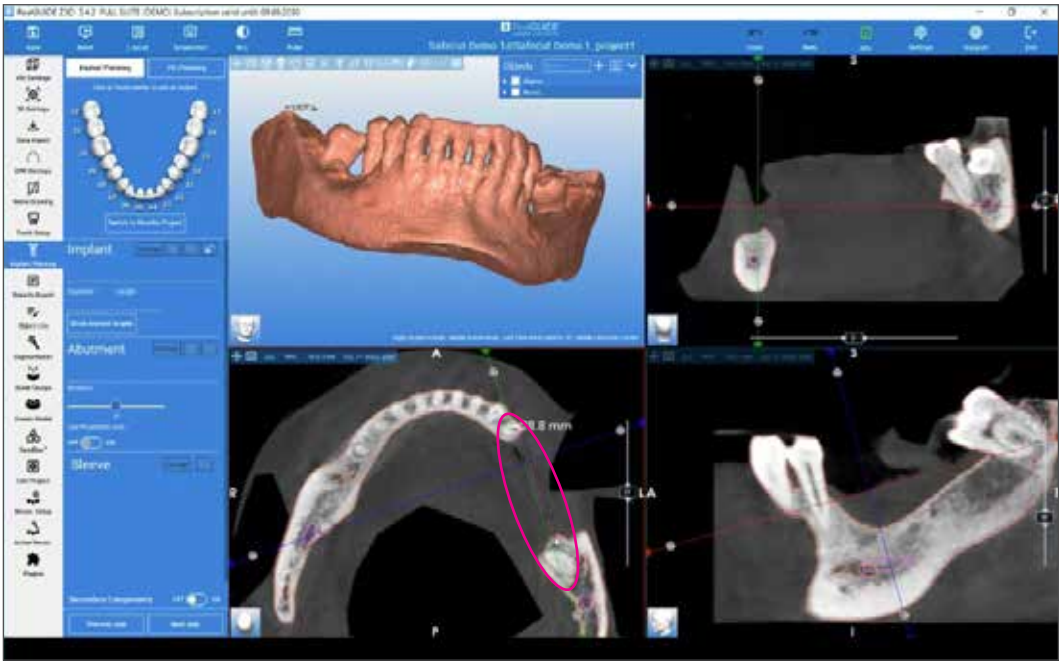


18. Once the green line is running along the length of the defect, the red line is positioned from the highest mesial to the highest distal peak and the blue vertical line is positioned in the area where the defect is the deepest, measurements can be taken.

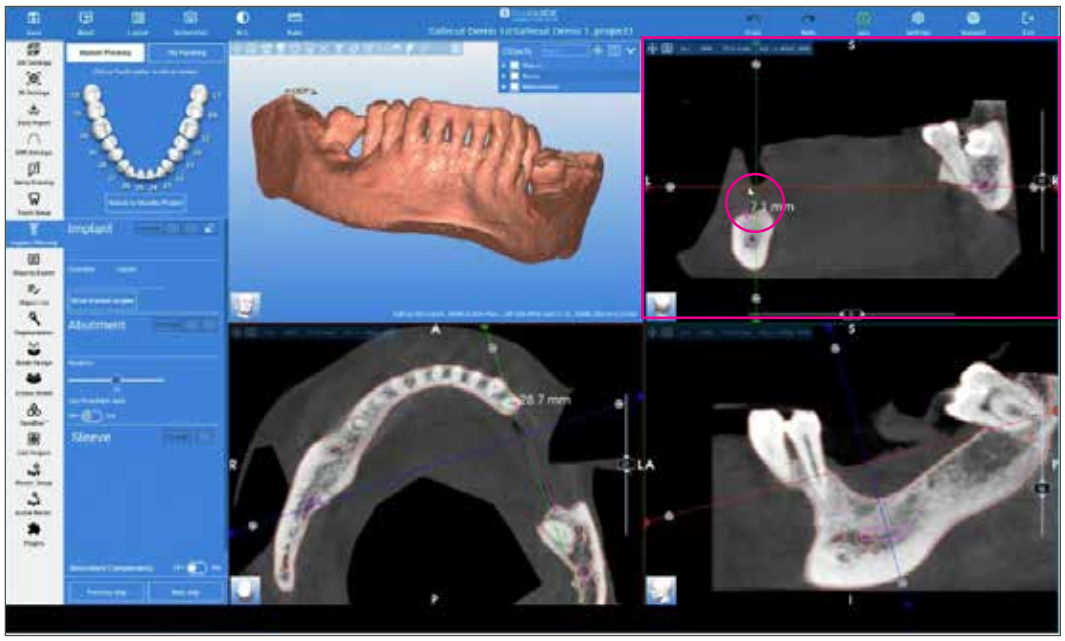


19. To take measurements, click on the "**Ruler**" button located at the top of the tool bar, in the drop-down menu select distance. Using the **lateral view**, first take the measurement of the maximum length by clicking from the mesial to distal area of the defect.

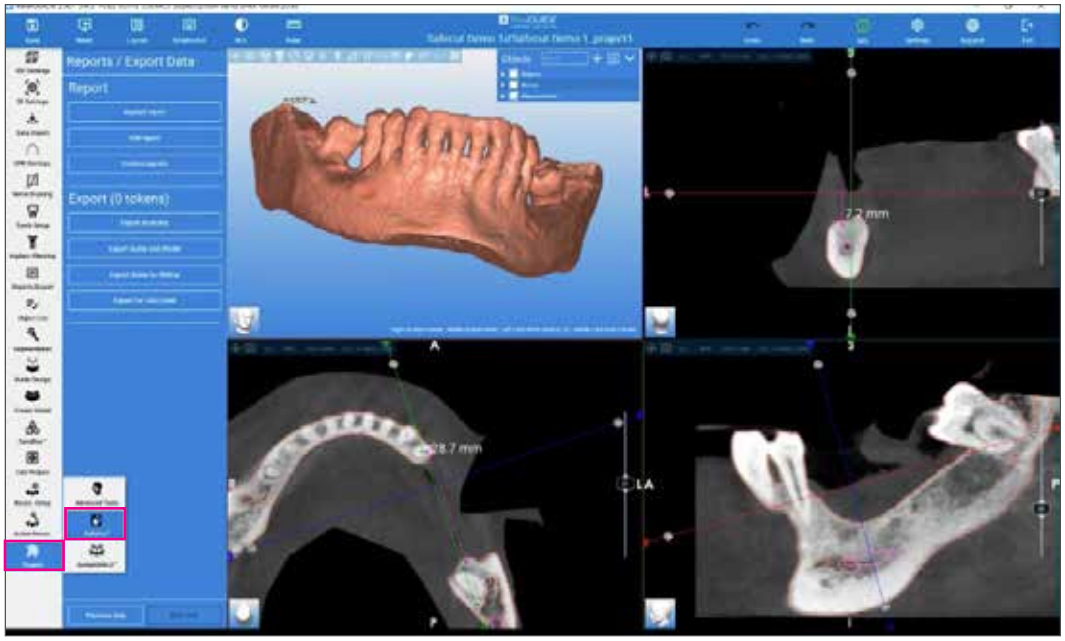




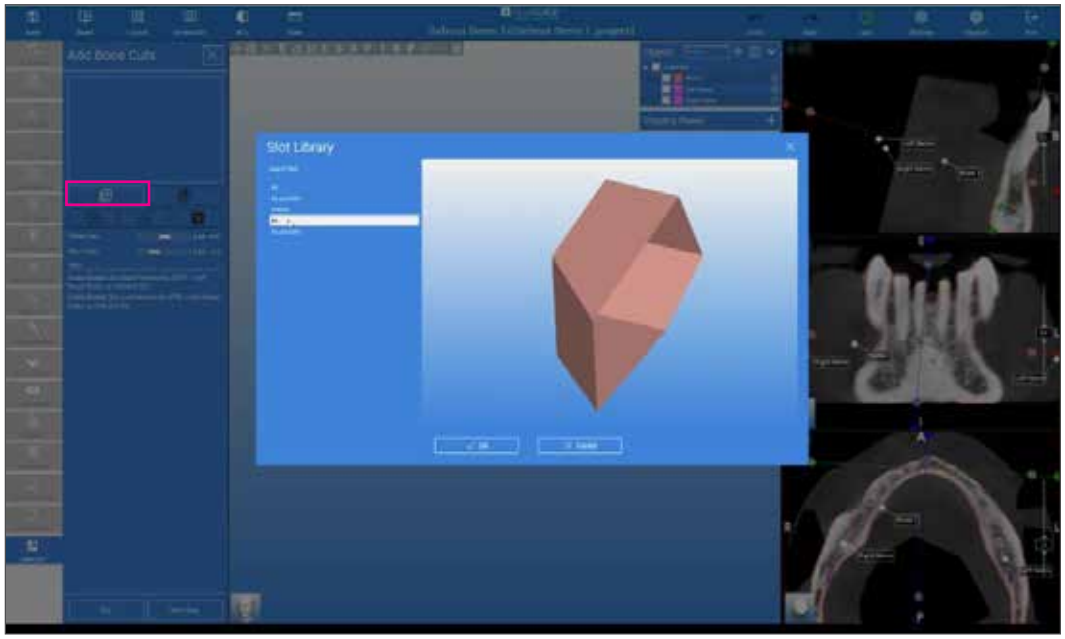
20. Next looking at the **Coronal** view to obtain the maximum height, measure the distance from the red line to the crest of the ridge. **Note:** Ensure the blue vertical line is repositioned into the deepest portion of the defect in the lateral view before taking this measurement.



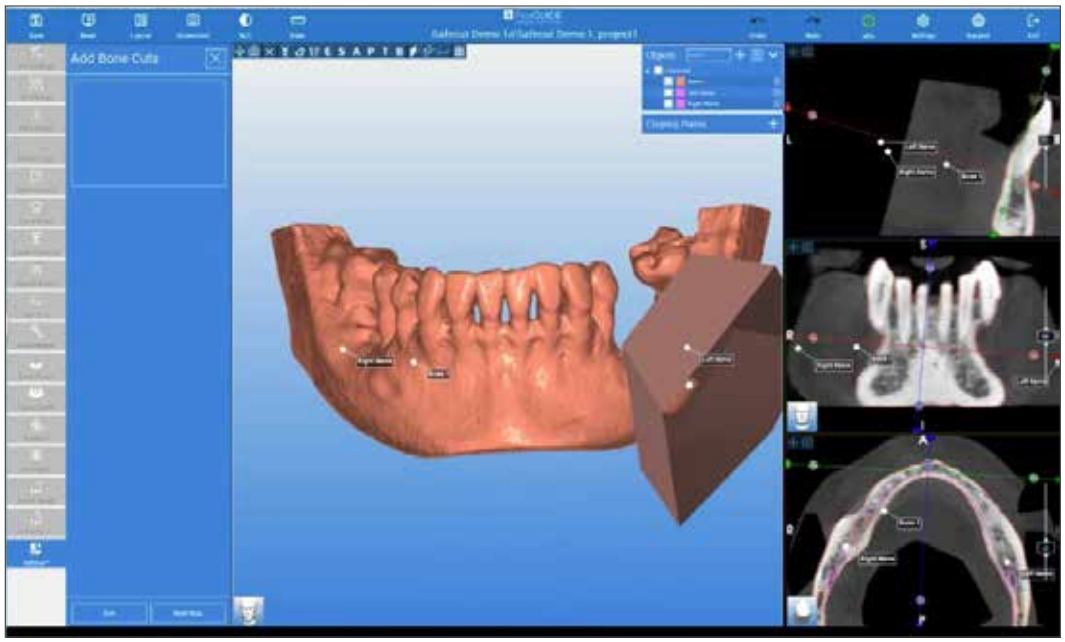
21. Note down the measurements and move directly into the SafeCut plug in located on the left of the tool bar under the Plug in's tab.



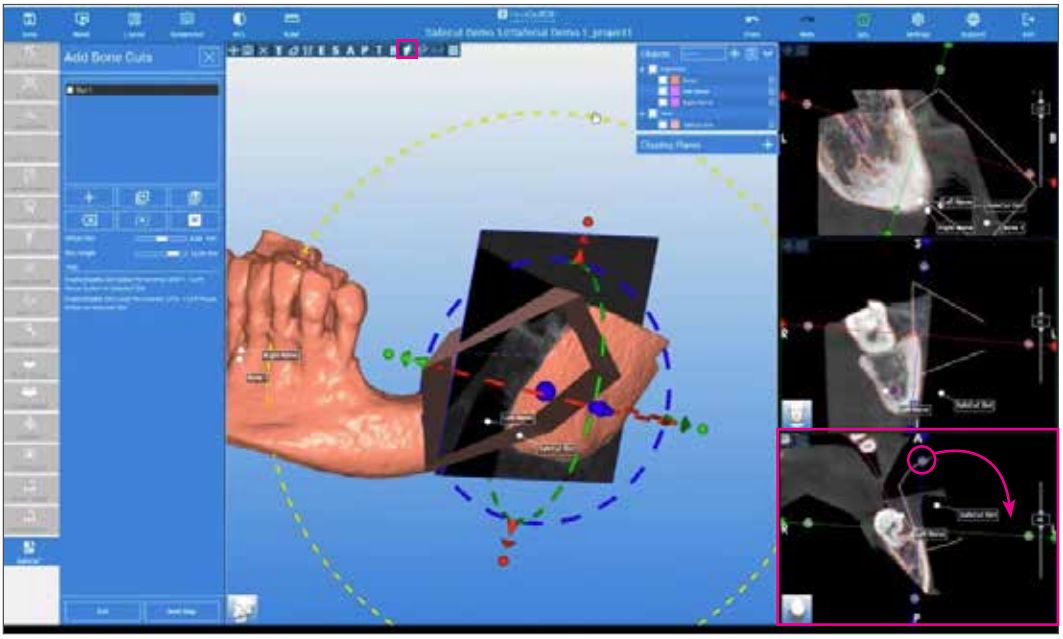
22. Once in the plug in, click on the "**+**" button under the add cuts section on the left of the tool bar, select a cutting plane template from this menu most appropriate to the defect.

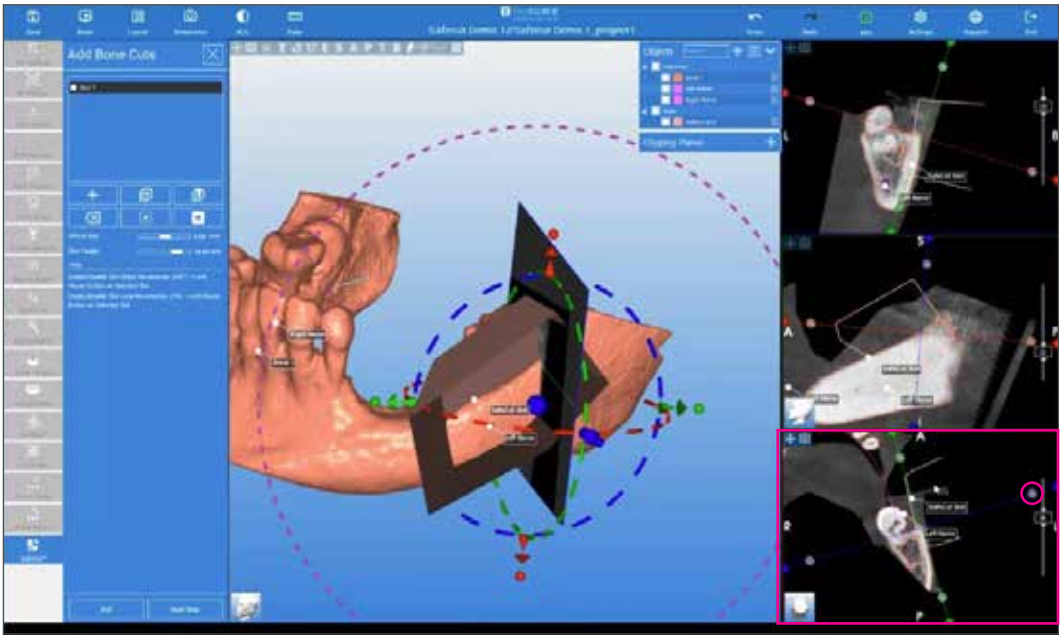


23. Click **ok** and the cutting plane will appear near your model, using the left button of the mouse position the box in the area to cut.

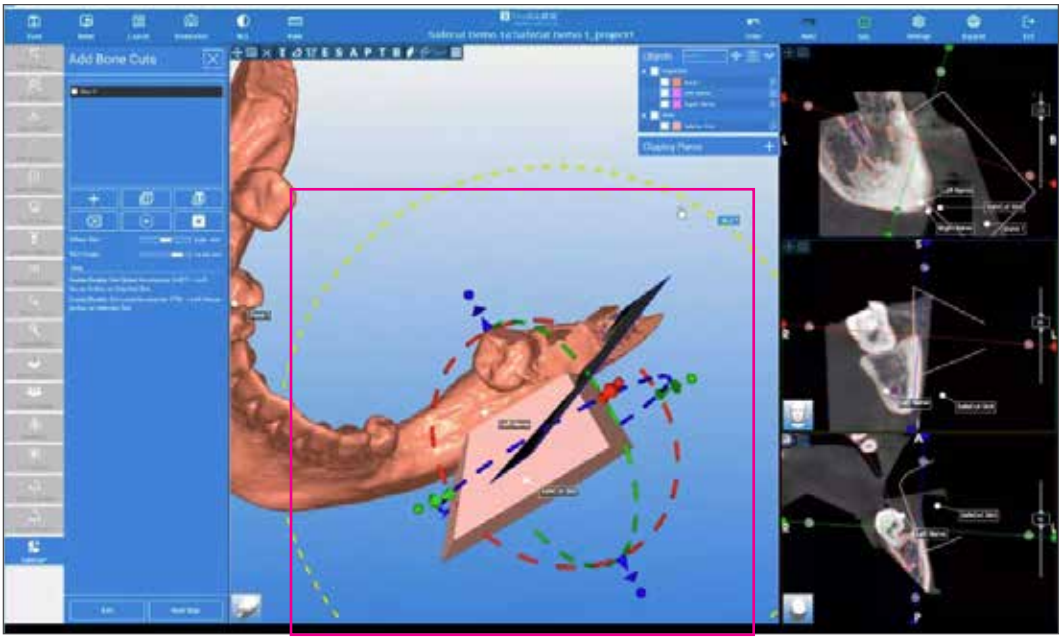


24. Click on cross section, located at the top of the tool bar, and position this cross section, parallel to the distal part of the cutting slot. Click on the clockwise arrow on the blue line and rotate. Repositioning the cross-section plane allows visualization of the position of the cutting slot in the bone.

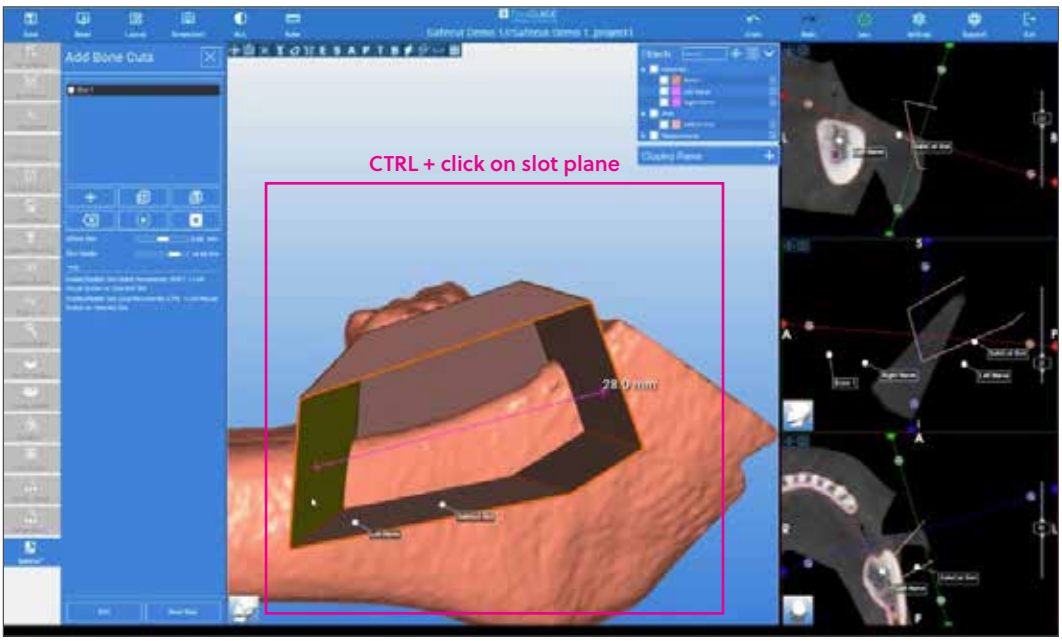




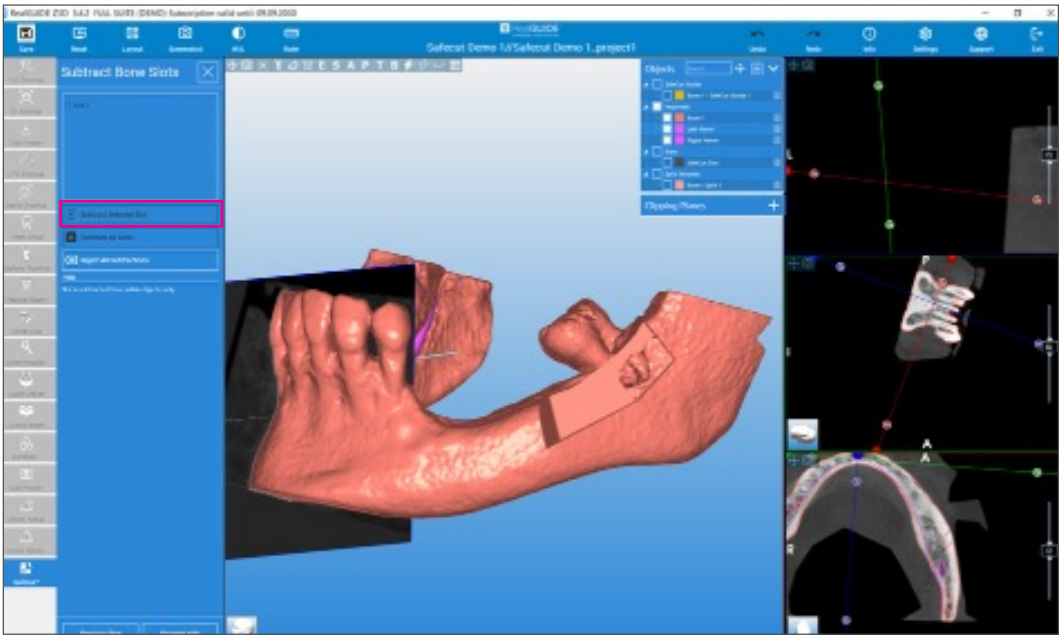
25. Using the cross-sectional view, reposition the cutting slot in the bone. There are two ways to do this:
    a. To move and rotate the body of the slot, click "**Shift + Click"** on the slot, grids will appear which allow you to move the entire slot or rotate in different directions. To remove this grid view, click "**Shift + Click"** on the slot again.



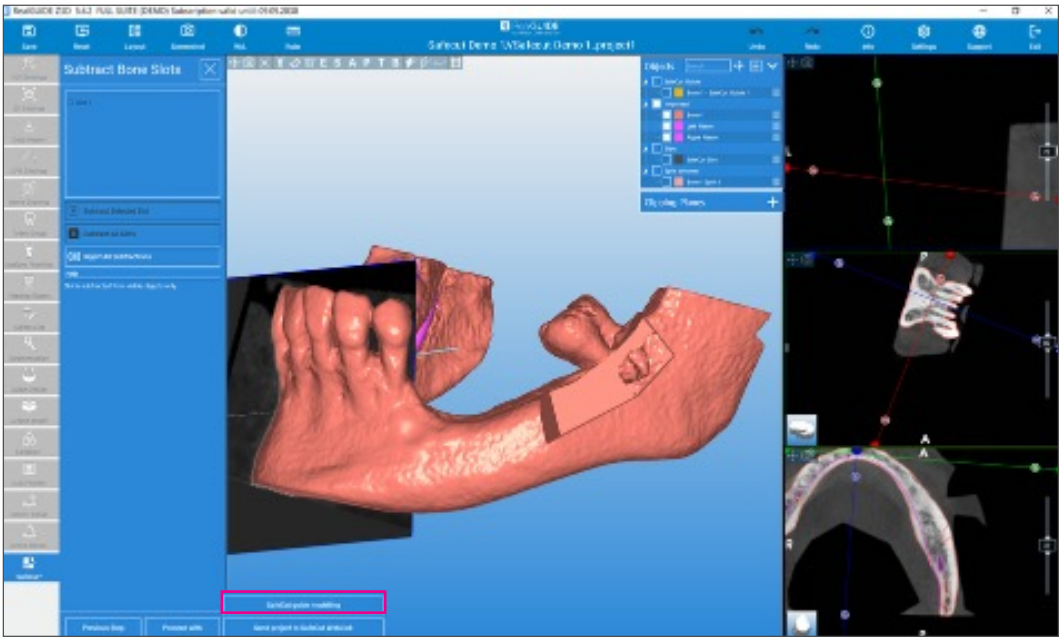
    b. If you wish to move only one plane of the slot, click "**CTRL + Click"** on the plane you wish to move, this area will highlight where you can now click and pull into the desired position. To leave this view, click "**CTRL + Click"** on the slot. Use the ruler function to recheck the measurements of both lateral and cross-sectional views and adjust accordingly. The slot will turn red to alert you that you are too close to the nerve.



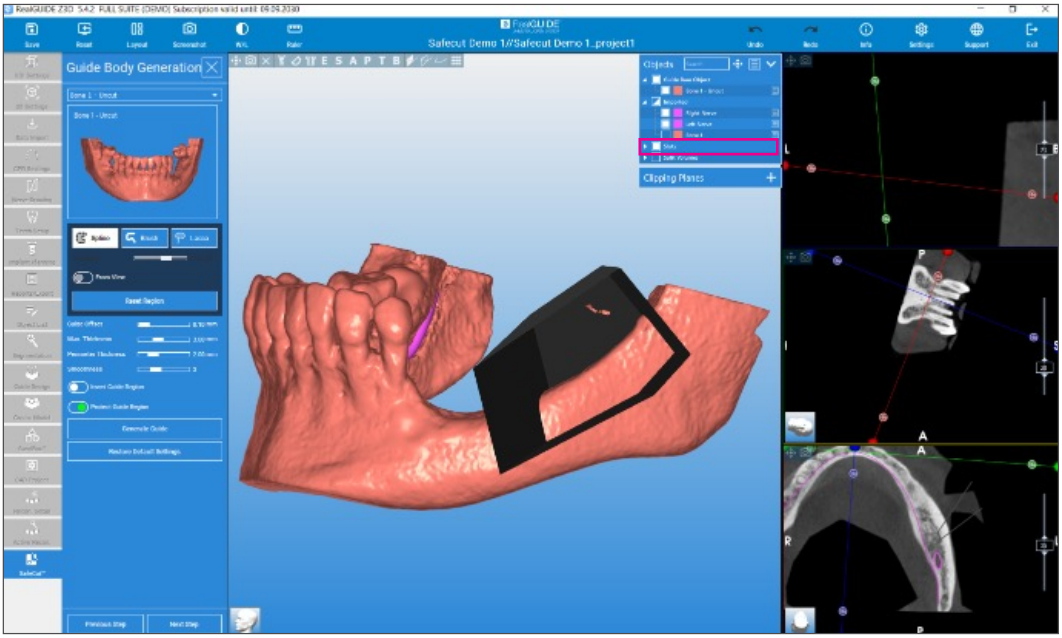
26. Click next step, click on the "**Subtract Selected Slot**" button on the left of the tool bar, this function will remove the slot of bone on the model.



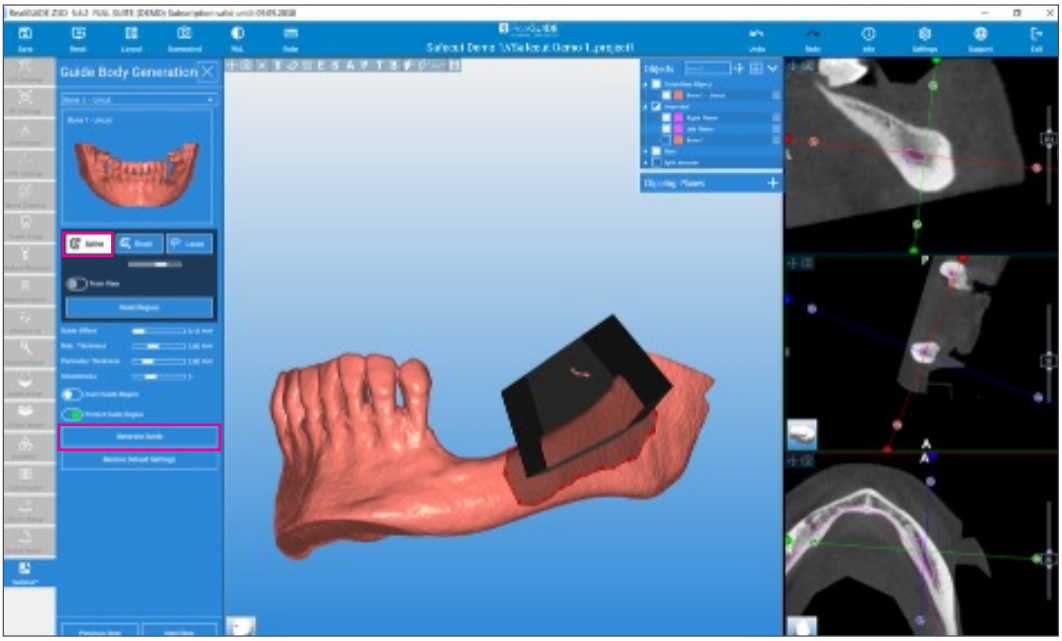
27. Next click on proceed with, you now have two options:
    - **Send project to "SafeCut Weblink"** - To outsource the design of the SafeCut guide.
    - "**SafeCut Guide Modelling**" - To create your own guide.



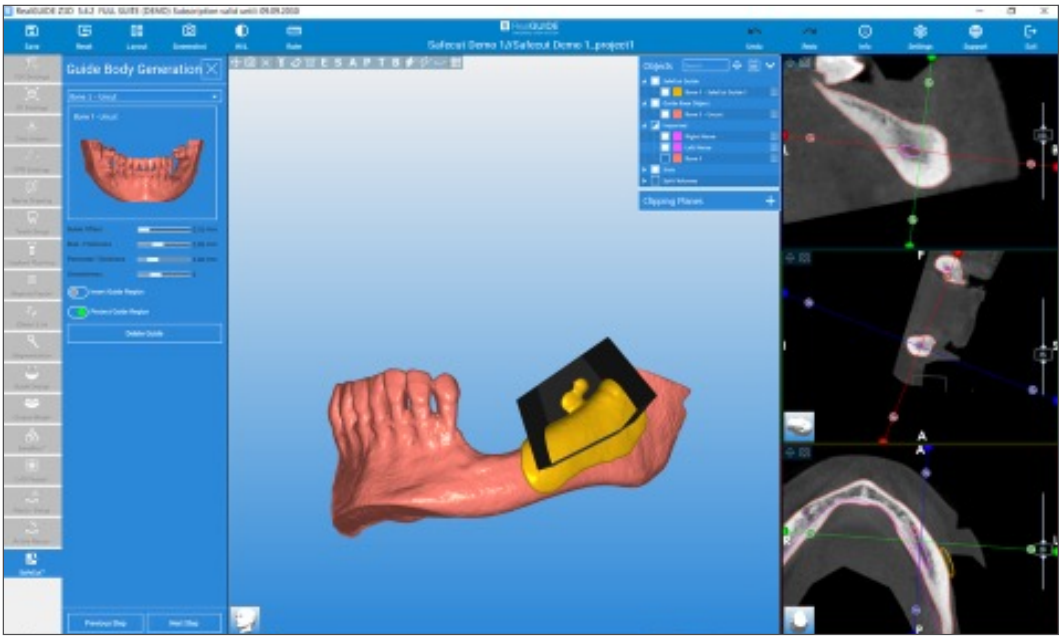
28. To create the surgical template, ensure you can see the slot object to visualize where to create the guide. Do this by clicking on the box next to slot in the objects list.



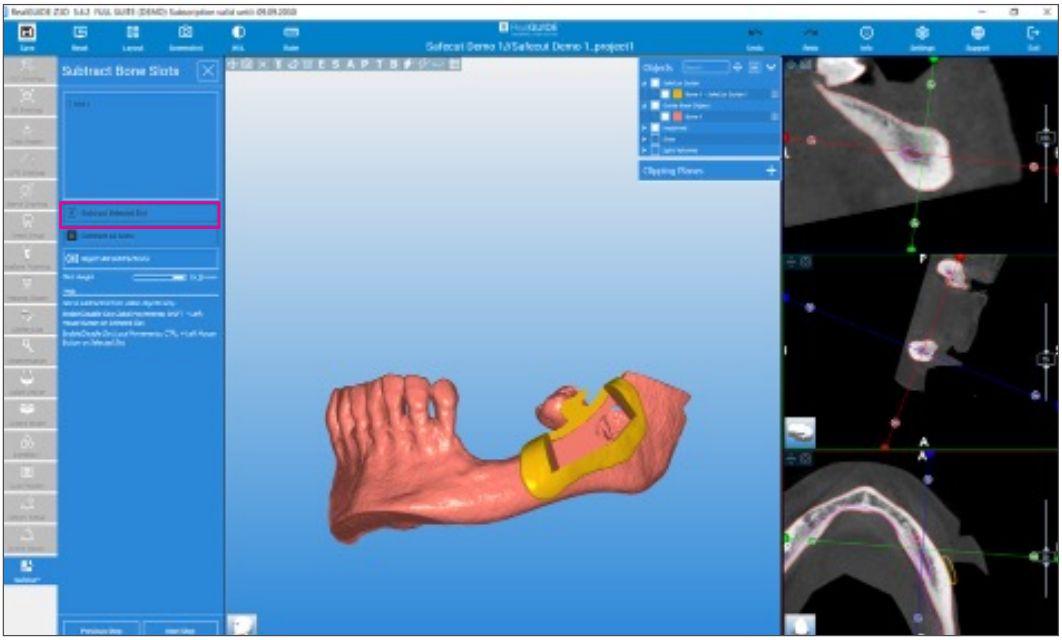
29. Next, activate the "**Spline**" button on the left side of the tool bar, design the boundary position of the guide point by point around the slot using the left mouse button. Ensure there is a good distance between the slot and the points to create the correct thickness for the SafeCut Guide. Make sure to leave enough space mesial to the slot to allow for the placement of the fixation screw to hold the guide to the bone. Click "**Generate Guide**" to generate the surgical guide.



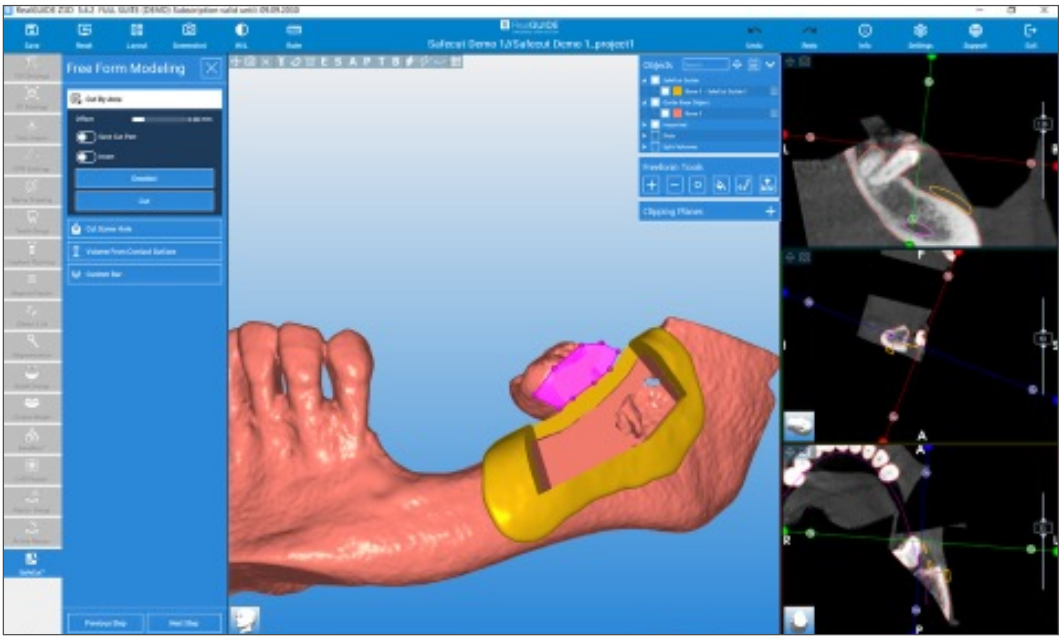
30. A yellow guide will now appear within the area dictated by the points drawn.



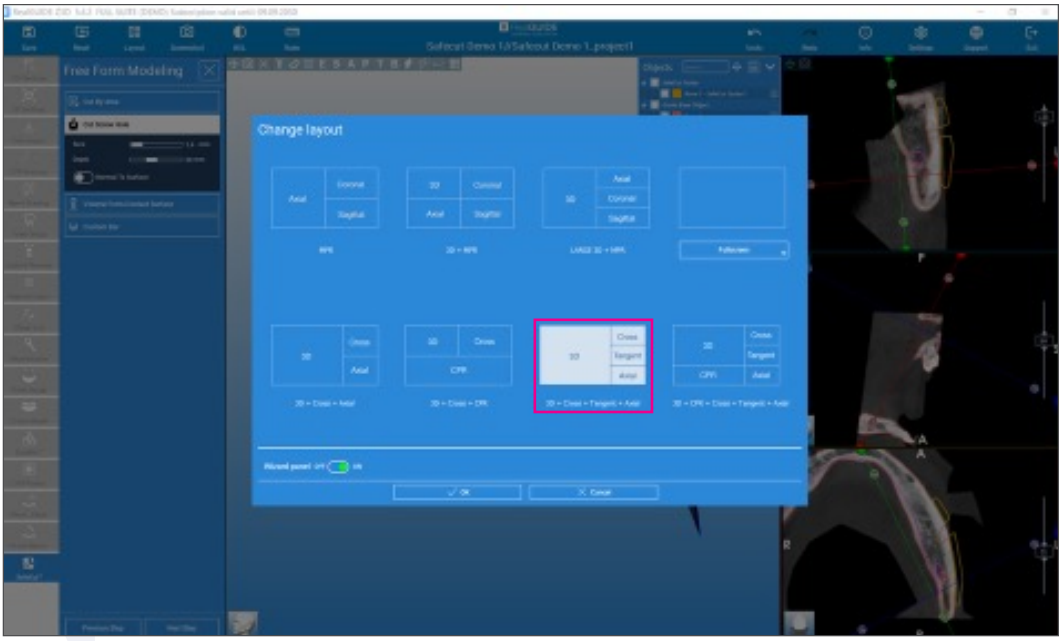
31. Click on next step, select "**Subtract Selected Slot**", this removes the slot volume within the guide which creates the boundary condition, these are the planes which will guide the tip of the Piezo during bone harvesting.



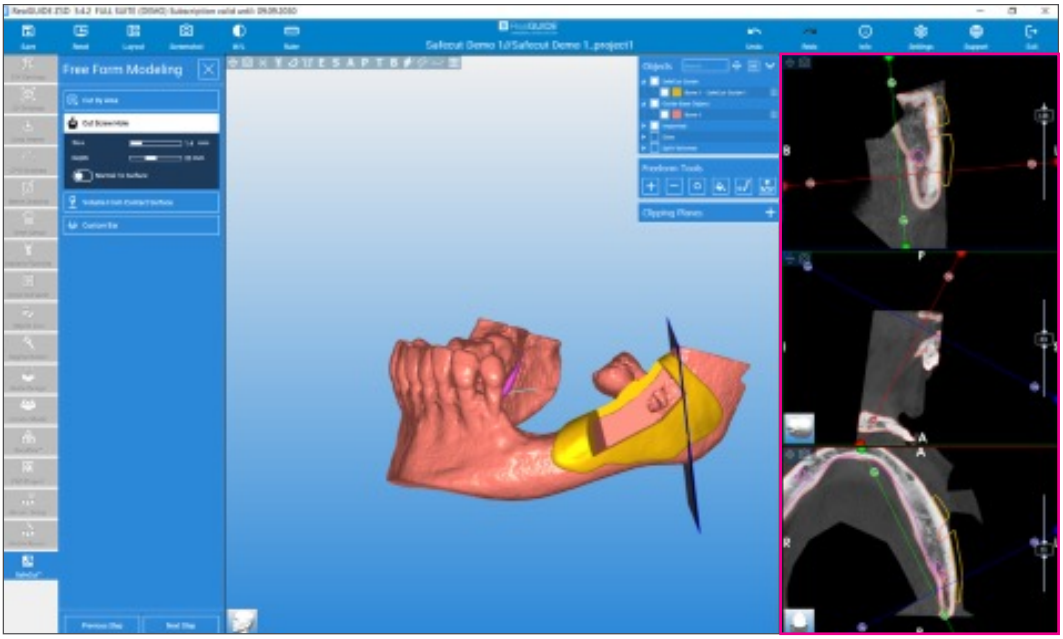
32. Click on next step into free form modelling, we now have four steps which we need to follow:
    a. Click cut by area to remove excess guide not required, e.g.: around the tooth
    b. Use click points around the area to be removed, select cut form left tool bar.
    c. Use the "**Smooth**" button in free from tools to smooth any sharp areas.
    d. Click smooth button, hover over area to be smoother, a circle will appear, click on the left mouse button and smooth to desired outcome.



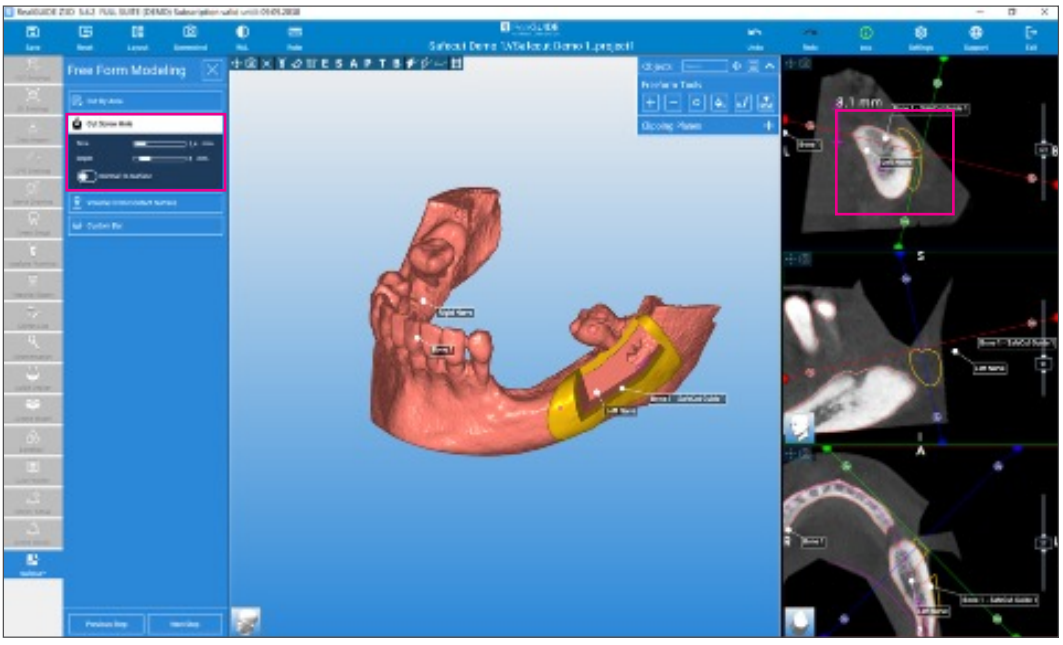
33. Create the fixation screw hole. Change the layout in the top of the tool bar. Select "**3D + Cross + Tangent + Axial**" view and click ok.



34. Before placing the fixation screw, assess the cross-sectional view of the screw hole location, click on the area in the cross-section slice to ensure the screw placement will not impact the nerve or other anatomical structures.

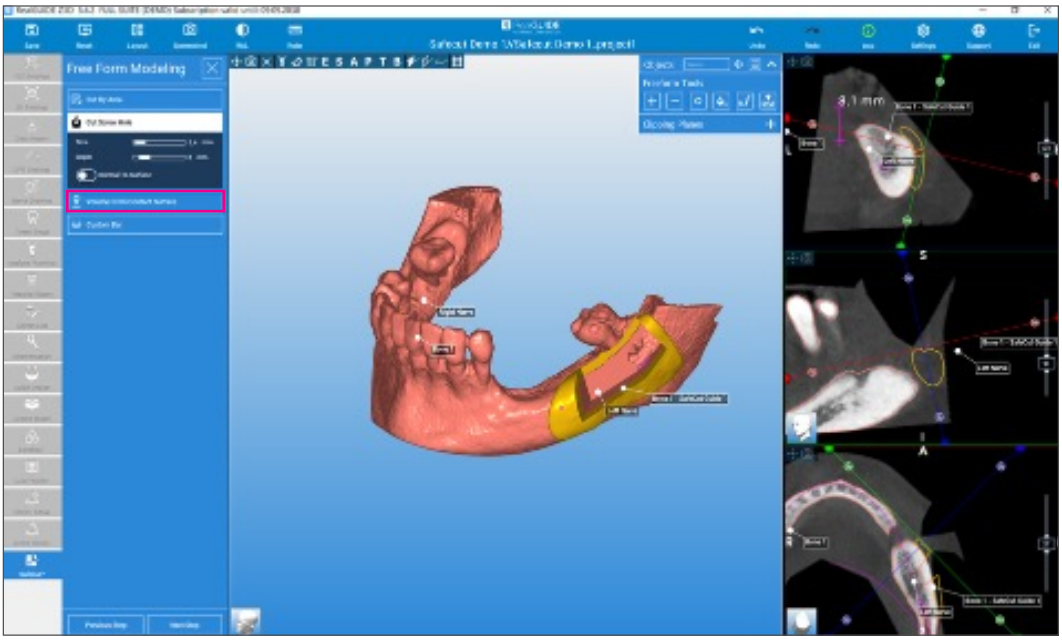


35. Click "**Cut Screw Hole"** button on the left of the tool bar, select the preferred screw dimensions to correspond to the manufacturer's measurements. To change these dimensions, simply slide the scale left to right. Hover over the guide template on the model in the area the screw needs to be placed, a green circle will appear, then click and a hole will appear. Reassess the cross-sectional view to ensure that this screw hole is in the optimum position.



36. To provide stability to the guide, next create a supporting arm of a mesially adjacent tooth by following the next steps:
    a. Click on "**Volume from Contact Surface**"(Image A) and then the "**Brush**" button from within the tool bar.

Image A



    b. Next, hover over the tooth to create the support, a green circle will appear and using the left button of the mouse click in this area.
    c. A grey area will appear on the tooth, then click "**Generate Volume**" button in the tool bar (Image B). This will create the yellow volume on the tooth surface (Image C).

Image B

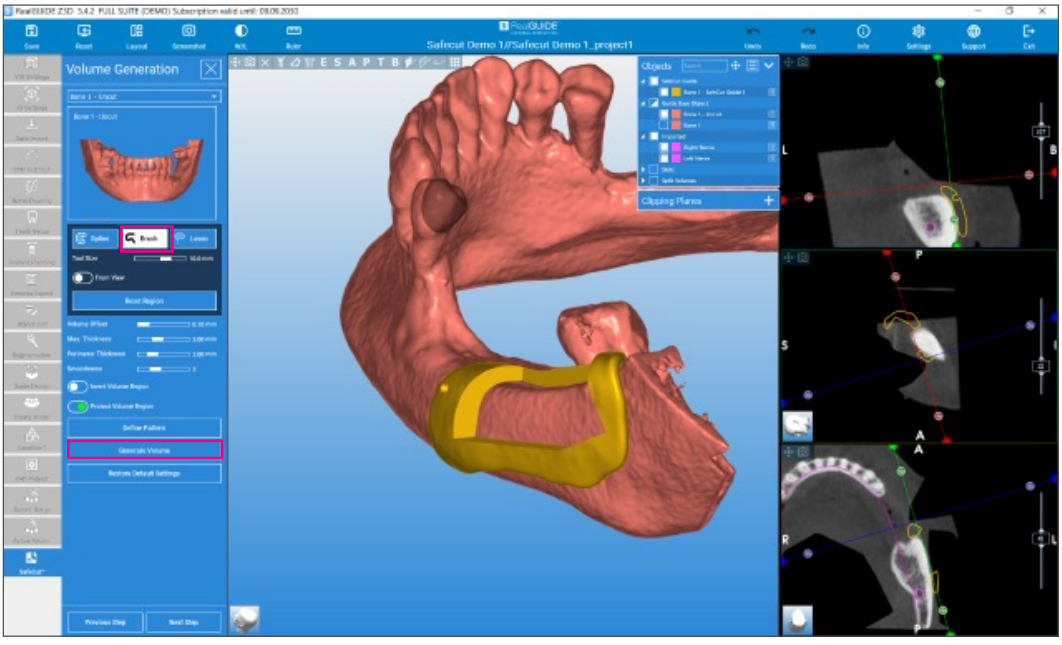
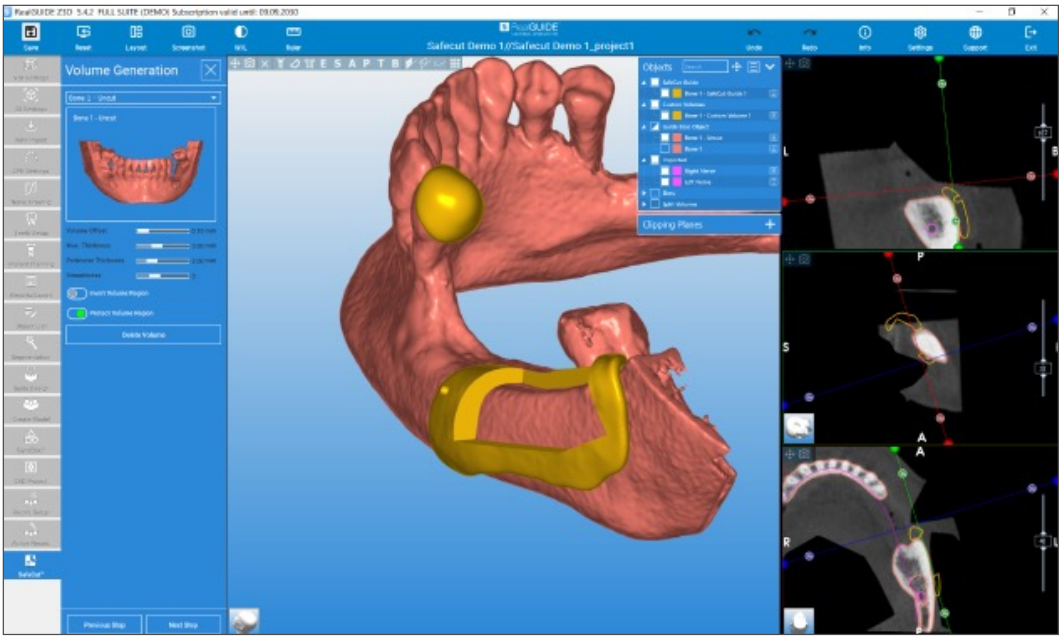
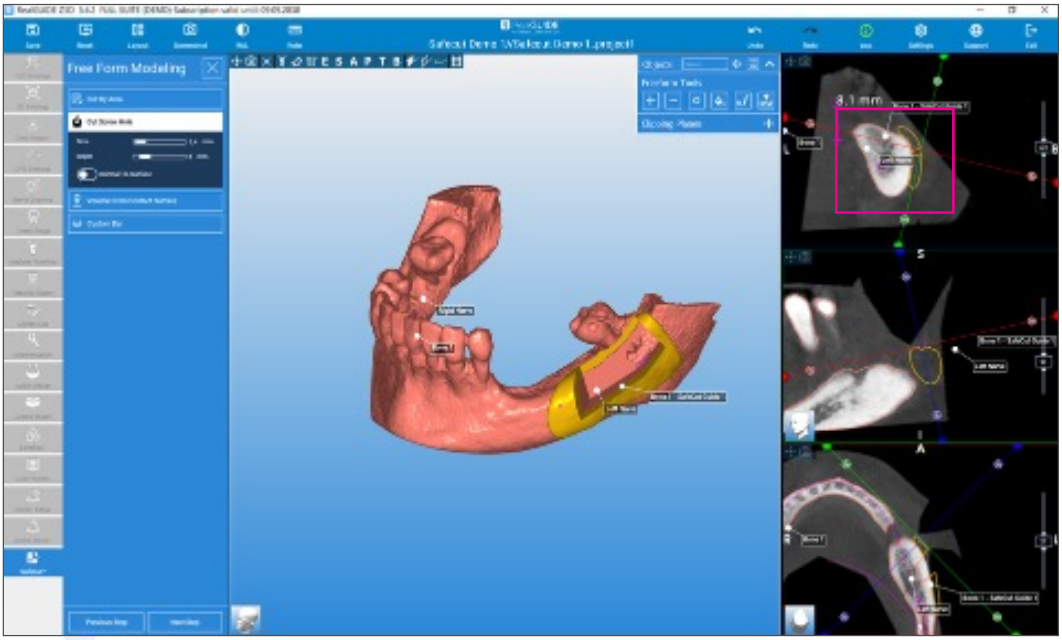


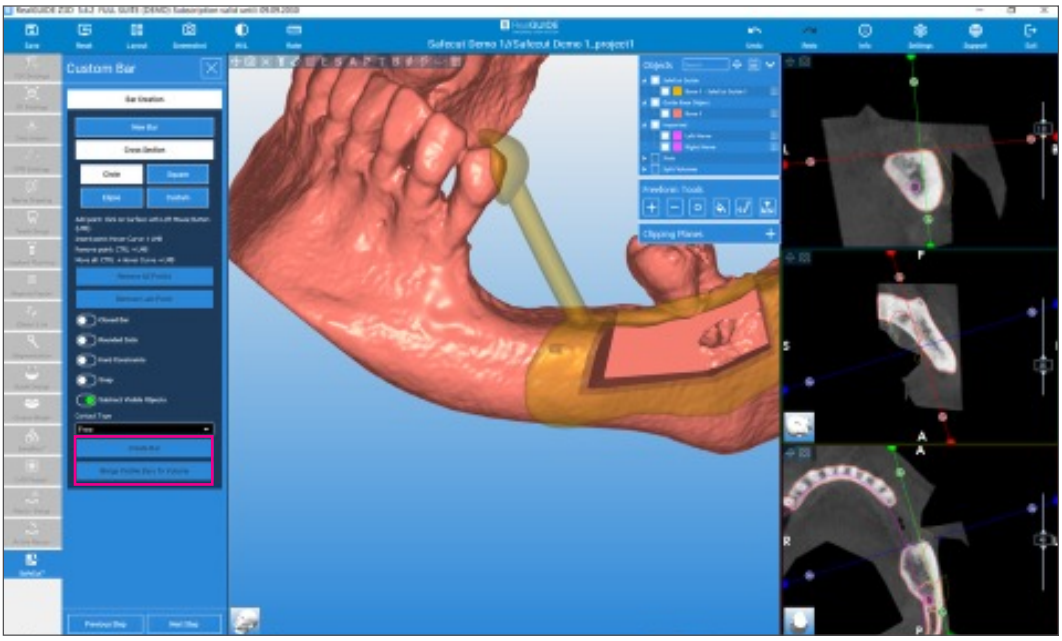
Image C



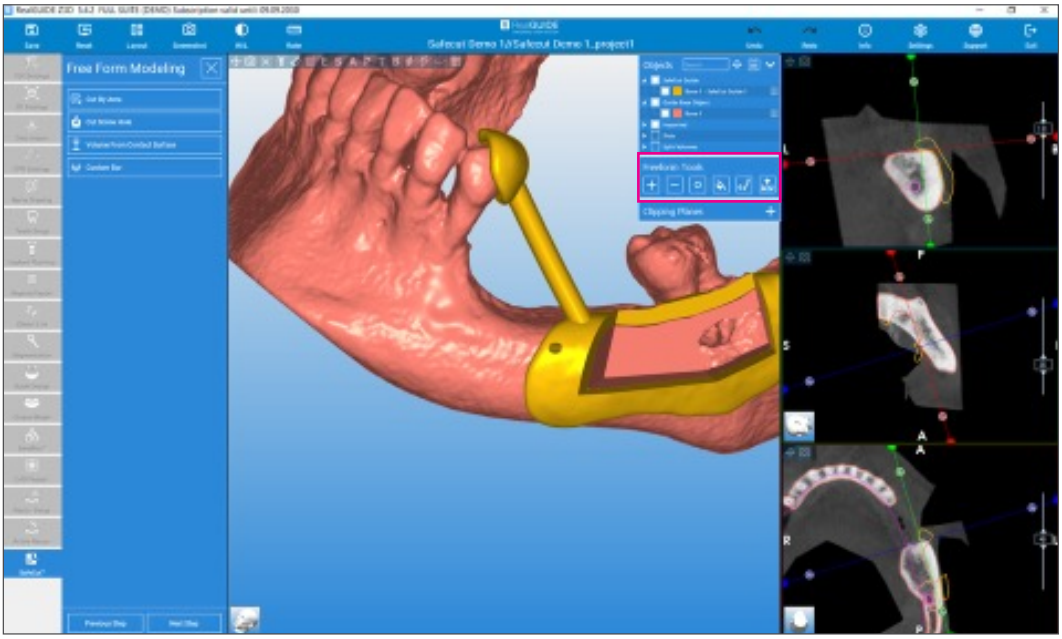
37. a. Click next step, to create the custom bar, this bar must touch both the volume surface of the guide and the adjacent tooth where the volume area has been created. Click "**Custom bar**" button in the tool bar, select 3 points on the model.
    b. Hover over the area of the guide, click once and a point will appear.
    c. Next click on the area between the guide and adjacent tooth.
    d. Click to create a second point and thirdly on the adjacent tooth.
    e. A grey bar will now appear, click on the red points to move the bar in to the preferred position. After final adjustments, ensure the bar is still in contact with both the guide and adjacent tooth.



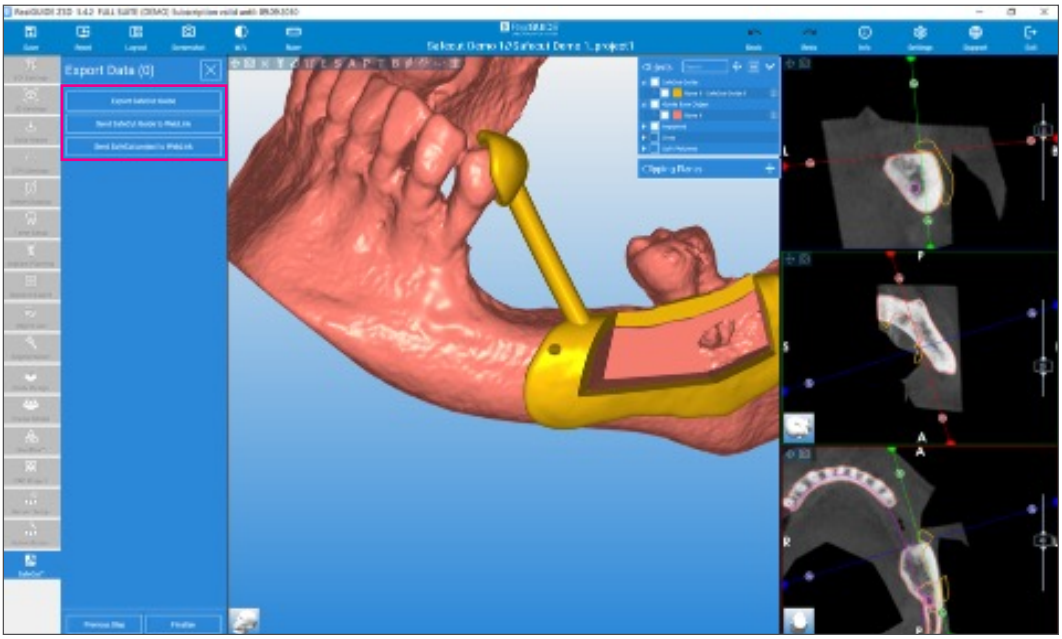
38. Next click "**Create Bar**" and then click "**Merge Visible Bars to Volume**" to merge the bar to existing Guide and mesial tooth support, the bar will now change colour from grey to yellow.



39. Click next step into free form modelling to smooth any areas or thicken the material where the bar connects to the guide for added strength, please ensure not to adjust the area within the slot cutting planes.



40. Click on next step. You will see the following options in the export data window:
    a. "**SafeCut Guide**" - Allows to export guide for in-house 3D printing.
    b. "**Send SafeCut Guide to Weblink**" - Outsource SafeCut guide for printing at the SafeCut production center.
    c. "**Send "SafeCut Project to Weblink**" - Outsource entire SafeCut project to SafeCut production center for guide design and printing.



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