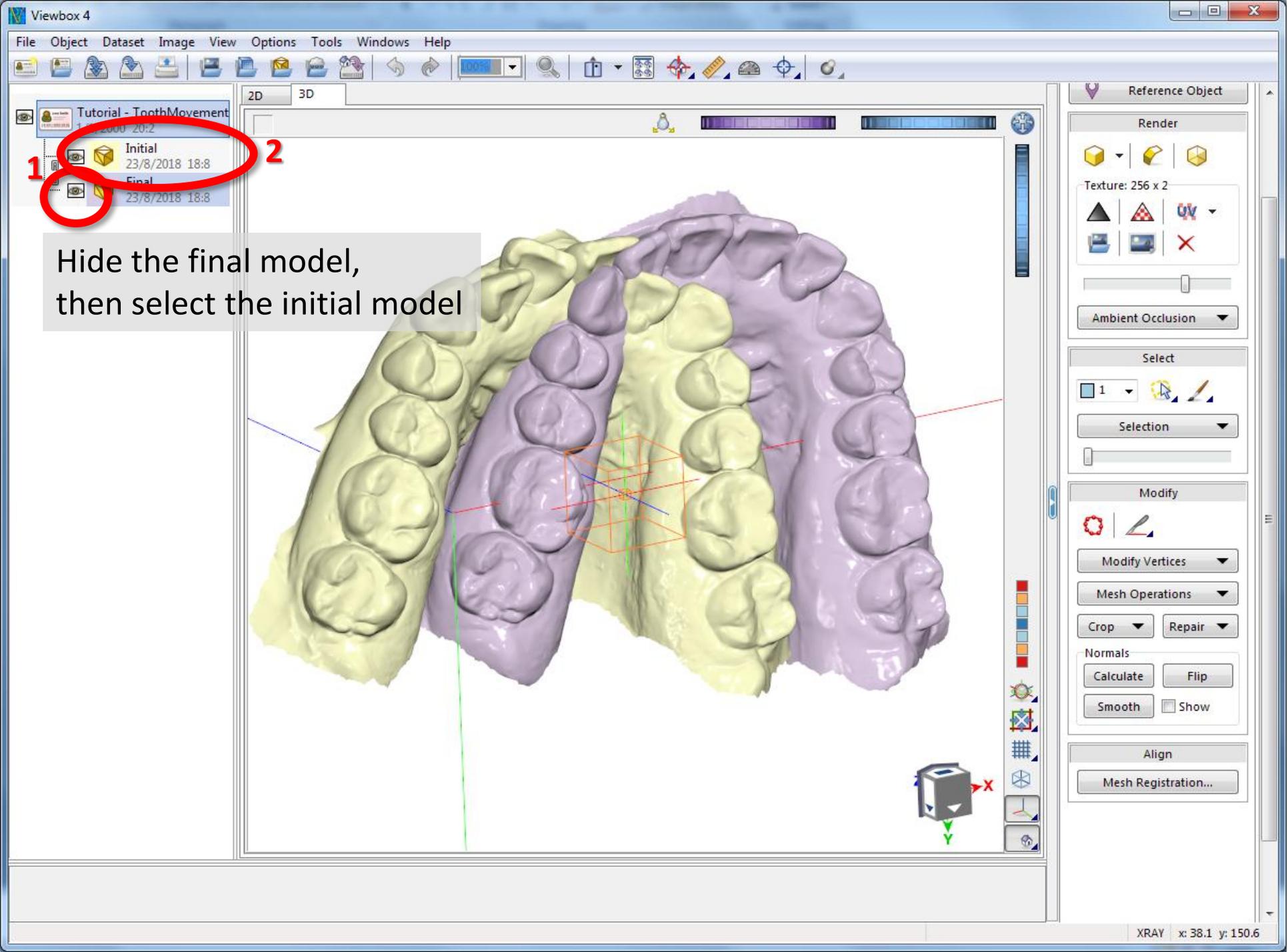


Viewbox Tutorial

How to measure tooth movement

Requires a 'before' and 'after' virtual model

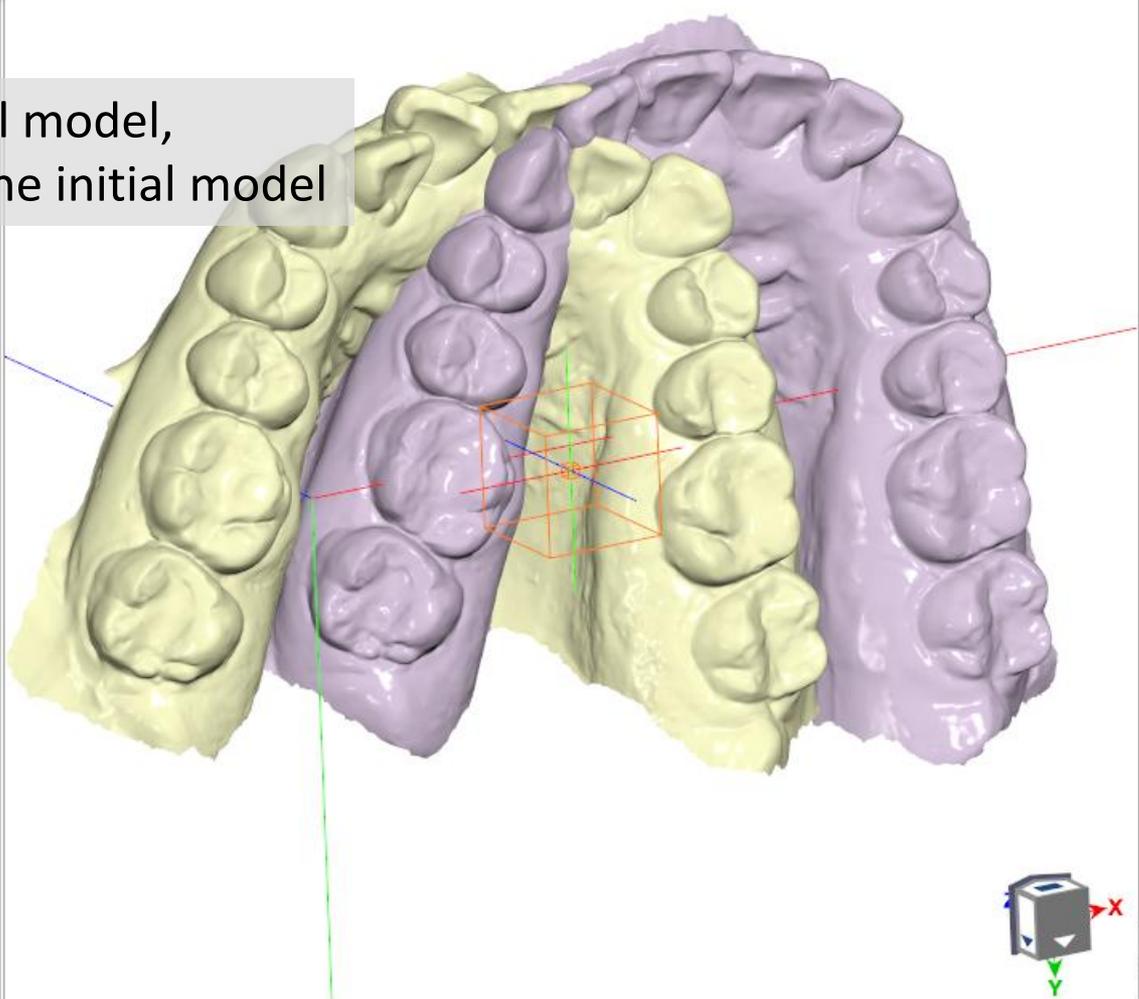
www.dhal.com



- Tutorial - ToothMovement
- 1 2000 20:2
- Initial 23/8/2018 18:8
- Final 23/8/2018 18:8

1 2

Hide the final model,
then select the initial model



Reference Object

Render

Texture: 256 x 2

Ambient Occlusion

Select

1 Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

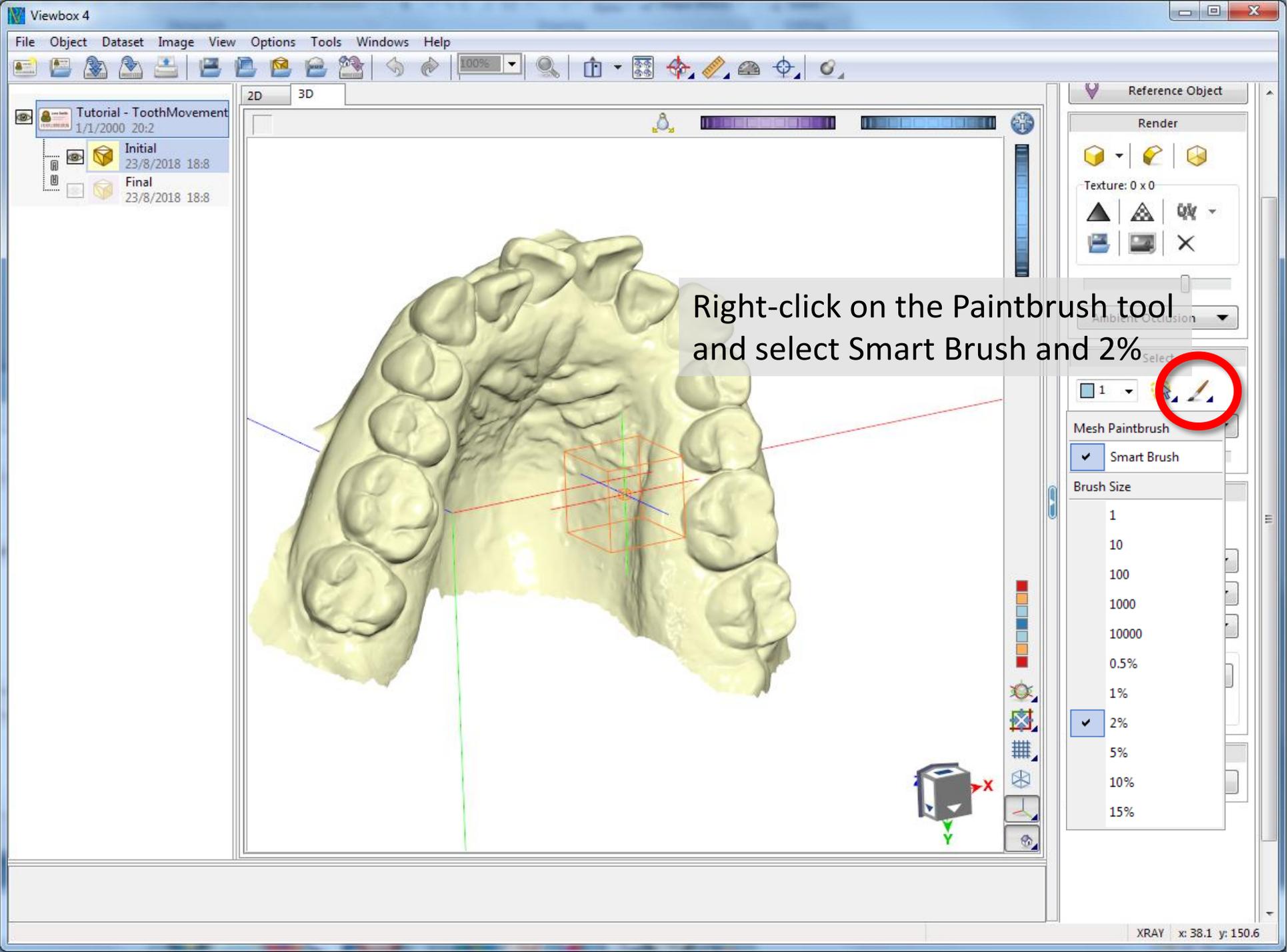
Normals

Calculate Flip

Smooth Show

Align

Mesh Registration...



Right-click on the Paintbrush tool and select Smart Brush and 2%

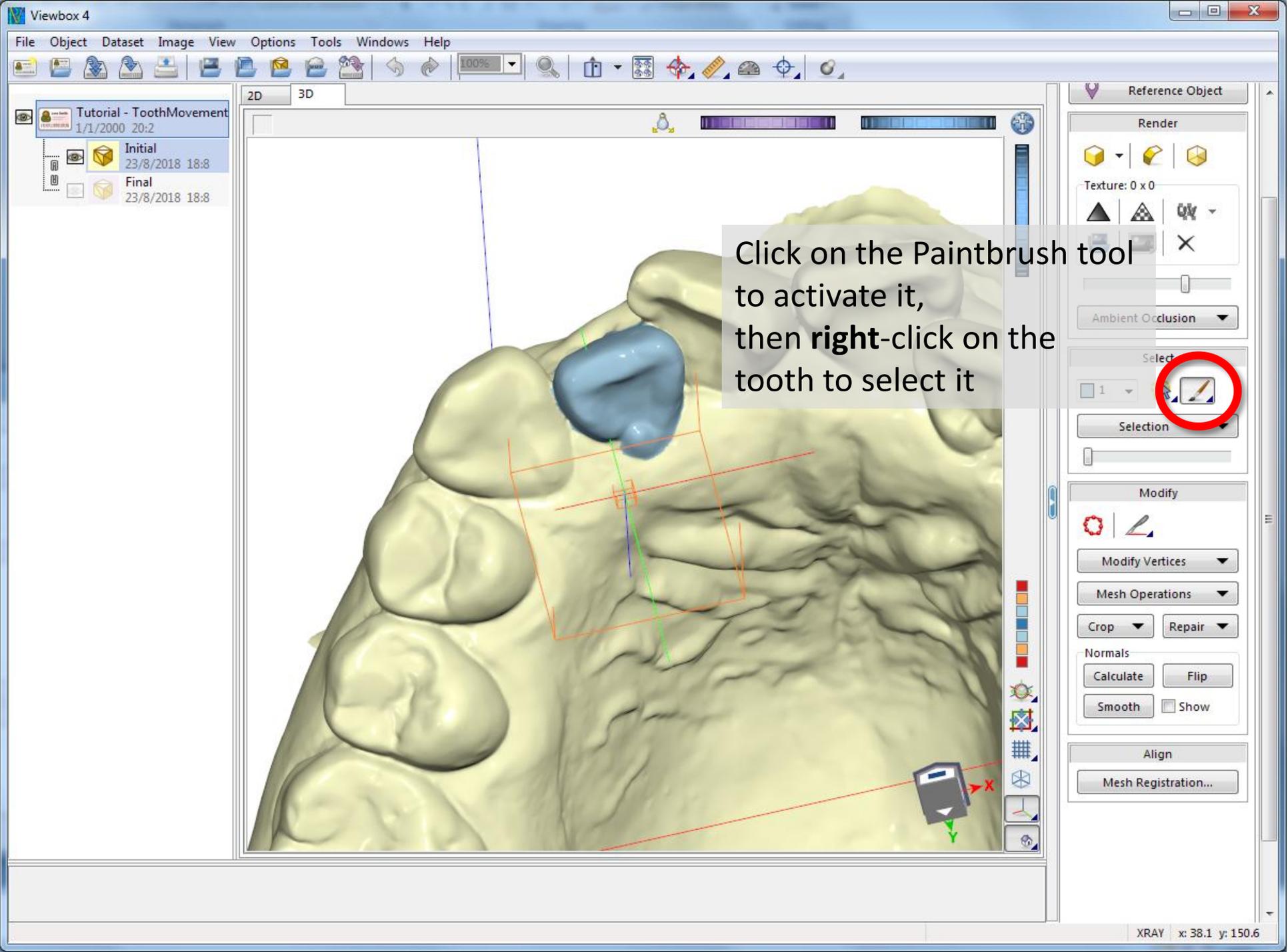


Mesh Paintbrush

- Smart Brush

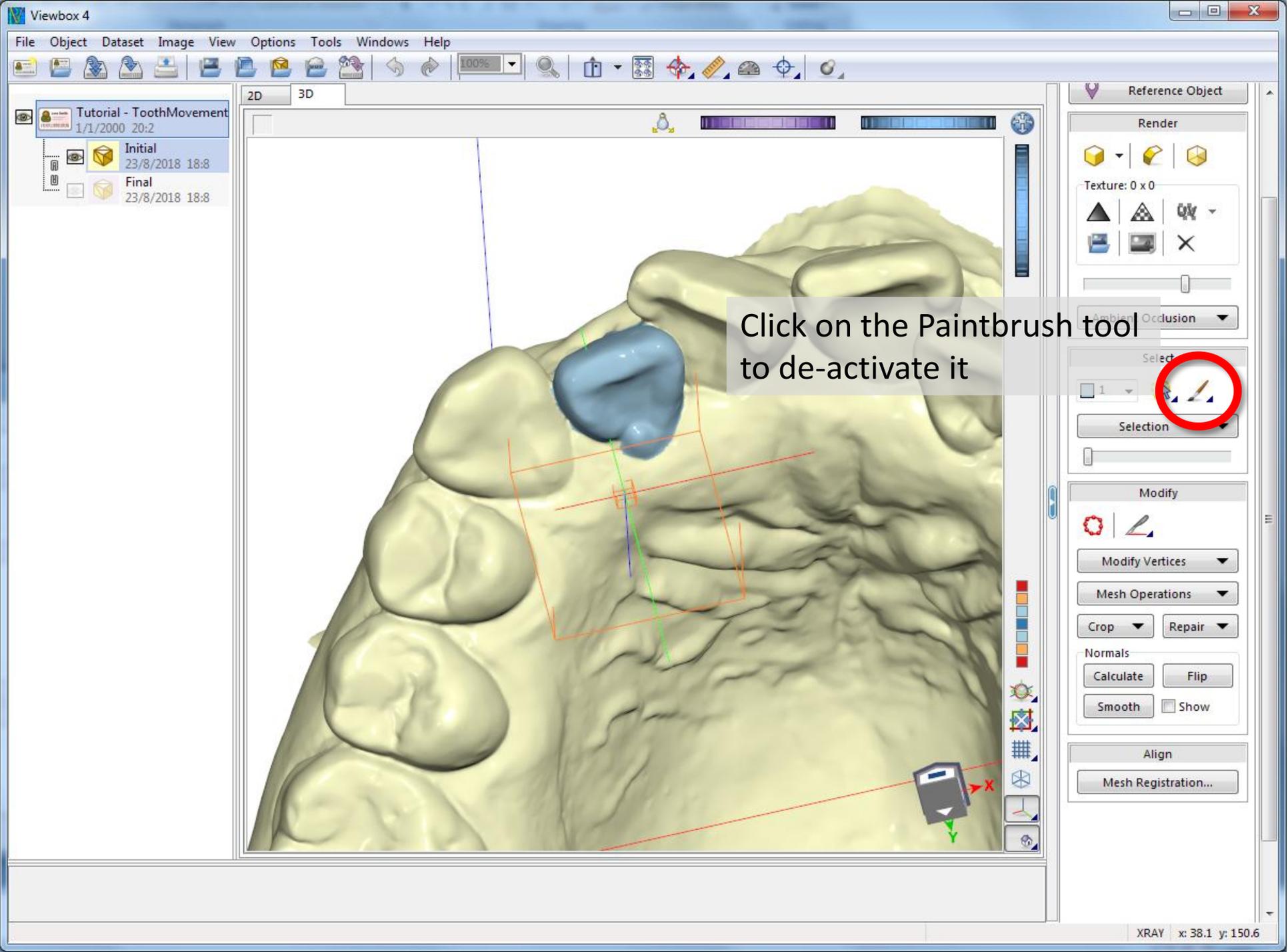
Brush Size

- 1
- 10
- 100
- 1000
- 10000
- 0.5%
- 1%
- 2%
- 5%
- 10%
- 15%



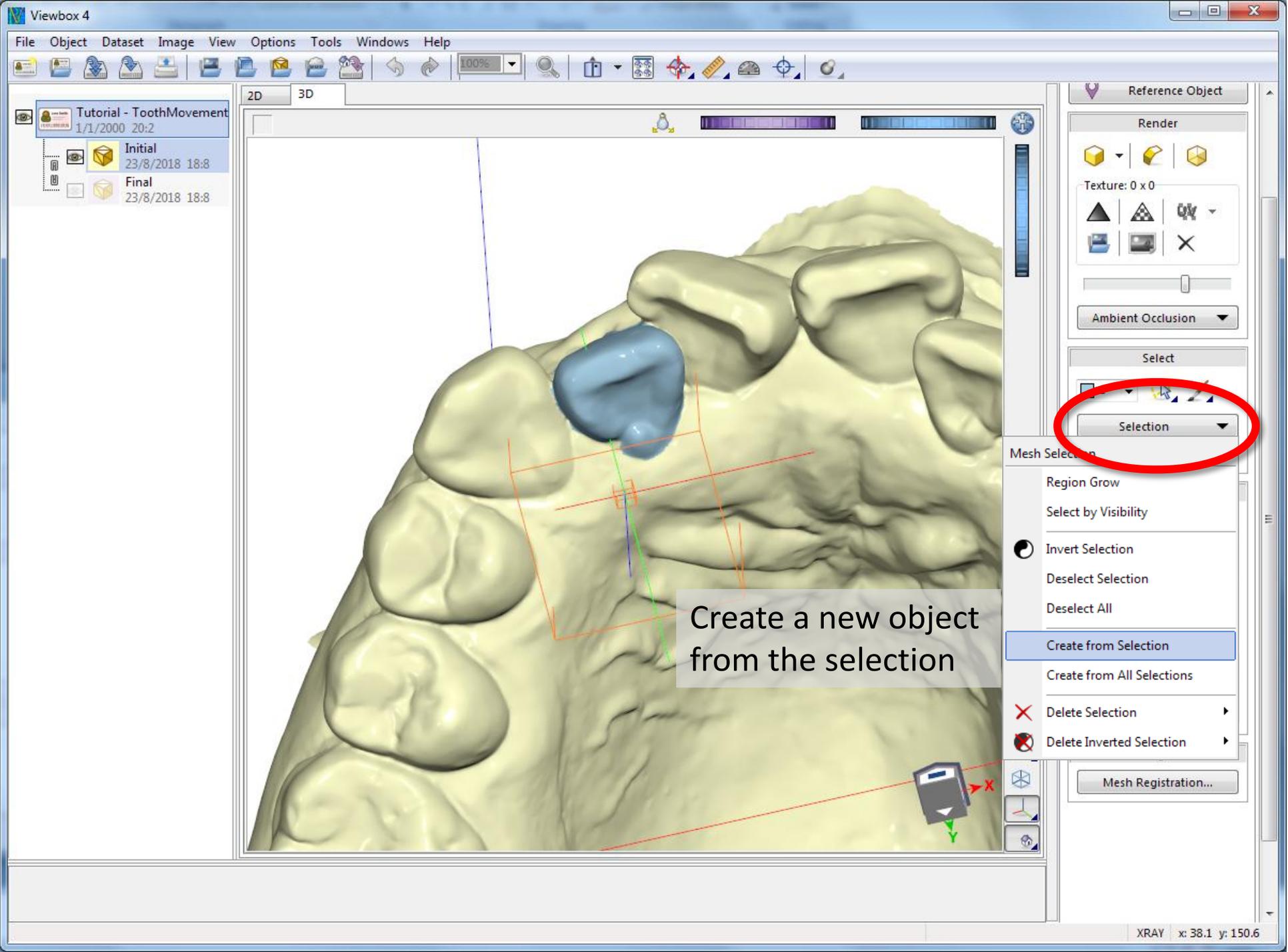
Click on the Paintbrush tool to activate it, then **right**-click on the tooth to select it





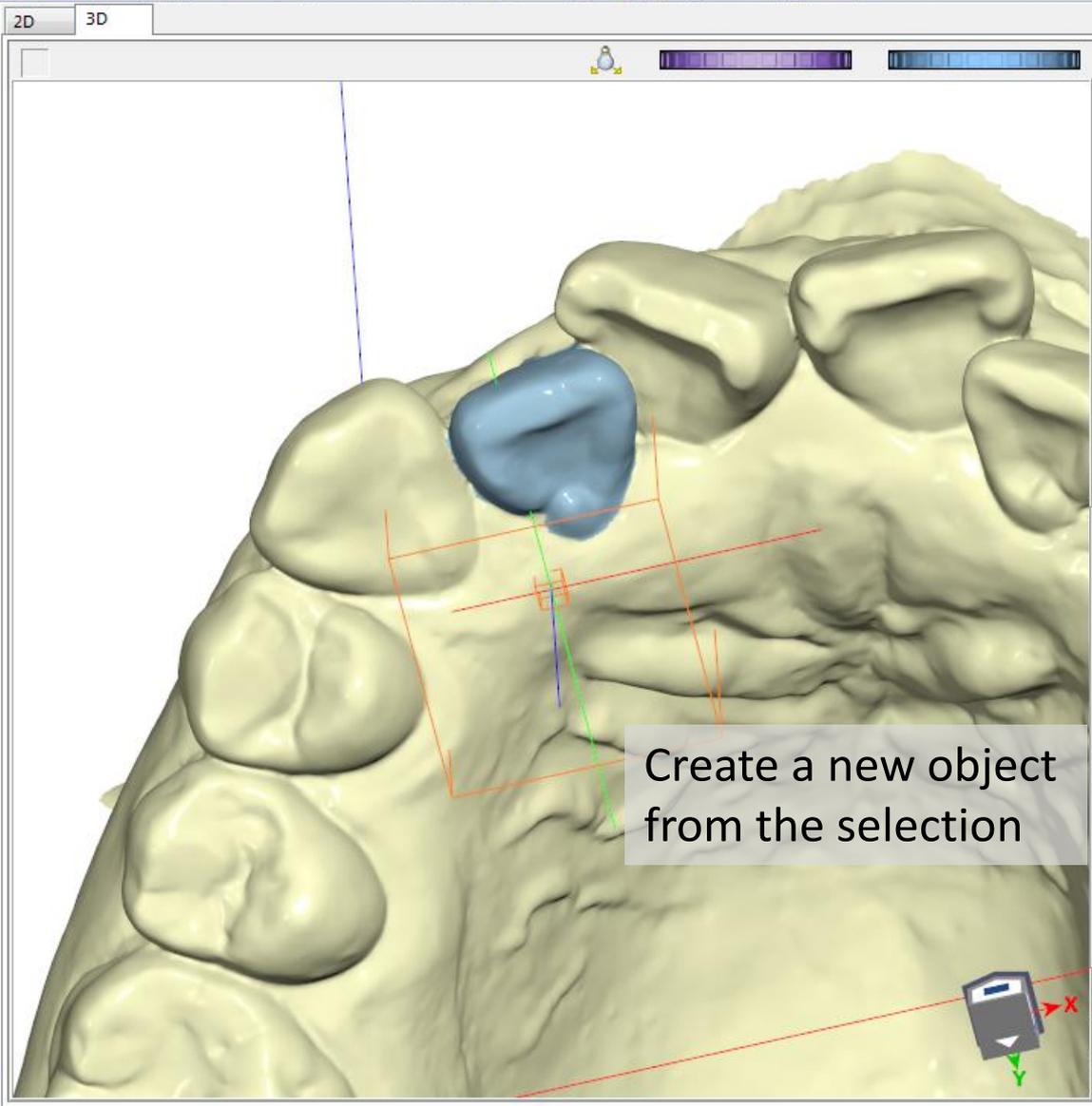
Click on the Paintbrush tool to de-activate it





Tutorial - ToothMovement
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- Final
23/8/2018 18:8



Reference Object

Render

Texture: 0 x 0

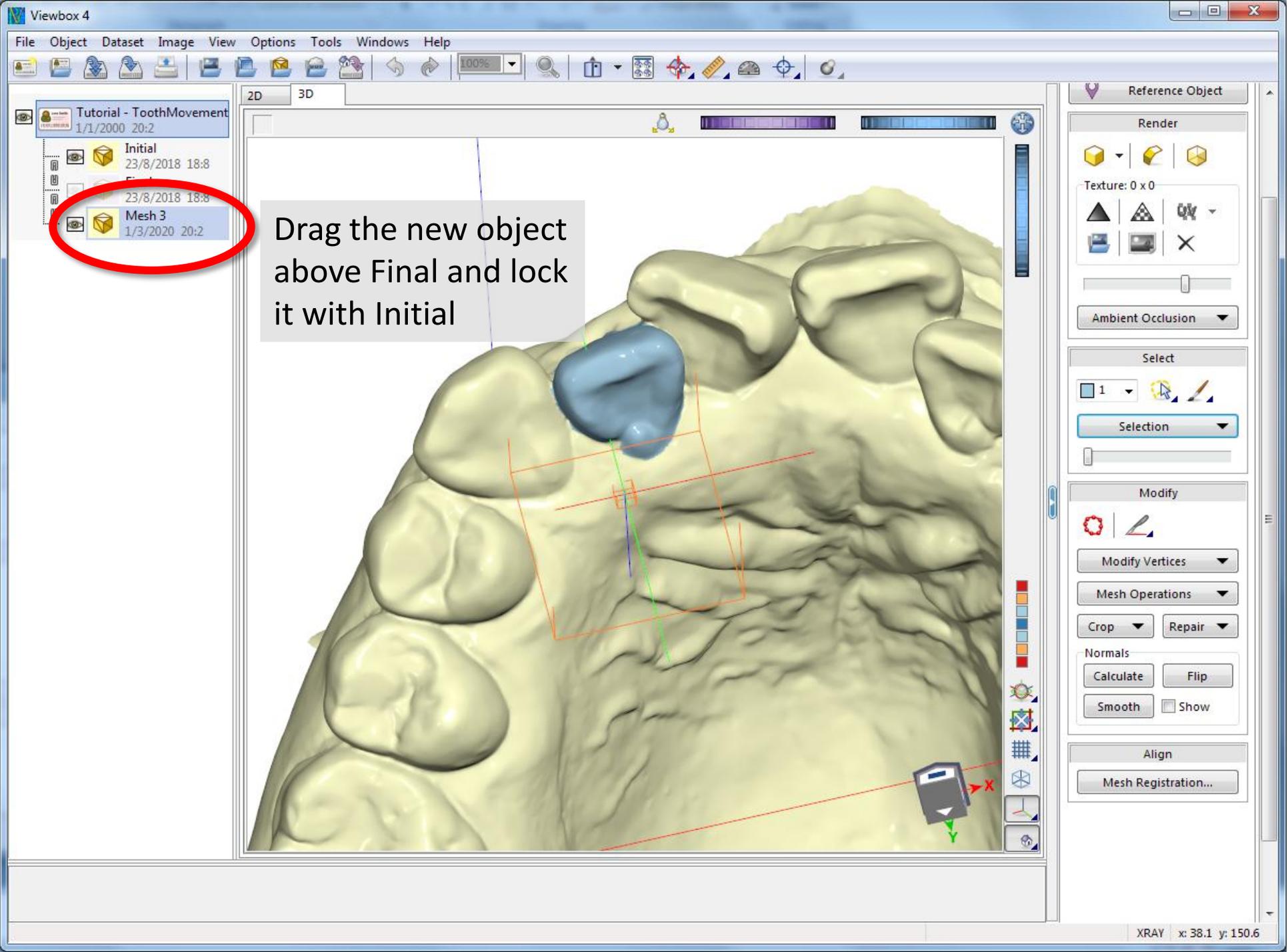
Ambient Occlusion

Select

Selection

- Mesh Selection
- Region Grow
 - Select by Visibility
 - Invert Selection**
 - Deselect Selection
 - Deselect All
 - Create from Selection**
 - Create from All Selections
 - Delete Selection
 - Delete Inverted Selection

Mesh Registration...



- Tutorial - ToothMovement
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- Initial
23/8/2018 18:8
- Final
23/8/2018 18:8
- Mesh 3**
1/3/2020 20:2

Drag the new object
above Final and lock
it with Initial

Reference Object

Render

Texture: 0 x 0

Ambient Occlusion

Select

1 Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

Normals

Calculate Flip

Smooth Show

Align

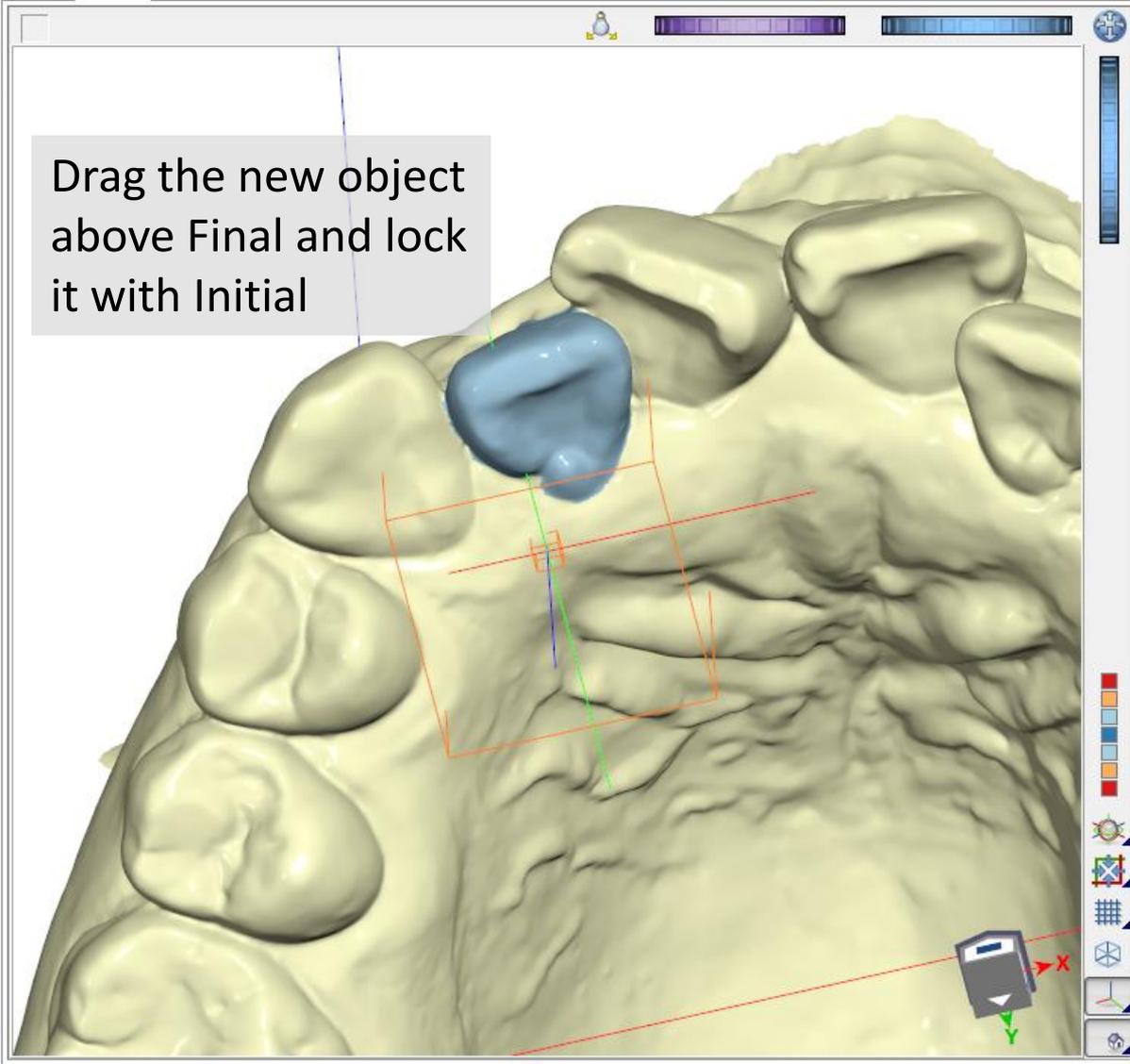
Mesh Registration...

Tutorial - ToothMovement
1/1/2000 20:2

- Initial
23/8/2018 18:8
- Mesh 3
1/3/2020 20:2
- Final
23/8/2018 18:8



Drag the new object
above Final and lock
it with Initial



Reference Object

Render

Texture: 0 x 0

Ambient Occlusion

Select

1

Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

Normals

Calculate Flip

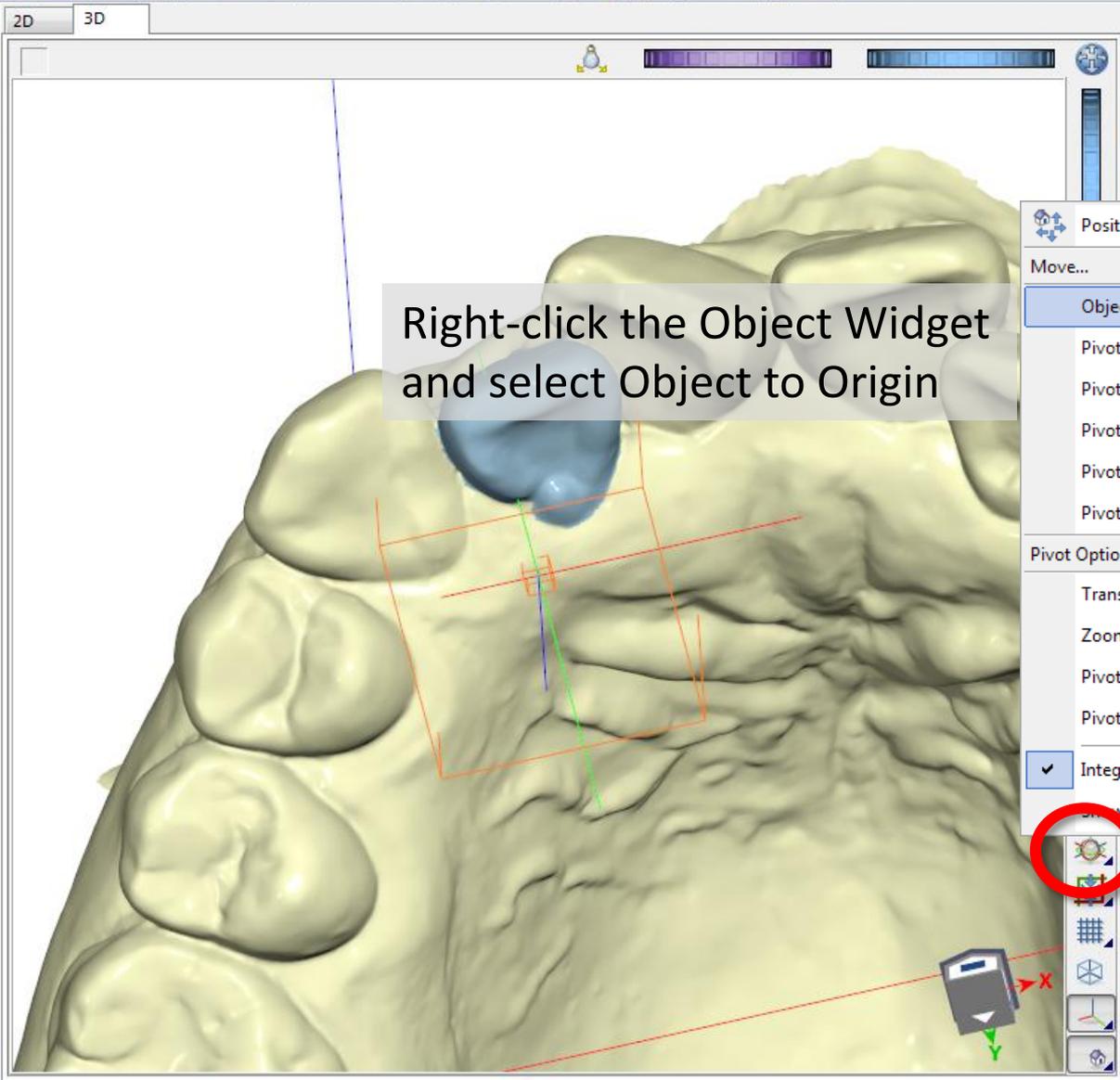
Smooth Show

Align

Mesh Registration...

Tutorial - ToothMovement
1/1/2000 20:2

- Initial
23/8/2018 18:8
- Mesh 3
1/3/2020 20:2
- Final
23/8/2018 18:8



Right-click the Object Widget and select Object to Origin

Position / Rotation / Scale...

Move...

- Object to Origin
- Pivot to Origin
- Pivot to Viewing Centre
- Pivot to Rotation Axis
- Pivot to Object Centre
- Pivot to Object Origin

Pivot Options

- Transform...
- Zooms with View
- Pivot Size
- Pivot to Object Centre on Selecting

Integrated in View



Reference Object

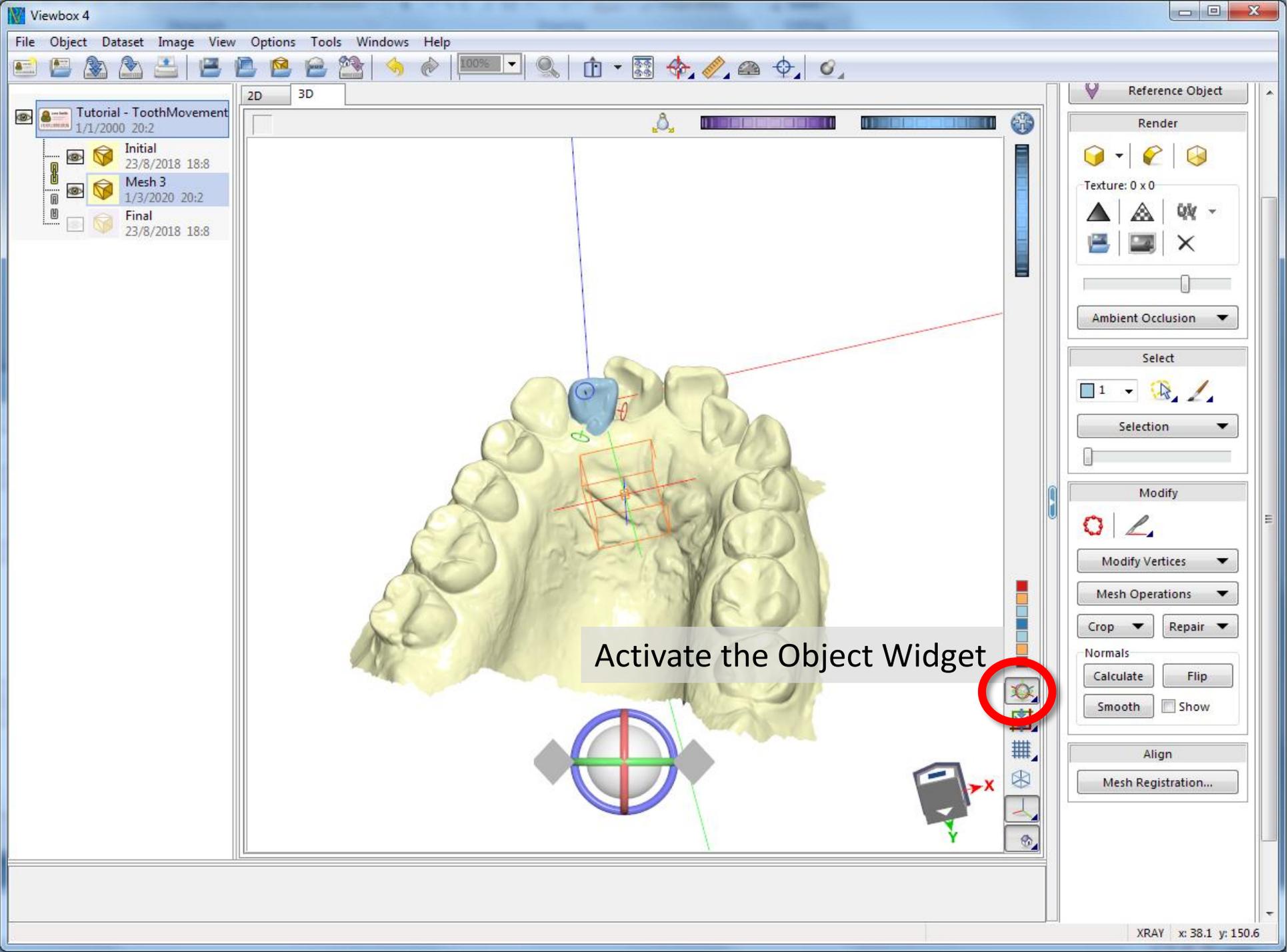
Render

Texture: 0 x 0

Smooth Show

Align

Mesh Registration...

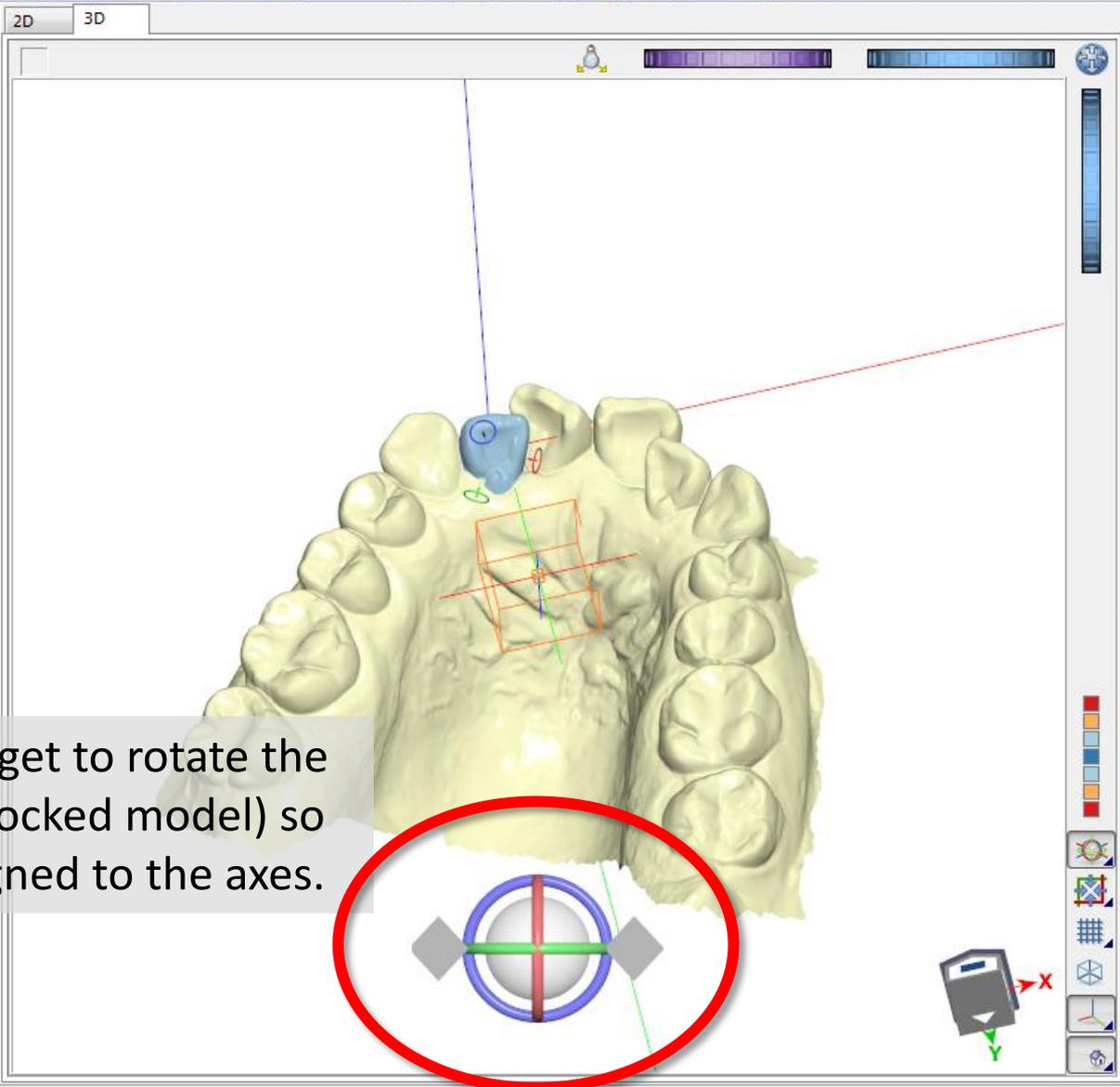


Activate the Object Widget



Tutorial - ToothMovement
1/1/2000 20:2

- Initial
23/8/2018 18:8
- Mesh 3
1/3/2020 20:2
- Final
23/8/2018 18:8



Use the widget to rotate the tooth (and locked model) so that it is aligned to the axes.

Reference Object

Render

Texture: 0 x 0

Ambient Occlusion

Select

1 Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

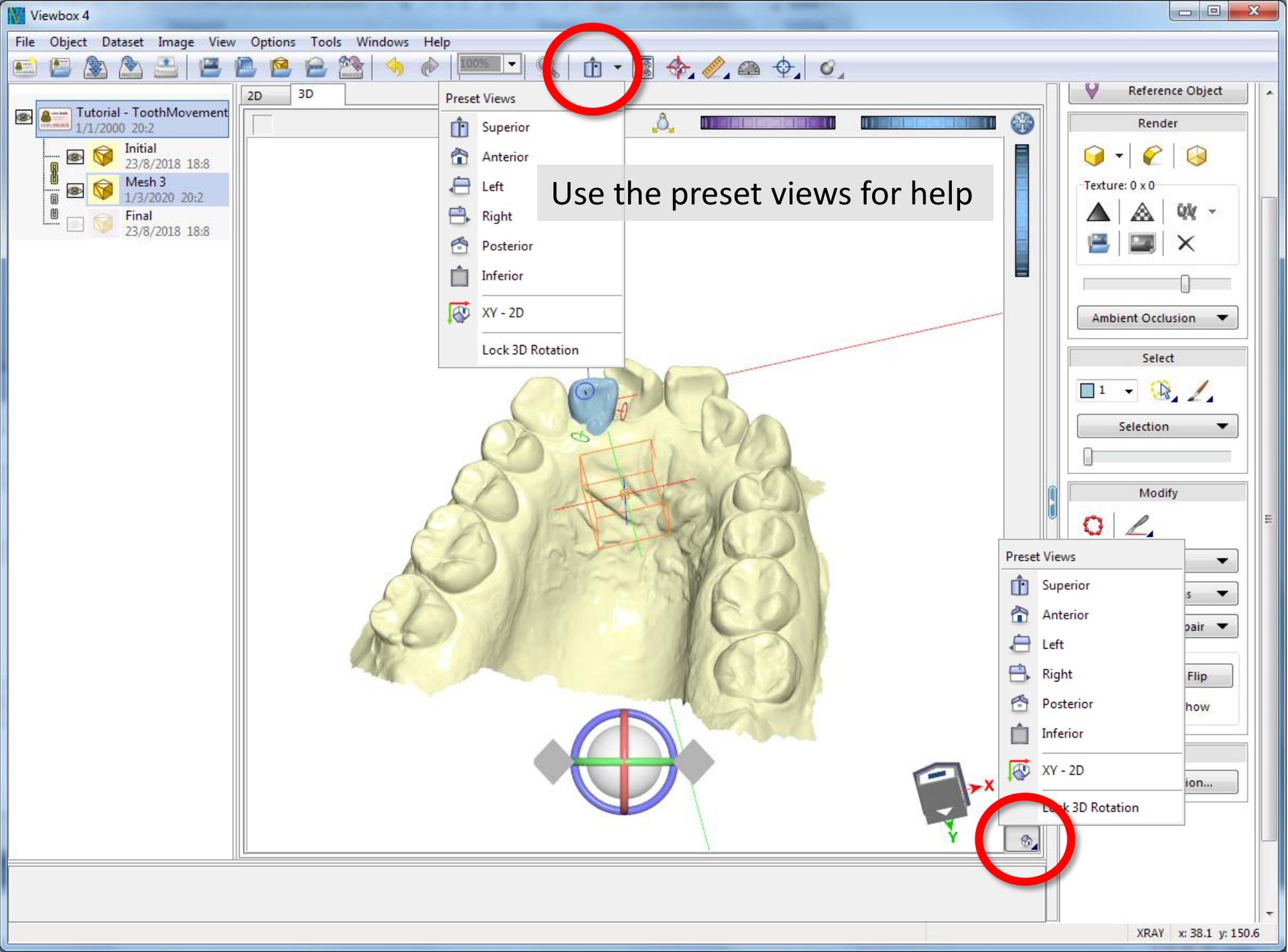
Normals

Calculate Flip

Smooth Show

Align

Mesh Registration...



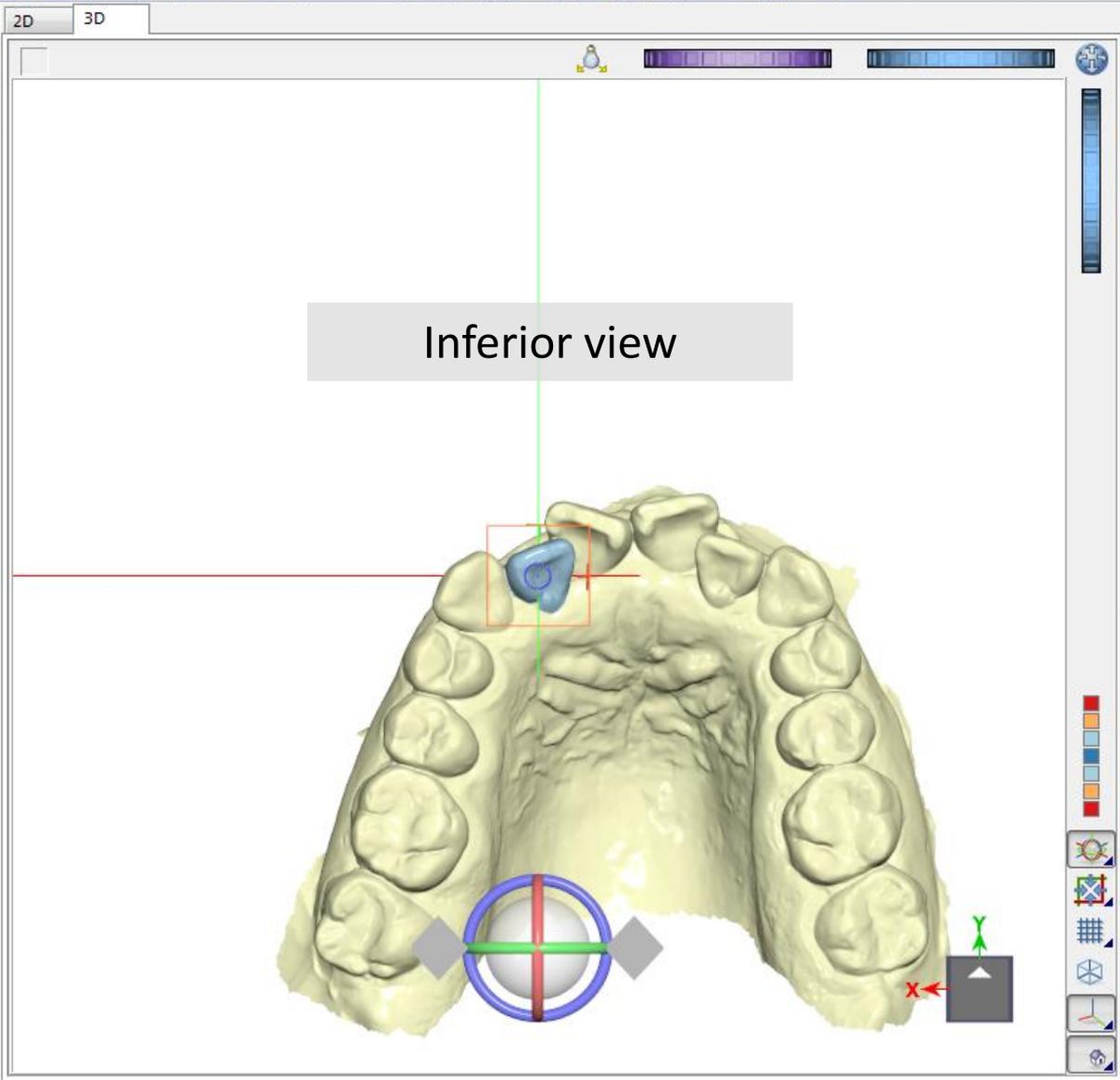
Use the preset views for help

- Superior
- Anterior
- Left
- Right
- Posterior
- Inferior
- XY - 2D
- Lock 3D Rotation

- Superior
- Anterior
- Left
- Right
- Posterior
- Inferior
- XY - 2D
- Lock 3D Rotation

Tutorial - ToothMovement
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- Initial
23/8/2018 18:8
- Mesh 3
1/3/2020 20:2
- Final
23/8/2018 18:8



Inferior view

Reference Object

Render

Texture: 0 x 0

Ambient Occlusion

Select

1 Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

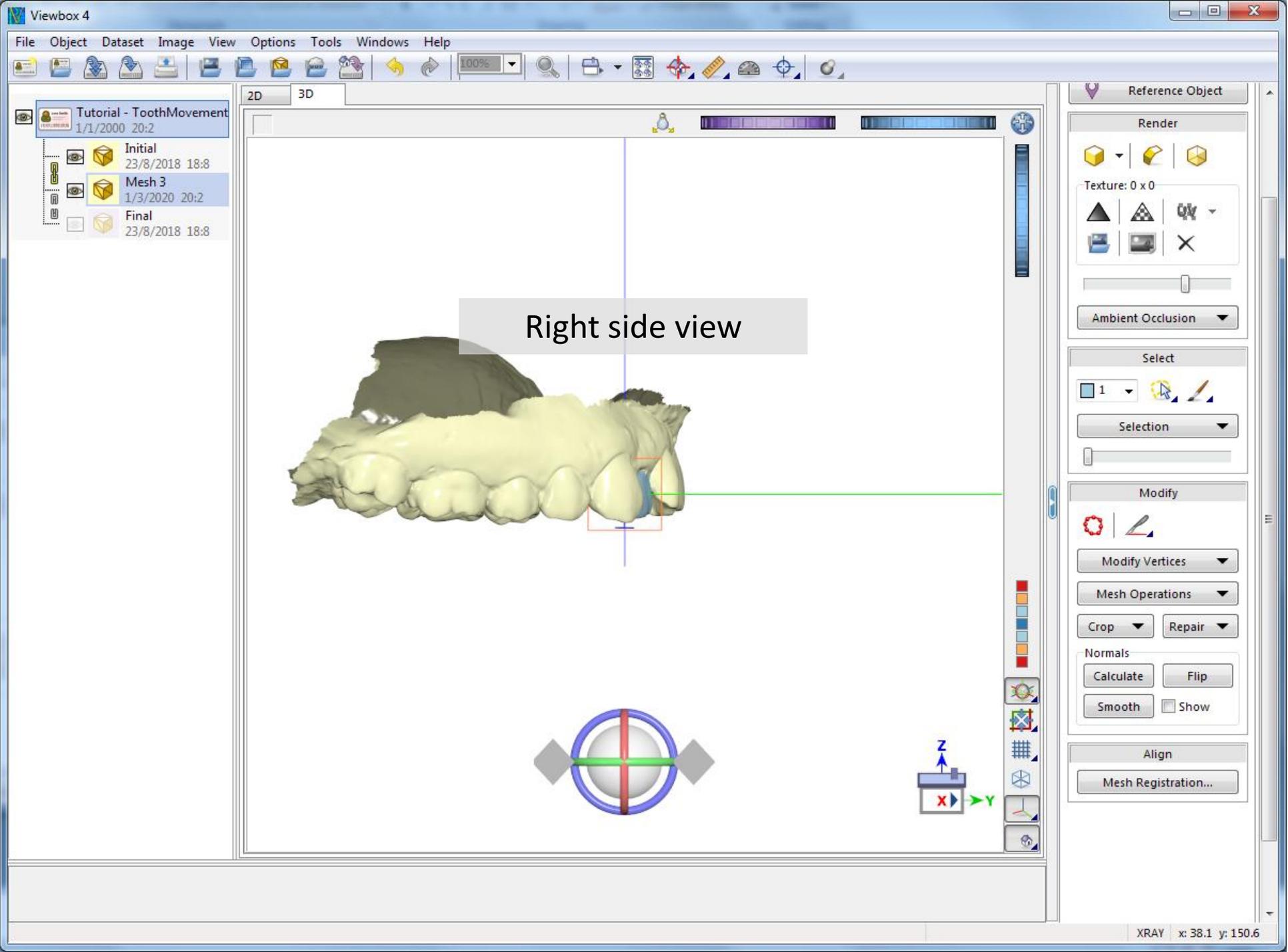
Normals

Calculate Flip

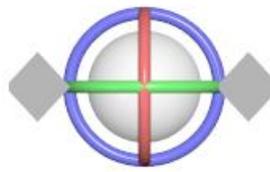
Smooth Show

Align

Mesh Registration...



Right side view



Reference Object

Render

Texture: 0 x 0

Ambient Occlusion

Select

1

Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

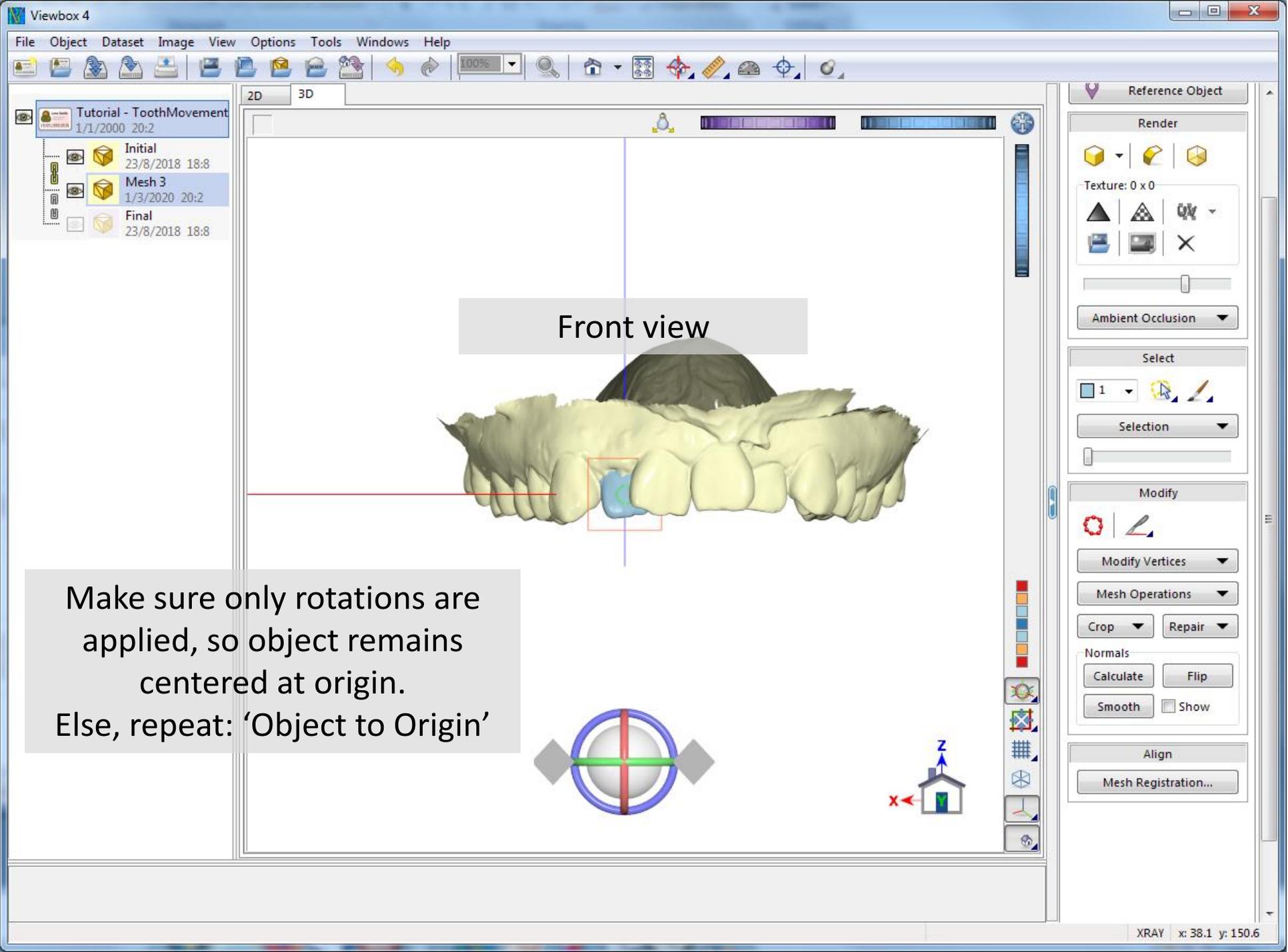
Normals

Calculate Flip

Smooth Show

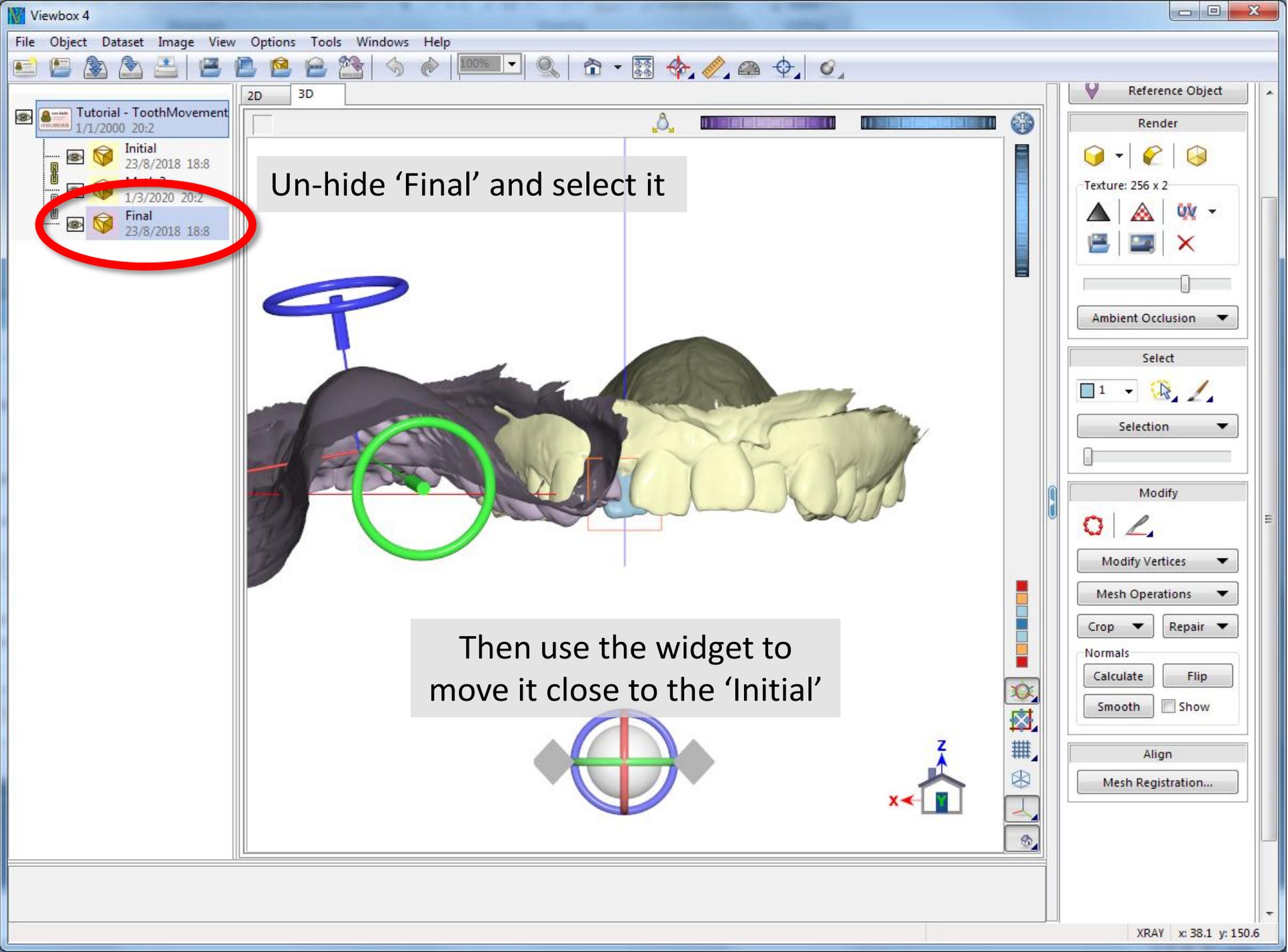
Align

Mesh Registration...



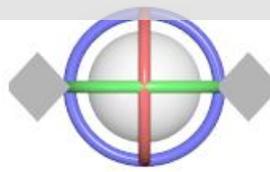
Front view

Make sure only rotations are applied, so object remains centered at origin.
Else, repeat: 'Object to Origin'



Un-hide 'Final' and select it

Then use the widget to move it close to the 'Initial'



Reference Object

Render



Texture: 256 x 2



Ambient Occlusion

Select



Selection

Modify



Modify Vertices

Mesh Operations

Crop

Repair

Normals

Calculate

Flip

Smooth

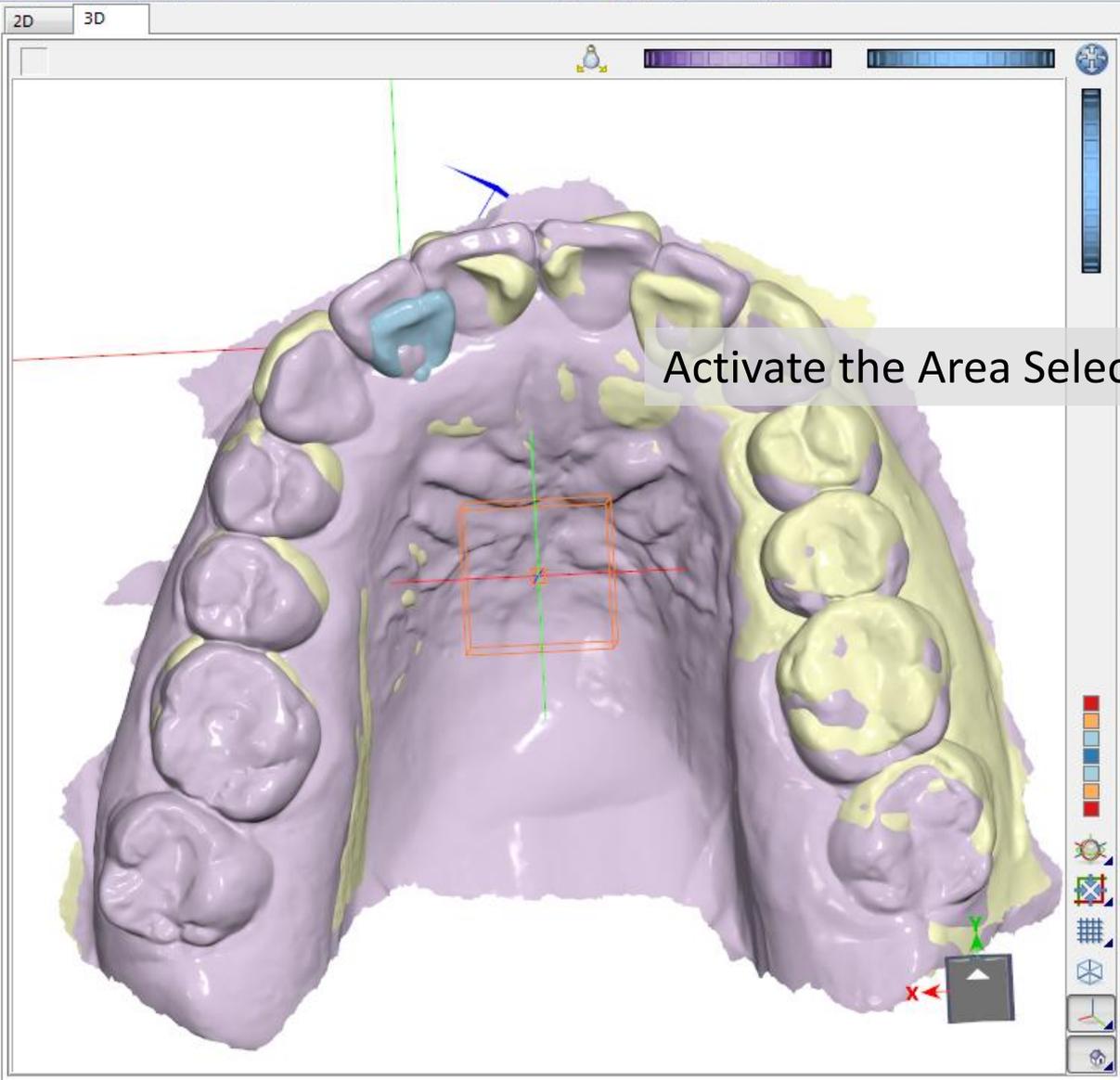
Show

Align

Mesh Registration...

Tutorial - ToothMovement
1/1/2000 20:2

- Initial
23/8/2018 18:8
- Mesh 3
1/3/2020 20:2
- Final
23/8/2018 18:8



Reference Object

Render

Texture: 256 x 2

Ambient Occlusion

Select

Modify

Modify Vertices

Mesh Operations

Crop Repair

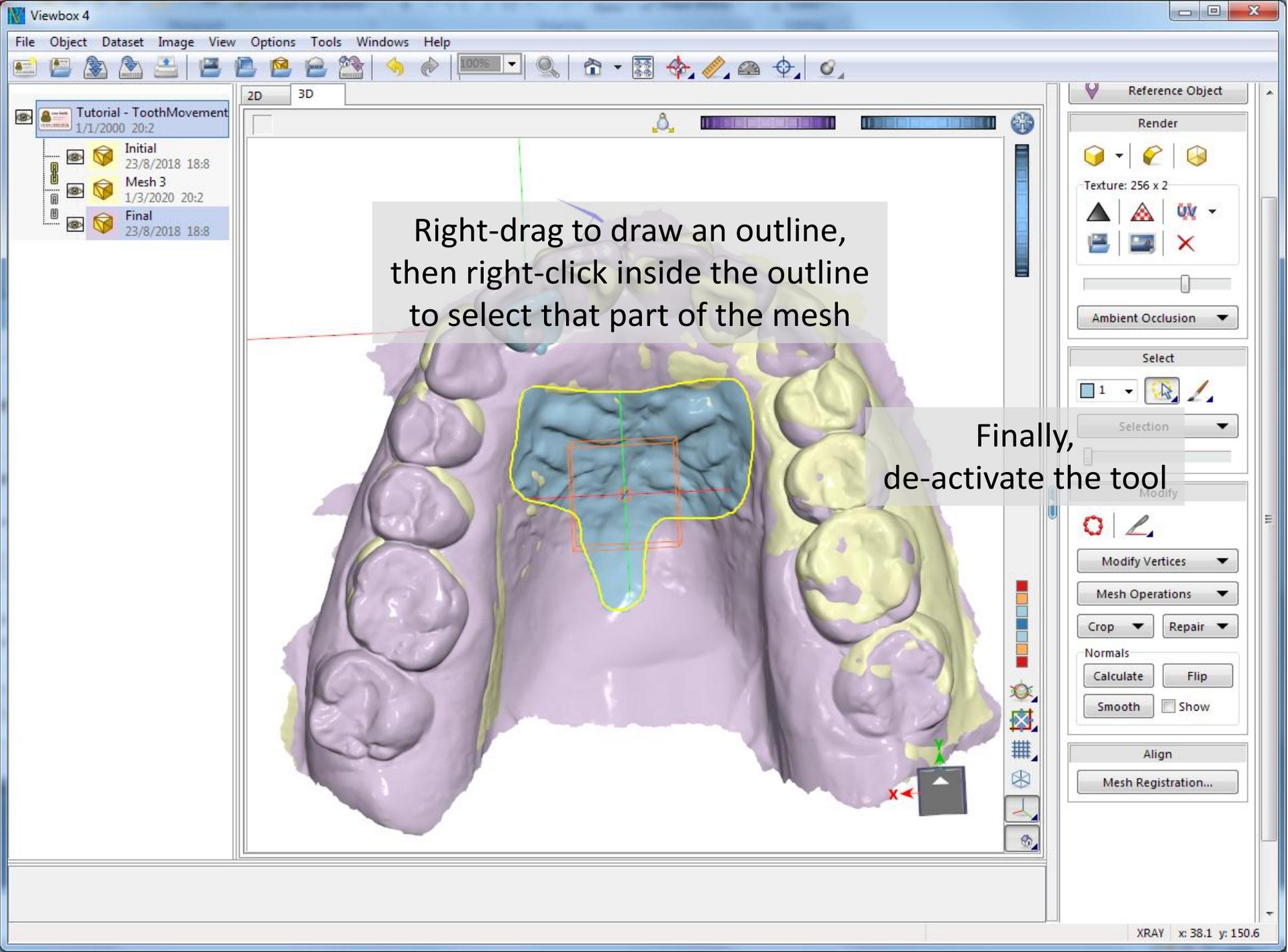
Normals

Calculate Flip

Smooth Show

Align

Mesh Registration...



Right-drag to draw an outline, then right-click inside the outline to select that part of the mesh

Finally, de-activate the tool

Viewbox 4

File Object Dataset Image View Options Tools Windows Help

Tutorial - ToothMovement
1/1/2000 20:2

- Initial
23/8/2018 18:8
- Mesh 3
1/3/2020 20:2
- Final
23/8/2018 18:8

Reference Object

Render

Texture: 256 x 2

Ambient Occlusion

Select

Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

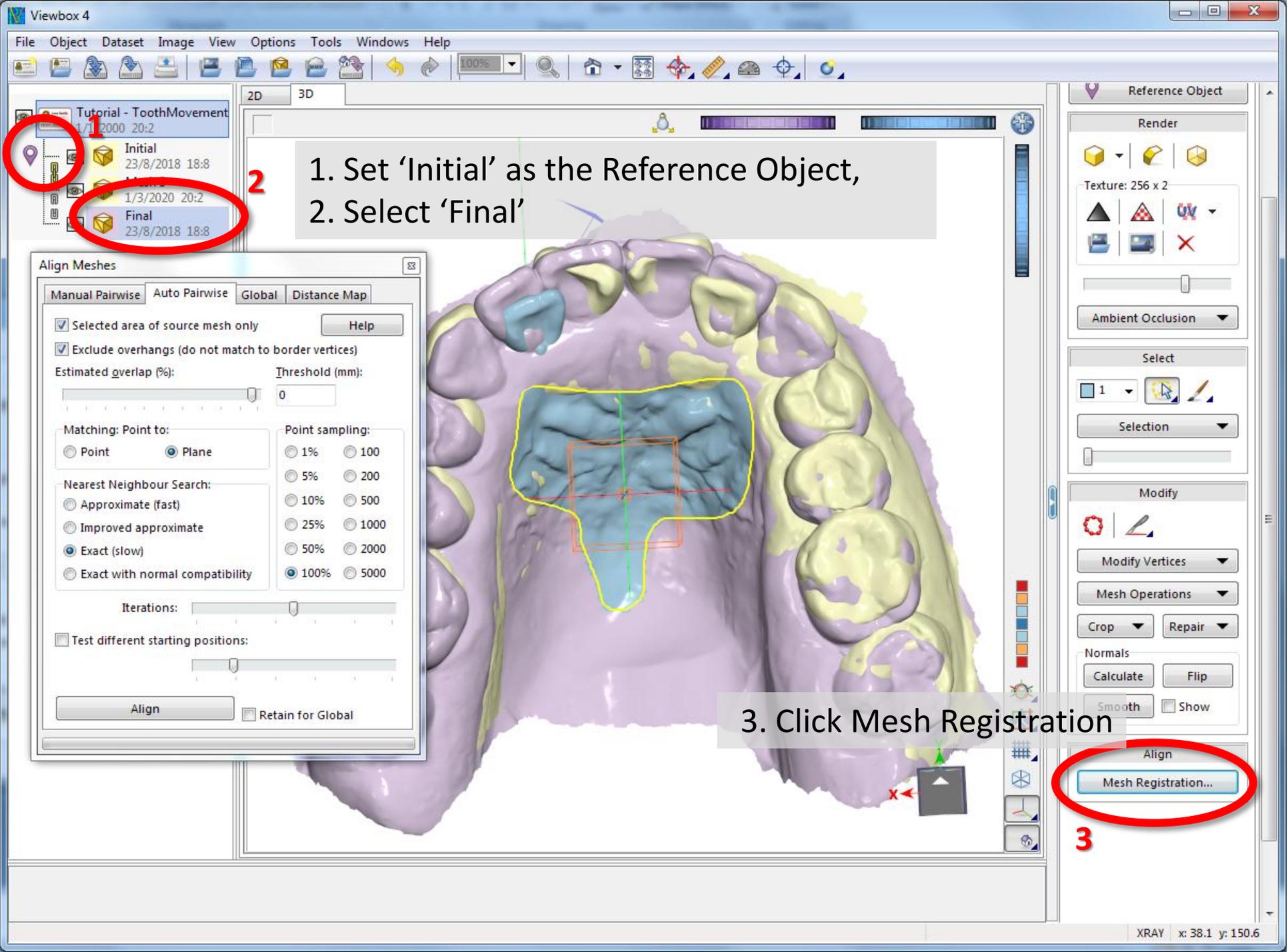
Normals

Calculate Flip

Smooth Show

Align

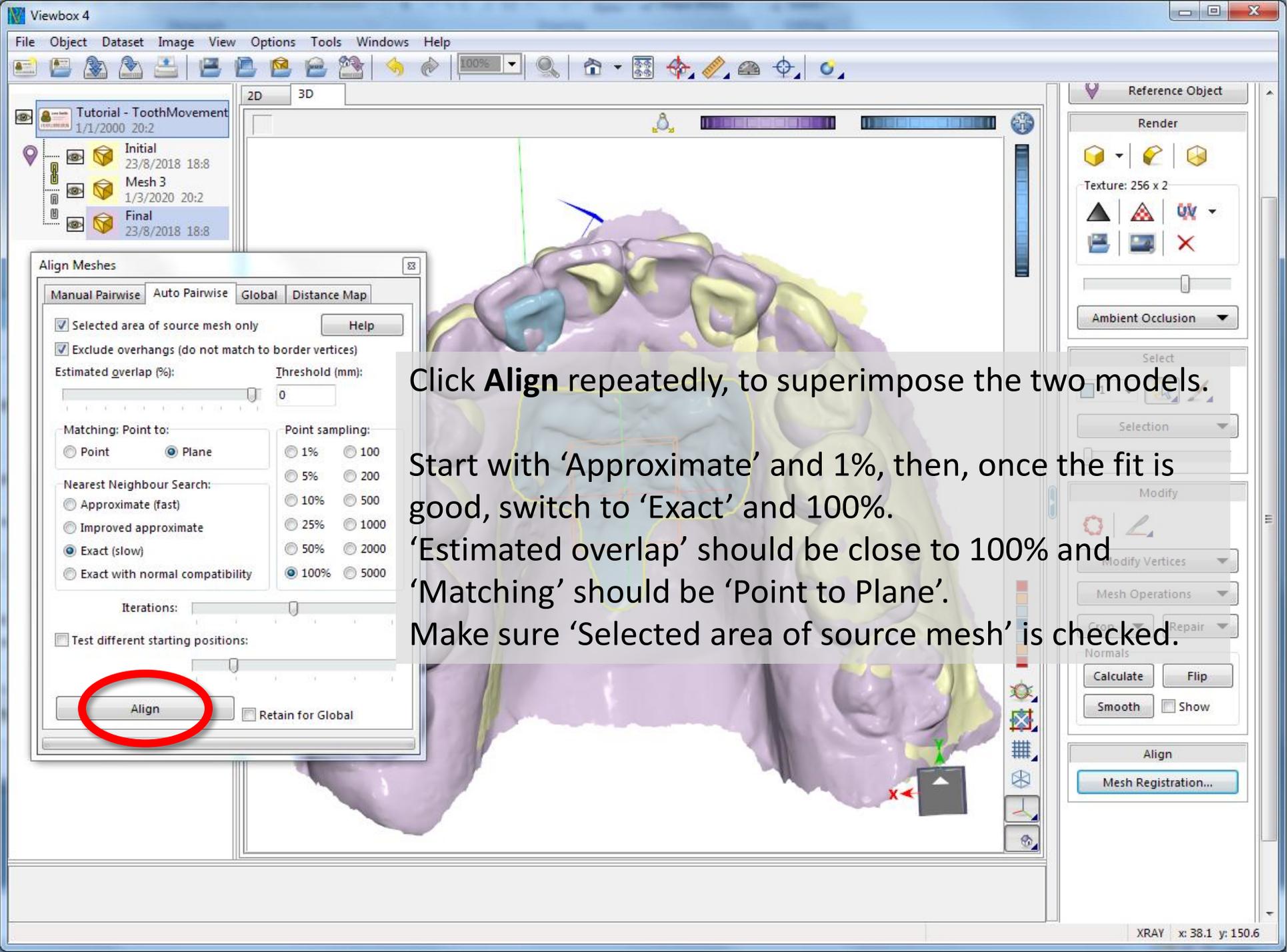
Mesh Registration...



1. Set 'Initial' as the Reference Object,
2. Select 'Final'

3. Click Mesh Registration

3

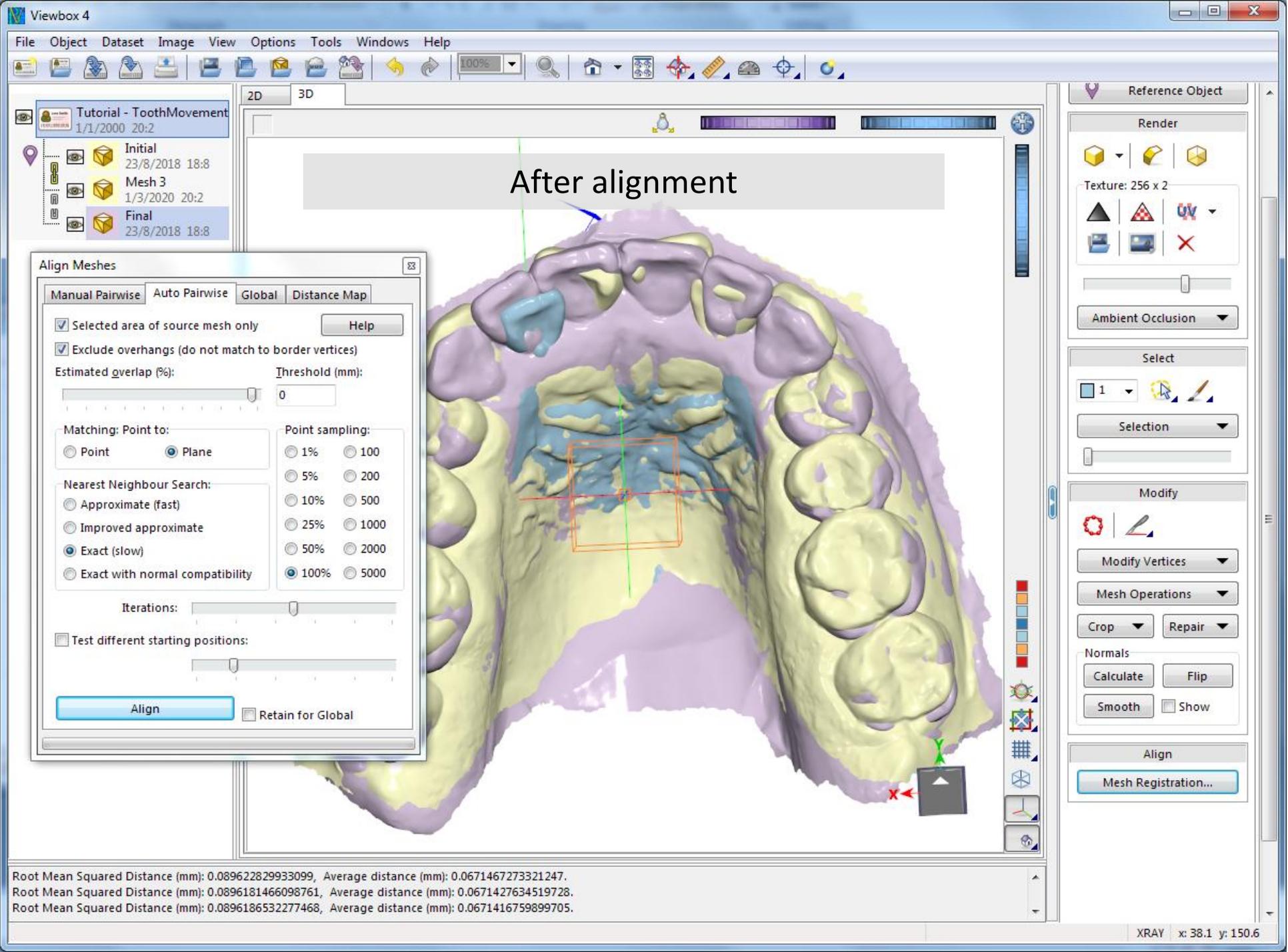


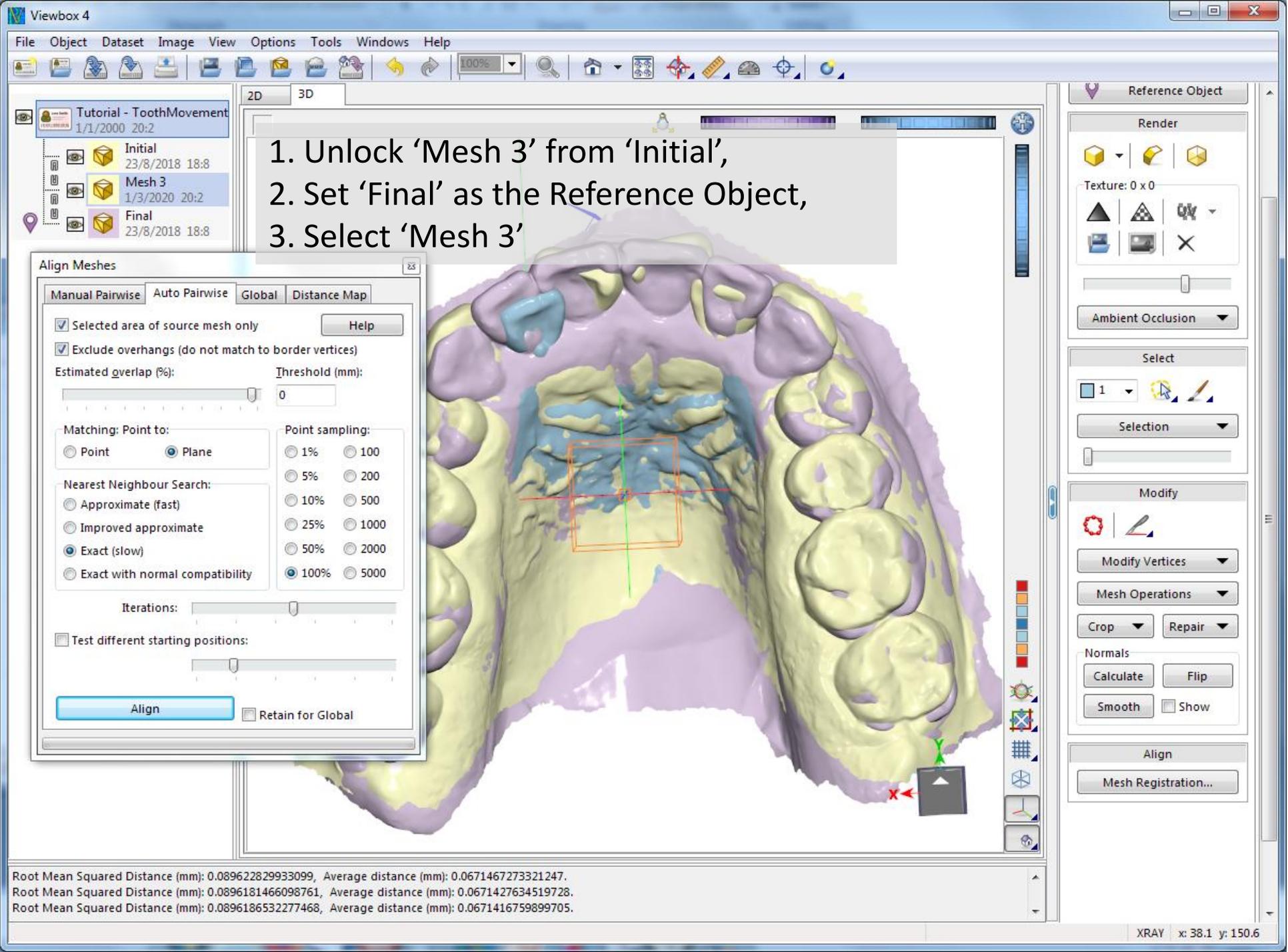
Click **Align** repeatedly, to superimpose the two models.

Start with 'Approximate' and 1%, then, once the fit is good, switch to 'Exact' and 100%.

'Estimated overlap' should be close to 100% and 'Matching' should be 'Point to Plane'.

Make sure 'Selected area of source mesh' is checked.





1. Unlock 'Mesh 3' from 'Initial',
2. Set 'Final' as the Reference Object,
3. Select 'Mesh 3'

Align Meshes

Manual Pairwise Auto Pairwise Global Distance Map

Selected area of source mesh only Help

Exclude overhangs (do not match to border vertices)

Estimated overlap (%):

Threshold (mm):

Matching: Point to:

Point Plane

Point sampling:

1% 100

5% 200

10% 500

25% 1000

50% 2000

100% 5000

Nearest Neighbour Search:

Approximate (fast)

Improved approximate

Exact (slow)

Exact with normal compatibility

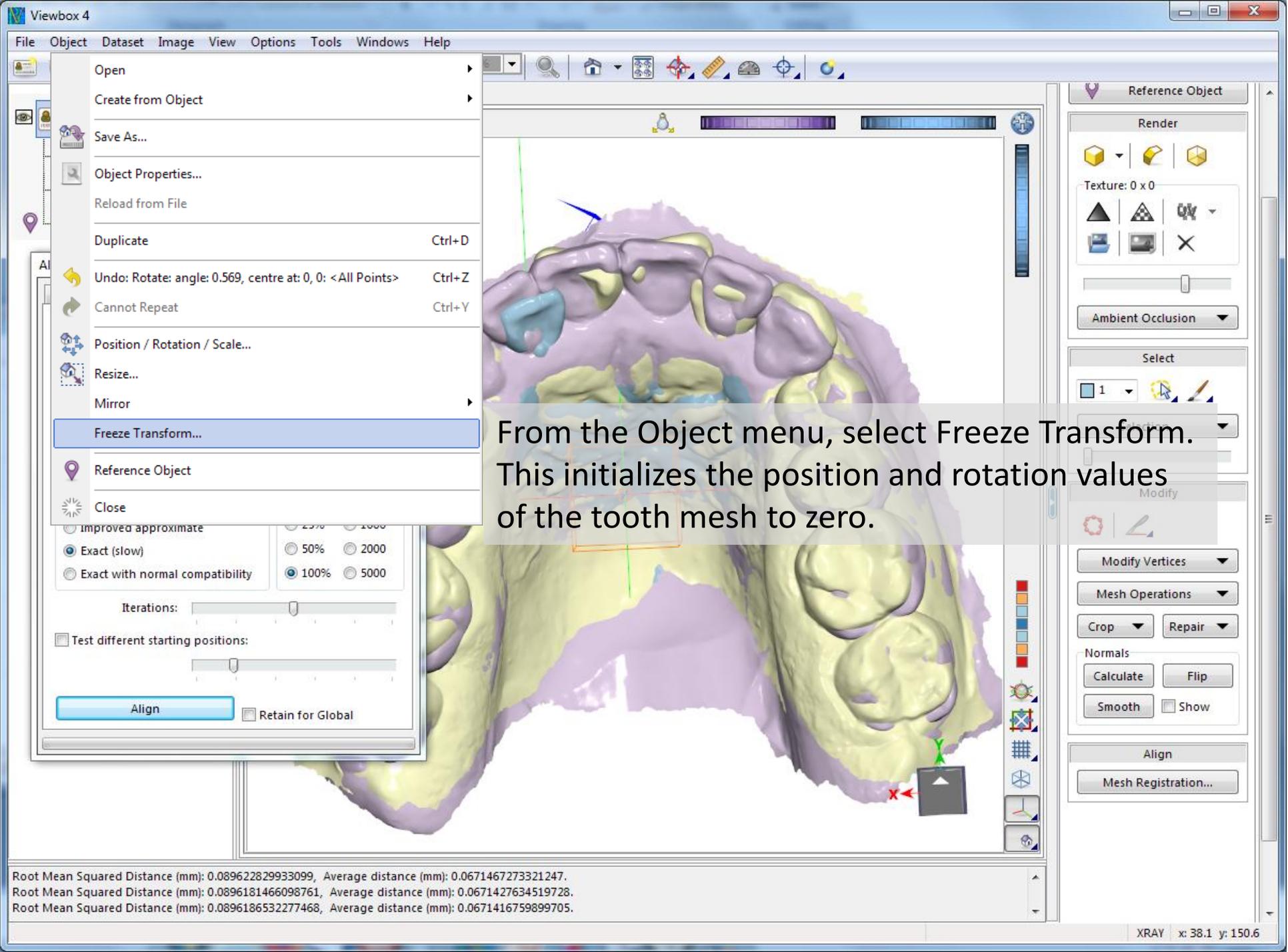
Iterations:

Test different starting positions:

Align

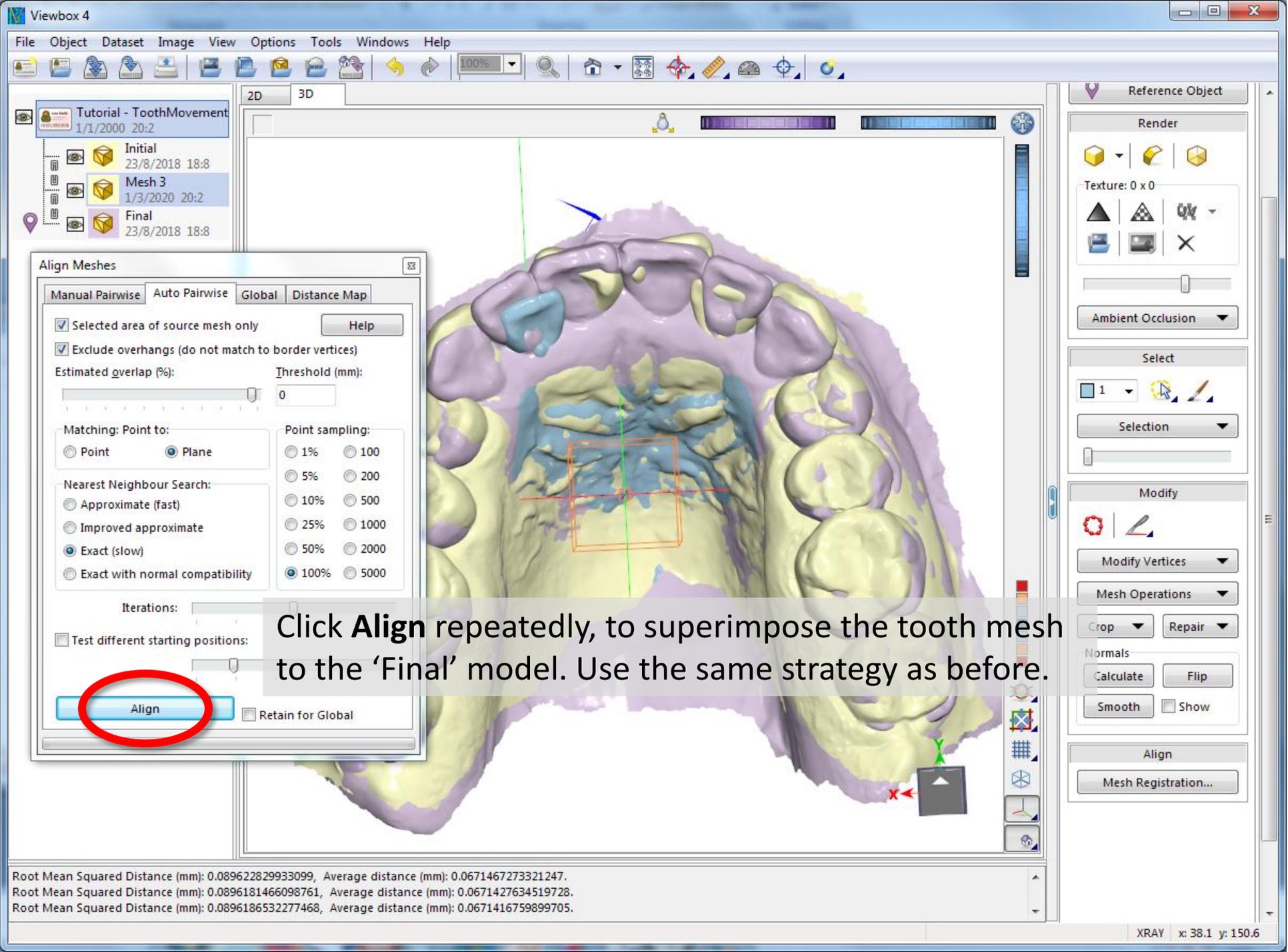
Retain for Global

Root Mean Squared Distance (mm): 0.089622829933099, Average distance (mm): 0.0671467273321247.
Root Mean Squared Distance (mm): 0.0896181466098761, Average distance (mm): 0.0671427634519728.
Root Mean Squared Distance (mm): 0.0896186532277468, Average distance (mm): 0.0671416759899705.



From the Object menu, select Freeze Transform. This initializes the position and rotation values of the tooth mesh to zero.

Root Mean Squared Distance (mm): 0.089622829933099, Average distance (mm): 0.0671467273321247.
Root Mean Squared Distance (mm): 0.0896181466098761, Average distance (mm): 0.0671427634519728.
Root Mean Squared Distance (mm): 0.0896186532277468, Average distance (mm): 0.0671416759899705.



Click **Align** repeatedly, to superimpose the tooth mesh to the 'Final' model. Use the same strategy as before.

Align Meshes

Manual Pairwise | Auto Pairwise | Global | Distance Map

Selected area of source mesh only Help

Exclude overhangs (do not match to border vertices)

Estimated overlap (%): Threshold (mm):

Matching: Point to:

Point Plane

Point sampling:

1% 100

5% 200

10% 500

25% 1000

50% 2000

100% 5000

Nearest Neighbour Search:

Approximate (fast)

Improved approximate

Exact (slow)

Exact with normal compatibility

Iterations:

Test different starting positions:

Retain for Global

Align

Reference Object

Render

Texture: 0 x 0

Ambient Occlusion

Select

Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

Normals

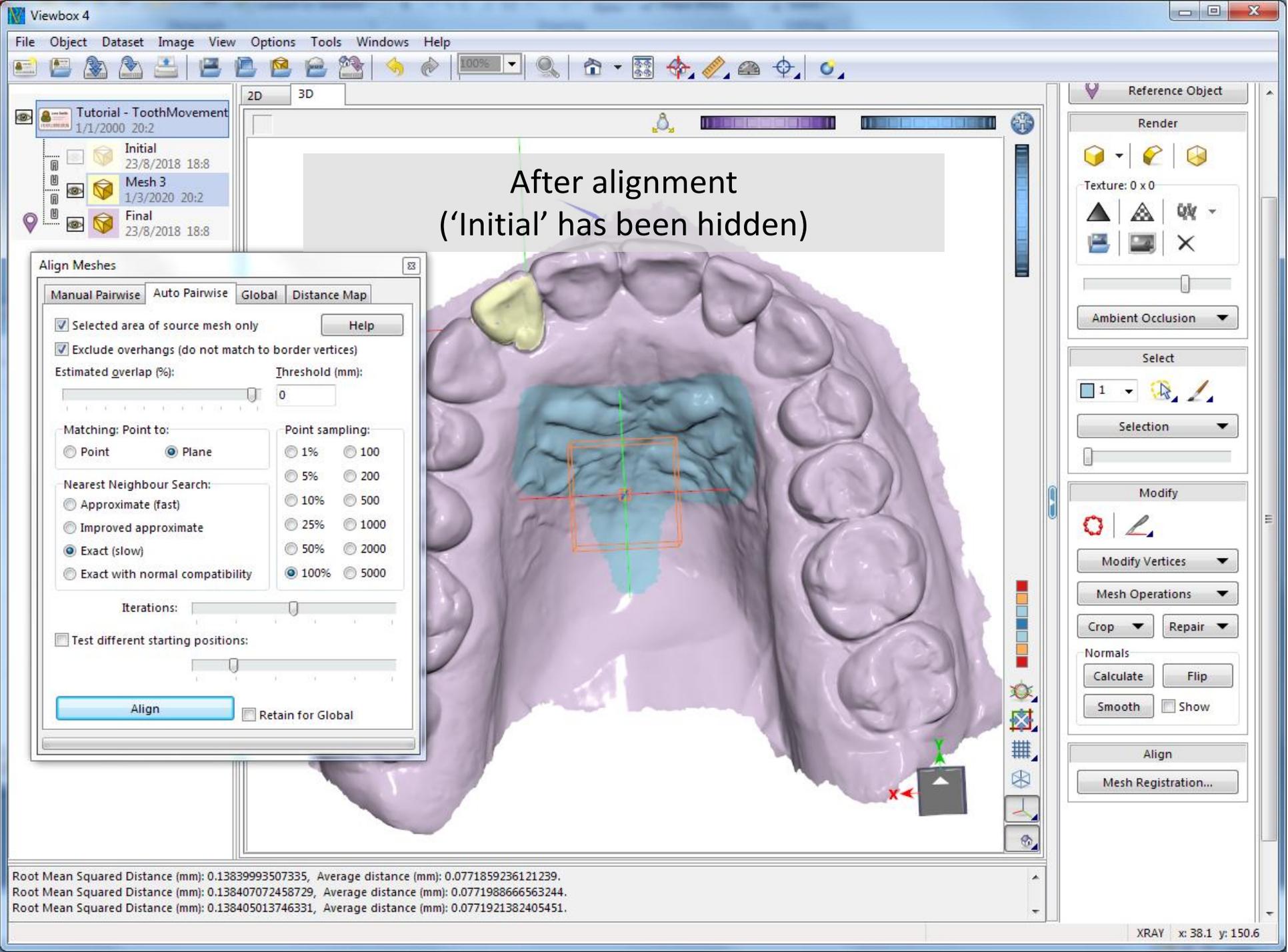
Calculate Flip

Smooth Show

Align

Mesh Registration...

Root Mean Squared Distance (mm): 0.089622829933099, Average distance (mm): 0.0671467273321247.
Root Mean Squared Distance (mm): 0.0896181466098761, Average distance (mm): 0.0671427634519728.
Root Mean Squared Distance (mm): 0.0896186532277468, Average distance (mm): 0.0671416759899705.



After alignment
(‘Initial’ has been hidden)

Align Meshes

Manual Pairwise | Auto Pairwise | Global | Distance Map

Selected area of source mesh only Help

Exclude overhangs (do not match to border vertices)

Estimated overlap (%): Threshold (mm):

Matching: Point to:

Point Plane

Point sampling:

1% 100

5% 200

10% 500

25% 1000

50% 2000

100% 5000

Nearest Neighbour Search:

Approximate (fast)

Improved approximate

Exact (slow)

Exact with normal compatibility

Iterations:

Test different starting positions:

Retain for Global

Reference Object

Render

Texture: 0 x 0

Ambient Occlusion

Select

1

Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

Normals

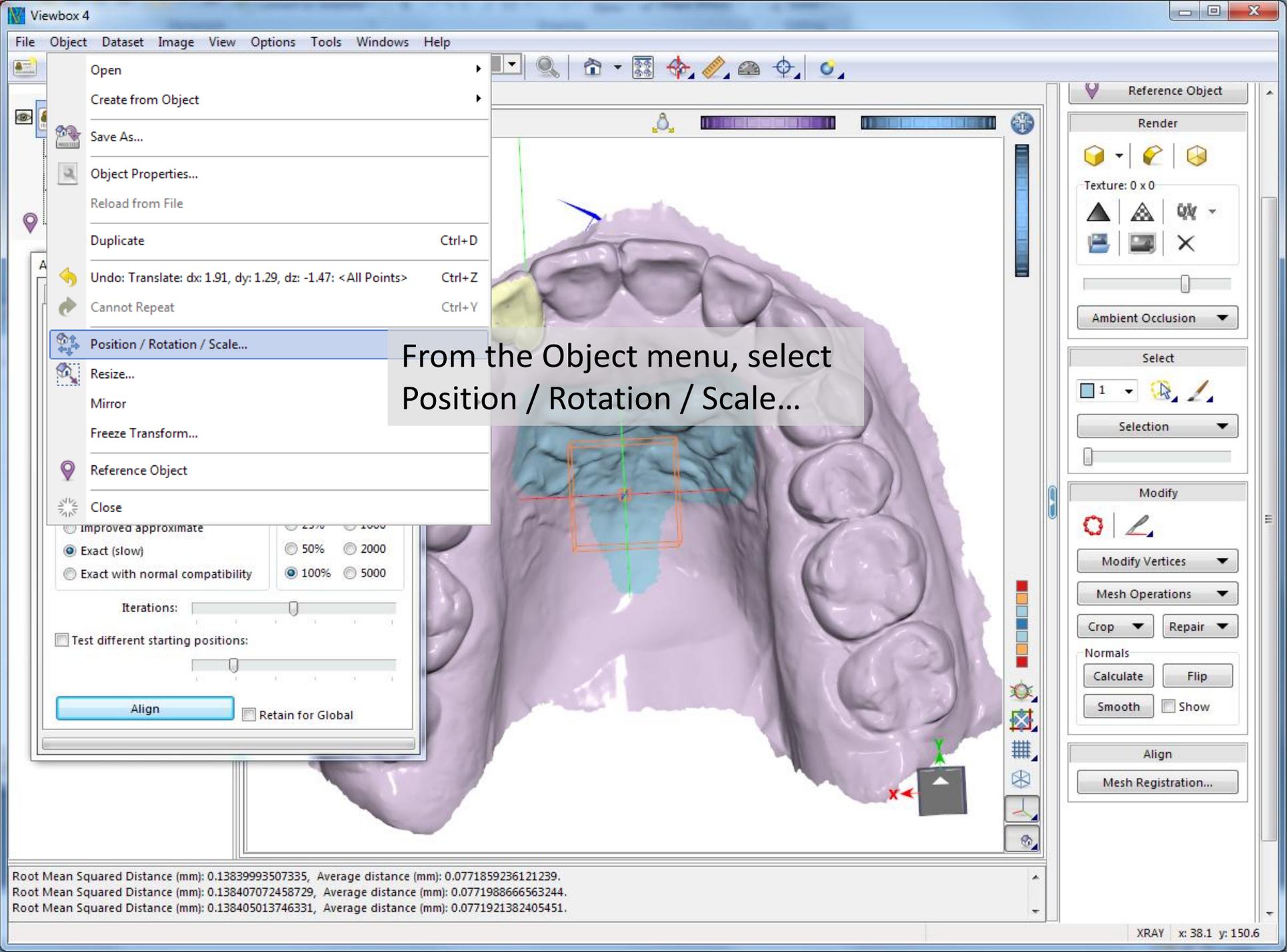
Calculate Flip

Smooth Show

Align

Mesh Registration...

Root Mean Squared Distance (mm): 0.13839993507335, Average distance (mm): 0.0771859236121239.
Root Mean Squared Distance (mm): 0.138407072458729, Average distance (mm): 0.0771988666563244.
Root Mean Squared Distance (mm): 0.138405013746331, Average distance (mm): 0.0771921382405451.



From the Object menu, select
Position / Rotation / Scale...

- Open
- Create from Object
- Save As...
- Object Properties...
- Reload from File
- Duplicate Ctrl+D
- Undo: Translate: dx: 1.91, dy: 1.29, dz: -1.47: <All Points> Ctrl+Z
- Cannot Repeat Ctrl+Y
- Position / Rotation / Scale...**
- Resize...
- Mirror
- Freeze Transform...
- Reference Object
- Close

Improved approximate 25% 1000

Exact (slow) 50% 2000

Exact with normal compatibility 100% 5000

Iterations:

Test different starting positions:

Retain for Global

Reference Object

Render

Texture: 0 x 0

Ambient Occlusion

Select

Selection

Modify

Modify Vertices

Mesh Operations

Crop Repair

Normals

Calculate Flip

Smooth Show

Align

Mesh Registration...

Root Mean Squared Distance (mm): 0.13839993507335, Average distance (mm): 0.0771859236121239.
Root Mean Squared Distance (mm): 0.138407072458729, Average distance (mm): 0.0771988666563244.
Root Mean Squared Distance (mm): 0.138405013746331, Average distance (mm): 0.0771921382405451.

