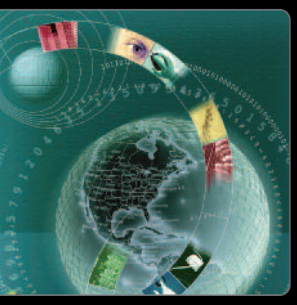
opal-chiro



Your Practice. Your Preference.
Your Productivity Solution.

USER MANUAL

VIZTEK

Table of Contents

PLEASE NOTE: NUCCA Tools section is currently UNDER CONSTRUCTION

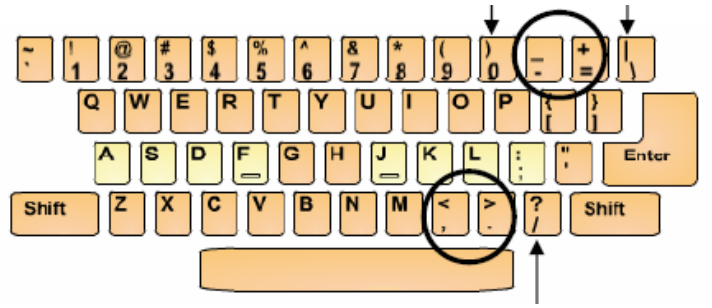
1 Introduction

Opal RAD Chiropractic tools are built as an enhanced feature to the existing library of annotation tools in Opal RAD. Please note the term "annotation" and chiropractic tool" will be used interchangeably.

1.1 Basic Keyboard Functionality

The Opal-RAD Chiropractic tools have several new functional additions when compared to regular Opal-RAD annotations. These tools have the following functions when using the keyboard for activating functionality:

- **Rotate Left (<), Rotate Right (>)**. Will rotate template left or right in 1/10 degree steps.
- **Zoom In (+), Zoom Out (-).** Will zoom in/out template by a factor of 10% if template is not used for direct measuring (not size dependent.)
- **Reset Rotation (0).** Will reset the rotation level on the template.
- **Invoke Action (?/).** Will draw a line from template, apply the template or request insertion of the value inferred from template.
- **Change template (\).** Will change the style of the Center of Skull tool.



1.2 Image View Orientation

ATTENTION!

Images are generally captured in an Anterior to Posterior view, shown allopathically. In the chiropractic field, images are usually viewed, and annotated, from a Posterior to Anterior perspective, as though the chiropractor is standing behind the patient in preparation for adjustment. Therefore, it is highly recommended that all images are captured with the **R** and **L** markers included to verify correct anatomical positioning. If the image(s) being viewed is not shown as Posterior to Anterior, it is recommended that the Flip Horizontal ( ) icon be applied to the image, as shown below in Figure 1.0.

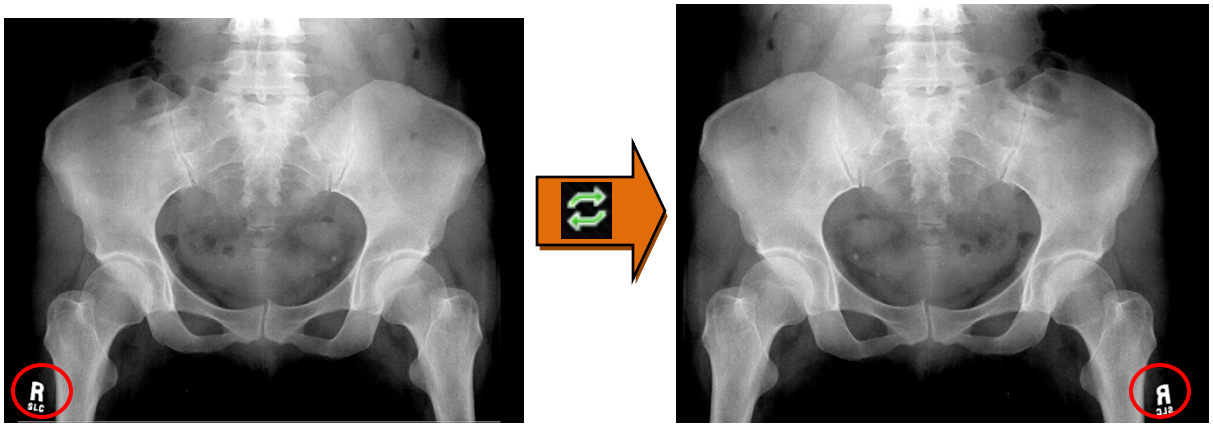


Figure 1.0 – Flip Applied for Chiropractic Application

1.3 Annotation Customization and Edit Features

Within the Opal Viewer, it is possible to customize various annotation features to include annotation font size and annotation color(s). To access this module,

1. Hover over the **Main Menu icon** ( ) found in the upper left corner of the Opal Viewer.
2. Select **Settings**>>**Edit**>>**Annotation Options** tab (See Figure 1.1)

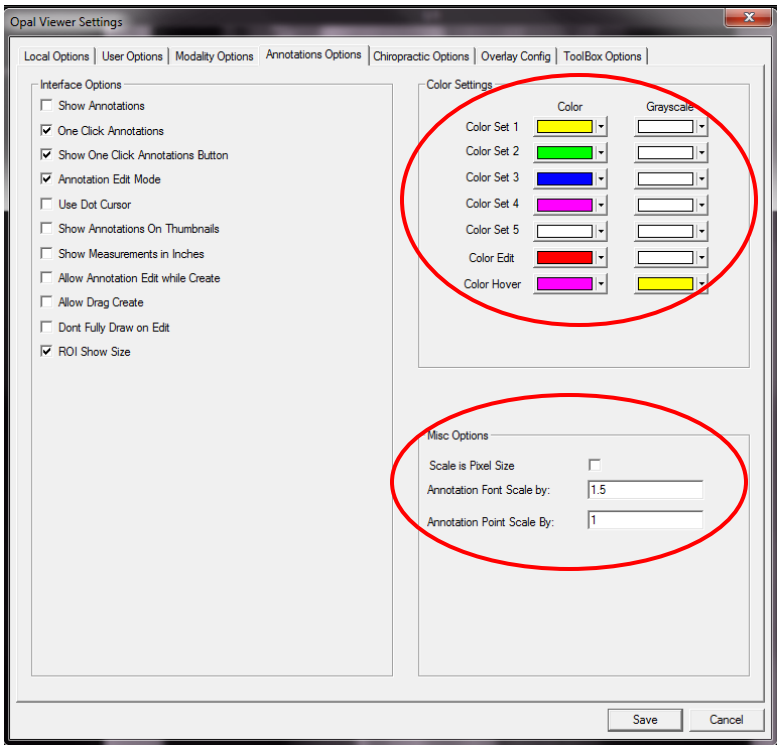


Figure 1.1 – Annotation Options TAB

1.3.1 Color Settings

(Figure 1.2)

Color Set (1-5)

- Allows you to customize the color that displays when an annotation is applied to an image **(SET).**

Color Edit

- Allows you to customize the color that displays when an annotation is highlighted for editing **(EDIT).**

Color Hover

- Allows you to customize the color that displays when a user hovers over the annotation **(HOVER).**

1.3.2 Misc Options

Scale is Pixel Size

- Check this box if font size should be determined by Pixel Size

Annotation Font Scale by: _____

- Allows you to customize the font size of an applied annotation
- Default is approximately 1 or 1.5 when **Scale is Pixel Size** *IS NOT* checked
- Default is approximately 10 is when **Scale Pixel Size** *IS* checked.

Annotation Point Scale by: _____

- Allows you to customize the point scale (size) of the annotation "end points"
- Enter a number between 0.1 – 5

Once you have made your selections and changes, click **SAVE**.

For a complete reference on the Opal Viewer Administrative Settings Module, please go to the User manual located at: OpalViewerAdminUserSettingsManual

2 General Chiropractic Tools

1. Hover over the **Main Menu icon** ( ) found in the upper left corner of the Opal Viewer.
2. Click **Chiropractic**.
3. The list of all Chiropractic Tools available will display. (See Figure 2.0)

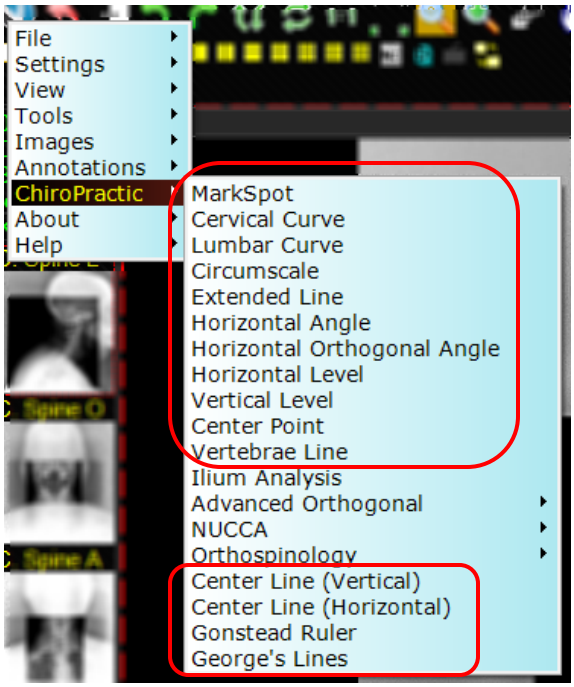


Figure 2.0 – General Chiropractic Tools

2.1 Mark Spot Tool

✓ Used to mark a chosen anatomical point.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Mark Spot** tool.
3. Left click anywhere on the image that you would like to place a dot annotation.
   NOTE: Every single left click will produce a dot annotation.
4. Triple-click on the last plotted point OR select **End Annotation** tool ( ) to deactivate **Mark Spot** tool. (Figure 2.1)

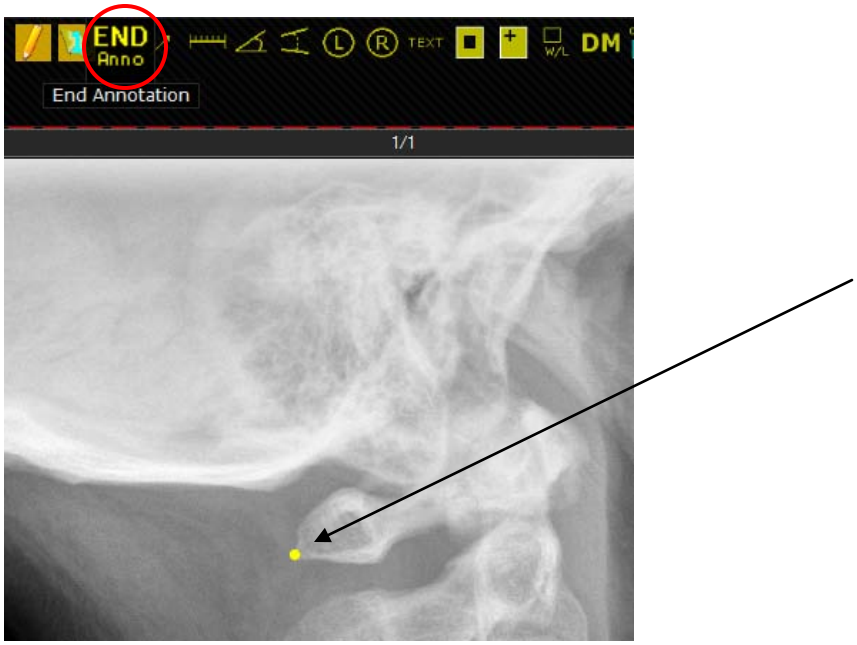


Figure 2.1 – Mark Spot Tool with End Annotation

2.2 Cervical Curve Tool

- ✓ Used on a **lateral view** of the **cervical spine**.
- ✓ Displays an arc of a circle with the radius of **17cm/170mm**.
- ✓ Indicates a patient's cervical curve in relation to the textbook normal and how much adjustment their spine is in need of based on the deviation, in mm and degrees.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Cervical Curve** tool.
3. Left click on the *top of the posterior aspect of the anterior tubercle*. This is the 1st point of 3.
4. Left click on the *middle of the anterior vertebral body of T2*. This is the 2nd point of 3.
5. Left click on the left side of spine if the curve should display on the left side.

OR

Left click on the right side of the spine if the curve should display on the right side.
This is the 3rd and final point, causing the curve itself to display. (See Figure 2.2)

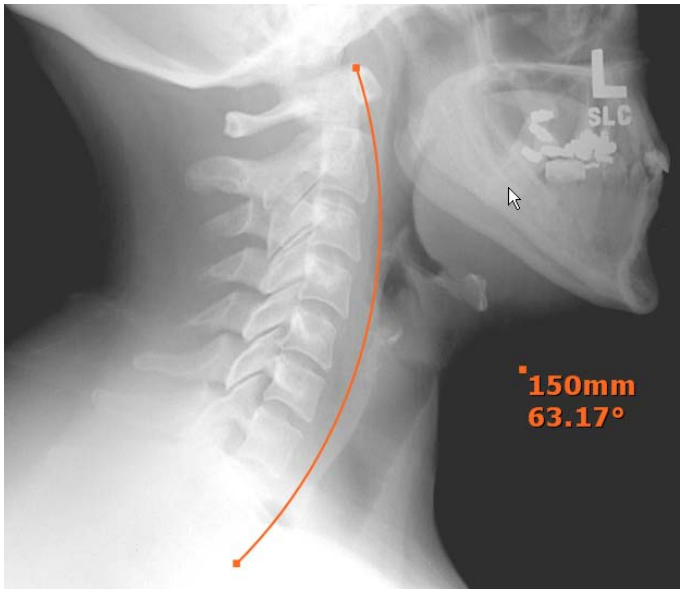


Figure 2.2 – Cervical Curve Tool Annotation

2.3 Lumbar Curve Tool

- ✓ Used on a **lateral view** of the **lumbar spine**
- ✓ Displays an arc of a circle with a **19-24cm/190-240mm** radius.
- ✓ Indicates a patient's lumbar curve in relation to the textbook normal and how much adjustment their spine is in need of based on the deviation, in mm and degrees.

♦**NOTE:** Although the range 19-24cm is considered textbook normal for the lumbar curve, the ***average of 22cm/220mm*** has been chosen by the software and used to represent the textbook normal lumbar curve in this calculation.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Lumbar Curve** tool.
3. Left click on the *anterior superior portion on the vertebral body of L1*. This is the 1st point of 3.
4. Left click on the on the *anterior portion of the sacral base/promontory*. This is the 2nd point of 3.
5. Left click on the left side of spine if the curve should display on the left side.
   OR
   Left click on the right side of the spine if the curve should display on the right side.
6. This is the 3rd and final point, causing the curve itself to display. (See Figure 2.3)

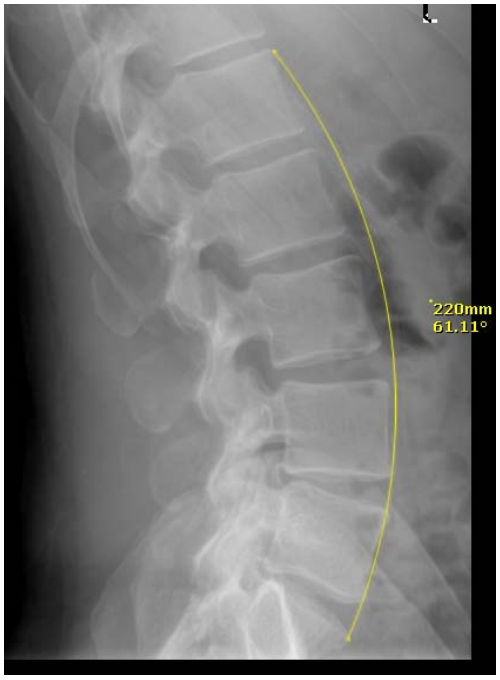


Figure 2.3 – Lumbar Curve Tool Annotation

Change the Radius of the Circle in both Cervical Curve/Lumbar Curve tools:

1. Activate **Annotation Edit Mode**. = Activated
2. Left click on a point on the curve annotation created.
3. Press (?/) key on keyboard.
4. Enter the value of the radius of the circle in millimeters (mm).

2.4 Circumscale

- ✓ Used on a **Nasium/Frontal** view. Zoom and adjust image contrast as needed.
- ✓ This template is used for manually finding the axial and condyle circles.
- ✓ *Specific Application Example*: Used for assessment of the *Superior Articular Surface* (SAS) of C2 For the purpose of determining the angle of the articulation of the lateral articular edge of the occipital condyle and the lateral articular edge of the SAS of C2.
- ✓ *Suggestion*: Use the **Mark Spot** tool to mark the lateral articular edges of C2 points plotted about 1/8 inch apart on both sides, *before* placing Circumscale template, for reference.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Circumscale** tool.
3. Left click the image to place the **Circumscale** tool on the image.

4. **To move the template**, hover your cursor over the small square in the center of the template. Left click the square and holding your mouse button, move the template into position to where the template is placed over the 4 points generated using the **Mark Spot** tool to find an arc that simultaneously touches all four dots on the cortex. (See Figure 2.4)
5. Left click to engage template.

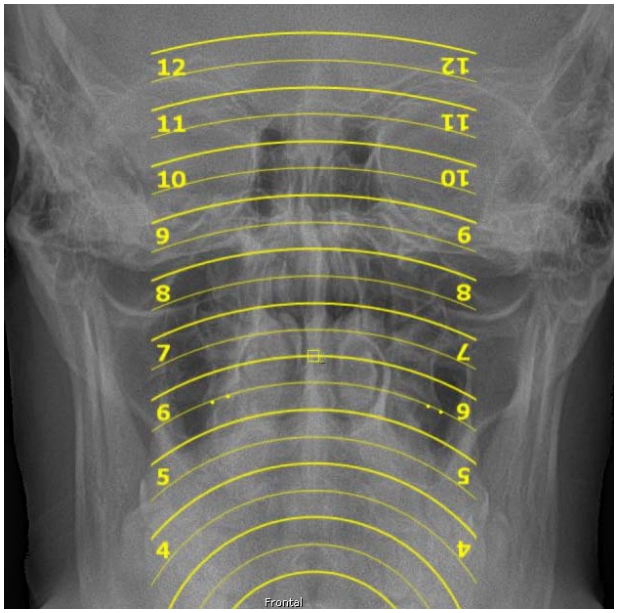


Figure 2.4 – Circumscale Tool Template (shown with Mark Spot tool for reference)

♦In this example = 6th line touches all 4 points simultaneously so the axial circle is a 6.

2.5 Extended Line Tool

✓ Provides a straight line through selected anatomical points based on what is required for the specific analysis being performed.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Extended Line** tool.
3. Left click to begin drawing your line on the chosen anatomic structure.
4. Drag your mouse to position the line.
5. Left click on the second anatomic structure to set the extended line. (See Figure 2.5)

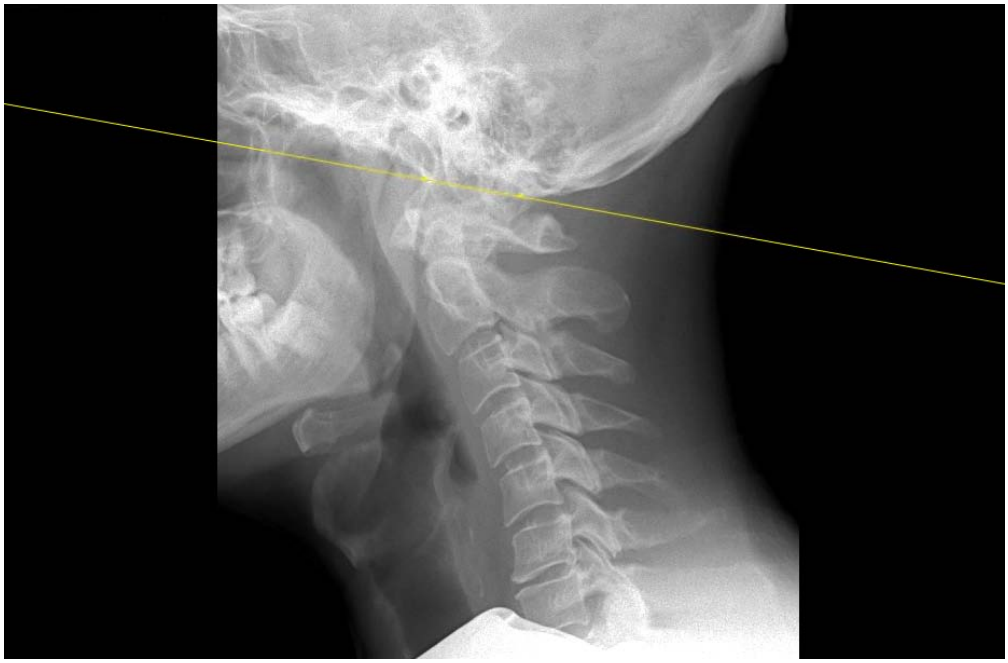


Figure 2.5 – Extended Line Tool Annotation (shown with Mark Spot Annotation for reference)

2.6 Horizontal Angle

- ✓ This tool generates a horizontal angle on a **Lateral/Sagittal** view to determine the proper *angle* needed to set the x-ray tube to capture the AO joint for Frontal/Nasium view.
- ✓ *For example*: Used to display how superior the atlas vertebrae is located, in degrees, in relation to the True Horizontal (bottom edge of film)

1. Make sure the **Annotation Edit Mode** is activated.  = Activated
2. Left click on the **Horizontal Angle** tool.
3. Left click on the desired anatomical structure to plot the 1st point (Note: the degree of angle measurement will display)
4. To plot the 2nd point, drag the mouse along the line of measurement and left click on the second anatomical point.
5. Upon plotting the 2nd point, the Horizontal Angle measurement will display yielding the optimum frontal shot. (See Figure 2.6)
6. Keep in mind, in Annotation Edit mode, the annotation may be edited by hovering over the annotation to highlight its activity. Then edit with a left click and use a drag motion to change the angle measurement in relation to the True Horizontal.

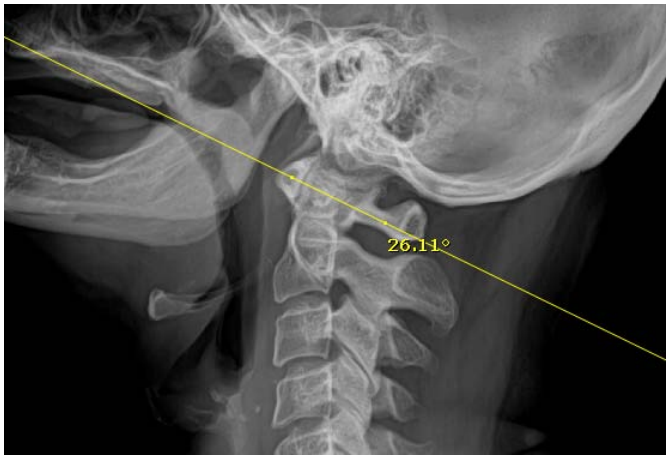


Figure 2.6 – Horizontal Angle

2.7 Horizontal Orthogonal Angle

- ✓ This tool generates a horizontal angle on a **Lateral/Sagittal** view to determine the proper *perpendicular angle* for the Frontal /Nasium view.

1. Left click and drag the Lateral/Sagittal View thumbnail so it appears in the image viewing area.
2. Make sure the **Annotation Edit Mode** is activated. = Activated
3. Left click on the **Horizontal Orthogonal Angle** tool.
4. Left click to plot the 1st point. (Note: the degree of angle measurement will display)
5. Drag the mouse *perpendicular* to the line of measurement and left click to plot the 2nd point.
6. Immediately following the plotting of the 2nd point, the Horizontal Orthogonal Angle measurement will display. (See Figure 2.7)

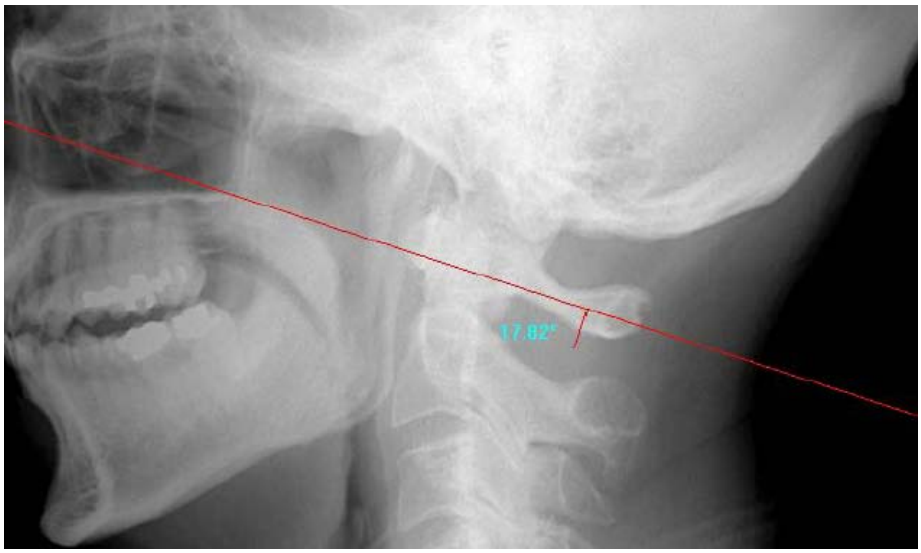


Figure 2.7 – Horizontal Orthogonal Angle

2.8 Horizontal Level

- ✓ Used to measure the vertical difference between two anatomical points by placing a perfect horizontal line across an image using chosen anatomical points and
- ✓ Measures height in mm between a perfect horizontal and any other chosen anatomical point and provides degrees for the angle created.
- ✓ NOTE: The *dashed line* shows the true horizontal and the *solid line* displays along the chosen anatomical points.

1. Make sure the **Annotation Edit Mode** is activated.  = Activated
2. Left click on the **Horizontal Level** tool.
3. Left click a point to automatically create the dashed line (true horizontal line).
4. Left click to automatically create the solid line where the cursor is attached.
5. Drag and drop the 2nd point to create the measurement and angle. (See Figure 2.8)

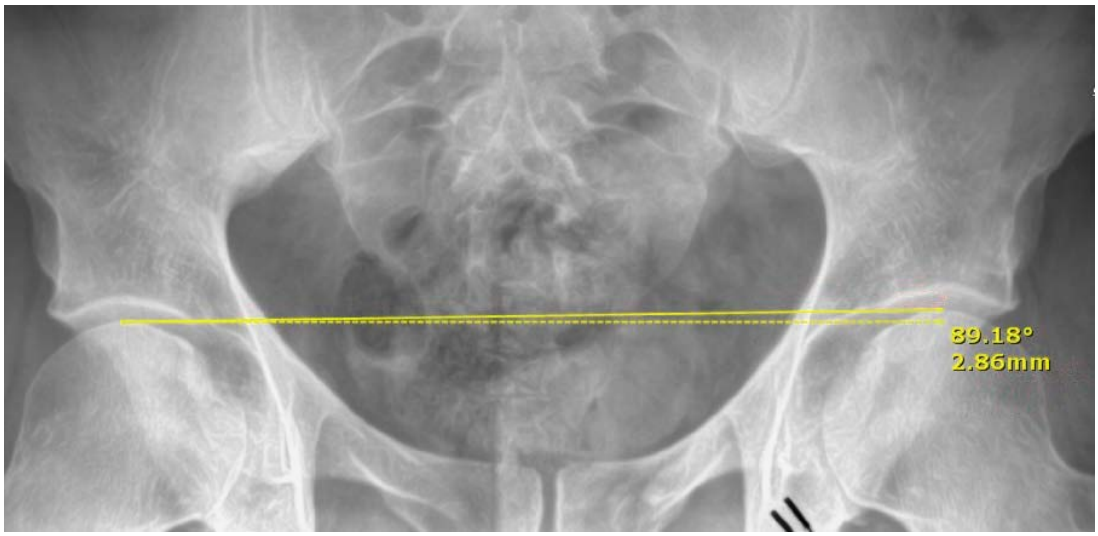


Figure 2.8 – Horizontal Level Annotation

2.9 Vertical Level

- ✓ Used to measure the horizontal difference between two anatomical points by placing a perfect vertical line across an image using chosen anatomical points and
- ✓ Measures height in mm between a perfect vertical and any other chosen anatomical point and provides degrees for the angle created.
- ✓ NOTE: The *dashed line* shows the true vertical and the *solid line* displays along the chosen anatomical points.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Vertical Level** tool.
3. Left click a point to automatically create the dashed line (true vertical line).
4. Left click to automatically create the solid line where the cursor is attached.
5. Drag and drop the 2nd point to create the measurement and angle. (See Figure 2.8)

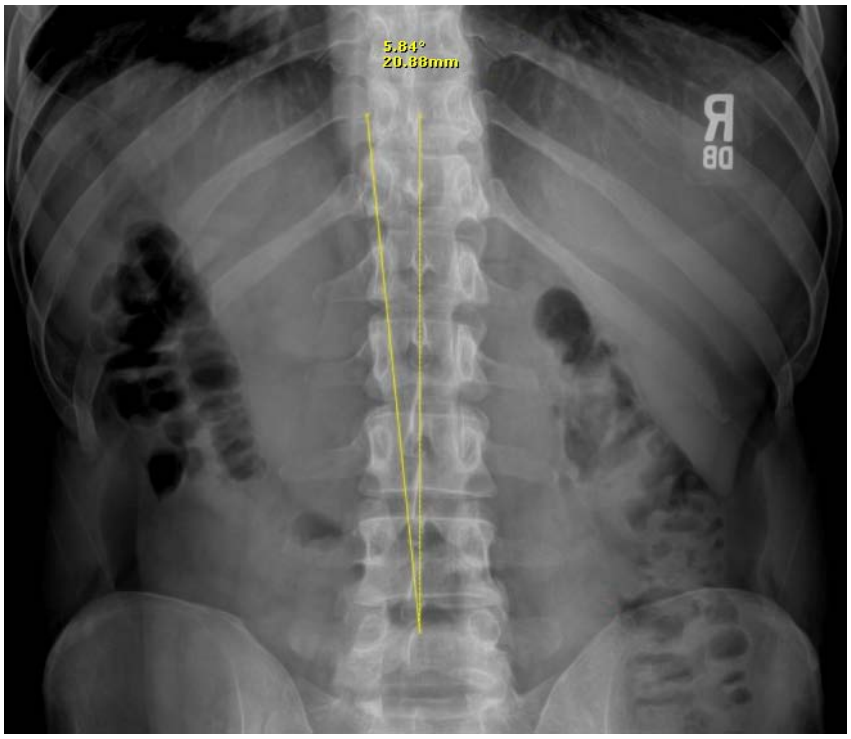


Figure 2.9 – Vertical Level Annotation

2.10 Center Point Tool

✓ This tool generates a center point measured between two plotted points.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Center Point** tool.
3. Left click to plot the first anatomical point. *Plot all points from left to right)
4. Left click to plot the second anatomical point.
5. The **Center Point** is generated. (See Figure 2.10)

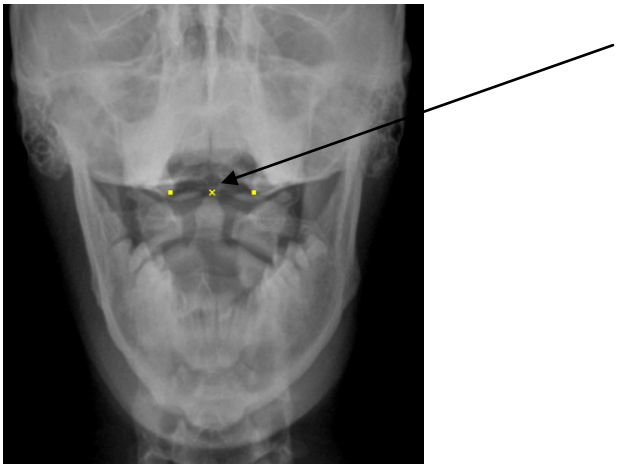


Figure 2.10 – Center Point Annotation

2.11 Vertebrae Line Tool

✓ This tool generates a vertical line that passes through six points plotted along the spinal canal.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Vertebrae Line** tool
3. Plot the six points below, plotting all points from top to bottom and left to right, each performed by a single left click.

   - Plot **Point 1** on left side of a vertebral body
   - Plot **Point 2** on right side of a vertebral body

The software will generate a middle point of the vertebrae exactly between point 1 and 2.

   - Plot **Point 3** at the junction of the lamina (or tip of the spinous process)

The software will generate a middle point from the previous middle point of the vertebrae and point 3 to represent the center of the spinal column.

   - Plot **Point 4** on the left side of the next vertebrae in question.
   - Plot **Point 5** on the right side of the next vertebrae in question.

The software will generate a middle point of the vertebrae exactly between points 4 and 5.

   - Plot **Point 6** at the junction of the lamina (or tip of the spinous process)

A line will be generated that passes through the center of the spinal canal. (See Figure 2.11)

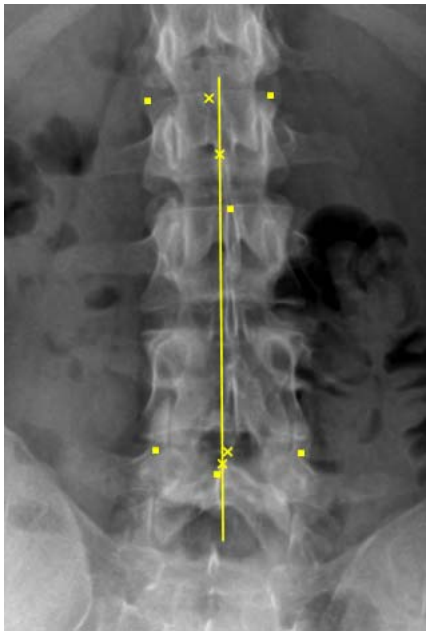


Figure 2.11 – Vertebrae Line Tool

2.12 Center Line (Vertical)

✓ Finds a center ***vertical*** line between points.

1. Make sure the **Annotation Edit Mode** is activated.  = Activated
2. Left click on the **Center Line (Vertical)** tool.
3. Left click on the 1st anatomical point.
4. Left click on the 2nd anatomical point.
5. A center vertical line will be generated. (Figure 2.12)

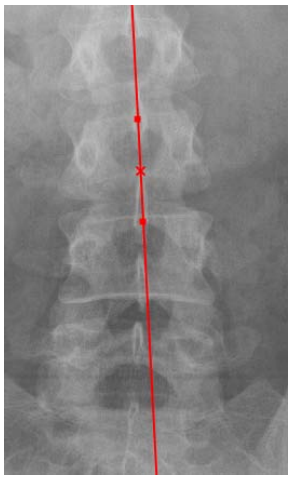


Figure 2.12 – Center Line (Vertical)

2.13 Center Line (Horizontal)

✓ Finds a center ***horizontal*** line between points

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Center Line (Horizontal)** tool.
3. Left click on the 1st anatomical point.
4. Left click on the 2nd anatomical point.
5. A center horizontal line will be generated. (Figure 2.13)

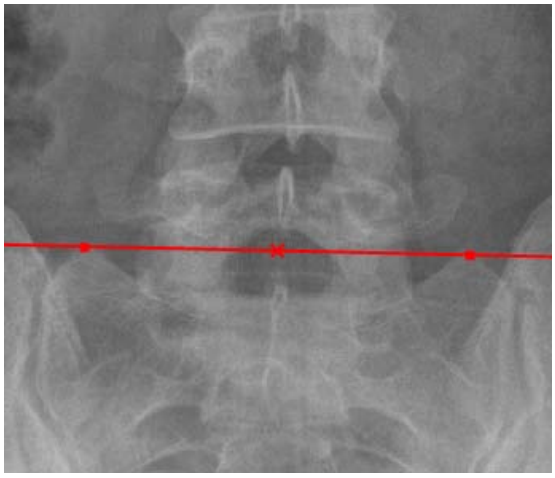


Figure 2.13 – Center Line (Horizontal)

2.14 Gonstead Ruler

✓ The Gonstead Ruler is a digital version of the ruler used in analog analysis to determine measurements in mm, draw a line to measure length, identify end plate lines or apply Gonstead feather lines.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Select **Gonstead Ruler** tool
3. Left click on the image to place the **Gonstead Ruler** tool on the image. (See Figure 2.14)

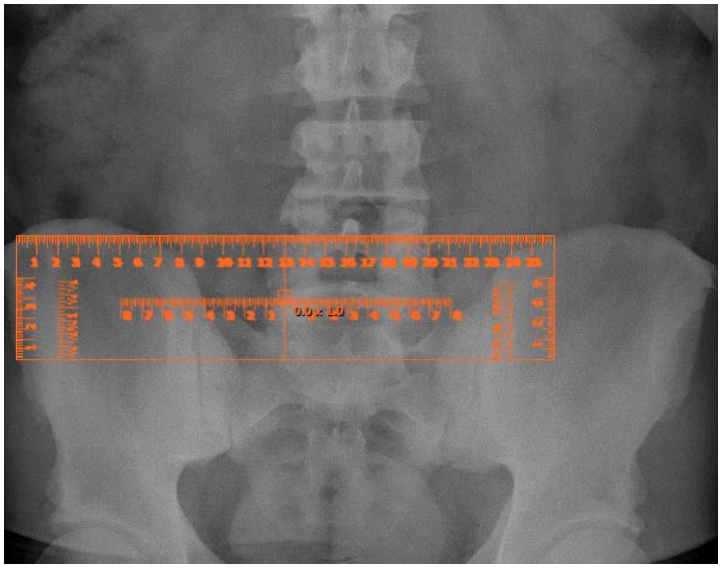


Figure 2.14 – Initial Placement of Gonstead Ruler

4. **To move the template**, hover your cursor over the small box in the center of the Template. The cursor changes to crosshairs. Left click and hold the left mouse key down to drag and move Gonstead Ruler template into position.
5. **To rotate the template**, press **(<)** or **(>)** keys. For example - if using the tool to identify vertebral end plate lines.
6. **To place a vertical line on the vertebral end plates** using the Gonstead Ruler, press **(?/)** key on the keyboard.
7. Continue to check the entire vertebral column, lining up the ruler edge and marking it with a Horizontal line.

2.15 George's Lines

✓ This tool is used on a **lateral view** of the cervical spine to generate measurements (in mm) between vertebrae.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **George's Line** tool
3. Begin drawing lines on each posterior vertebral body from superior to inferior as indicated:
4. Left click on the ***top of the posterior vertebral body***.
5. Left click on the ***bottom of the posterior vertebral body***.
6. Repeat steps 4 and 5 until all desired lines have been drawn on part or all of the vertebral column.
7. Triple-click off to the side of the lines drawn OR select End Annotation tool ( ) and the software will generate measurements (in mm) which account for the anterior or posterior offset in relation to the vertebrae immediately below. (See Figure 2.15)

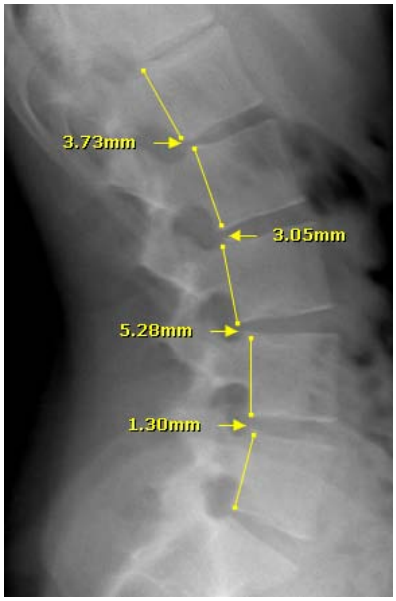


Figure 2.15 – George's Lines

3 ILIUM ANALYSIS

The Ilium Analysis provides a full analysis of the pelvis using an AP Bilateral Pelvic view to display different aspects of pelvic/sacral misalignment using a 16 point system of anatomically plotted points and a set of calculations to display appropriate lines and measurements (in mm and degrees).

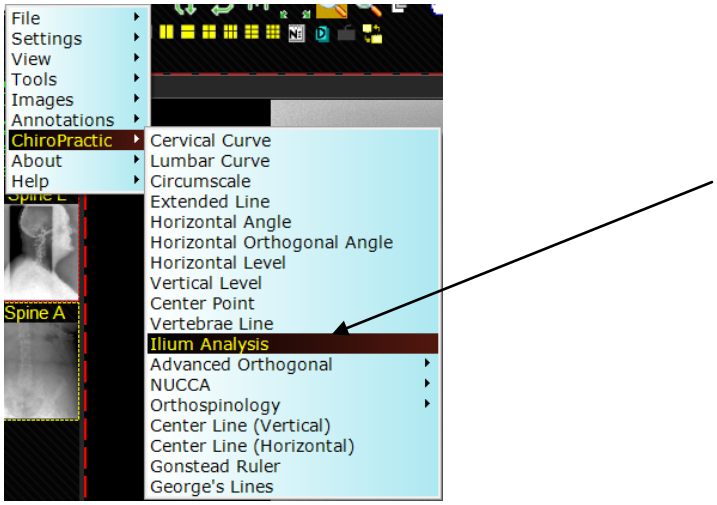


Figure 3.1

3.1 Step by Step Ilium Analysis

Step 1

Use AP Pelvis image making sure the image displays the tops of the iliac crests, borders of the sacrum, and inferior borders of the Ischia. (See Figure 3.2)

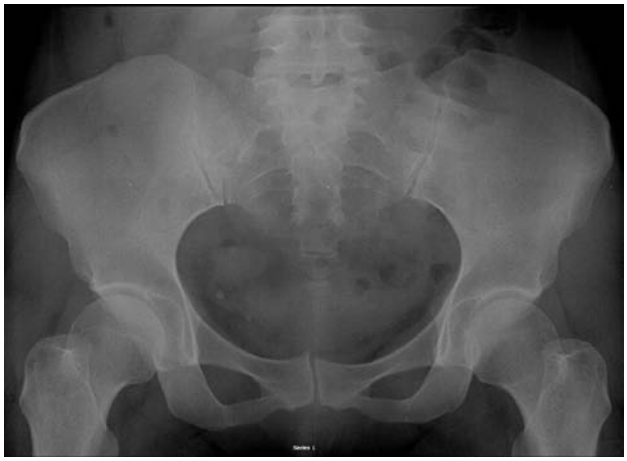


Figure 3.2 – AP Bilateral Pelvis Image

Step 2

Use the **Ilium Analysis Tool** to plot 16 points and perform the Ilium Analysis.

1. Make sure the **Annotation Edit Mode** is activated.  = Activated
2. Select **Ilium Analysis** tool.
3. Using the left click, plot the following 16 points, one plot at a time, on the image ***in the following order***:

1. **Top of the left iliac crest**
2. **Top of the right iliac crest**
3. **Left sacral groove**
4. **Right sacral groove**
5. **Center of the first sacral tubercle**
6. **Lateral border of the left ilia**
7. **Lateral border of the left sacrum**
8. **Medial border of the left ilia**
9. **Medial border of the right ilia**
10. **Lateral border of the right sacrum**
11. **Lateral border of the right ilia**
12. **Top of left femur head**
13. **Top of right femur head**
14. **Center of symphysis pubis**
15. **Inferior border of left ischeal tuberocity**
16. **Inferior border of right ischeal tuberocity**

Step 3

Upon plotting the 16th point, all lines and measurements (in millimeters) are displayed on the image as shown in Table 3.1 below.

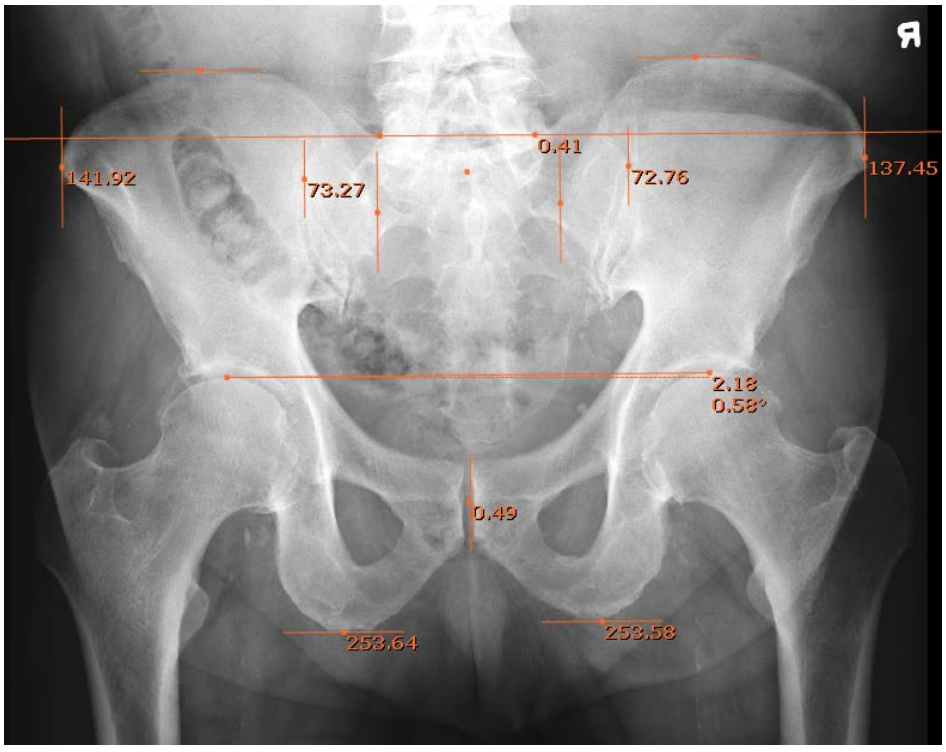


Figure 3.3

Below find Table 3.1- Ilium Analysis Reference for Lines and Measurements. Use in conjunction with Figure 3.4 to familiarize yourself with the digital version of the Ilium Analysis results.

1. Iliac Crest Lines
2. Horizontal Plane Line of the Sacrum (Sacral Baseline)
3. Femur Head Line
4. Ischium Lines (Ischial Tuberocity Lines)
5. Sacral Center Line
6. Lines of Medial Ilia Border
7. Lines of Lateral Ilia Border
8. Lines of Lateral Border of Sacral Ala
9. Width of Left and Right Ilium (Width between lateral Iliac border & medial iliac border, in mm)
10. Width of Left and Right Sacrum (Rotation of sacrum, in mm)
11. Height of Left and Right Innominates (Top of Iliac Crest to bottom of Ischeal Tuberocity, in mm)
12. Vertical difference in height of femur heads
13. Horizontal difference between Center of Sacrum and Center of Symphysis Pubis

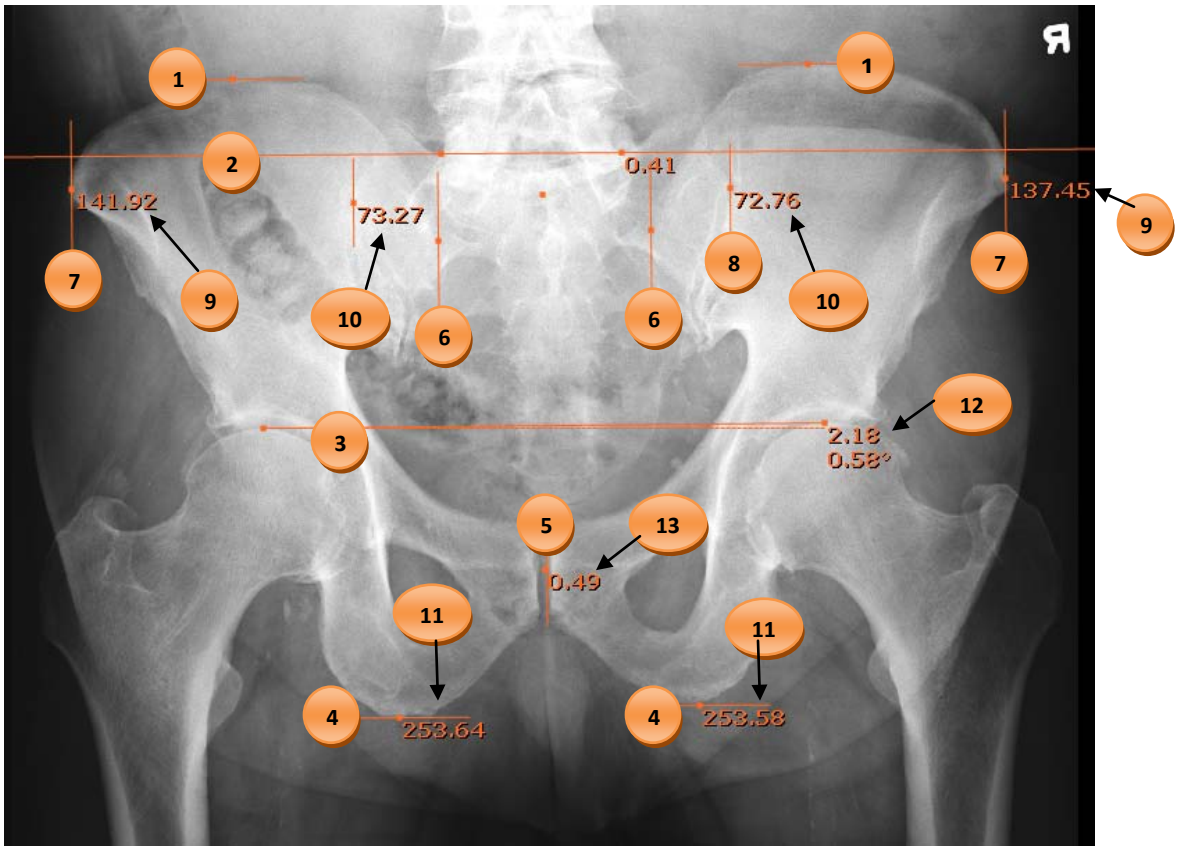


Figure 3.4 – Reference to Table 3.1 for Ilium Analysis

Making a Correction to an Already Plotted Point During the Analysis

If an error is made where one of the points was not placed in the correct location, make a note of which point was placed in error and continue plotting the remaining points. The noted incorrectly placed point can be adjusted at the end of the analysis by activating the Annotation Edit Mode () icon, hover over the plotted point to be moved then left click, drag, and drop the point to its correct location.

You may also press the ESC key on the keyboard to cancel the Ilium Analysis and begin again.

4 ADVANCED ORTHOGONAL TOOLS

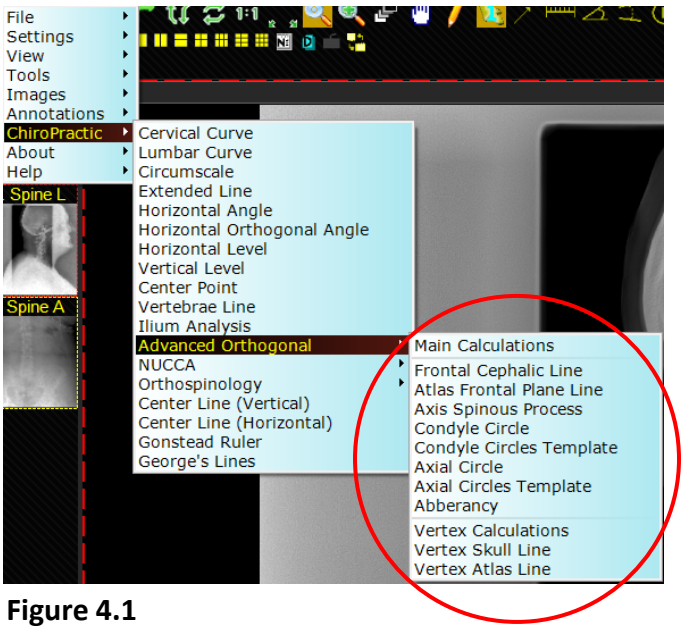


Figure 4.1

The list of all Advanced Orthogonal Tools are highlighted above (See Figure 4.1)

Important Information Regarding Advanced Orthogonal Calculations

1. To display the Main Calculations for the AO analysis, follow the path from the **Main Menu>>Chiropractic>>Advanced Orthogonal>>Main Calculations**. Once **Main Calculations** have been selected from the series of dropdown displays, you must click anywhere inside the main viewing area to actually display the table of calculations.
2. All of the tools must be utilized in order to successfully complete the *Atlas Orthogonal Analysis*.
3. All calculations will be automatically performed by Opal RAD software once all analysis steps have been completed.
4. To remove the displayed table of calculations, click on the AO table to change the color of the table annotation, then press the Delete button on your keyboard.

Friendly Reminder ….

Complete all steps assuring the analysis and calculate before closing the viewer!

4.1 Step by Step Advanced Orthogonal Analysis

(Optional Step) – Determine the **Horizontal Angle**

✓ This tool generates a horizontal angle on a lateral/sagittal view to determine the proper angle needed to set the x-ray tube to capture the AO joint for Frontal/Nasium view.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Horizontal Angle** tool.
3. Left click the image to plot the 1st point (Note: the degree of angle measurement will display)
4. To plot the 2nd point, drag the mouse along the line of measurement and left click the point.
5. Upon plotting the 2nd point, the Horizontal Angle measurement will display yielding the optimum frontal shot. (See Figure 4.2)
6. Keep in mind, in Annotation Edit mode, the annotation may be edited by hovering over the annotation to highlight its activity. The edit with a left click and drag motion to change the angle measurement in relation to the True Horizontal.

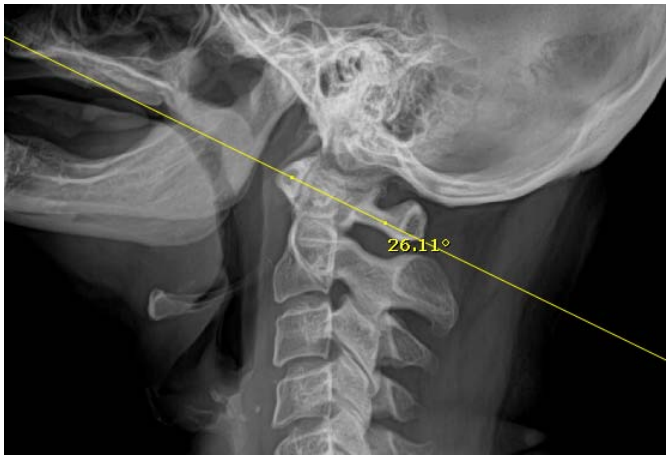


Figure 4.2 – Horizontal Angle

(Optional Step) –Determine the **Horizontal Orthogonal Angle**

✓ This tool generates a horizontal angle on a lateral/sagittal view to determine the proper *perpendicular* angle for the Frontal /Nasium view.

1. Left click and drag the Lateral/Sagittal View thumbnail so it appears in the image viewing area.
2. Make sure the **Annotation Edit Mode** is activated. = Activated
3. Left click on the **Horizontal Orthogonal Angle** tool.
4. Left click to plot the 1st point. (Note: the degree of angle measurement will display)
5. Drag the mouse *perpendicular* to the line of measurement and left click to plot the 2nd point.
6. Immediately following the plotting of the 2nd point, the Horizontal Orthogonal Angle measurement will display. (See Figure 4.3)

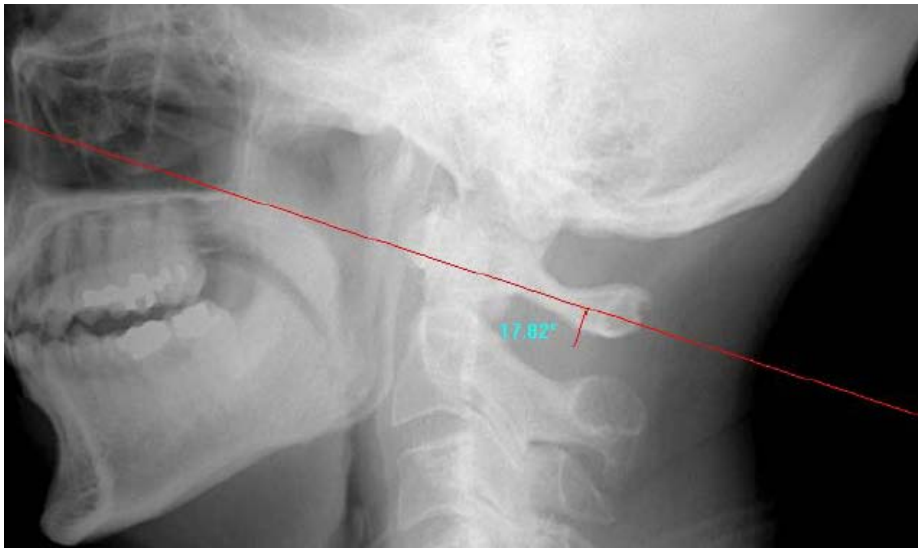


Figure 4.3 – Horizontal Orthogonal Angle

Step 1

Acquire Frontal (Nasium) and Horizontal views of the

Step 2

Use the **Vertex Skull Line** tool to find the **Horizontal Cephalic Line (HCL)** on the horizontal view.

1. Make sure the **Annotation Edit Mode** is activated.  = Activated
2. Select **Vertex Calculations** tool.
3. This will display the AO Vertex with preY: _____. (See Figure 4.4). Proceed to calculate the AO Vertex.

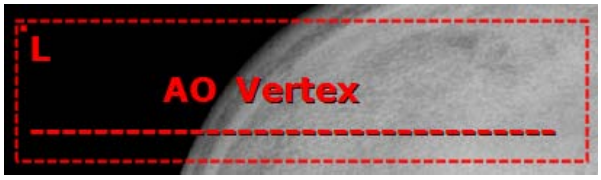


Figure 4.4 – AO Vertex Calculation Template

4. Select **Vertex Skull Line** tool
5. Left click on the image to place the template. (See Figure 4.4)

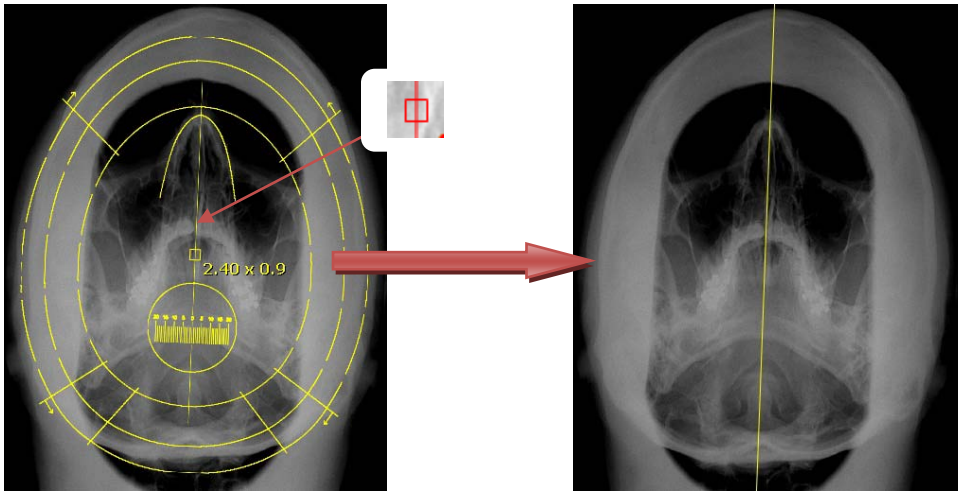


Figure 3.5 – Vertex Skull Line template (Before & After)

6. **To move the template**, hover your cursor over the small square in the center of the template. Left click, hold the mouse button and move the mouse to position your template. Left click to engage template.
7. **To increase or decrease the size of the template**, use the **(+)** and **(-)** keys on your keyboard.
8. Press **(/)** key on your keyboard to display the **Horizontal Vertex Line**.
9. Select **Vertex Atlas Line** tool.
10. Plot two points with a left click to place first dot, drag line then left click to place second point. (See Figure 4.6)

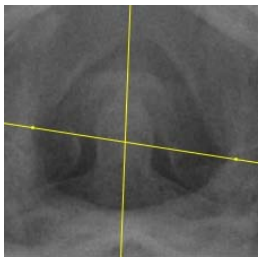


Figure 4.6

* Notice the preY angle measurement in the AO Vertex calculation will actively measure as you plot your points using the **Vertex Atlas Line** tool.

11. You have now successfully calculated the **AO Vertex** in preY.
12. Click on the **Main Calculations** table (shown earlier to display the AO Vertex Calculation annotation = PreY table (See Figure 4.7)

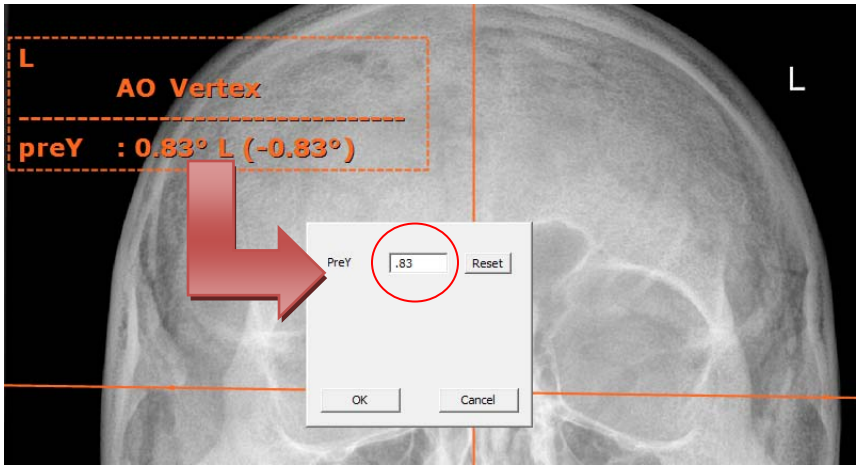


Figure 4.7

13. Transpose the calculated preY from AO Vertex table to the pop up display, as shown by the red circle in Figure 4.7. Then click **OK**. The preY value will populate the Main Calculations table. (See Figure 4.8)

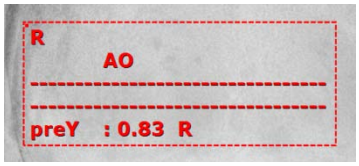


Figure 4.8

Notes:

- The calculation box may be moved by hovering over it (turns pink and the 4 arrow crosshair appears) and using the left mouse button to move it to its new location.
- If any adjustments are made by deleting and replacing the HCL or moving any of the AHPL points, the calculation will automatically update.

IMPORTANT: This is the first in a series of calculations to be performed. As you continue through the listed steps, the AO Main Calculations table will auto populate with your measurements to ultimately provide a complete Advanced Orthogonal Analysis.

Step 3

✓ Use the **Frontal Cephalic Line** tool, together with the **Atlas Frontal Plane Line** tool to calculate the *Atlas Cephalic Displacement (ACD) Angle* and *Atlas Frontal Plane Angle (AFP*) on the frontal view.

1. Make sure the **Annotation Edit Mode** is activated.  = Activated
2. Select **Frontal Cephalic Line** tool.
3. Left click on the image to place the template. (See Figure 4.9)

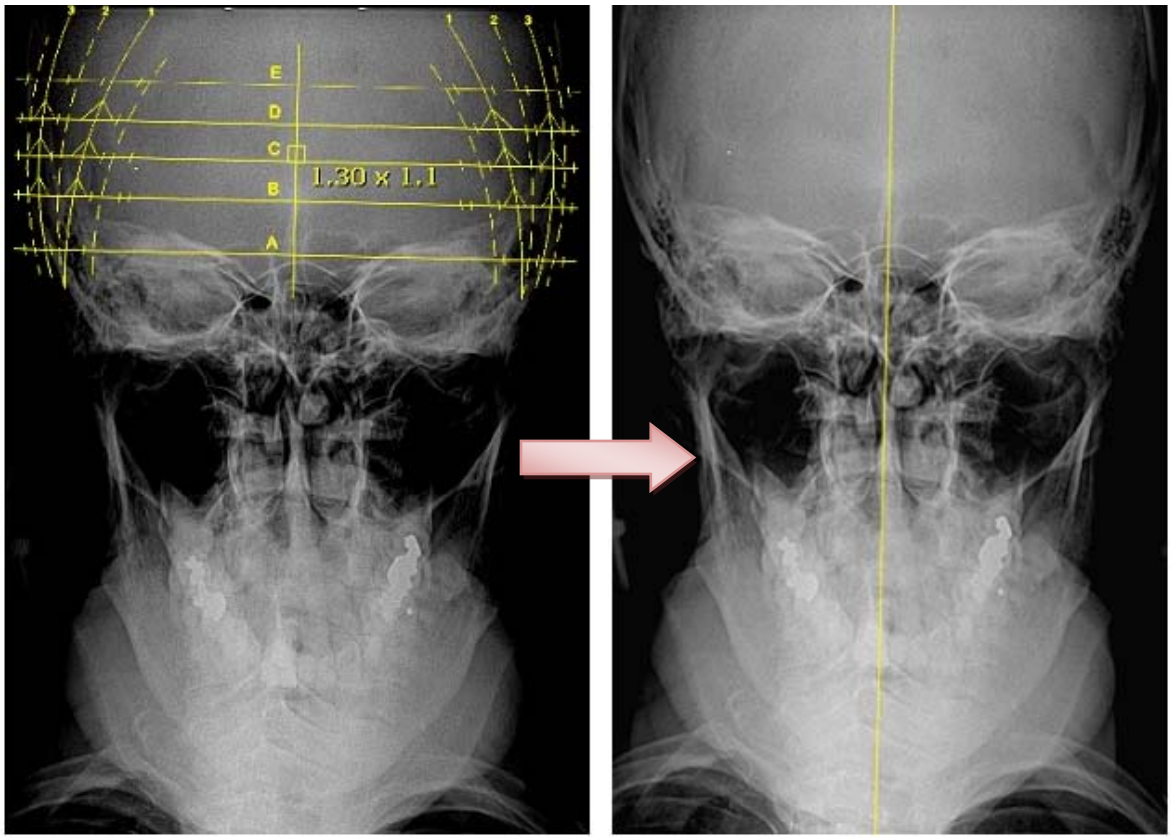


Figure 4.9 – Frontal Cephalic Line template (Before & After)

4. **To move the template**, hover your cursor over the small square in the center of the template. Left click and hold your mouse button and move the mouse to position your template. Left click to engage template.
5. **To increase or decrease the size of the template**, use the **(+)** and **(-)** keys on your keyboard.
6. Press **(?/)** key on your keyboard to display the *Frontal Cephalic Line*, which is the center of the skull.
7. With the frontal image still in the viewing area, use the Zoom, Pan, Window and Level tools to adjust the image until there is a good view of the frontal atlas features.
8. Select **Atlas Frontal Plane Line** tool to find the Atlas Frontal Plane Line (AFPL)

9. Left click on a left atlas point and then a right atlas point. A line will connect the two points as shown in Figure 4.10 and the software will calculate the ***ACD*** and ***AFP*** angles and display those measurements on the Main Calculations table.
   **** Make sure to move the ---x--- on both sides of the AFPL to the edges of the skull before committing the measurement.***

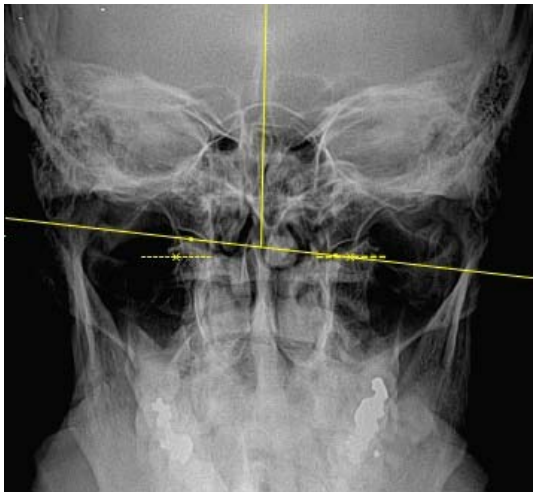


Figure 4.10 - AFPL

Step 4

Use the **Axis Spinous Process** tool to find *Axis Spinous Process (AxSP*), *Cervical Spine Line (CSL).*

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Select **Axis Spinous Process** tool. This is a 5-Point Tool of plotting.
3. Begin plotting your 5 points as referenced, in the order listed in Table 4.1, by a single left click to plot each point.

1	•Left base of dens (Odontoid)/Left lateral C2 body
2	•Right base of dens (odontoid)/Right lateral C2 body
3	•Tip of Spinous Process
4	•Left Lateral body of C6 or C7
5	•Right lateral Body of C6 or C7

Table 4.1 – Axis Spinous Process 5 Point tool

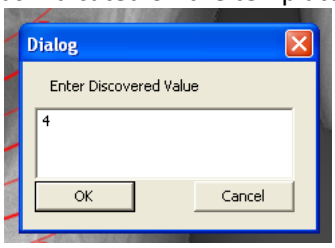
NOTE: During the AxSP plotting, several new calculations are automatically appended to the Main Calculations Annotation

Step 5

Use the **Condyle Circles Template** tool to find the *Condyle Circle (C)*.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. *Optional*: Use the **Mark Spot** tool to mark lateral articular edge(s) of the occipital condyle, as shown in yellow in Figure 4.11.

3. Select **Condyle Circles Template** tool.
4. Left click on the image. The Condyle Circle Template will appear (See Figure 4.11)
5. **To move the template**: hover the cursor over the small box in the center of the template. When the template changes annotation color and the 4-arrow crosshair appears, hold the left mouse key down and move the mouse around to position the template.
6. **To rotate**: Use **(<)** and **(>)** keys to rotate the template.
7. Once properly positioned, press the **(?/)** key on the keyboard to enable the "Enter Discovered Value" box and enter the value as indicated on the template, then click OK.



8. The Main Calculations annotation will now append itself to reflect the C value.

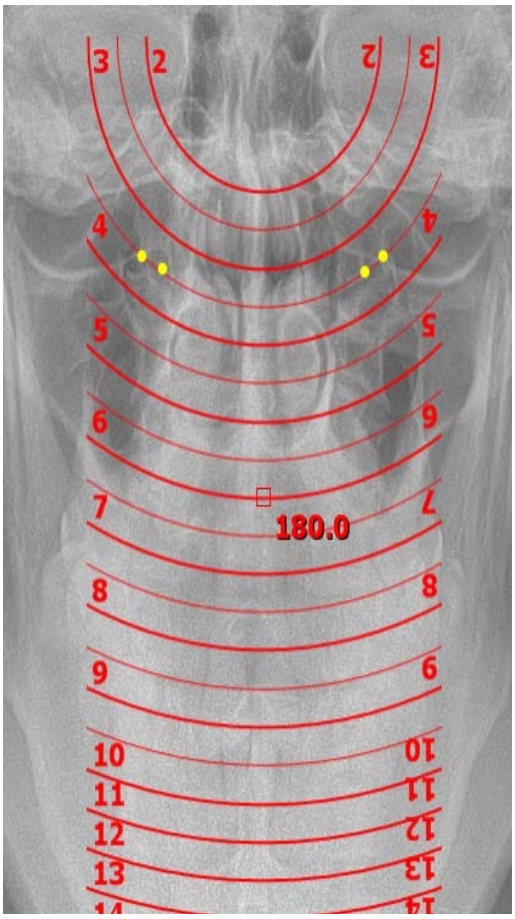


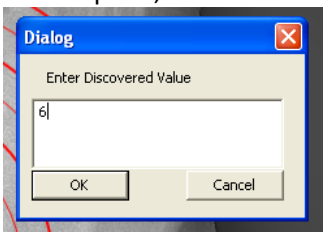
Figure 4.11 – Condyle Circle tool

Step 6

Use the **Axial Circle Template** tool to find the *Axial Circle (A).*

1. Make sure the **Annotation Edit Mode** is activated.  = Activated
2. Select **Axial Circles Template** tool.
9. *Optional*: Use the **Mark Spot** tool to mark desired anatomical structures, as shown in yellow in Figure 4.12.

3. Left click on the image. The Axial Circle Template will appear (See Figure 4.11)
4. **To move the template**: hover the cursor over the small box in the center of the template. When the template changes annotation color and the 4-arrow crosshair appears, hold the left mouse key down and move the mouse around to position the template.
5. **To rotate**: Use **(<)** and **(>)** keys to rotate the template.
6. Once properly positioned, press the **(?/**) key on the keyboard to enable the "Enter Discovered Value" box and enter the value as indicated on the template, then click OK.



7. The Main Calculations annotation will now append itself to reflect the *A* value.

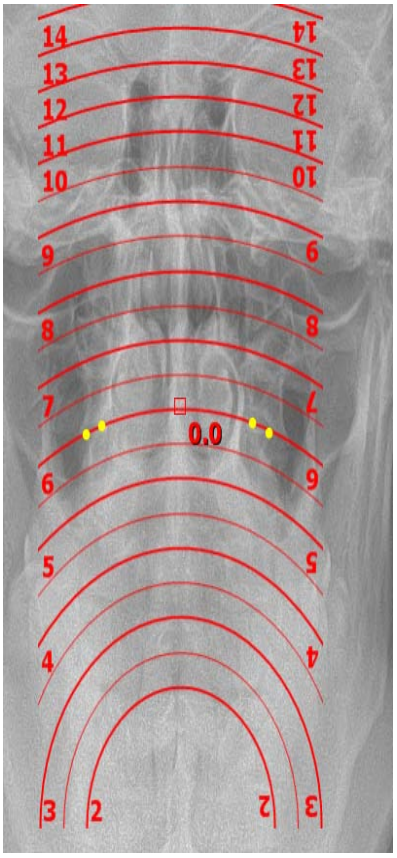


Figure 4.12 – Axial Circle tool

Step 7 (Optional)

Use the **Aberrancy** tool to analyze a Frontal shot that appears aberrant.

1. Make sure the **Annotation Edit Mode** is activated.  = Activated
2. Select **Aberrancy** tool.
3. Left click on the image. The Aberrancy Template will appear (See Figure 4.13)

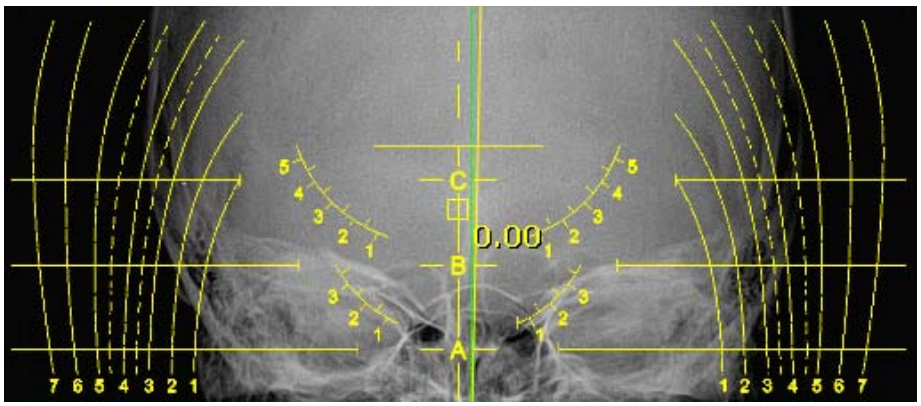


Figure 4.13 – Aberrancy Template

4. **To move the template:** hover the cursor over the small box in the center of the template. When the template changes annotation color and the 4-arrow crosshair appears, hold the left mouse key down and move the mouse around to position the template
5. **To Rotate:** Use **(<)** and **(>)** to rotate the template.
6. Once properly positioned, press the **(?/**) key on the keyboard to enable the "Enter Discovered Value" box and enter the value as indicated on the template, then click OK.

The Main Calculations annotation will now automatically update several of the Atlas Orthogonal calculations. (See Figure 4.13)

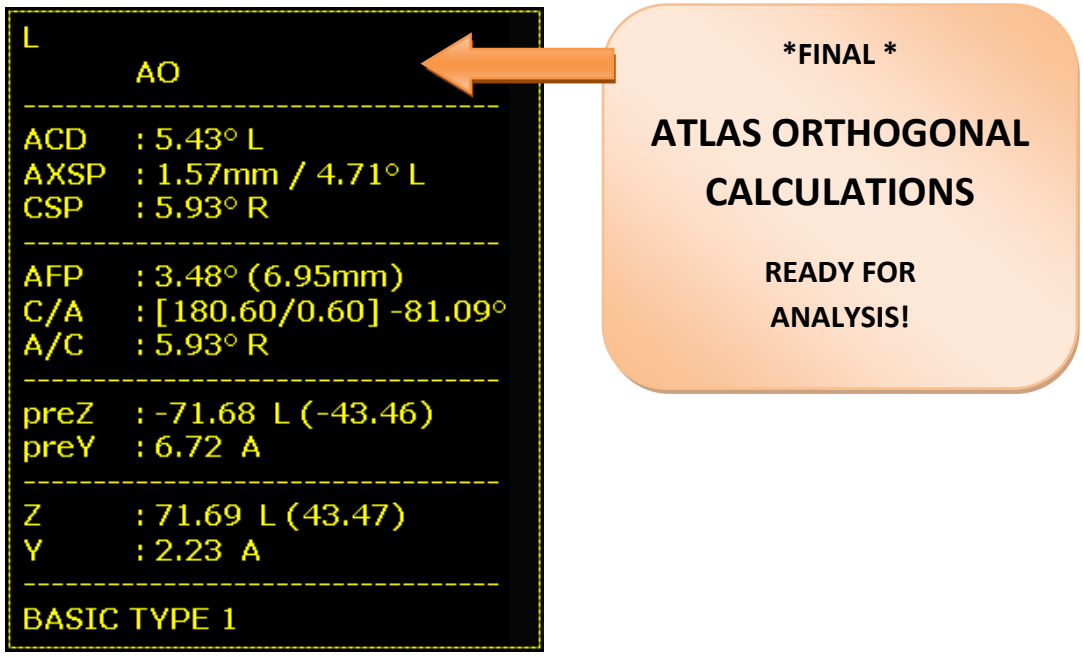


Figure 4.13 – Main Calculation Annotation.

5 NUCCA TOOLS

Figure 5.1

The list of all NUCCA Tools are highlighted above (See Figure 5.1)

Important Information Regarding NUCCA Calculations

1. To display the Main Calculations for the AO analysis, follow the path from the **Main Menu>>Chiropractic>>NUCCA>>Main Calculations**. Once **Main Calculations** have been selected from the series of dropdown displays, you must click anywhere inside the main viewing area to actually display the table of calculations.
2. All of the tools must be utilized in order to successfully complete the *NUCCA Analysis*.
3. All calculations will be automatically performed by Opal RAD software once all analysis steps have been completed.
4. To remove the displayed table of calculations, click on the NUCCA table to change the color of the table annotation, then press the **Delete** button on your keyboard.

Friendly Reminder ….

Complete all steps assuring the analysis and calculate *before* closing the viewer!

5.1 Step by Step NUCCA Analysis

Step 1 – Vertex Frontal Line

- ✓ Use the **Vertex Frontal Line** tool to find the **Horizontal Cephalic Line (HCL)** on the horizontal view.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Select **Vertex Calculations** tool . This will display the NUCCA Vertex table (See Figure 5.2). Proceed to calculate the NUCCA Vertex.

Figure 5.2

Notes:
- The calculation box may be moved by hovering over it (turns pink and the 4 arrow crosshair appears) and using the left mouse button to move it to its new location.

IMPORTANT: This is the first in a series of calculations to be performed. As you continue through the listed steps, the NUCCA Main Calculations table will auto populate with your measurements to ultimately provide a complete NUCCA Analysis.

1. Select **Vertex Frontal Line** tool.
2. Plot 8 points, positioning 2 sets of 4 points around the occipital condyles.
3. Upon plotting the 7th point, a moveable line will be generated.
4. Plot the 8th point marking the Frontal Line on the Vertex view.

Figure 5.4 – Vertex Frontal Line

Step 2 – Vertex Spinal Process

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Select **Vertex Spinal Process** tool
3. Plot 4 points. Plotting the 3rd point generates a vertical line. Click the 4th point to place.

Figure 5.5 – Vertex Spinous Process

Step 3 – Vertex Square (Optional)

- ✓ The **Vertex Square** template uses a ruler method with C/A measurements to measure the distance from the vertex spinal process.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Select **Vertex Square** template.
3. Left click the image to place the template.
4. **To move the template**: hover the cursor over the small box in the center of the template. When the template changes annotation color and the 4-arrow crosshair appears, hold the left mouse key down and move the mouse around to position the template.
5. **To rotate**: Use (<) and (>) keys to rotate the template.
6. Once properly positioned, press the (?/) key on the keyboard.

Figure 5.6 – Vertex Square template

Step 4 – Plane Line

- ✓ Use the **Plane Line** tool to *mark plane lines* on a frontal view image.
- ✓ The atlas plane line represents the horizontal plane ofC1 and forms a part or all of C1 laterality and the degree of C1 laterality determines the degree of magnitude of C2 odontoid and spinous process displacement.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Select **Plane Line** tool.
3. Draw a line through the attachments of the posterior ring to the lateral masses through the rami of the jaw. Note: The attachments are found by starting at the posterior tubercle of C 1 and tracing the inferior border of the ring outward to the outer edges of the lateral masses where a whitish dot is usually found due to the greater attenuation resulting from thicker bone density at these points. Additionally, a slight bulging area is seen between the superior and inferior aspects of the posterior ring attachments to the lateral masses at their outer edges due to the transverse roots.

Figure 5.6 – Plane Line Tool

Step 5 - Cephalometer

✓ Use the **Cephalometer** template to find the *Central Skull Line (CSL)* by generating a centrally located vertical line through the skull.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Select **Cephalometer** tool.
3. Left click for placement.

Figure 5.7 – Cephalometer template

Step 6 – Angular Rotation

✓ Use the **Angular Rotation** tool to find the *angular rotation of the vertical axis line*.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Select **Angular Rotation** tool.
3. Begin plotting the 6 points as referenced, in the order listed in Table 5.1, by a single left click to plot each point.

1	•Left Articular Pillar of the Lateral boy of C2
2	•Right Articular Pillar of the Lateral body of C2
3	•Tip of Spinous Process of C2
4	•Left Articular Pillar of the Lateral body of C6 or C7
5	•Right Articular Pillar of the Lateral Body of C6 or C7

Table 5.1 – Angular Rotation 6 Point Reference table

4. The acute angle will display.
5. Drag the angular measurement into position and plot POINT 6 to place.

Figure 5.8 – Angular Rotation

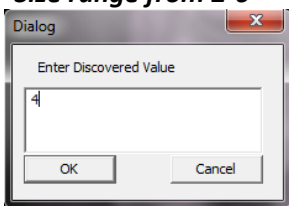
Step 7 – Condyle Circles

✓ Use the **Condyle Circles Template** tool to find the *Condyle Circle (C)*.

NOTE: Condylar and axial circles should be measured accurately to obtain the proper vector necessary to correct atlas laterality and the lower angle (angular rotation).

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. *Optional*: Use the **Mark Spot** tool to mark the lateral articular edge(s) of the occipital condyle as shown in yellow in Figure 5.9.
3. Select **Condyle Circles Template** tool.
4. Left click on the image. The Condyle Circle Template will appear (See Figure 5.9)
5. **To move the template**: hover the cursor over the small box in the center of the template. When the template changes annotation color and the 4-arrow crosshair appears, hold the left mouse key down and move the mouse around to position the template.
6. **To rotate**: Use **(<)** and **(>)** keys to rotate the template.
7. Once properly positioned, press the **(?/)** key on the keyboard to enable the "Enter Discovered Value" box and enter the value as indicated on the template, then click OK.

Size range from 2-6



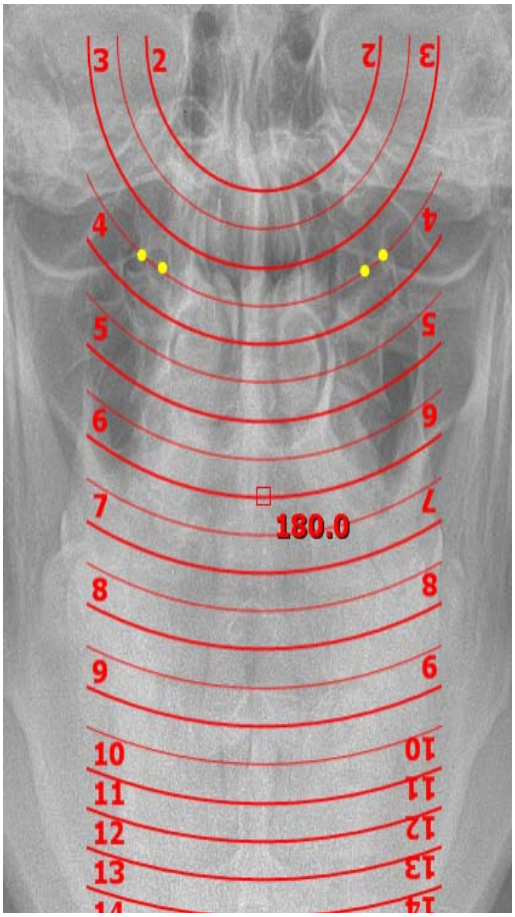


Figure 5.9 – Condyle Circle tool

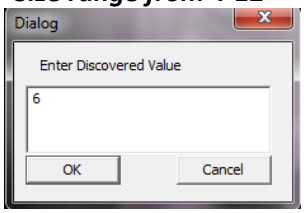
Step 8 – Axial Circle

✓ Use the **Axial Circle Template** tool to find the *Axial Circle (A).*

NOTE: Condylar and axial circles should be measured accurately to obtain the proper vector necessary to correct atlas laterality and the lower angle (angular rotation).

1. Make sure the **Annotation Edit Mode** is activated.  = Activated
2. Select **Axial Circles Template** tool.
3. *Optional*: Use the **Mark Spot** tool to mark the superior lateral aspects of the axis vertebrae.
4. *Optional:* Use the **Mark Spot** tool to mark a point exactly three-thirty seconds 3/32 of an inch below the grooves at the base of the odontoid process, on both sides, at right angles to the plane of the superior articulating surfaces in the region of the inner edges of the lateral masses ofC1.
5. Left click on the image. The Axial Circle Template will appear (See Figure 5.10)
6. **To move the template**: hover the cursor over the small box in the center of the template. When the template changes annotation color and the 4-arrow crosshair appears, hold the left mouse key down and move the mouse around to position the template.
7. **To rotate**: Use **(<)** and **(>)** keys to rotate the template.
8. Once properly positioned, press the **(?/**) key on the keyboard to enable the "Enter Discovered Value" box and enter the value as indicated on the template, then click OK.

Size range from 4-12



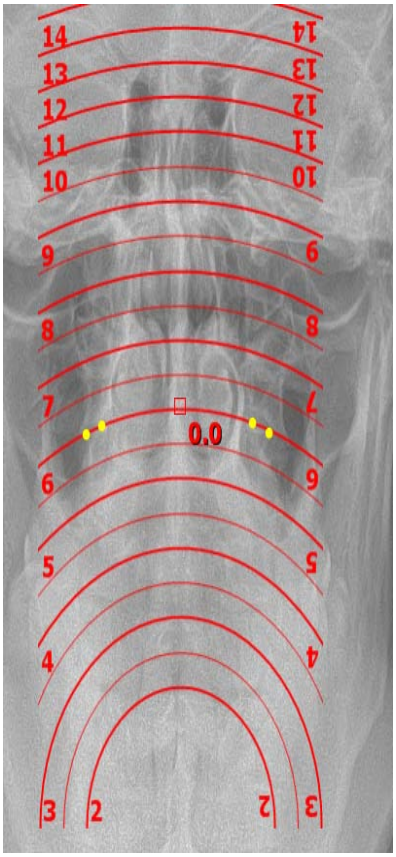


Figure 5.10 – Axial Circle tool

STEP 7 – Vertex Calculations

1. Double-click on the **Vertex Calculations** annotation and enter values for ***Nasium Laterality, Condyle Circle and AT***, as found in Steps 6 and 7. (Figure 5.11)

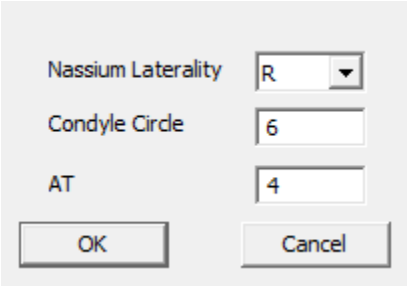


Figure 5.11 – Vertex Calculations

2. Click **OK.** The **NUCCA (Vertex)** calculations annotation will update with the reflected entered information. (Figure 5.12)

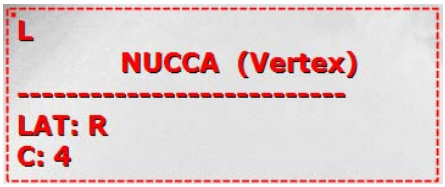


Figure 5.12 – NUCCA (Vertex) Annotation

Step 8 – Intermastoid Line

✓ Use the **Intermastoid Line (IML)** tool to determine head tilt.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on **Intermastoid Line** tool.
3. Left click to plot the first point.
4. Drag and left click to plot the second point, which generates the Intermastoid Line (IML)

Figure 5.13 – Intermastoid Line Tool

Step 9 - Atlas Check Line (Optional)

- ✓ Use the **Atlas Check Line** tool to determine the accuracy of the atlas plane line.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Atlas Check Line** tool.
3. Plot 2 points with a left click on the superior attachments of the posterior ring ofC1 (which stretch outward across the rami of the jaw.
4. The software will generate two lines where two lines are drawn identifying those points from which the superior attachments of the posterior ring ofC1 join the outer edges of the lateral masses.

Figure 5.14 – Atlas Check Line

Step 10 – Patient Rotation (Optional)

- ✓ Use the **Patient Rotation** tool to check for anatomical symmetry on an X-ray.
- ✓ Used to determine if Nasium view is acceptable regarding patient placement. Note: Excessive image rotation decreases validity and accuracy of the measurement process.
- ✓ Can be done at beginning of analysis or anytime during the analysis.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Zoom into the image.
3. Left click on the **Patient Rotation** tool.
4. Select **medial aspect of the lacral bone on the *left*** with a left click.
5. Select the **medial aspect of the lacral bone on the *right*** with a left click

Once 2 points have been plotted, the software will generate 2 "x"'s to represent the selected anatomical points.

6. Select an "x" with a left click and drag the "x" to the **lateral margin of the skull**.
7. Repeat on the other side.
8. See Figure 5.15

***RULE OF THUMB**: The distance measured should be **less than 4 mm** in order to have a reliable reproducible x-ray.*

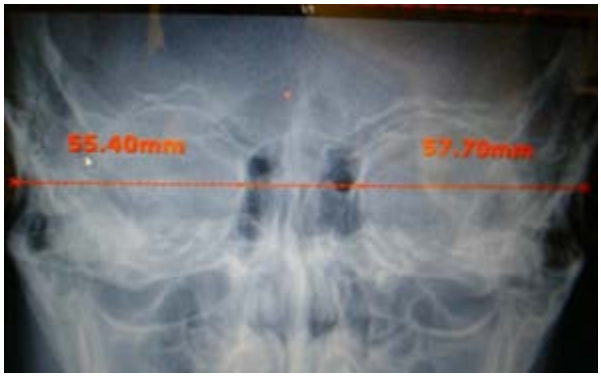


Figure5.15 – Patient Rotation Calculation

Step 11 – Contact

✓ Use the **Contact** tool to mark the anatomical point needed in the NUCCA calculations.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on **Contact** tool.
3. Plot the Contact point with a single left click on the desired anatomical position.

Figure 5.16 – Contact

Step 12 - Main Calculations

✓ The Main Calculations annotation table shows the NUCCA calculations from all NUCCA corresponding Opal CHIRO tools and techniques used related to Nasium measurements, as indicated below.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on **Main Calculations**. An empty NUCCA calculations table is shown in Figure 5.17)

Figure 5.17 – Empty NUCCA Main Calculations Table*

When all of the NUCCA steps have been completed, the table in Figure 5.17 will be automatically populated with NUCCA technique values, based on the values obtained throughout the analysis. To make changes to the values, double click on the table and the following will display: (Figure 5.18)

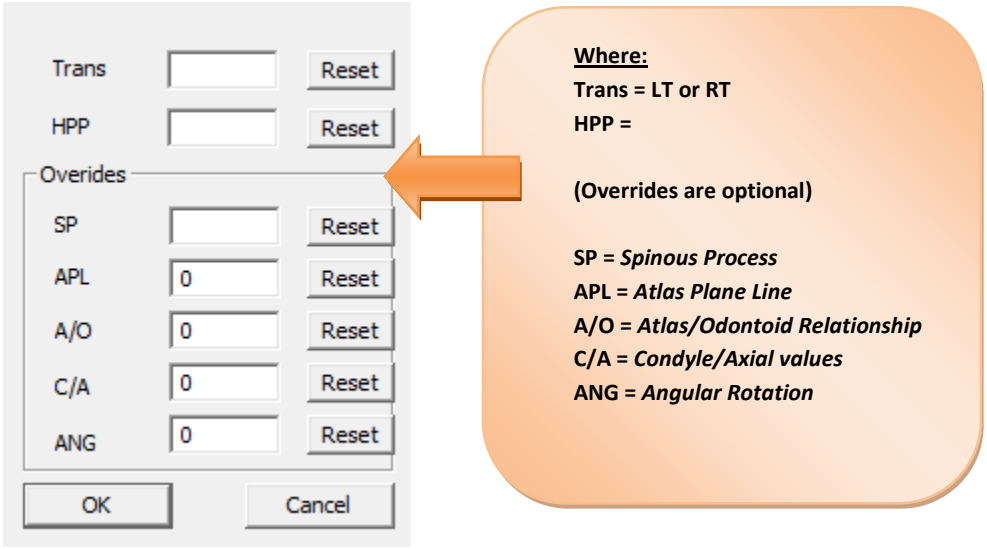


Figure 5.18 – Override Table

If necessary, you may override the auto-populated values here in this display window. Once any and all overrides have been completed,

Click **OK.**

All updated and final values will be processed and the NUCCA analysis is complete!

6 ORTHOSPINOLOGY

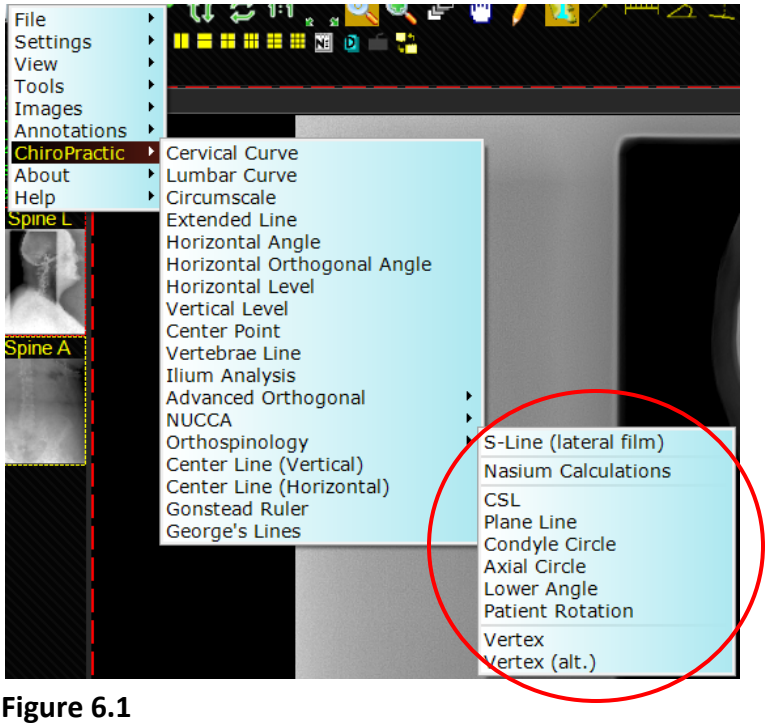


Figure 6.1

6.1 S-Line (lateral film)

- ✓ This tool will generate the S-Line upon plotting 2 points as indicated below.
- ✓ Using lateral C-Spine image (Figure 6.1)

Figure 6.1 -Lateral C-Spine view

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **S-Line (lateral film)** tool.

3. Left click to plot the 1st point on the inferior aspect of the posterior arch exactly behind the lateral mass. This will generate a moveable line.
4. Left click to place the 2nd point approximately 1/4 inch behind the 1st plotted point, remaining on the inferior aspect of the posterior arch.
5. The software will then display a dropdown menu allowing you to select the appropriate S-Line.
6. Select the S-Line with a single left click.
7. The S-Line has now been generated. (See Figure 6.2)

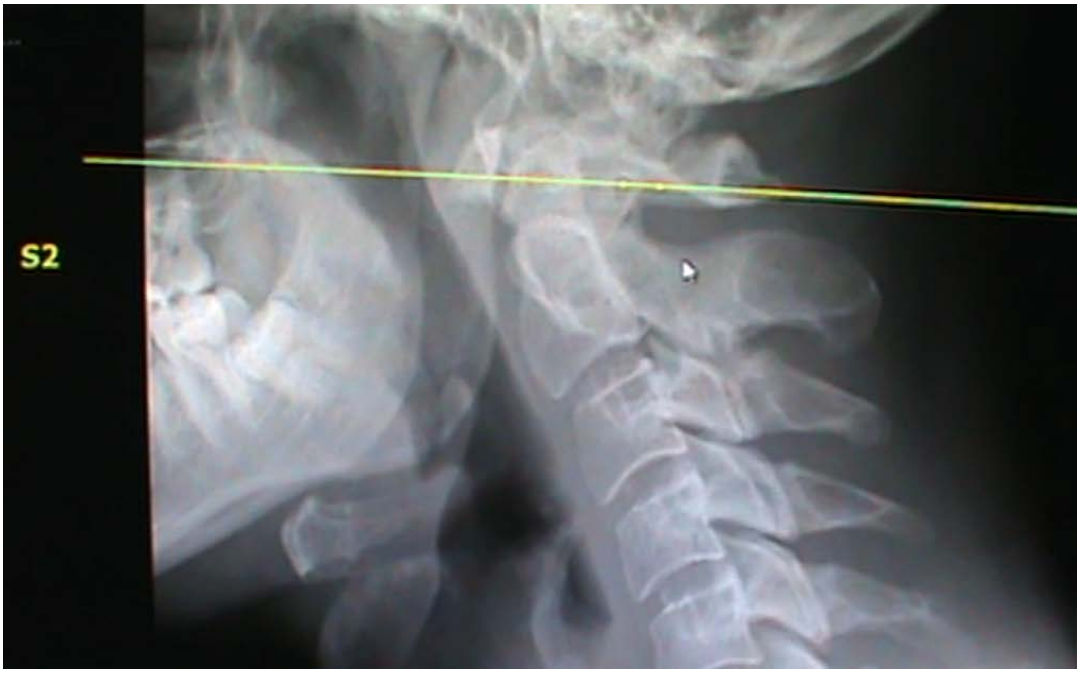


Figure 6.2

6.2 Step by Step Orthospinology Analysis

Step 1 - Central Skull Line (CSL)

- ✓ This tool determines the central skull line without using templates.
- ✓ Using a Nasium/Frontal image view. (Figure 6.3)

Figure 6.3 – Frontal/Nasium view

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **CSL** tool.
3. Zoom into skull surface.
4. Left click at approximately ¼ inch outside of the left margin and approximately 1-1/2 inches above the suture line, then drag the box along and across the edges of the skull, remaining at about the same level as the suture line on the other side. You will see as you drag the box the lines will outline where the skull surface is being curve fit.
5. Select about 1-1 ½ inches of the skull surface above the suture line, then click to place. If the suture line on one side is more superior to the other side, then select the portion of the skull above the most superior suture line. (See Figure 6.4)

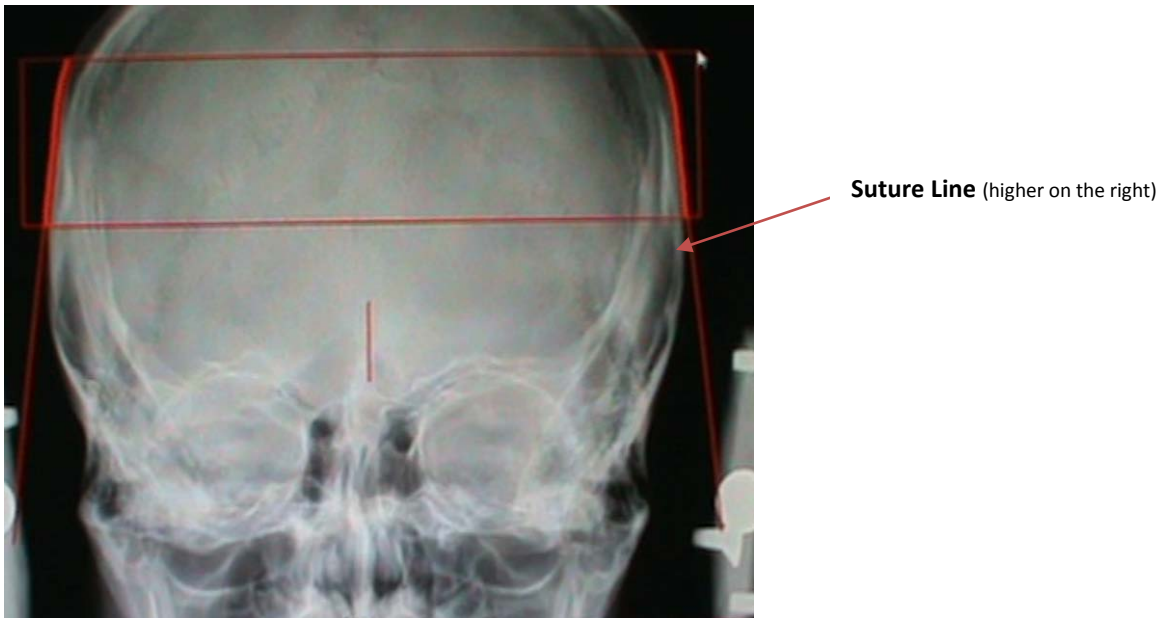


Figure 6.4

6. Left click a second time for the calculations to display. (See Figure 6.5)

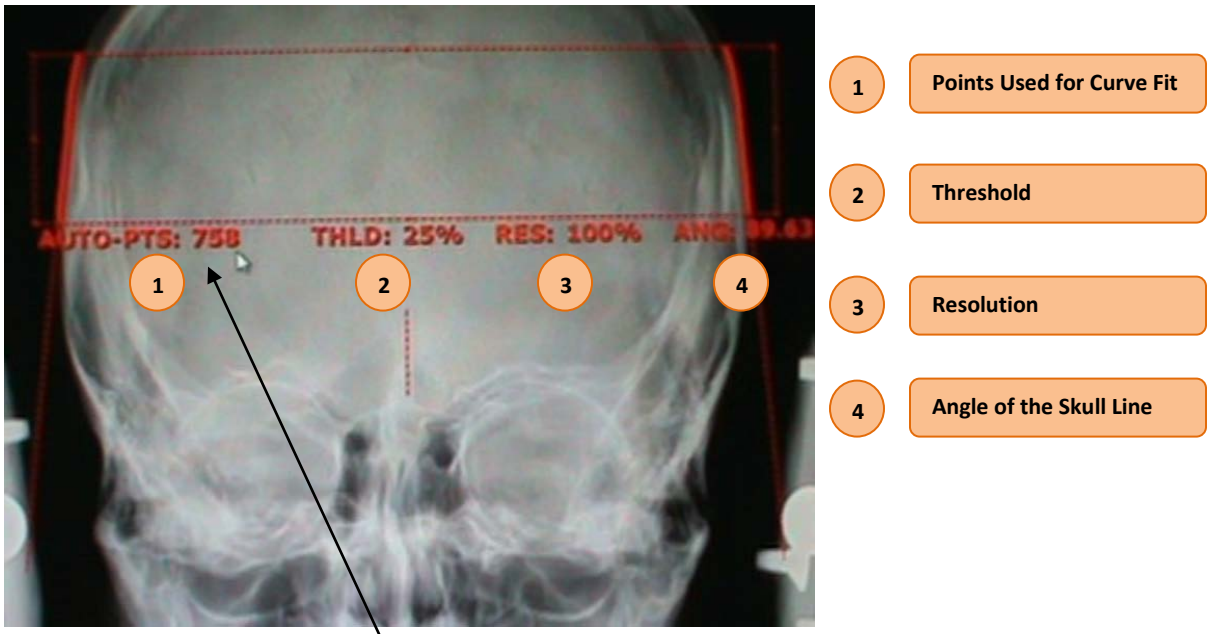


Figure 6.5

♦The example above shows that ***758*** points were used to curve fit this skull. This is an important number to note to ensure the same portion of the skull is used on comparative film to maximize reliability of the analysis.

7. **To change the Threshold** -press the **(-) or (+)** key on your keyboard to change the way the curve fit occurs. This allows the software to perform an edge detection algorithm to determine the Central Skull Line based on the points it can detect.
8. Once you are satisfied with the measurements, press the (?/) key on the keyboard.
9. The software will now draw the Central Skull Line (See Figure 6.6)

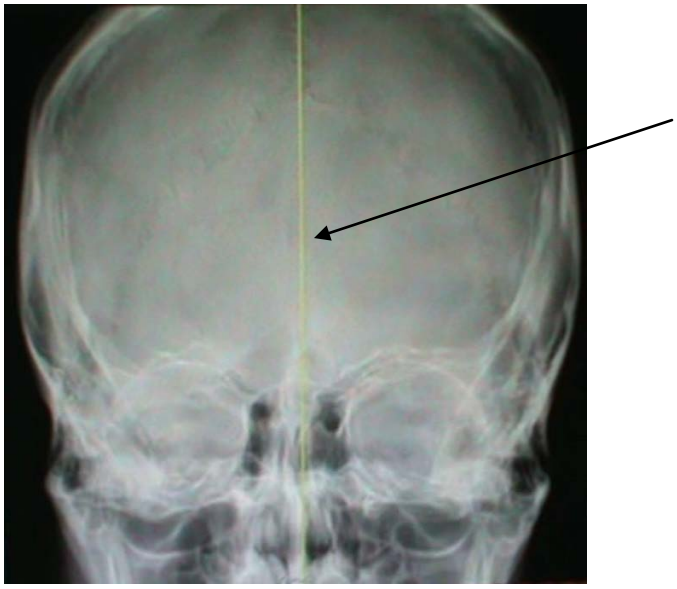


Figure 6.6 – Central Skull Line

10. Use Pan ( ) and/or Zoom (to see the atlas, occipital condyles, the Articular surfaces of the axis, and lower cervical region.

Step 2 - Plane Line

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Plan Line** tool.
3. Using the left click function, plot 2 points by selecting the inferior aspects of the posterior arches of the atlas at the edge of the lateral masses.
4. Left click 1st point.
5. Left click the 2nd point.
6. Left click to place the Plane line. *It is helpful to use the W/L feature to clearly identify accurate anatomical point selections. (See Figure 6.7)

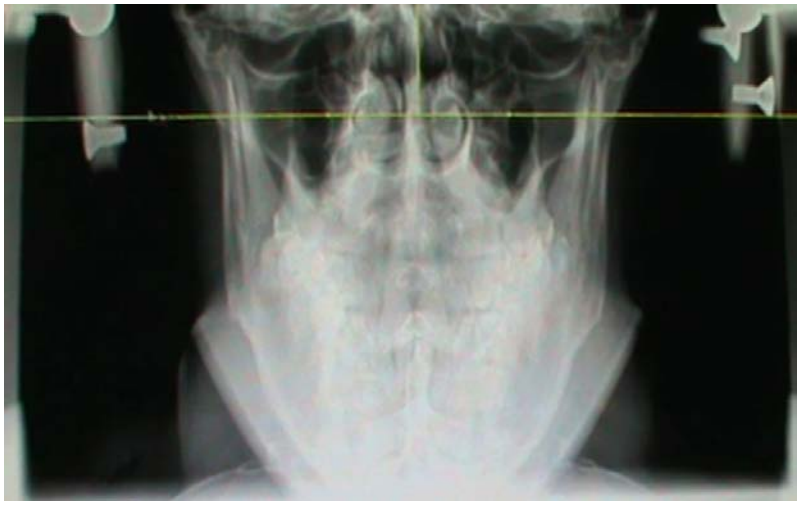


Figure 6.7 – Plane Line

Step 3 - Condyle Circle

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Condyle Circle** tool.
3. Plot 2 points on the left outside 1/3 of the occipital condyle surface (approx ¼+ inches apart)
4. Plot 2 points on the right outside 1/3 of the occipital condyle surface (approx ¼+ inches apart)
5. See Figure 6.8 for reference where the red circles show the approximate placement of the four plotted points.

Figure 6.8

6. The software will now curve fit the occipital Condyle Circle, determine the best fit circle and measure the circle size, at this point. Hovering the cursor over any created condyle point makes the circle visible. (See Figure 6.9)

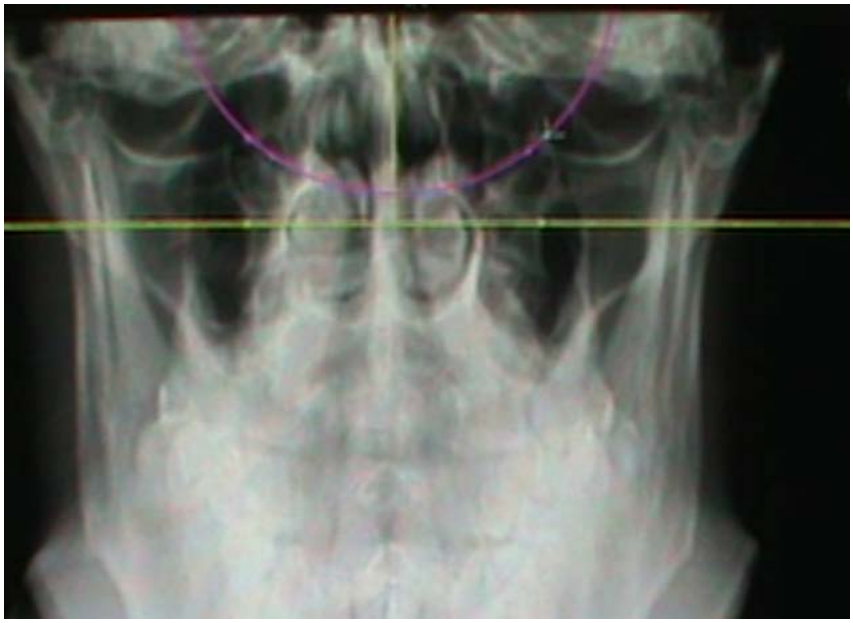


Figure 6.9 – Condyle Circle

7. The circle will disappear and the plotted points will remain as annotations during this phase.

Step 4 - Axial Circle

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Axial Circle** tool.
3. Plot the following points in the order shown beginning on the left side:
4. Plot the 1st point on the left lateral margin and surface of the axis articulation.
5. Follow the lateral surface to the medial surface and left click to plot. * Notice 2 plotted dots. These 2 dots represent the **3/32 inch dip dot line**.
6. Plot the 3rd point on the right lateral margin with a left click.
7. Follow the Articular surface in and select that surface with a left click. *Notice the active axial circle as you plot the points. (See Figure 6.10)

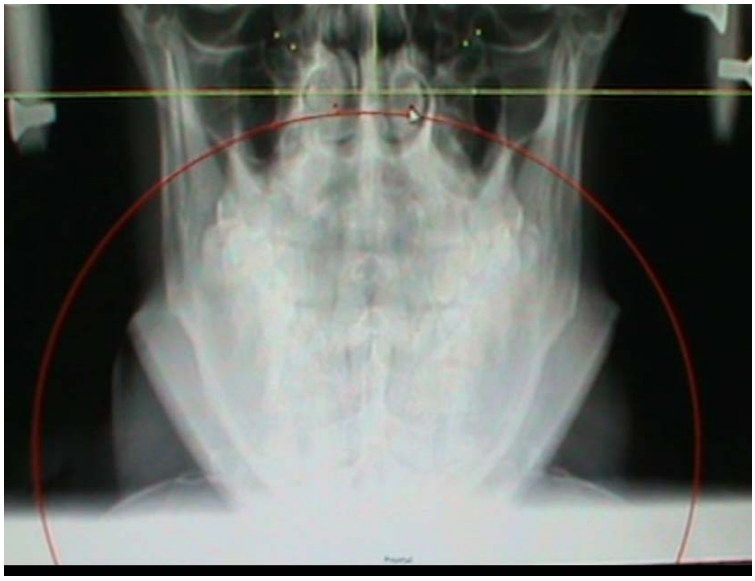


Figure 6.10 – [Active} Axial Circle

8. Left click to plot the points
9. The dip dot lines will now determine the **Axial Surface Circle Size**. The circle will disappear and the plotted points will remain as annotations during this phase. Again, hovering the cursor over any created condyle point makes the circle visible.

Step 5 - Lower Angle

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Lower Angle** tool.
3. Plot the 1st point by left clicking an anatomical point on the very **lateral superior margin of C2 on the *left***.
4. Click, drag and Plot the 2nd point by left clicking an anatomical point on the very **lateral superior margin of C2 on the *right***.
5. This will determine the bisection point. (See Figure 6.11)

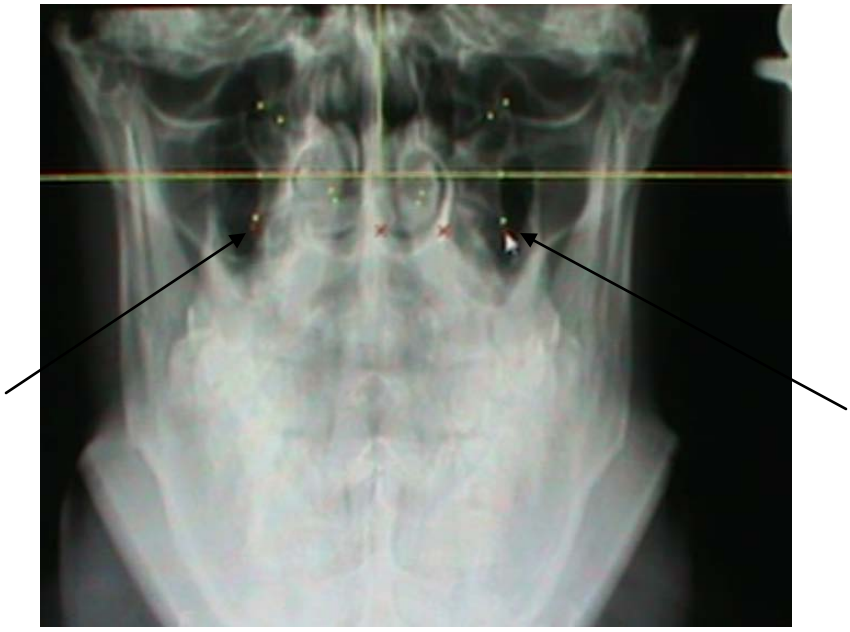


Figure 6.11 – Bisection Point

6. Next, left click to plot the 3rd point on the spinous process of C2. (See Figure 6.12)

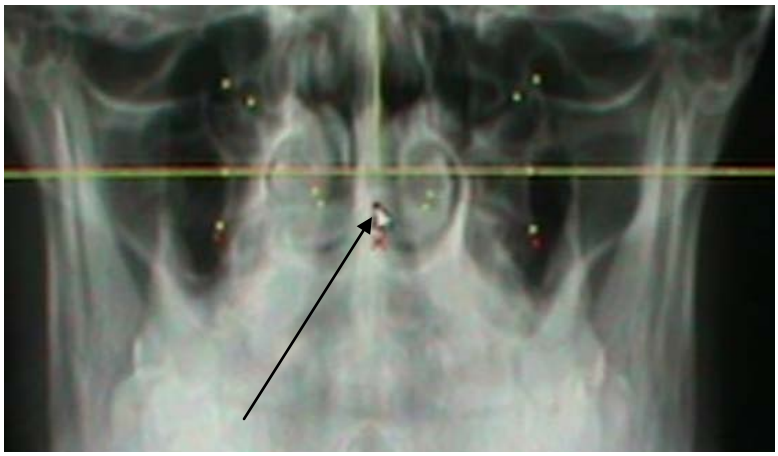


Figure 6.12 – Spinous Process

7. Then proceed to the lower cervical region. Plot a point on the left lateral margin of the lowest clearly visible cervical vertebra with a single left click. (See Figure 6.13)

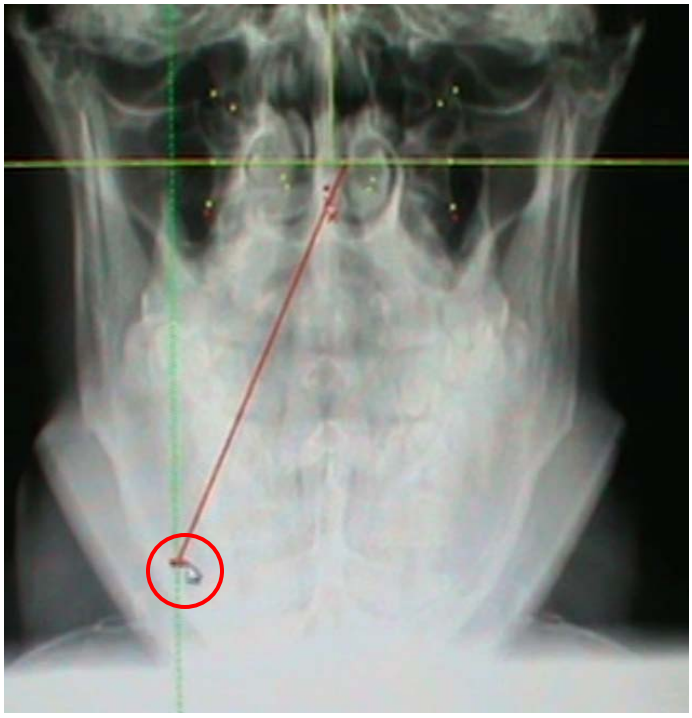


Figure 6.13 – Point plotted on Left Lateral Margin

8. Then plot a point on the right lateral margin with a single left click. (See Figure 6.14) *Keep in mind you can adjust these points *

Figure 6.14 – Point plotted on the Right Lateral Margin

9. Now click the **Fit Image to Window** icon ( ). (See Figure 6.15)

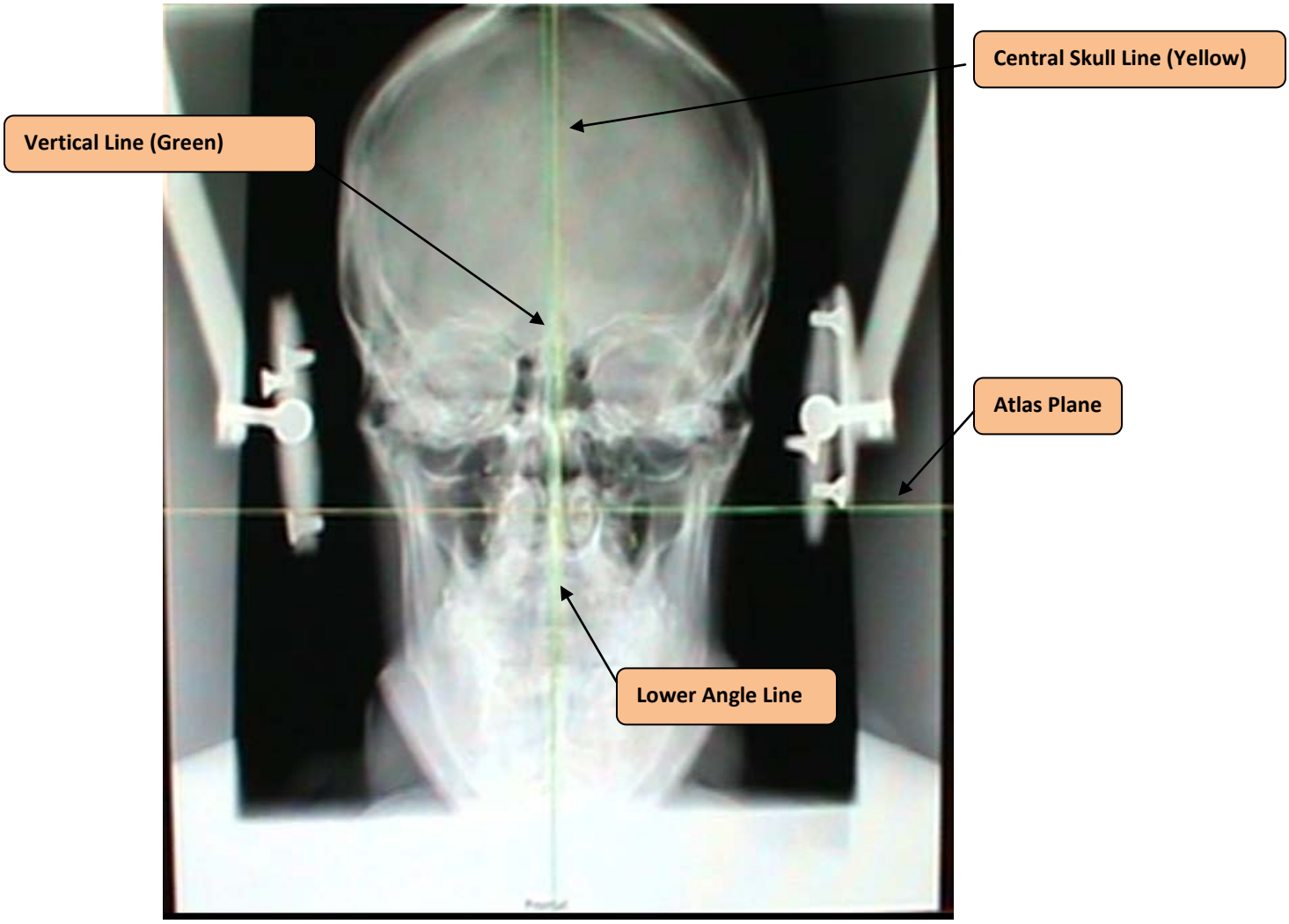


Figure 6.15

6.3 Nasium Calculation

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Left click on the **Nasium Calculation tool**.
3. Left click anywhere on the image above the **Atlas Plane Line** and all the calculations will display as a table annotation on the image. (See Figures 6.16 & 6.17)
4. The calculations tables can be dragged to the side of the Atlas Laterality (if necessary) by left clicking and holding, then positioning the table in one chosen upper quadrant for optimal viewing and professional conformity.
   Note: Figure 6.17 are same calculations zoomed in for clarity

Figure 6.16 – Nasium Calculations Table

Orthospinology Calculations
***Where: L=Left & R = Right**

AT = Atlas Laterality ( ) = Head Tilt
OD = Odontoid Laterality
SP = Spinous Process Laterality ( ) = y-axis rotation
LA = Lower Angle Measurement
C = Condyle Circle (rounded *down* to the nearest whole number)
A = Axial Circle (rounded *up* to the nearest whole number)
PL = Plane Line

Orthospinology Height Factors

PL = Plane Line Factors
C/A = Condyle/Axial Surface ratio factor
A/OD = Atlas Odontoid Relationship factor
ANG = Angles Calculation (Lower Angle Factor)
HF = Total Height Factor

Figure 6.17 – Nasium Calculations Table, (Zoomed)

6.4 Patient Rotation

- ✓ Used to determine if Nasium view is acceptable regarding patient placement. Note: Excessive image rotation decreases the validity and accuracy of the measurement process.
- ✓ Can be done at beginning of analysis or anytime during the analysis.

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Zoom into the image.
3. Left click on the **Patient Rotation** tool.
4. Select **medial aspect of the lacral bone on the *left*** with a left click.
5. Select the **medial aspect of the lacral bone on the *right*** with a left click

   Once 2 points have been plotted, the software will generate 2 "x"'s to represent selected anatomical points.

6. Select an "x" with a left click and drag the "x" to the **lateral margin of the skull**.
7. Repeat on the other side.
8. See Figure 6.17.1

***RULE OF THUMB**: The distance measured should be **less than 4 mm** in order to have a reliable reproducible x-ray.*

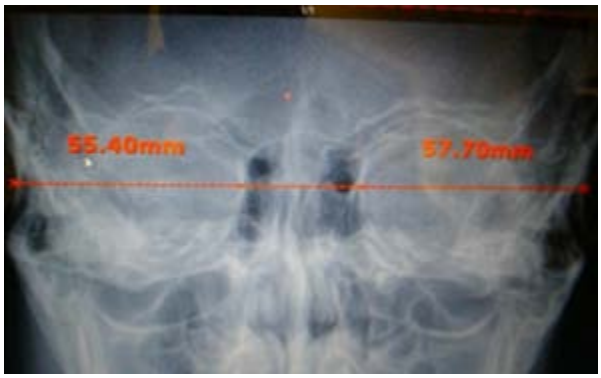


Figure 6.17.1 – Patient Rotation Calculation

6.5 Vertex – (Vertex Algorithm Analysis)

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Zoom into the image (See Figure 6.18)
3. Left click on the **Vertex** tool.

Figure 6.18

4. Begin by outlining the lateral margins of the ethmoid junction with 2 points on the left, then 2 points on the right.
5. The software will then automatically locate the *center anterior portion of the skull* based on the markings of the ethmoid junctions. (See Figure 6.19)

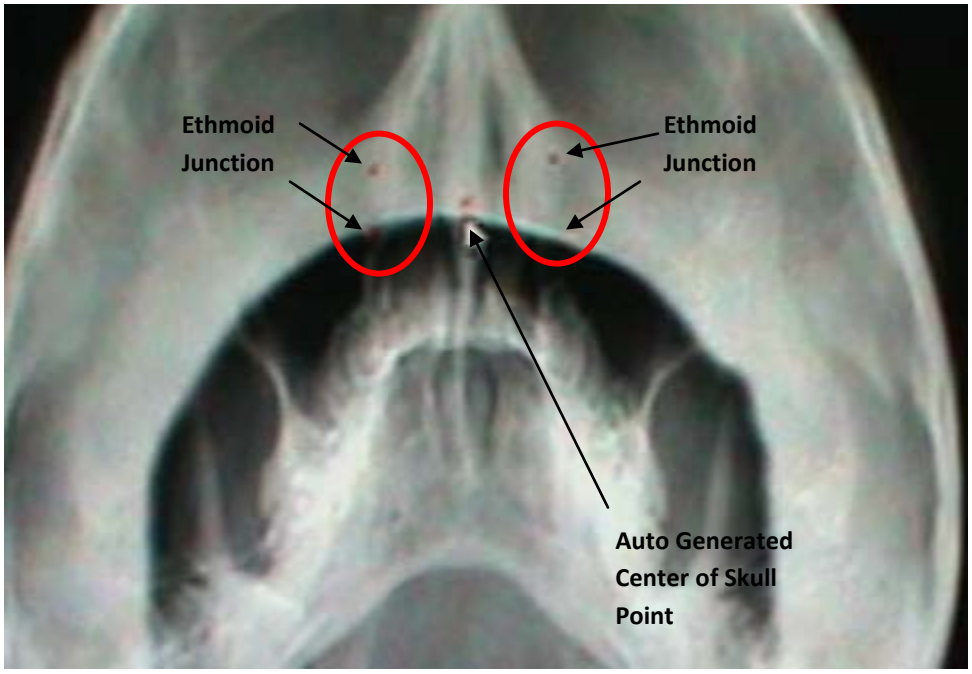


Figure 6.19

6. Next, left click to plot the **center of the transverse foramen** of atlas on the left.
7. Left click to plot the **center of the transverse foramen** on the right.
8. See Figure 6.20 to see an example of the 2 plotted points on the transverse foramen.

Figure 6.20

*IMPORTANT: Notice the RIGHT marker is on the reading left. (See Figure 6.21a) To change this marker Right-to-Left or Left-to-Right to conform to the corresponding side of the patient, single click the annotation to highlight (changes color) then press the "F" key on your keyboard to flip it. (See Figure 6.21b)

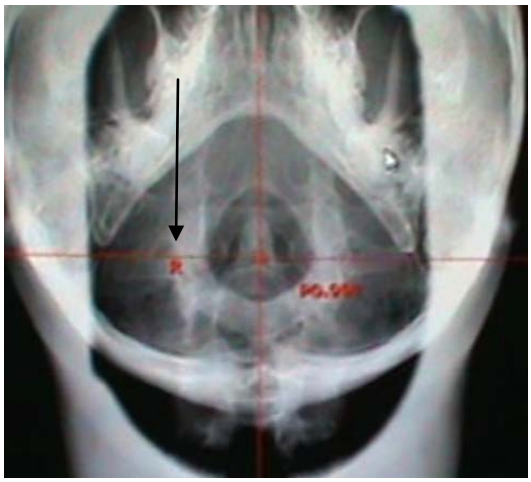


Figure 6.21a

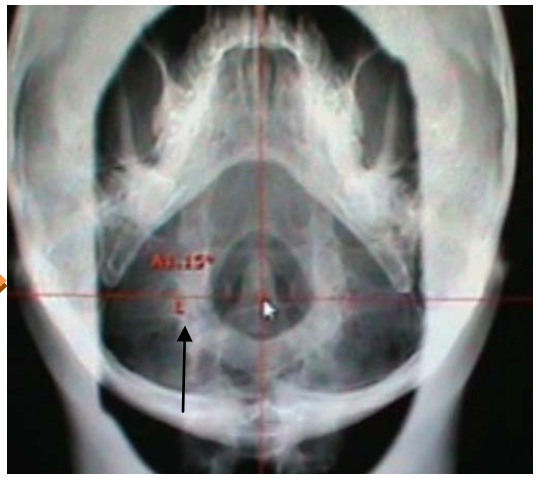


Figure 6.21b

♦Software automatically offsets the center of the odonotoid points based on the Nasium analysis in degrees.

Go back to the Nasium Calculations Table and you will see the software has added the calculations needed for determining adjustment factors. (Figure 6.22)

Orthospinology Adjustment Factors *after* Vertex Analysis Algorithm is applied:

HF = Total Height Factor
A = Anterior S2 = S-Line
Inst = If using LaneyTable or Hand-Held Instrument (in degrees)

Figure 6.22

6.6 Vertex (alt) – Alternative Method to Analyze the Vertex

1. Make sure the **Annotation Edit Mode** is activated. = Activated
2. Zoom into the image using the entire skull surface to construct a central skull line.
3. Left click on the **Vertex (alt)** tool.
4. Left click on the image and hold down the mouse button to drag a box around the entire skull. (Figure 6.23). Then single left click to place.
   *In some cases, due to the lack of contrast variance between the soft tissue of the neck and the posterior aspect of the skull, one may have to use only the anterior 2/3 of the skull to determine the reliable central skull line. (See Figure 6.25)

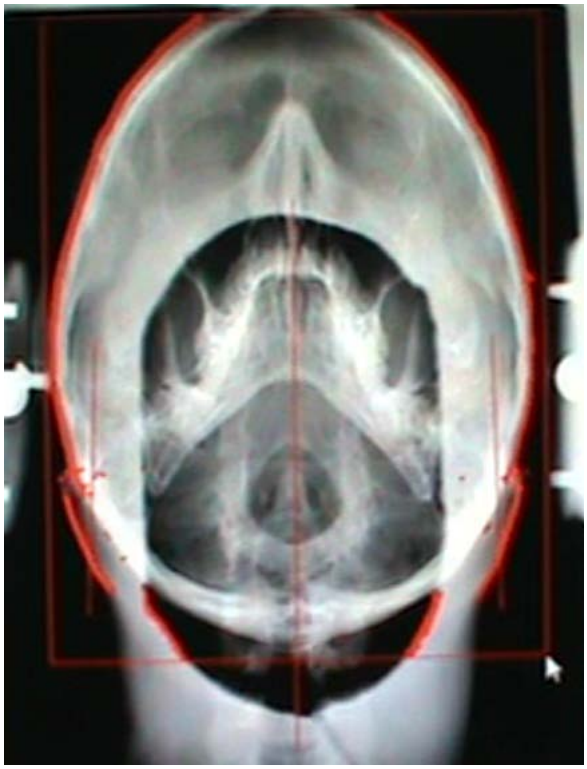


Figure 6.23

5. Next, plot a point on the **center of the transverse foramina** on the left.
6. Then, plot a point on the **center of the transverse foramina** on the right.
7. For an example of the placement of points as shown by the ◯ in Figure 6.24.

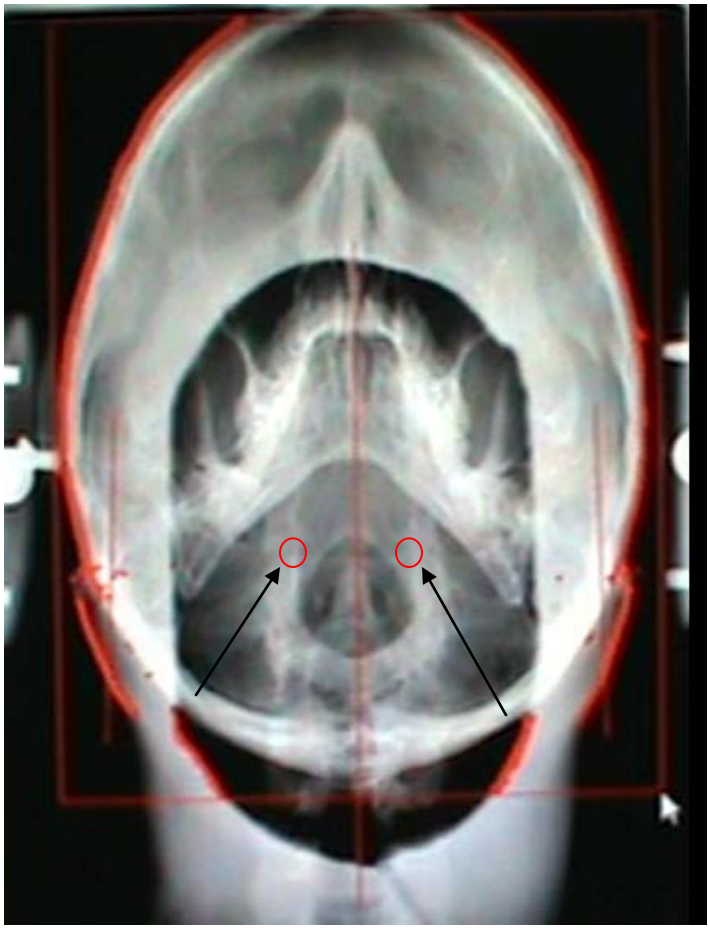


Figure 6.24

8. Left click on the annotation to set and display the measurements.
9. **To change the Threshold** -press the (-) or **(+)** key on your keyboard to change the way the curve fit occurs. This allows the software to perform an edge detection algorithm to determine the Central Skull Line based on the points it can detect. *Note: You can also adjust the plotted points with a left click to move and adjust in Figure 6.25.
10. Go back to the Nasium Calculations Table and you will see the software has added the calculations needed for determining adjustment factors. (Figure 6.22)

Figure 6.25

7 Chiropractic Toolbox

Chiropractic Toolbox allows a user to create and customize their own personal "Toolbox" of icons for most frequently used Chiropractic Tools and Annotations.

1. Hover over the **Main Menu icon** ( ) found in the upper left corner of the Opal Viewer.
2. Click on **Settings>>Edit** to get to the Administrative Settings Module (See Figure 7.1)

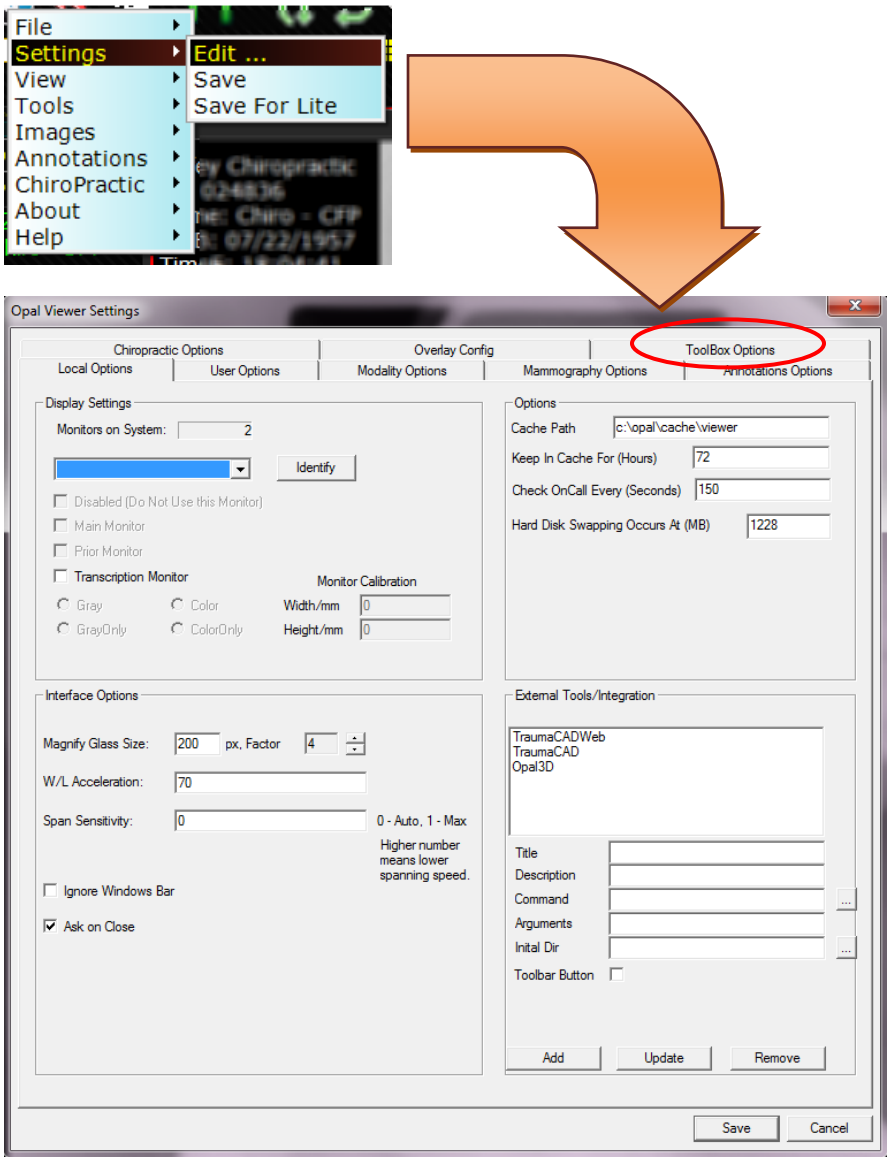


Figure 7.1

3. Click **Toolbox Options (**See Figure 7.2)
4. **Click on the (+) to expand the series. Click on the (-) to minimize the series.**

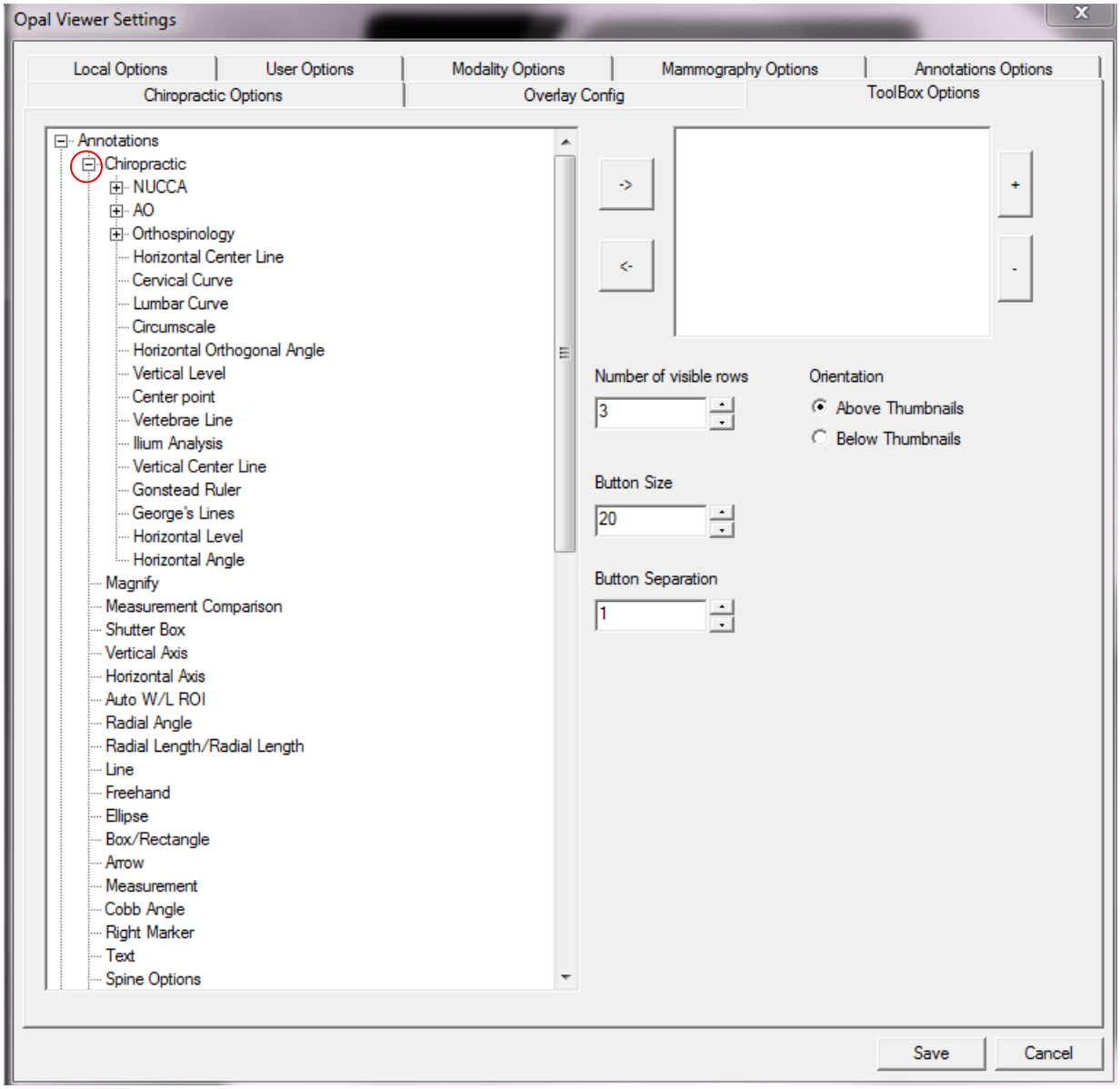


Figure 7.2

5. Click on the individual functionality icons for customizing your toolbox.
6. Highlight with a single left click which icon you would like to display in your toolbox.
7. Then select the arrow icon to move that functionality over to the selected list.
   The function that you are "sending" over to the selected list box are the icons that will display in your toolbox.

See **Figure 7.3**. Notice the functionality that has been chosen to display in the user's toolbox in the following steps:

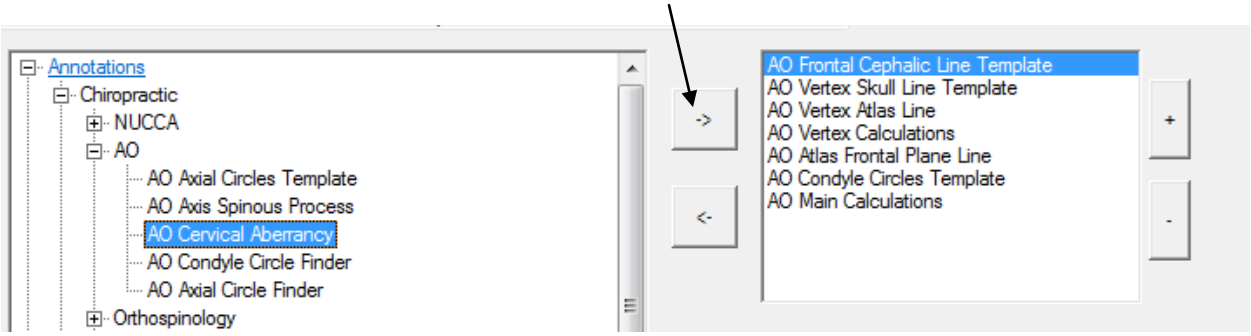


Figure 7.3

You may further customize the display of your toolbox as indicated below:

Number of visible rows

- Select the number of rows you would like to have in your toolbox.

Button Size

- Select the desired size of the toolbox buttons you would like to display in your toolbox.

Button Separation

- Select the desired size of separation between the various icons in your toolbox.

Orientation

- Select whether you would like your personalized toolbox to be displayed **Above Thumbnails** (as recommended for ease of use) or **Below Thumbnails.**

Notice in Figure 7.4 the customized toolbox display:

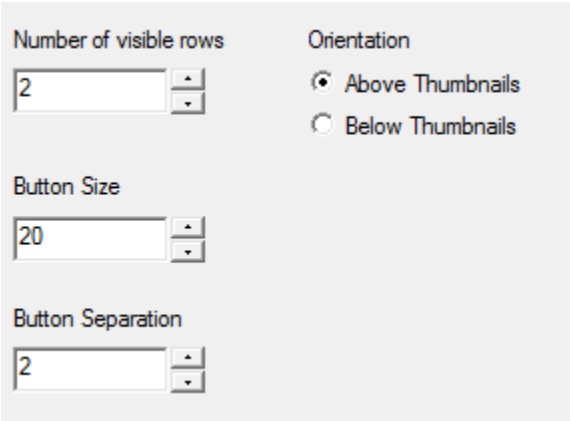


Figure 7.4

Based on the specifications and selection made above, the toolbox will display as indicated below. Please note the toolbox for reference, as shown in Figure 7.5.

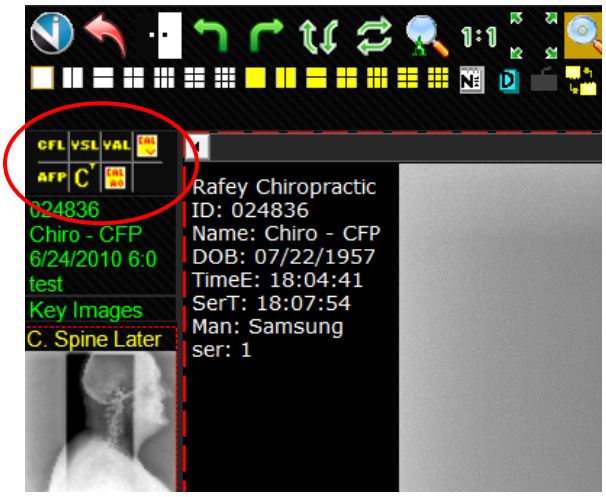


Figure 7.5

For a complete reference on the Opal Viewer Administrative Settings Module, please go to the User manual located at: OpalViewerAdminUserSettingsManual

Viztek LLC would like to extend a special thanks to the following individuals for their continuous efforts and dedication to the success of this user manual.

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Bo Rochester, D.C.

Chris Chapman, D.C.

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