Athena Hub - Quick Guide: Version 2.21

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1. Introduction

Athena Hub is a modular platform focused on educational medicine. Developed for both medical students and professors, Athena Hub provides a virtual learning space, with tools for anatomical and radiological analysis in different angles, formats and cutouts.

As a teacher, you have access to software compatible with existing medical equipment modalities and CT scans, MRI, Ultrasound, X-Ray, Mammography, among others, personalized workspaces and access to an exclusive module called cytology.

As a student, you have the freedom to purchase the virtual cadaver, human atlas, radiology, photorealism, veterinary and slide modalities according to your needs and have all the basic and advanced tools in any of them to boost your learning.

1.7 Software Requirements

Athena has some minimum requirements for running the *software* and some recommended requirements for a great user experience. Each module has a recommendation, as you will see below:

Radiology

Minimum Hardware	Recommended Hardware
or the like	i5 or similar
4GB RAM	8GB RAM
Intel HD Graphics	GeForce GTX 1080 (8GB) or similar

Photorealism

Minimum Hardware	Recommended Hardware
i5 or similar	i7 or similar
8GB RAM	16GB RAM
Intel HD Graphics	GeForce GTX 1050 (2GB) or similar

Virtual Cadaver

Minimum Hardware	Recommended Hardware
or the like	i5 or similar
4GB RAM	8GB RAM
Intel HD Graphics	GeForce GTX 1050 (2GB) or similar

Slides

Minimum Hardware	Recommended Hardware

or the like	i5 or similar
4GB RAM	8GB RAM
Intel HD Graphics	Intel HD Graphics

Cytology

Minimum Hardware	Recommended Hardware
or the like	i5 or similar
4GB RAM	8GB RAM
Intel HD Graphics	Intel HD Graphics

Human Atlas

Minimum Hardware	Recommended Hardware
or the like	i5 or similar
4GB RAM	8GB RAM
Intel HD Graphics	GeForce GTX 1050 (2GB) or similar

Veterinary Atlas

Minimum Hardware	Recommended Hardware
or the like	i5 or similar
4GB RAM	8GB RAM
Intel HD Graphics	Intel HD Graphics

3.3 Evaluate, Help and Guide

The development team is always ready to solve any type of problem encountered while using the software. To facilitate communication, you can find in the '**Help & Guide**' tab located in '**Settings**' the options to contact the team and get a quick answer to your problem.

Here the user can report minor errors found while using the software, suggestions for improvements and much more. To facilitate problem resolution, you should describe:

Software version
Problem description and how to reproduce it
Frequency of the problem.

Email: support@medicalharbour.com; Address: Rod. SC 401 km 01, nº 600 - room 3.13 - CELTA - Florianópolis / Santa Catarina / Brazil; Phone: +55 48 3028-1702; http://www.medicalharbour.com

In the '**Help & Guide**' tab you can also quickly download the user manual and quick guide and have direct access to explanatory videos on how to interact with the tools. In addition, the Athena Hub manual is also online and you can access it from anywhere.

Your review is very important! That's why we make available an option for you to do it directly in the software and also for you to share the software with others interested in the study of human anatomy (image 1).

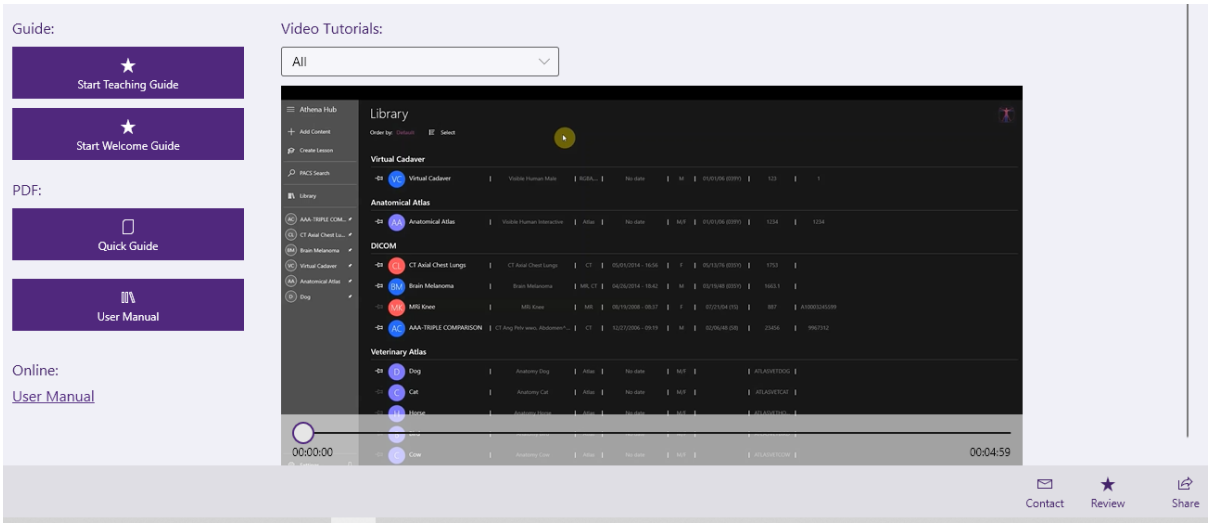

Image 1 - Help and Guide tab, for you to ask questions, rate and share Athena Hub

2. PACS Settings

Athena supports multiple configurations of PACS servers. They will be listed in the **' PACS Search**' panel and can be added, edited or removed via the '**PACS**' item in the '**PACS Configuration**' tab. To see the description, simply place your mouse over the text box of each configuration item (image 2).

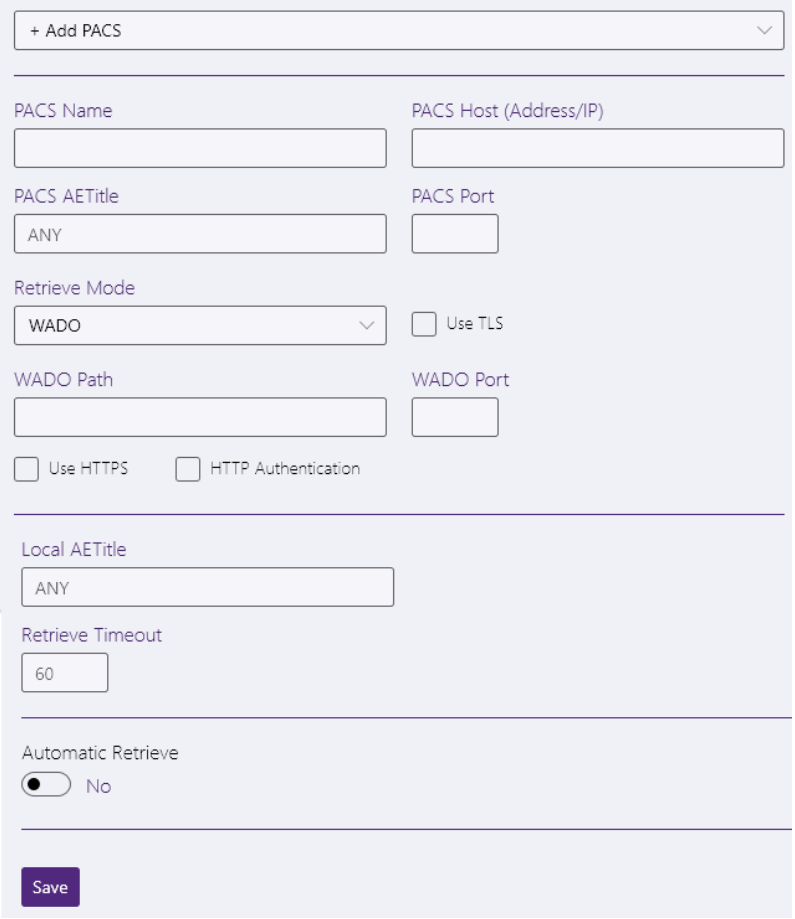

Image 2 - Access to PACS server settings

2.1 Add PACS

To add a PACS server, select '**Add New PACS**' from the combo box. Next, enter the required PACS settings. The next fields are not always known to users, so if you don't have the information at hand to add a PACS server, you may contact the hospital or institution's IT specialist.

After entering the information, Athena will display a message telling you if the PACS settings are correct, or if there is an error. In the case of WADO recovery mode, Athena will not verify if the path is correct during configuration. This check only happens during imaging recovery. In case of error, the software will show a message on the screen, informing if there was an error during the verification.

Athena Hub supports C-MOVE, WADO, and TLS / SSL encryption and also allows the changing of timeouts for all requests.

2.2 PACS Search

'**PACS Search**' allows you to search for various parameters, such as patient name, date, identification number (ID), accession number, study, modalities, among others, on PACS servers added to Athena Hub. You can search for studies and cases by, AM, PM, Today, Yesterday, Last 2 Days, Last 7 Days, and Last Month.

To access, click on the icon PACS and fill in the required fields. You can choose the server, *Knowledge Base* - databases with different studies - or name (1 and 2), choose parameters that facilitate the search (3) and the modalities that interest you (4) (image 3).

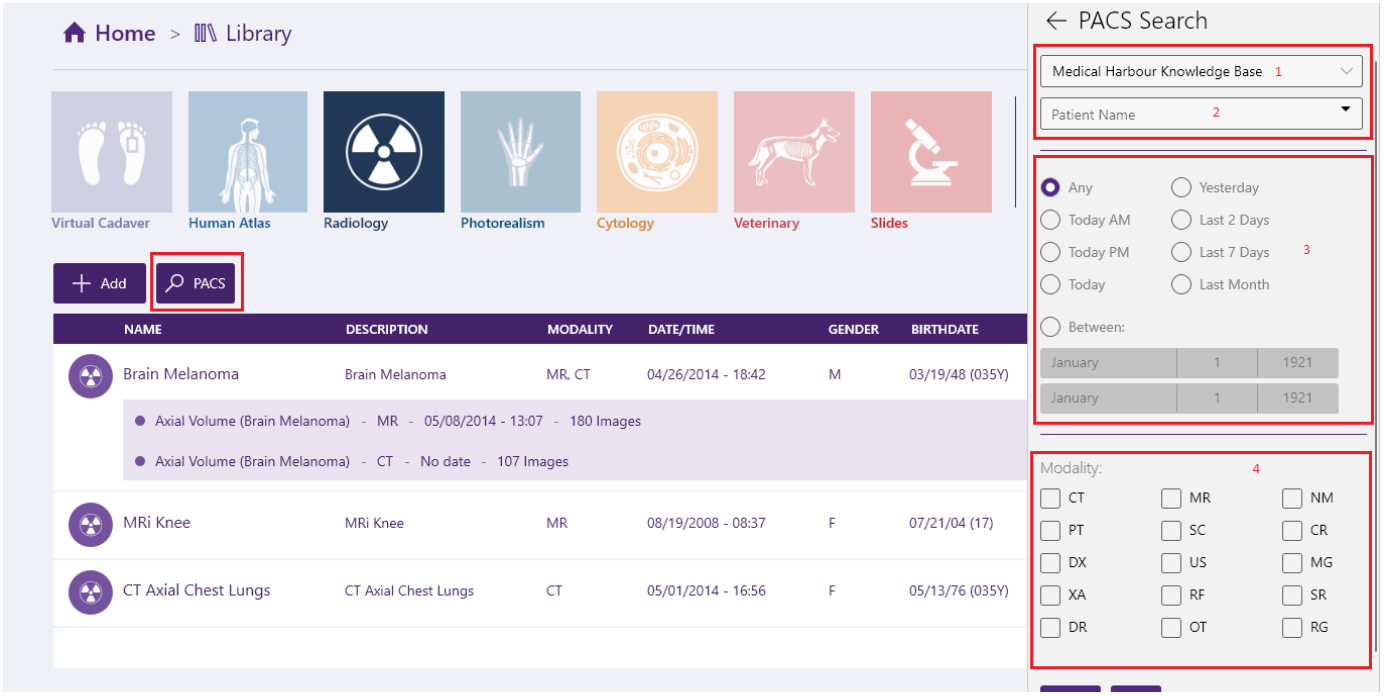

image 3 - (1) PACS or KB selection / (2) Patient name / (3) Search parameters / (4) Mode Selection

The results will appear after clicking on search and to download them you must click on the desired study. New studies will appear with a blue circle in the library (image 4).

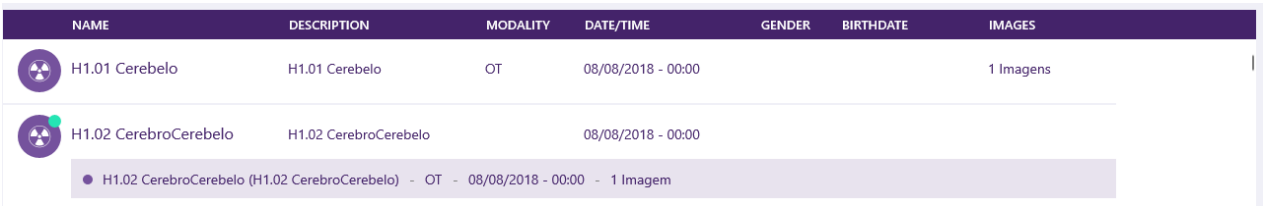

image 4 - new studies in the library

2.3 Knowledge Base

Athena Hub has an exclusive database with different contents separated by themes.

The *Medical Harbor Knowledge Base* (MHKB) is a DICOM library with hundreds of studies of the human body. *Slides Knowledge Base* (SlidesKB) is a specific library for histological and

pathological slides. In addition to these, at the Hub you can also access the *Pet Knowledge Base* (PetKB) a unique DICOM library with various animal studies.

Access to the Knowledge Base is available depending on your version of Athena, so check their availability in order to access them. To access them, just follow the steps of **'Search PACS '** and select the desired base (image 5).

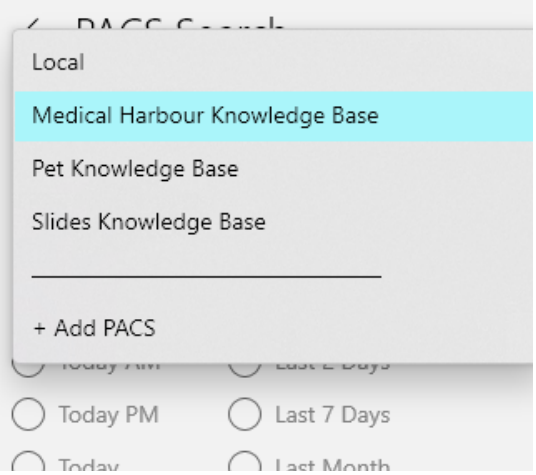

Image 5 - Athena Hub Knowledge Bases

3. Virtual Corpse, Radiology, Photorealism & Slides

The Virtual Corpse, Radiology, Photorealism and Slides modules use DICOM imaging to conduct the studies. In this way, the modules have some tools in common, which are the basic and advanced tools (images 6 and 7).

The **Virtual Cadaver** allows viewing in 4 modes: Transverse, Median, Frontal or 3D. It can also be accessed via the CV shortcut, fixed on the left tab of the menu.

The **Radiology module** was developed to import and analyze real cases. With it it is possible to select human studies as well as animal anatomies.

The **photorealism module** was developed to generate 3D imaging with more detailed and faithful forms of real medical imaging. It is only available for Computed Tomography (CT) images.

The **Slide module** was created for opening various histology studies, including pathological studies.

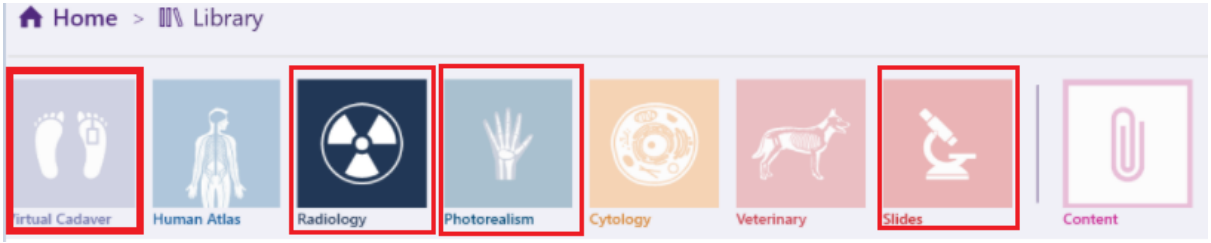

image 6 - location of virtual cadaver, radiology, photorealism and slides

3.1 Photorealism Tools

In addition to the transfer function and the Crop tool, the **'Photorealism'** module has the **' Dissecate'** tool. It is essentially an Advanced Crop and with it it is possible to crop in freehand style specific parts of the imaging recreated with Photorealism. The dissect tool has a menu to facilitate tool navigation (image 8).

With the **' Dissect'** tool menu, you can isolate the selected part, hide it, deselect it, undo, redo and reset changes to the original imaging.

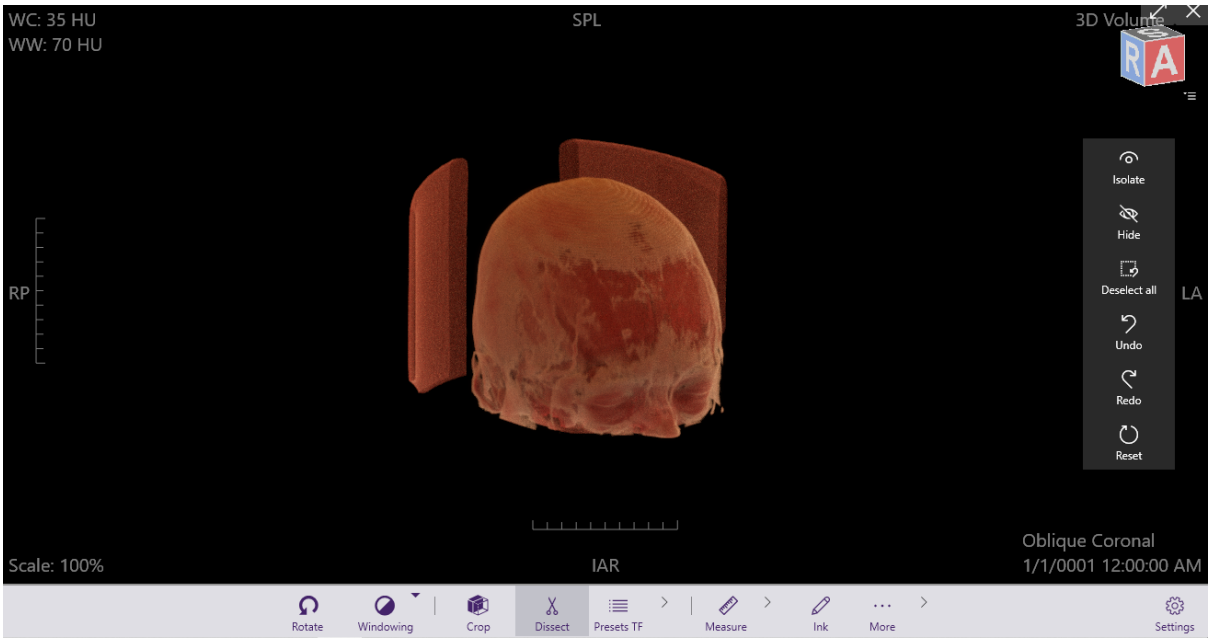

image 8 - Dissect tool and its menu

3.2 Transfer Function

The transfer function is a preset for the different types of modifications that can be made with Photorealism. With it, it is possible to modify the colors used for each type of organ, system or tissue visualized.

A practical example is to think that the defined color for bones is white. To change the colors, densities and other information relevant to the study of interest that is open with Photorealism, it is possible to access the TF editor, which provides a graph in histogram that presents the values in Hounsfield present in the study.

To access the TF editor, go to the Athena function bar and select ' **TF presets'** and then **'Add'**. You will have to name the new preset and then define the desired settings (image 9 and 10).

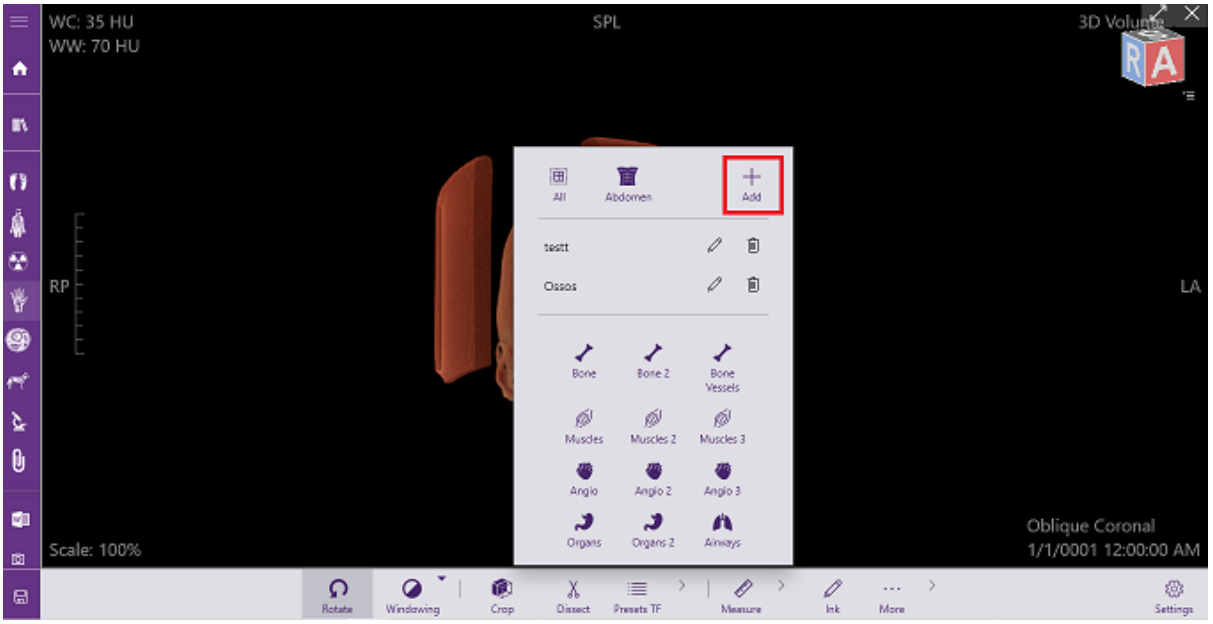

image 9 - Available TF presets and 'Add' function

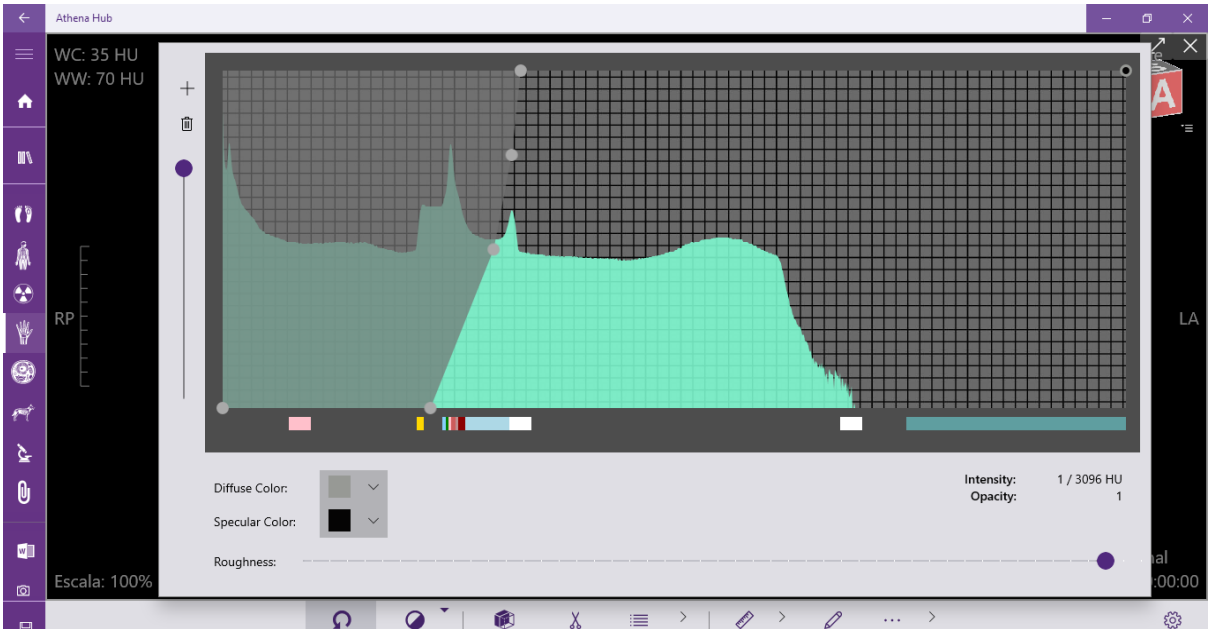

image 10 - Editing TF presets

4. Human, Cytology & Veterinary Atlas

The **Human Atlas** is separated into a Male and Female model and organized according to 12 anatomical systems, they are: integumentary, muscular, skeletal, articular, nervous,

lymphatic, endocrine, digestive, respiratory, arterial, venous and urogenital systems (image 11 and 12).

The **Cytology module** allows you to visualize and interact with three 3D models related to the eukaryotic cell, namely: animal cell, mitochondria and plasma membrane.

The **Veterinary module** allows you to view 8 different types of anatomies: Bird, bovine, canine, feline, equine, rodent, anura and porcine. Veterinary atlases have the female and male anatomy of the animals, as well as the systems: integumentary, muscular, skeletal, circulatory, nervous, lymphatic, digestive, respiratory, circulatory, urogenital (image 13).

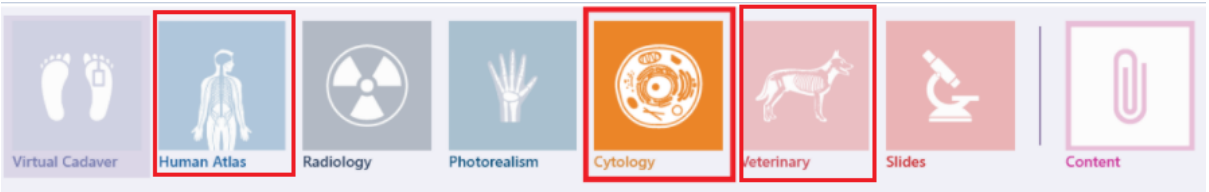

image 11 - location of the human, cytology and veterinary atlas in the library

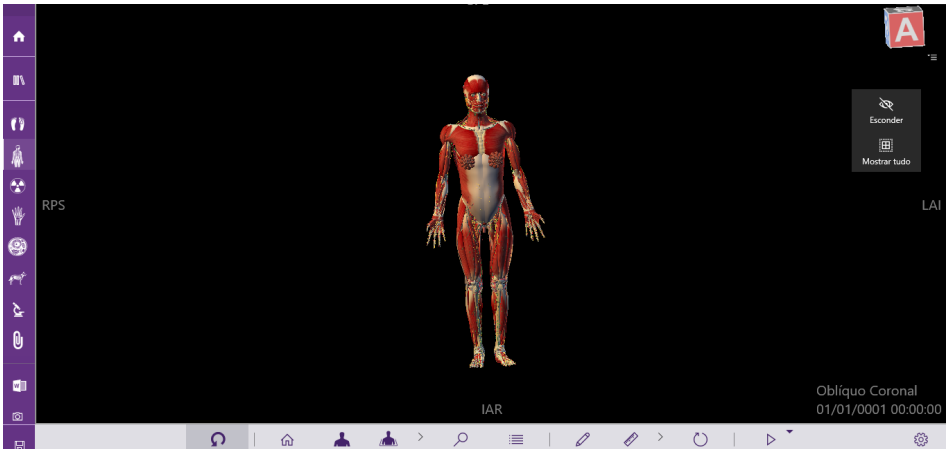

Image 12 - Anatomical atlas with active muscular, skeletal, articular, nervous, lymphatic, endocrine, digestive, respiratory, arterial, venous and urogenital systems

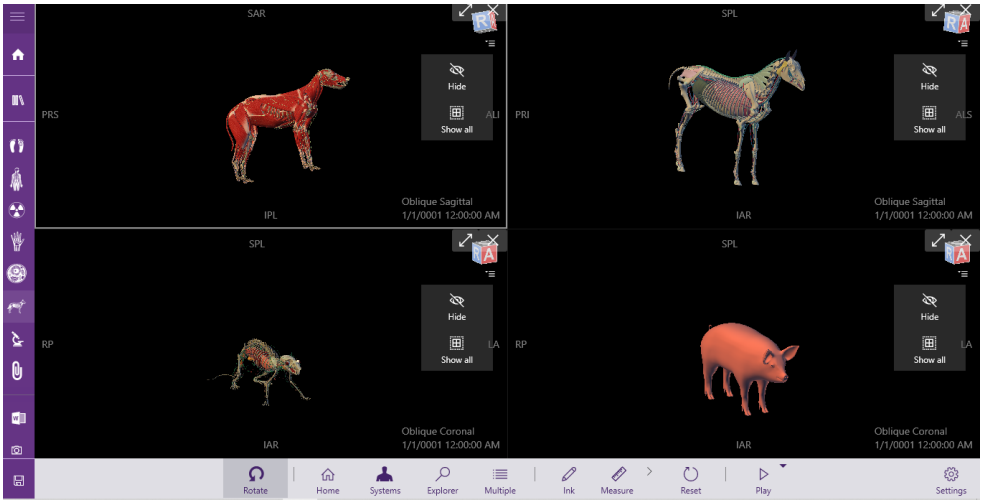

image 13 - examples of veterinary atlases with several active systems

4.1 Human Atlas Tools

The Human Atlas has some individual tools for your use. In addition to being divided between Female and Male, having division of systems and regions, it also has the **' Info' tool**.

With it it is possible to access detailed explanations about all the structures of the human anatomy and their functions, in 3 languages (English, Portuguese and Spanish) (image 14). To access the other languages, it is necessary to change the software language and restart it.

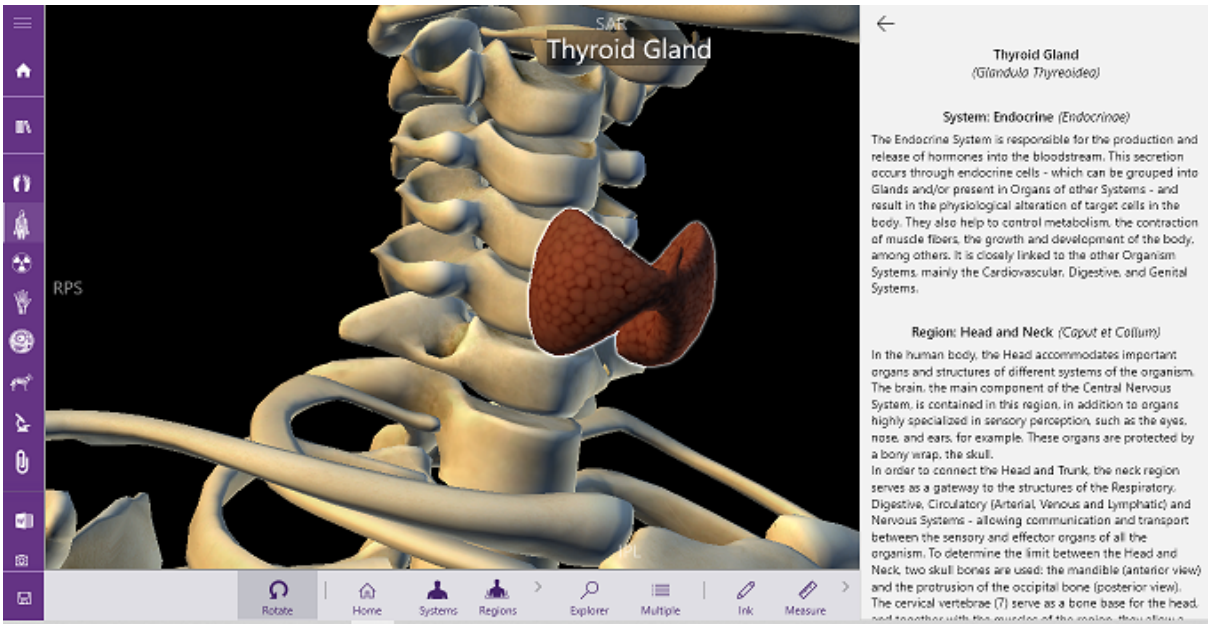

image 14 - Information from the thyroid gland and the Head and Neck region

4.2 Cytology Tools

The Cytology module has its own tool for visualizing structures. The **' Organelle'** tool works similar to the 'Isolate' tool by separating only the cell's organelles to facilitate their study (image 15).

image 15 - organelle tool before and after being activated

5. Workspace

While browsing Athena, you can save any visualization of an imaging, atlas or study. When you save it, you will create a **Workspace**.

Workspaces are sets of content that can be shared with other users of the software. They act as a work area for your studies, and you can leave and return to what you were doing without fear of losing important information (image 16).

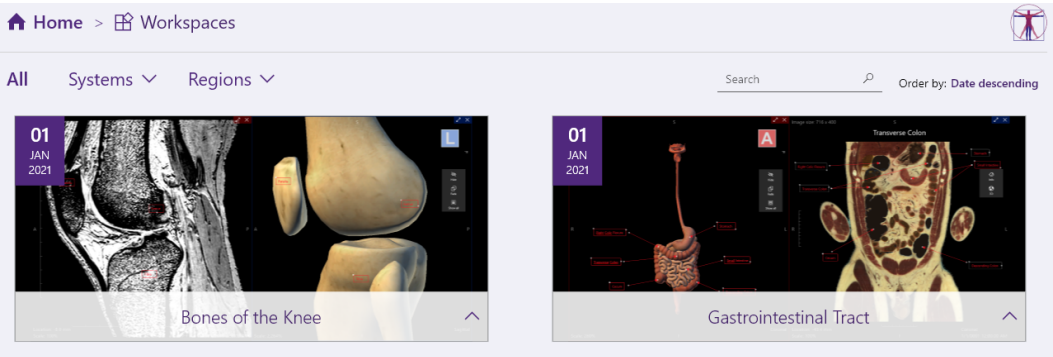

image 16 - Athena Hub Workspaces

5.1 Create Your Own Workspace

To create your own **Workspace**, just click on the icon  or close the view. The following fields will appear and you must fill them in (image 17). You must give a name and can even fill in a description with the type of study being conducted in this Workspace.

In addition, you can place **filters** such as systems (skeletal, endocrine, circulatory or others) and/or regions (abdomen, chest, upper left limb and the like) in your Workspace to make it easier to search for it later.

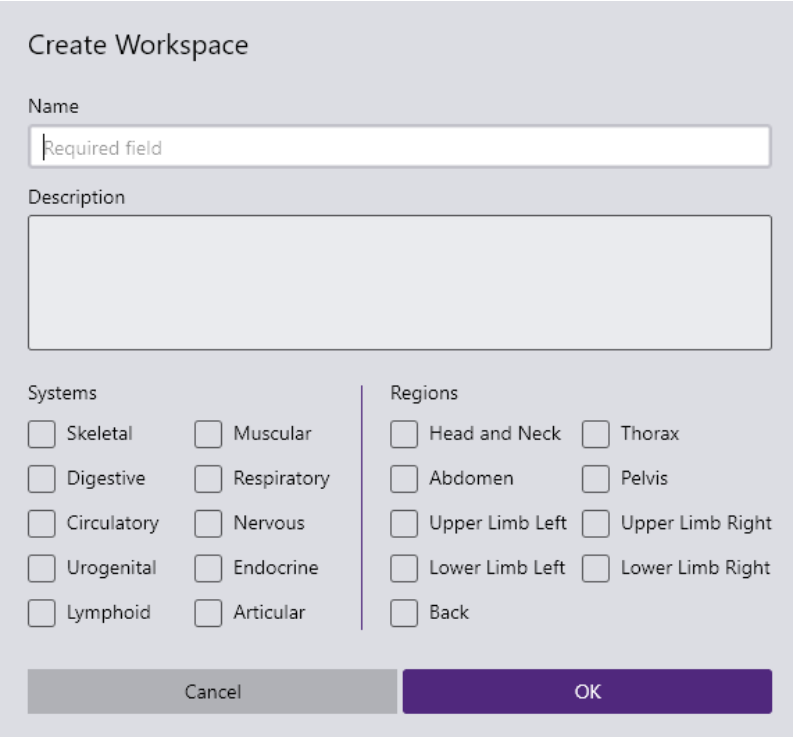

image 17 - fillable fields for creating a Workspace

6. Tools

Athena Hub has several basic and advanced tools that can be used in DICOM imaging and with the Virtual Corpse. In addition, each module has specific tools for manipulation.
In cases where the Athena Hub is installed on touch screens, it is possible to use the tools and move the imaging with just a touch (image 18).

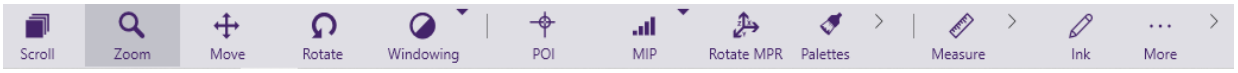

image 18 - toolbar in Athena Hub

6.1 Basic tools

Athena basic tools include: scrolling, zooming, moving, rotating, and windowing. These can be easily accessed through the bottom bar of the viewer and are available in the '**Virtual Cadaver**', **'Radiology'** and **' Slides'** module (image 19).

image 19 - Basic Athena Hub tools.

6.2 Advanced tools

Athena's advanced tools include: **Sync**, **POI** (point of interest), **Crop** (3D crop), **MIP, MinIP,** and **AIP** (maximum, minimum, and average intensity projection, respectively), and **Rotate MPR**.

6.2.1 Synchronization

Sync is a feature for zooming, scrolling, moving, rotating, windowing, and to apply palettes for all open views. This functionality allows you to replicate the procedure for all views. To enable **it** click and then 

.

6.8.2 Point of Interest (POI)

The POI tool allows you to reach a specific area or point of interest. This feature automatically syncs open views at the specified point of interest. To use this tool you must have more than one view open in different views (Original, MPR or Virtual Corpse), select the button 

, click and drag to some point. The setting can be applied to as many imagings as the user wants (image 20).

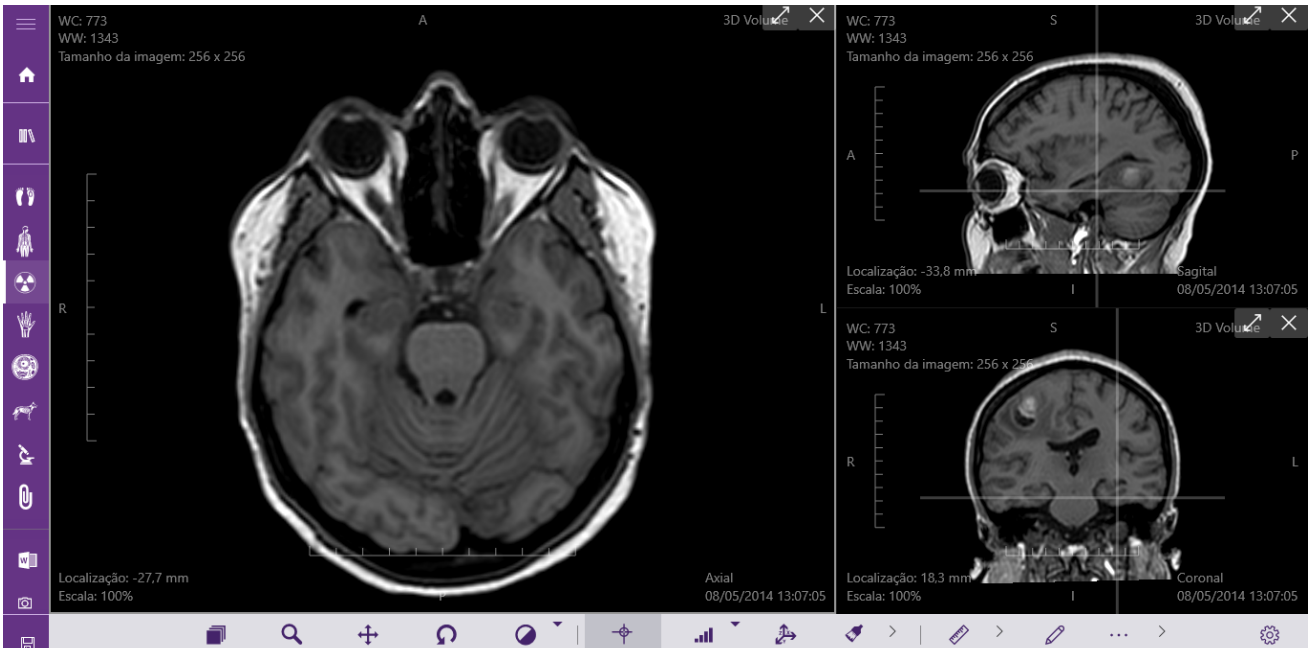

image 20 - Athena POI (point of interest) tool

6.2.3 Crop

The cropping tool allows you to view internal structures of reconstructed volumes during 3D manipulation (Volume, MIP, XRay, Isosurface). This tool allows orthogonal cuts to be made in any 3D view allowing for internal and external reconstruction analysis. To use this tool just

select the **'Crop'** button, click and drag the face center control button in the desired direction (image 21).

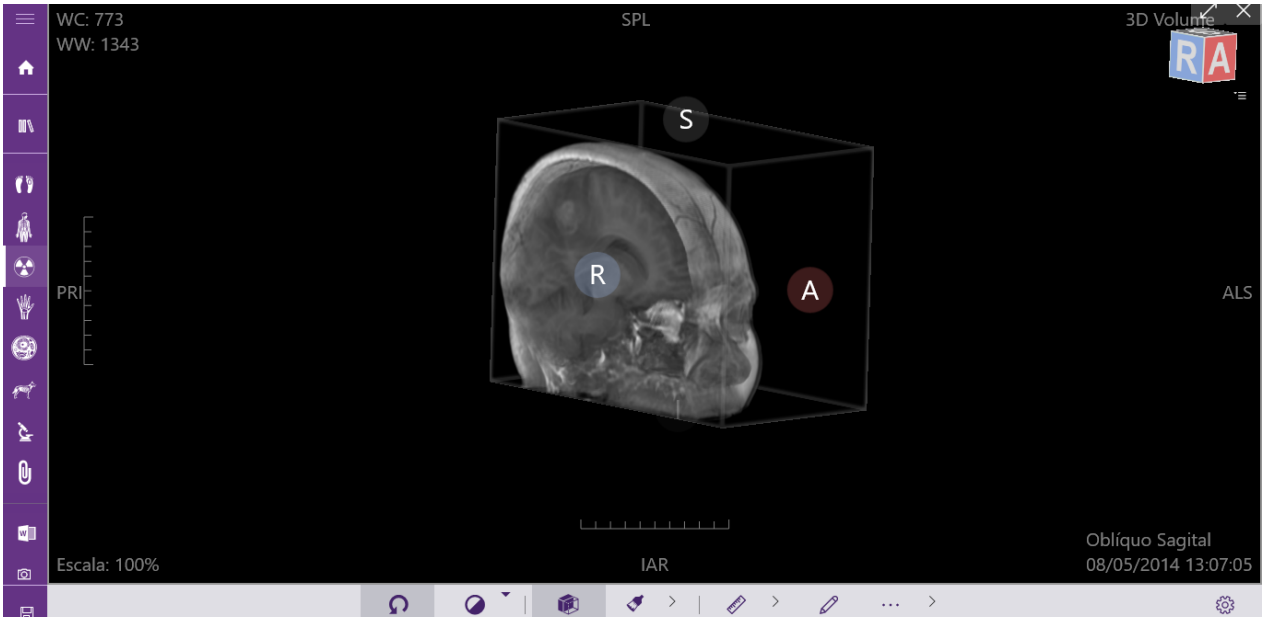

image 21 - Crop tool active in Athena viewer.

6.2.4 Maximum Intensity Projection (MIP)

MIP is a feature that designs the highest attenuated voxel on all views and volume for a 2D imaging. With MIP, it is possible to find all hyperdensing structures in a volume, from a chosen range. This method tends to exhibit bones and contrasted structures while hiding the lower attenuated structures.

One of the main clinical applications of MIP is to improve the detection of pulmonary nodules and to assess their profusion. This feature also helps to characterize the distribution of small nodules. In addition, this tool is excellent for assessing the size and location of vessels, including pulmonary arteries and veins.

To use this feature, simply select **'MIP'**, located on the lower toolbar, click and drag to select the desired range, which can be checked in the value of “MIP Width” and using the reference lines (image 22).

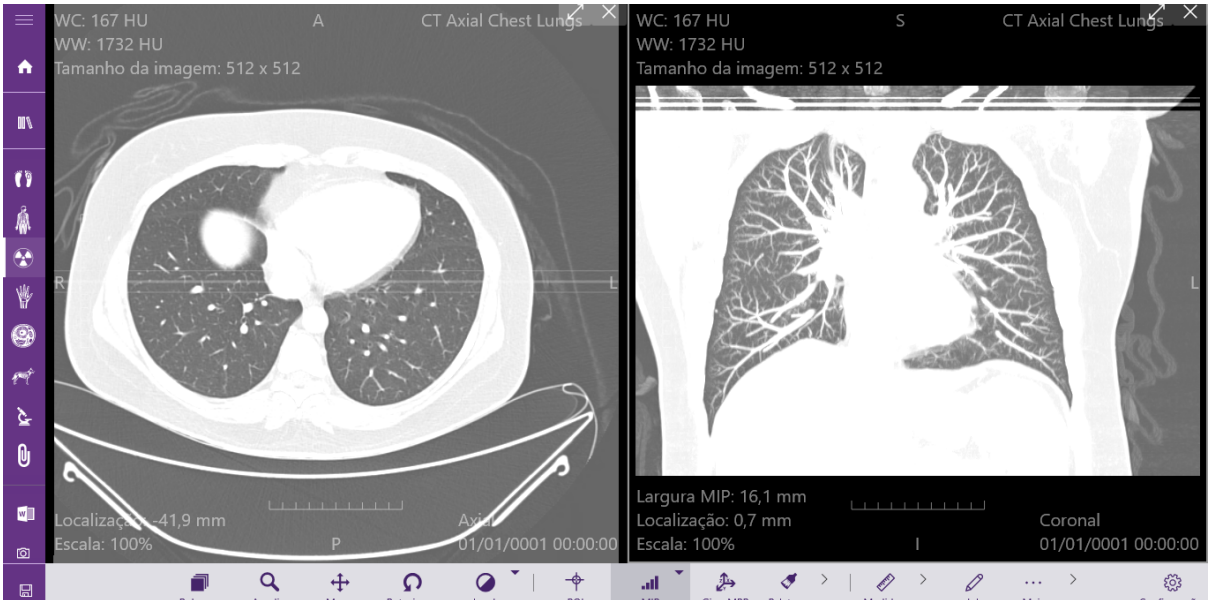

image 22 - Maximum Intensity Projection Tool (MIP) active in Athena

6.2.5 Minimum Intensity Projection (MinIP)

The operation of MinIP is very similar to MIP, but instead of showing voxels with the highest attenuation, it shows the least attenuated ones. With this tool, only the most hypodense volume structures are represented, so it becomes the ideal tool for detecting, locating, quantifying ground glass and linear attenuation patterns in chest scans.

MinIP is particularly useful for analyzing the biliary tree and pancreatic duct, which are hypodense compared to the surrounding tissue, especially in the pancreatic phase.

To access this feature click the button on the right arrow of the button and select “MinIP” (image 23)

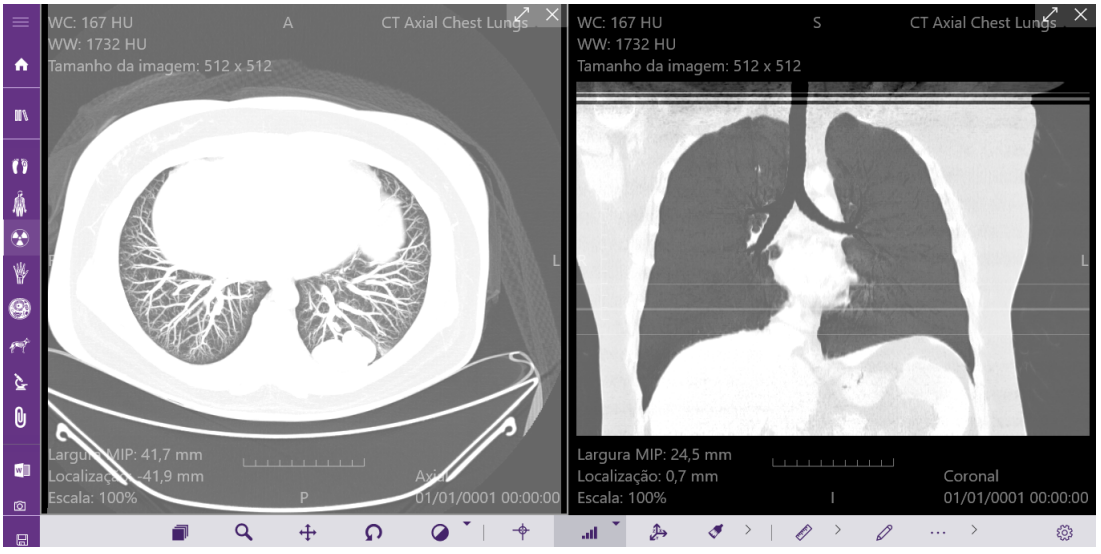

image 23 - Maximum Intensity Projection Tool (MIP) active in Athena

6.2.6 Rotate MPR

Non-orthogonal MPR is a tool that lets you manipulate the angulation of the 2D imaging series. This tool is useful for viewing regions that requires different angles or positions.

To use click 

and then manipulate the reference lines.

In Athena you can use the “**Rotate MPR**” tool in three different ways: drag horizontally or vertically using the white circle in the center of the line, rotate the reference lines using the white circle at the ends of the reference lines or click and drag on desired view and change in the direction you want to rotate (Figure 24).

image 24 - Rotate MPR active on Athena Hub