



Athena Hub User's Manual

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.

1.1 Description

The DICOM protocol (Digital Electrical Imaging and Communication in Medicine), which is defined by NEMA (National Electrical Manufacturers Association) and incorporated by Athena, allows you to import images from a CD/DVD, memory stick, local folder, or PACS (imaging server).

The transfer and retrieval of imaging from/to a PACS follow the query/retrieve model stipulated by DICOM, with the possibility of applying security layers as SSL/TLS if desired. The software can organize files by patients, studies, dates, and series, helping to locate exams quickly and effectively. You can display imaging in their original mode while opening them, or you can apply changes to them when opening in multiplanar mode (MPR), which can aid in the diagnostic process.

Athena Hub was designed for clinical training and critical thinking, enriching within a classroom, simulation lab, or a residency program. Enables students and physicians to interact with real cases in a virtual environment, integrating the clinical education of future doctors and health professionals. It is the evolution of medical education with medical imaging, from the first years of graduation to the residency program.

1.2 Indication of Use

Recommended for advanced anatomy and radiology studies, Athena Hub is suitable for the academic field such as medicine, bioengineering, biology, radiology courses, and the likes. In addition, the platform is indicated for the visualization, organization, and processing of exams (DICOM files) obtained in radiography, tomography, and magnetic resonance procedures, among others, as a diagnostic aid tool.

In the medical field, the Hub is adopted in hospitals (operating rooms and offices), radiological clinics, doctors' offices, radiologists, referring physicians, and health professionals in general.



1.3 Software Feature

Athena Hub displays and processes digital anatomical and medical DICOM imaging. The software does not interact and does not contact patients directly, nor with any device linked to them. Its main function is to assist the professional in the visualization, manipulation, and interpretation of anatomical and radiological imaging seeking to teach anatomy, radiology, and diagnosis through imaging.

1.4 Quality Policy and Homologation

The software follows a rigid policy of product quality, performed through a diversity of tests like integration tests, system tests, certification tests and individuals ones to then go through a homologation process. Athena follows all specifications of the DICOM standards determined by the NEMA standard PS3.

Other features that ensure the quality and security of the platform are the downloads and upload forms and the search for DICOM imaging since Athena allows the use of TLS / SSL protocols during the search and retrieval of the imaging by the DICOM protocol). In addition, with each upgrade of the software, new testings are performed to ensure product quality and user experience.

1.5 Warnings and Precautions

The platform allows free importation, exportation, manipulation, and transferring of imaging. Therefore, be aware of the norms of the local health establishment council of medicine in your country, mainly concerning the sharing of imaging. All messages and alerts displayed by the software to the user are relevant to the safe and effective operation of the user and should be read and considered carefully. There may be DICOM imaging not adequated to the DICOM standard and therefore you must pay attention to the software messages, for data identification with possible distortions, avoiding their use and probable errors.

1.6 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 Corpse

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



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

2. Home

On the Athena Hub home, you can access the **Settings** menu, the **Library** with studies and modules, and the **Workspace**, a space to share and save the interventions made in a study (image 1).



image 1 - Home and access options

2.1 My Account

In the **'My Account'** options, you can check a series of information relevant to the use of the software, such as registered name and email, active licenses, and positions. It is also possible to do a new key activation on this tab if you purchase a new Athena Hub license (images 2 and 3).

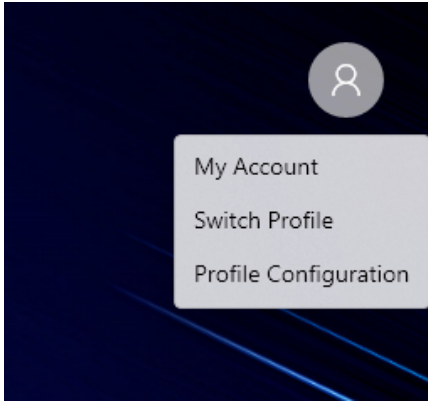


Image 2 - profile options

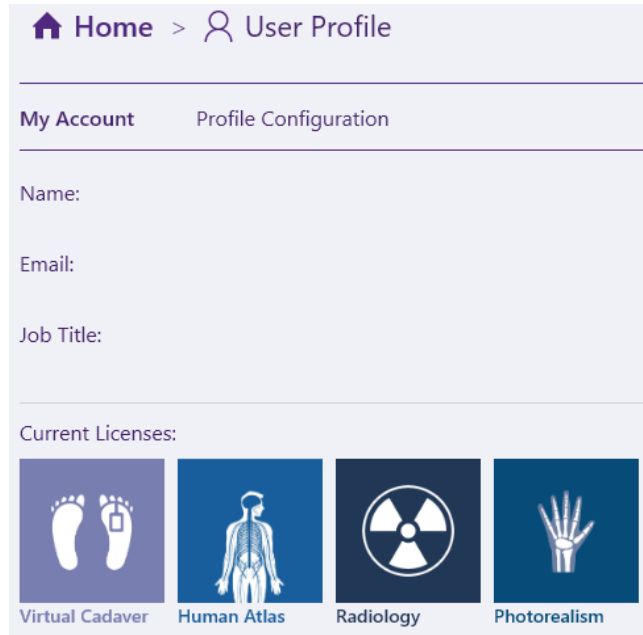


Image 3 - Account information: licenses and registration

2.1.1 Profile configuration

In profile settings, you can decide who will be the software administrator, add or remove other profiles (image 4).

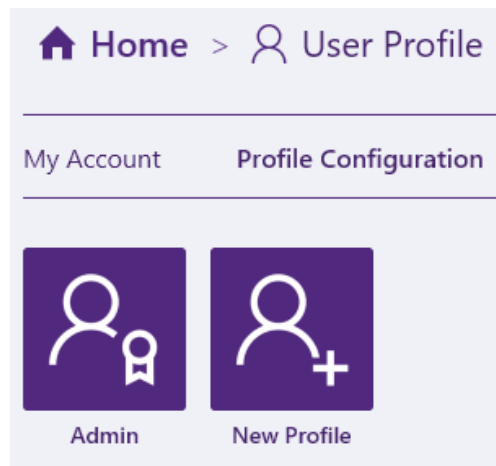


Image 4 - Profile configuration

2.2 Change profile

To make each experience unique, Athena Hub users can change profiles as they use the software. After adding it in the '**Users Configuration**' tab, click on change profile. Next, you must choose the desired profile to enter, and if applicable, add the password (image 5).

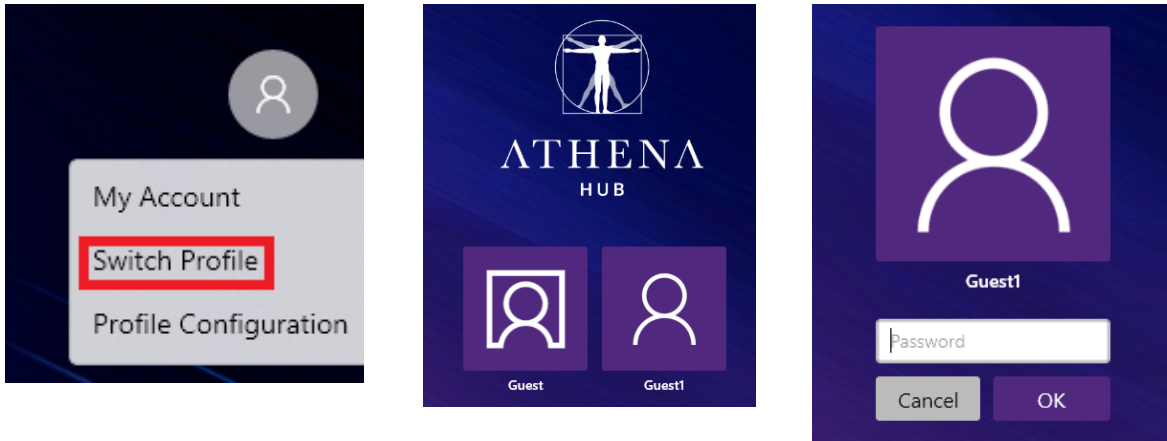


Image 5 - Access to other profiles

3 - Settings

In settings, you will find a range of options to customize your Athena Hub profile, your way. Divided between user configuration, PACS configuration, Help and Guide, Bibliographical references, and About, here you can solve any software-related issue (image 6).

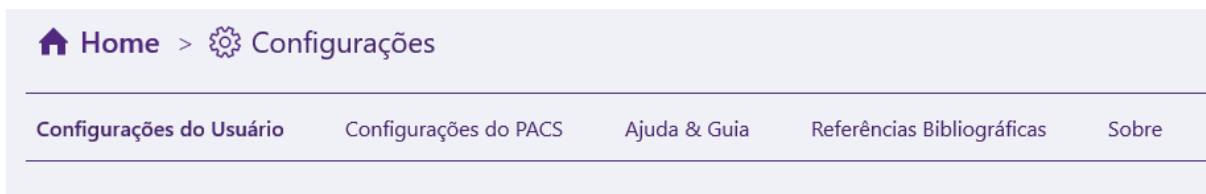


Image 6 - Athena Hub configuration tabs

3.1 User Settings

In user settings, you can change the software language, add or edit a Word report, decide how often to exclude exams and studies, and the like. It is also possible to change the resolution of the virtual cadaver, the number of images when static, and the number of samples during manipulation. These settings are present so that you can adapt the virtual corpse to the resources available on your computer (image 7).

You can also restore the library to the initial base, with base studies to start studying from scratch.



Language:

Word Report Template

Automatic Exams Deleting

Upload Key Images
 No

Virtual Cadaver Resolution
Low High

Number of samples when Static
Low High

Number of samples During Manipulation
Low High

Image 7 - user configuration

3.1.1 Languages

Athena Hub has support for multiple languages. To change the current language of the software just access '**User Settings**' and choose the language of interest (image 8). To apply the settings, Athena must be restarted.

User Settings PACS Configuration Help &

Use language preferences (recommended)

English

Português (Brasil)

中文(中华人民共和国)

Español

हिन्दी

English

Português

No

image 8 - localization of language setting



3.1.2 Add Word Report

To add a Word template, you must click on **'+Add Template'** and then select the desired *.doc file. To edit the default template, just go to **'User Configuration'**, choose the template in **'Word Report Template'** and click on **'Edit'** (image 9). A file will open in Word and you can make changes. To save them just click on save and close the file.

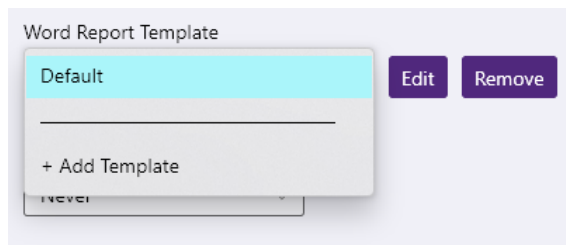


image 9 - Word Report Template Configuration.

3.1.3 Remove Template

To remove any created template or reset the default template, simply go to **'User Settings'**, select the template you want to delete and then click on the **'Delete'** button.

3.2 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 10).

Image 10 - Access to PACS server settings



3.2.1 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.

3.2.1.1 C-MOVE

C-MOVE recovery mode is a type of operation for transmitting DICOM (server-client) files widely supported by most PACS. In this operation, the receiver will not always be the same individual that requested the transmission.

To select C-MOVE mode, select '**MOVE**' in the '**Recovery Mode**' selection box (image 11). The transfer will follow the standard DICOM protocol. For this mode to work, the workstation must be previously registered on the PACS server.

The image shows a web-based configuration form for adding a PACS server. At the top, there is a dropdown menu labeled '+ Add PACS'. Below this, there are several input fields: 'PACS Name', 'PACS Host (Address/IP)', 'PACS AETitle' (with 'ANY' entered), and 'PACS Port'. At the bottom, there is a 'Retrieve Mode' dropdown menu with 'MOVE' selected, and a checkbox labeled 'Use TLS' which is currently unchecked. A red rectangular box highlights the 'Retrieve Mode' dropdown and the 'Use TLS' checkbox.

Image 11 - C-MOVE and C-GET configuration for PACS server

3.2.1.2 WADO

To select, choose '**WADO**' in '**Recovery Mode**'. The imaging transfer process will follow the WADO protocol. The process can reach 10 times faster than C-MOVE and does not require registration on the PACS server. In this mode, HTTP and HTTPS security checks can be made.

The '**WADO Directory**' field is the partial path of the server's WADO directory. This field may be empty, but most PACS servers just use the word "wado". The '**WADO port**' field is the directory access port. It can also be empty, however the most used is the "8080" port (image 12).



PACS Name:

PACS Host (Address/IP):

PACS AETitle:

PACS Port:

Retrieve Mode: Use TLS

WADO Path:

WADO Port:

Use HTTPS HTTP Authentication

Image 12 - Configuration of WADO Directory and WADO Port PACS server

3.2.2 Delete PACS

To remove a PACS, it is necessary to click on the '**delete**' button, next to the '**save**' button.

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 13).

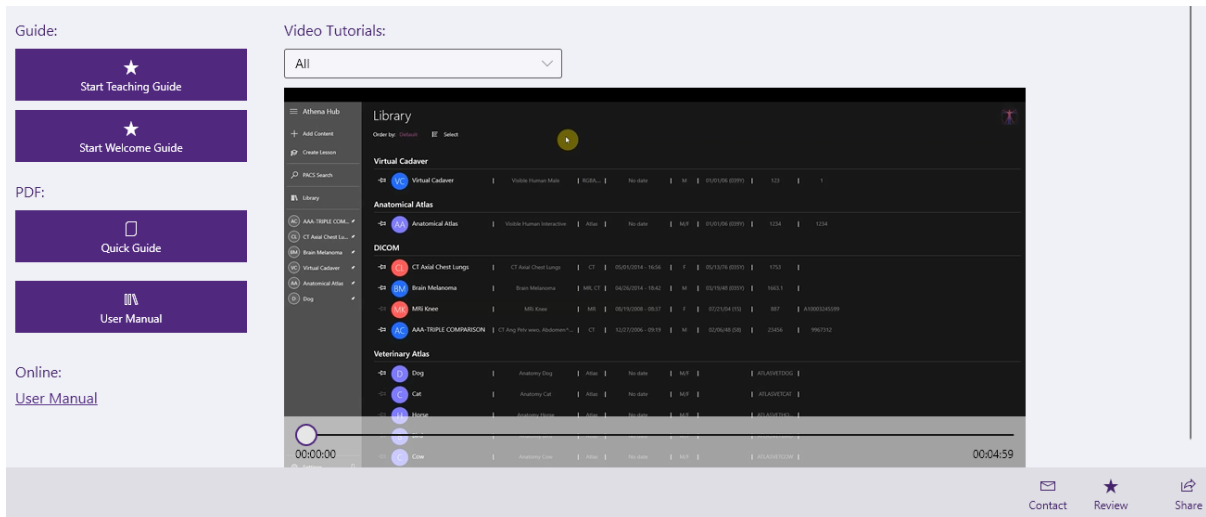


Image 13 - Help and Guide tab, for you to ask questions, rate, and share Athena Hub

3.4 Bibliographic References

Athena Hub was developed to assist and expand medical and student knowledge in the field. That said, you can find all the bibliographic references used to build our database in the 'Bibliographic References' tab under 'Settings' (image 14).



image 14 - bibliographical references

4. Library

The Athena Hub library houses the main functions of the software as well as its contents. Here you will find the modules **Virtual Corpse**, **Human Atlas**, **Radiology**, **Photorealism**, **Cytology**, **Veterinary**, and **Slides**. You can also import and access external content such as classes, articles, and studies conducted in other environments (image 15). Each module has unique tools for better learning and use of the content, which we will see below.

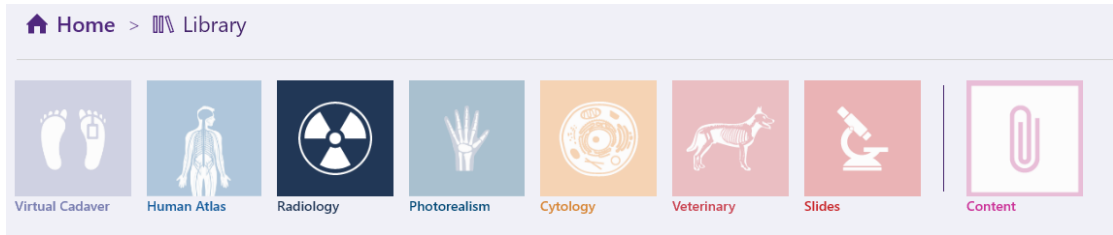


image 15 - Athena Hub library

4.1 Virtual Corpse

The Virtual Corpse (CV) is a real body that has been frozen, divided into thousands of slices, and photographed with high-resolution equipment. The Virtual Cadaver dataset can be reconstructed in 2D and 3D, and every little detail of the human body can be visualized in high detail. In this module, you can interact with the tools scroll, zoom, move, rotate, measure, ink, and other options such as resetting and recording what is happening.

To access the Virtual Corpse, just open the library and select it (image 16). You can open the CV by body region and in 4 viewing modes: Transversal, Median, Frontal, or 3D. It can also be accessed via the CV shortcut, fixed on the left tab of the menu (image 17).

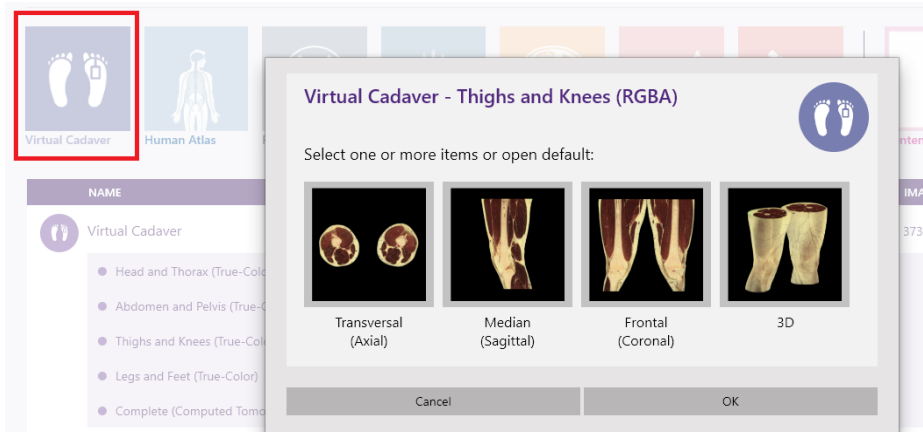


Image 16 - choice of view of the virtual cadaver in the library

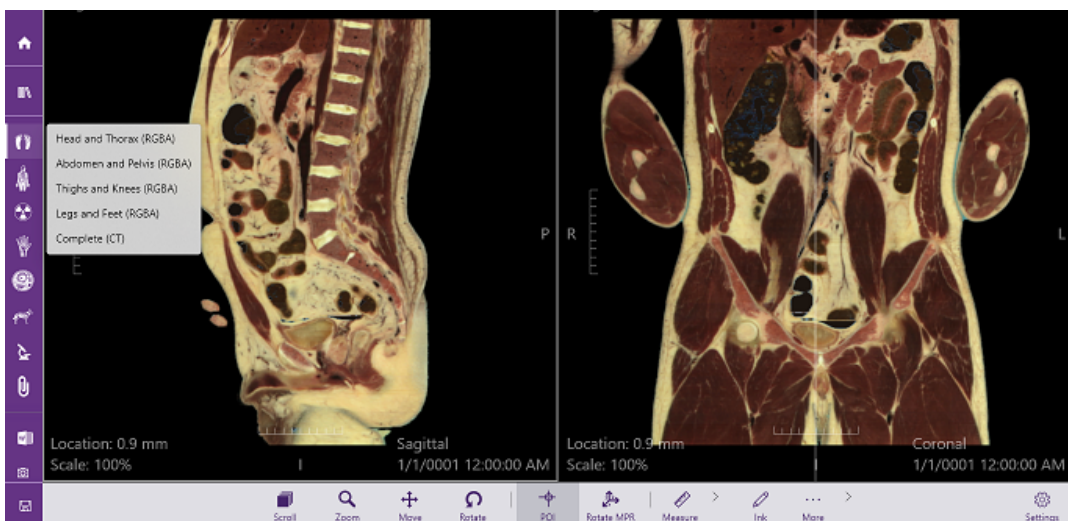


image 17 - Location of the CV shortcut in the preview menu



4.2 Human Atlas

The Human Atlas has more than 2,500 structures of all human body systems tagged with an advanced search engine. The atlas, which was developed with the highest quality of textures, guarantees an impressive set of data that can be used as a reference during the discussion of a case, a surgical plan, or an anatomy class (image 18).

The Human Atlas is separated into a Male and Female model and organized according to 12 anatomical systems, such as integumentary, muscular, skeletal, articular, nervous, lymphatic, endocrine, digestive, respiratory, arterial, venous, and urogenital systems (images 19 and 20).

You can also open the Human Atlas by regions, namely: head & neck, right upper limb, left upper limb, back, chest, abdomen, pelvis, right lower limb, and left lower limb (image 21).

For each anatomical part, it is possible to visualize its name in Portuguese, English, and Spanish in the upper region of the screen. To view, just click and select the part of interest.

You can also view detailed information to facilitate studies and the creation of medical content. To access the Human Atlas, just access it through the library and choose between Female and Male.

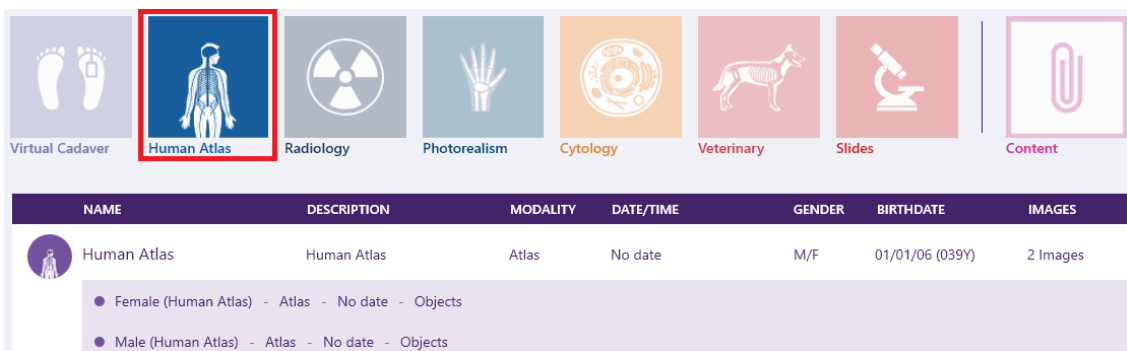


Image 18 – Anatomical Atlas option in the menu

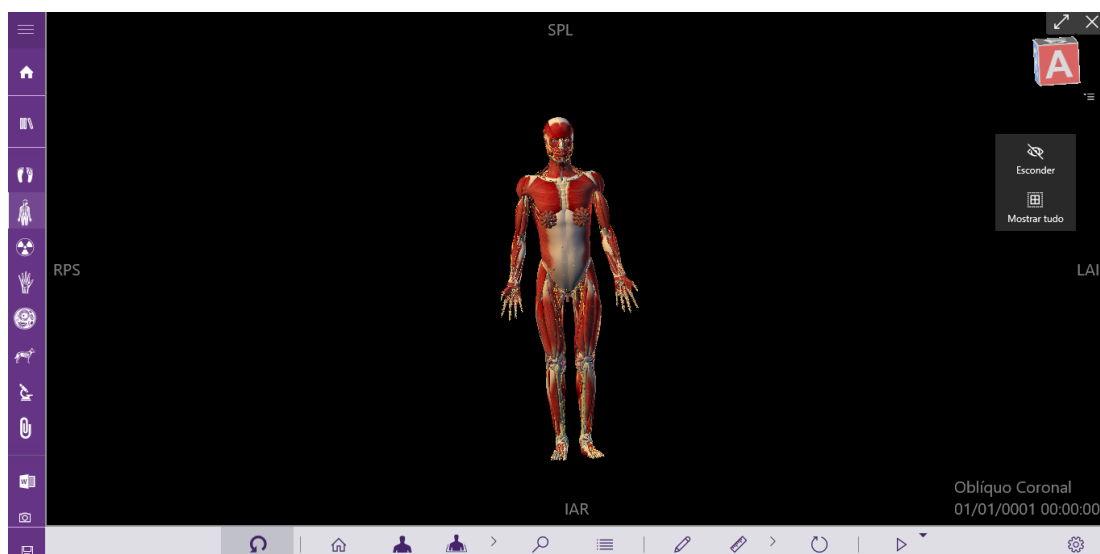


Image 19 - Anatomical atlas with active muscular, skeletal, articular, nervous, lymphatic, endocrine, digestive, respiratory, arterial, venous and urogenital systems



image 20 – Female human atlas with all active systems.

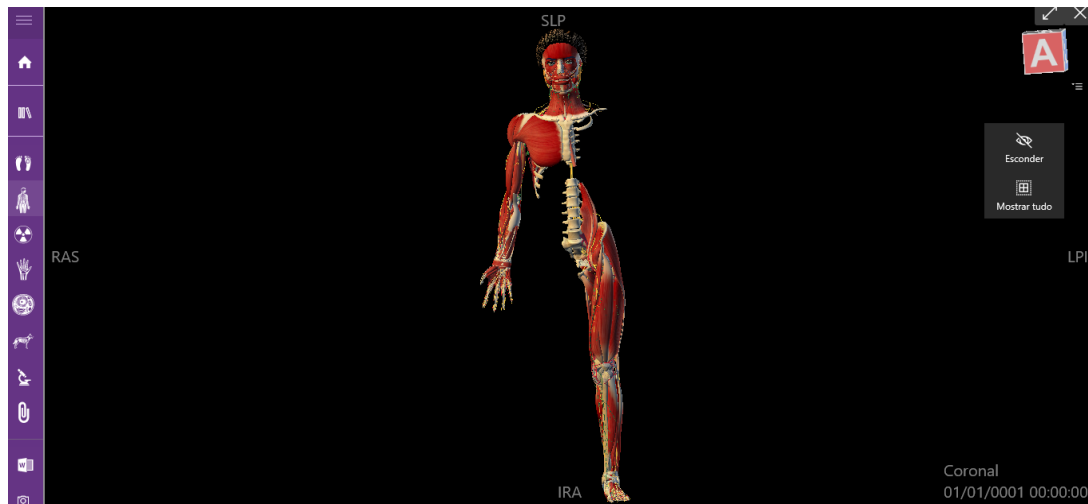


image 21 - Anatomical Atlas separation function

4.3 Radiology

With the radiology module, you have access to DICOM imaging and studies. The imaging obtained through medical imaging acquisition procedures allows specific studies of diseases and peculiarities of real medical cases (image 22). In addition to real cases of human anatomy, it is also possible to include DICOM imaging of animals for their study.

Studies can be downloaded from PACS servers or manually entered into the software. You can open them in transversal, median, frontal, 3D (X-ray, MIP, or Isosurface) view (image 23).



image 22 - access to radiology mode

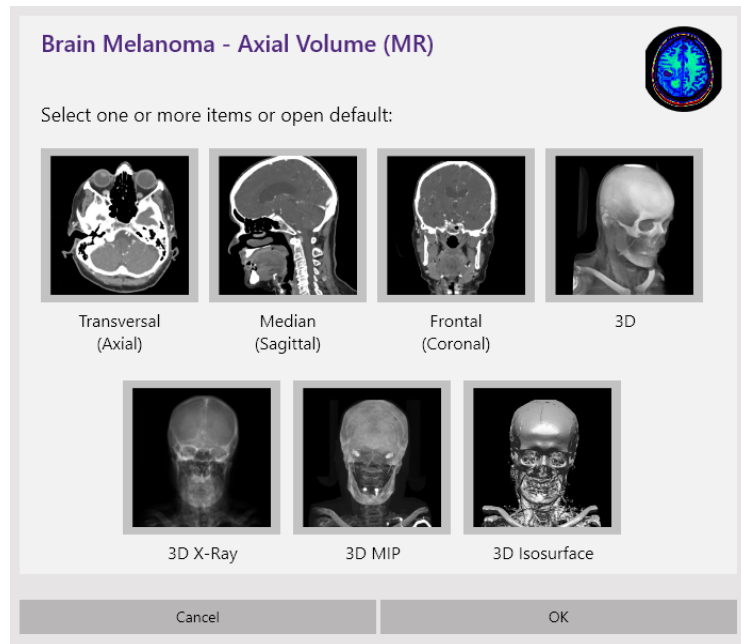
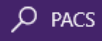


image 23 - choice of imaging opening

4.3.1 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  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 24).

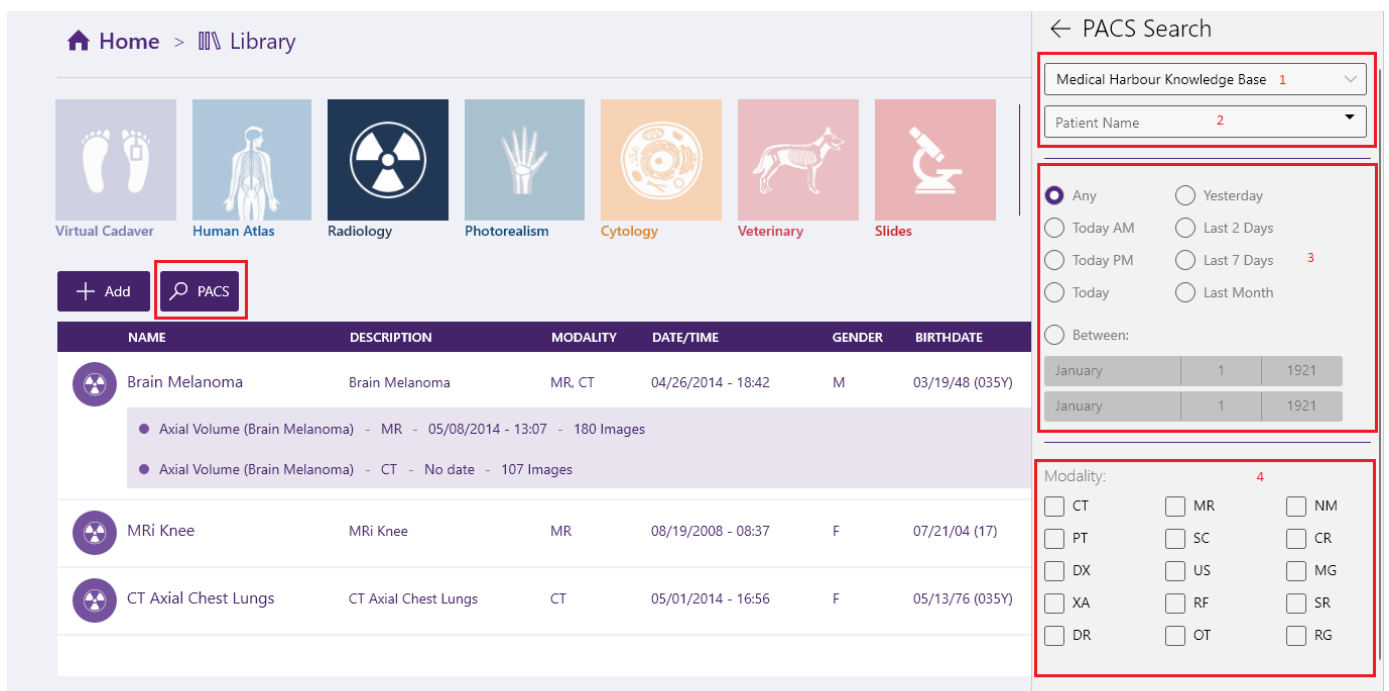


image 24 - (1) PACS or KB selection / (2) Patient name / (3) Search parameters / (4) Mode Selection



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 25).



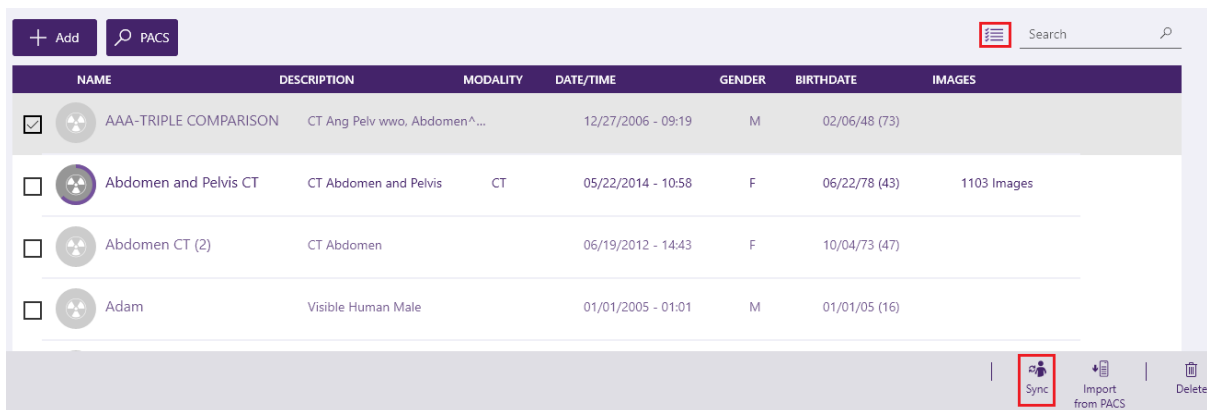
NAME	DESCRIPTION	MODALITY	DATE/TIME	GENDER	BIRTHDATE	IMAGES
 Abdomen and Pelvis CT	CT Abdomen and Pelvis	CT	05/22/2014 - 10:58	F	06/22/78 (43)	1103 Images
<ul style="list-style-type: none">● COR (CT Abdomen and Pelvis) - CT - No date - 60 Images● (CT Abdomen and Pelvis) - CT - No date - 3 Images● SAG (CT Abdomen and Pelvis) - CT - No date - 60 Images						

image 25 - new studies in the library

4.3.2 Synchronization

Before downloading a study from the PACS server or from a *knowledge base*, you can synchronize the information for that study. With this function you can check old and new studies related to a patient that is about to be imported into your library. Synchronization searches for exams performed on different dates and to access this option, just click on

 and then on '**Sync**' (image 26).







NAME	DESCRIPTION	MODALITY	DATE/TIME	GENDER	BIRTHDATE	IMAGES
<input checked="" type="checkbox"/>  AAA-TRIPLE COMPARISON	CT Ang Pelv wwo, Abdomen^...		12/27/2006 - 09:19	M	02/06/48 (73)	
<input type="checkbox"/>  Abdomen and Pelvis CT	CT Abdomen and Pelvis	CT	05/22/2014 - 10:58	F	06/22/78 (43)	1103 Images
<input type="checkbox"/>  Abdomen CT (2)	CT Abdomen		06/19/2012 - 14:43	F	10/04/73 (47)	
<input type="checkbox"/>  Adam	Visible Human Male		01/01/2005 - 01:01	M	01/01/05 (16)	

Image 26 - Athena Hub Sync Tool

4.5 Photorealism

The **photorealism module** was developed to generate 3D imaging with more detailed and faithful forms of real medical imaging (image 27). It is a volumetric reconstruction that uses photorealism techniques to deepen anatomical studies (image 28). The **Photorealism Module** is only available for Computed Tomography (CT) imaging. To import imaging, it is necessary to follow the same steps as in the **Radiology module**.



image 27 - access to the photorealism module

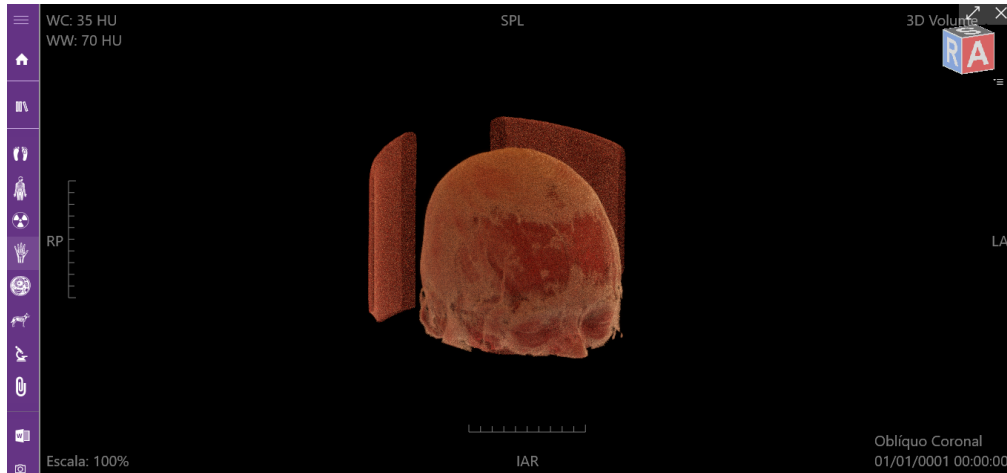


Image 28 - Active Photorealism Module

4.5.1 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 a 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 (images 29 and 30).

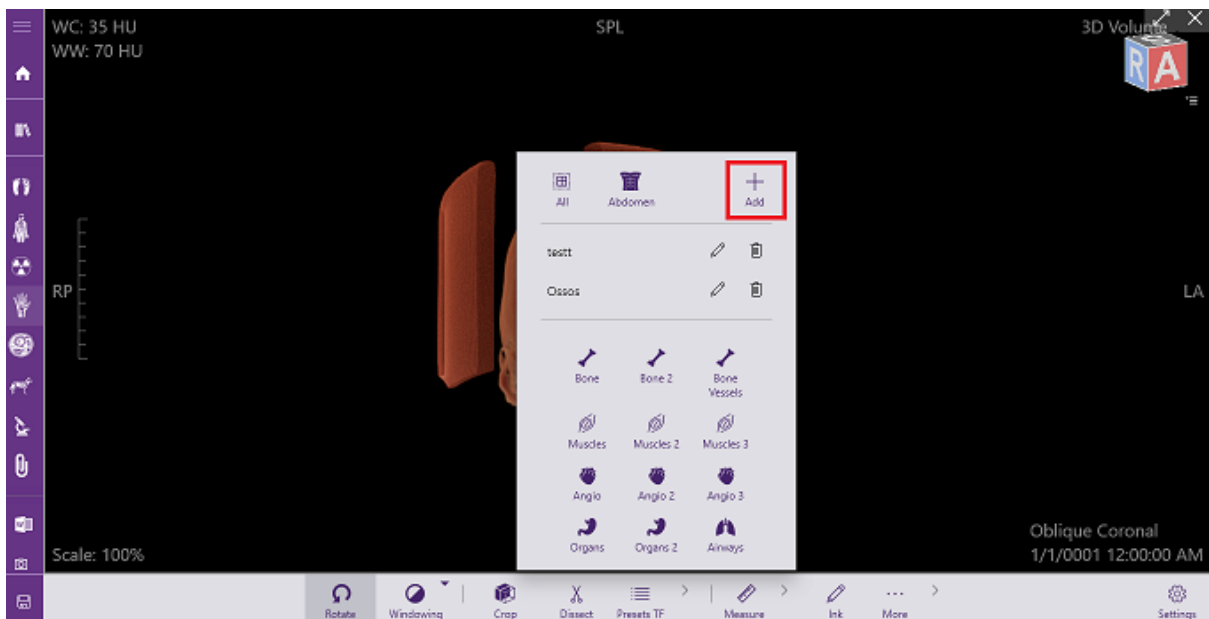


image 29 - Available TF presets and 'Add' function

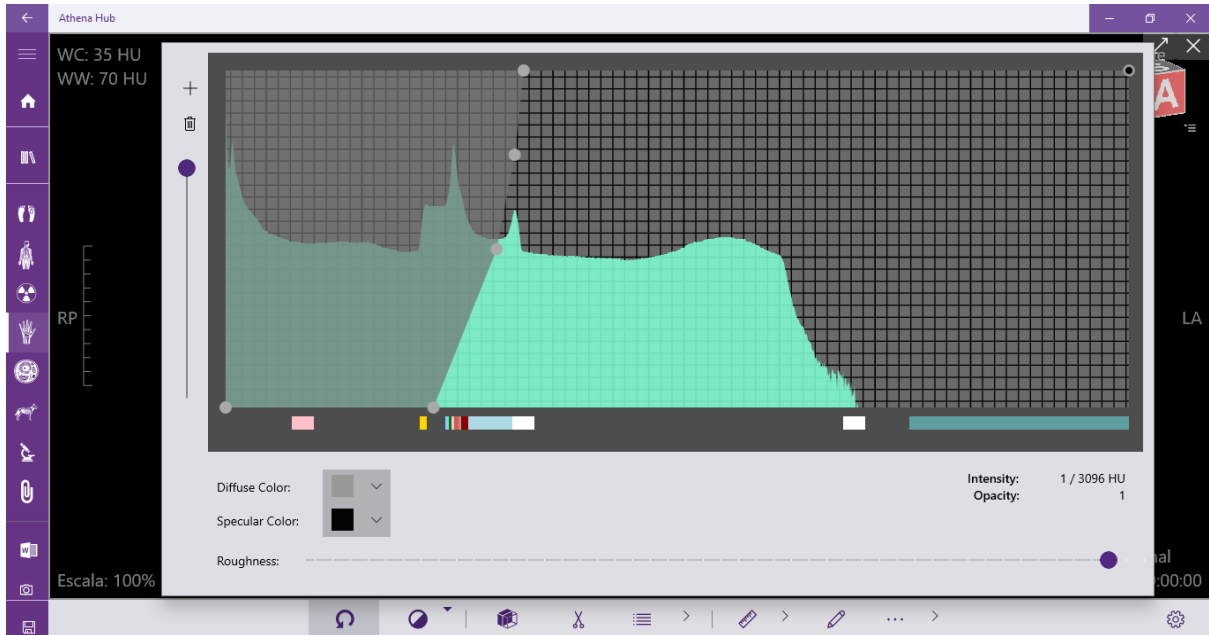


image 30 - Editing TF presets

4.6 Cytology

The cytology module (image 31) allows visualizing and interacting with three 3D models related to the eukaryotic cell, namely: animal cell (image 32), mitochondrion (image 33) and, cell membrane (image 34).

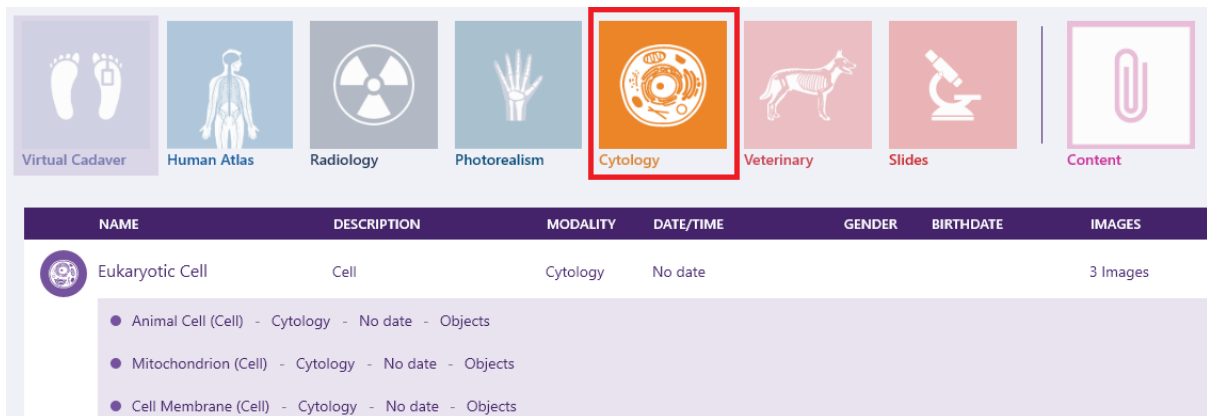


image 31 - Cytology module divisions

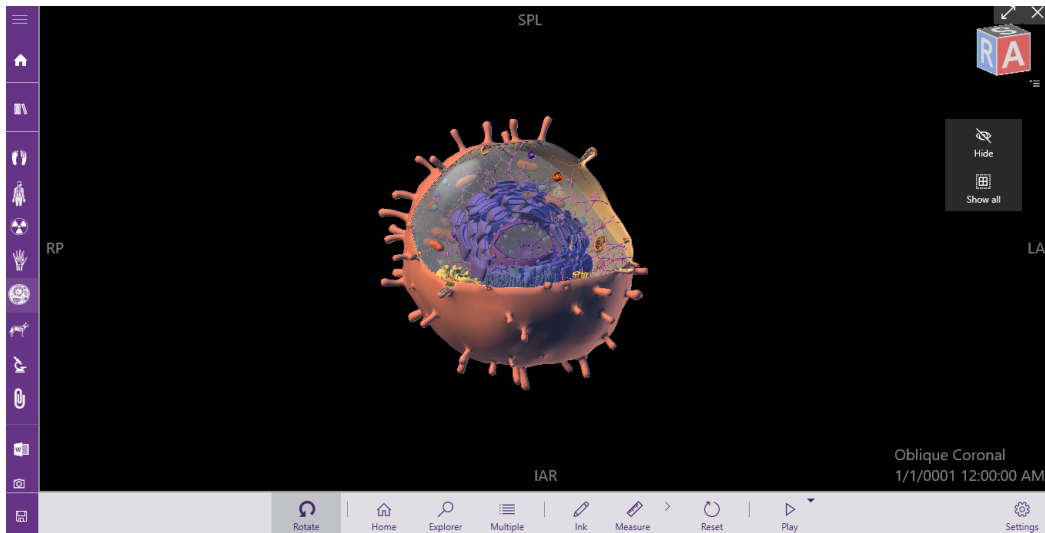


image 32 - Animal cell

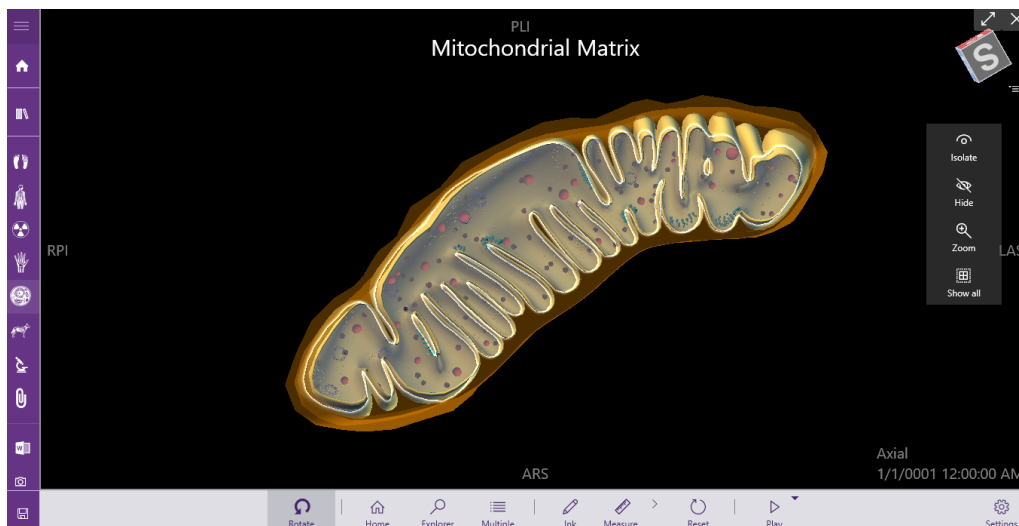


image 33 - mitochondrion

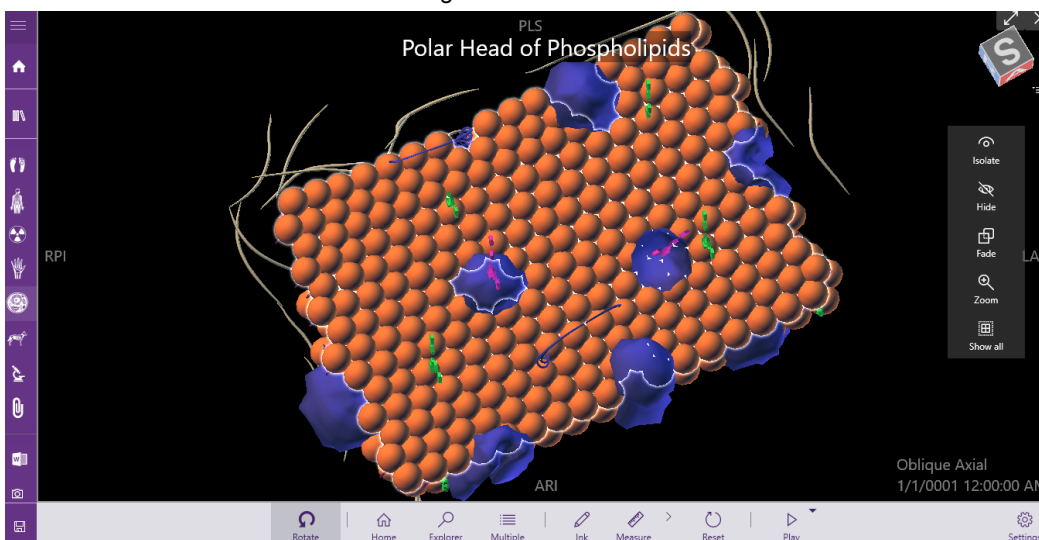


image 34 - cell membrane



4.7 Veterinary Atlas

With the Athena Hub Veterinary Atlas it is possible to visualize 8 different types of anatomies: avian, bovine, canine, feline, equine, rodent, anura, and porcine (image 35). 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 36). In addition to Atlas, Veterinary Mode also includes DICOM animal images for real case studies.

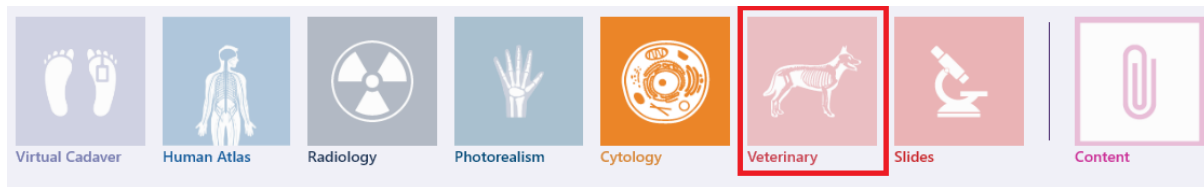


image 35 - Veterinary Atlas

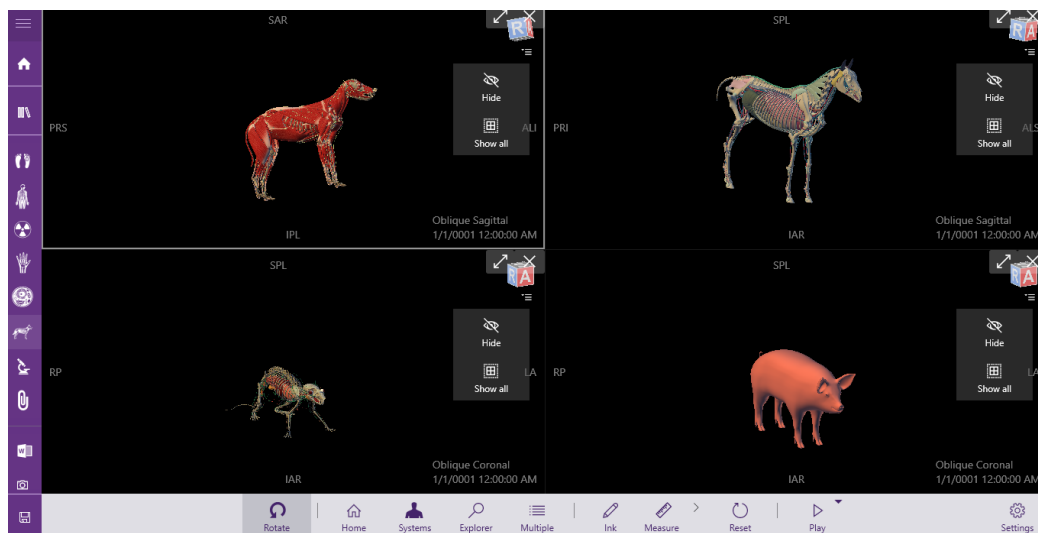


image 36 - examples of veterinary atlases with several active systems

4.8 Slides

The Slide module was created for opening various histology studies, including pathological studies. Slide module imaging can be downloaded from a PACS server, manually added, or downloaded from the Slides Knowledge Base (images 37 and 38). In the viewer, you can manipulate the image with the basic tools, color palette, and Ink.



image 37 - slide module

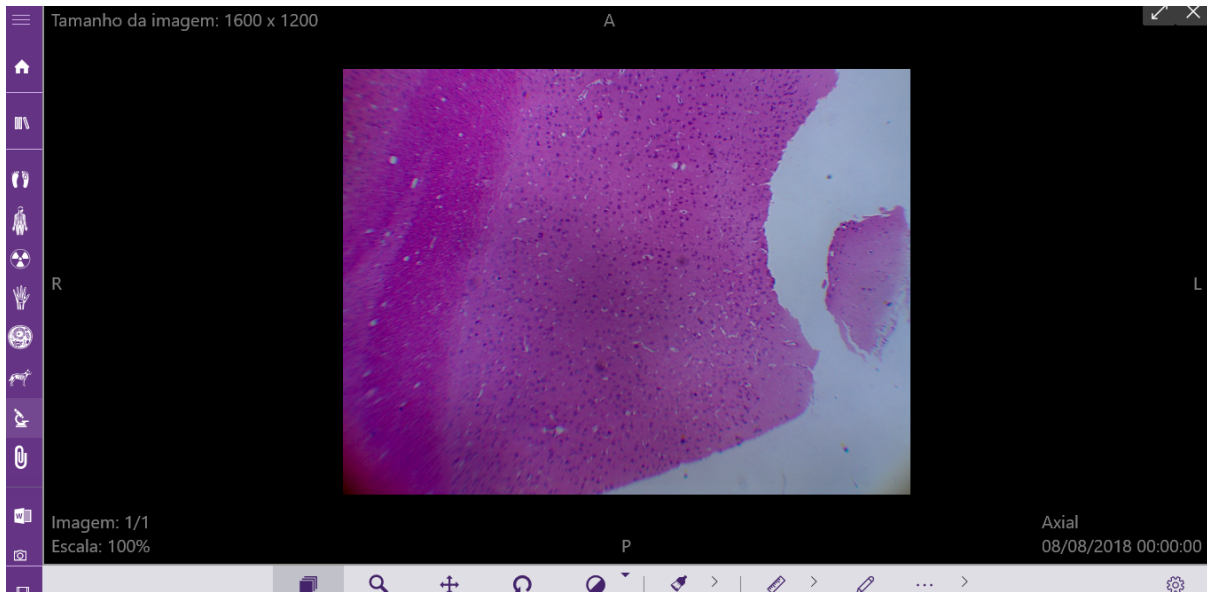


image 38 - histological imaging opened in the slide module

4.9 Contents

The contents tab allows any external documentation to be attached to Athena Hub to assist with studies. To start importing your contents to Athena Hub, simply access '**Contents**' and then '**Create Folder**' (image 39).

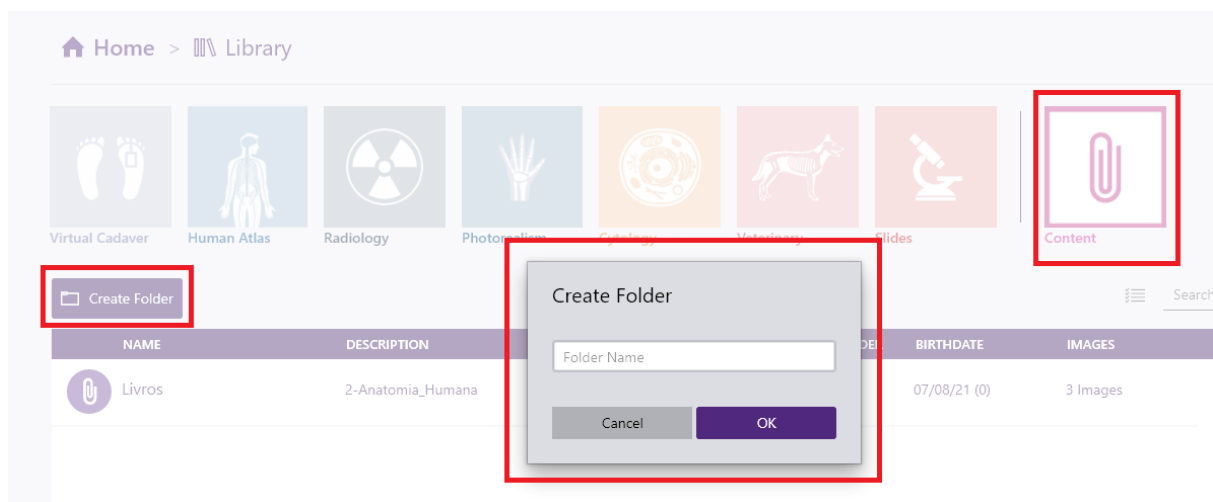


image 39 - Access 'Content' and how to create a folder

After naming the folder, right-click on it, and go to 'Import' to start adding contents to the software (image 40). Athena Hub accepts and opens directly in the viewer images in JPG, PNG, and BMP format and videos with the extension MP4, AVI, MOV, WMV, and FLV (image 41).

You can also add PDFs and other files to the content and they will open in your default browser.

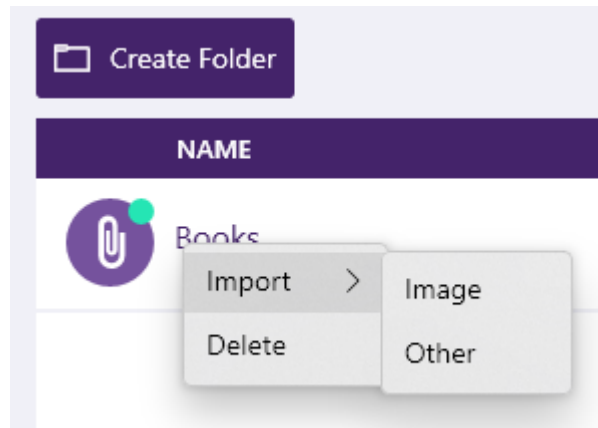


image 40 - import files into the contents tab

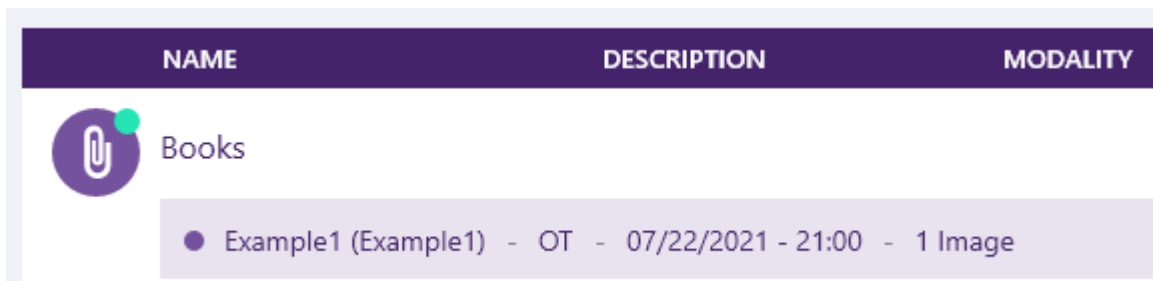


image 41 - organization of differentiated content

The image and video files will open in the viewer and you can manipulate and use it according to the demand of your study (image 42).



image 42 - PNG image opened in Athena Hub viewer



4.10 Tooltip

This feature was designed to provide quick access to a summary of an exam and contains all the information about a patient or a study/series. To access it, simply hold the *mouse* (without clicking) on the patient, or on the series of interest (image 43). It is available for the '**Radiology**' and '**Photorealism**' modules.

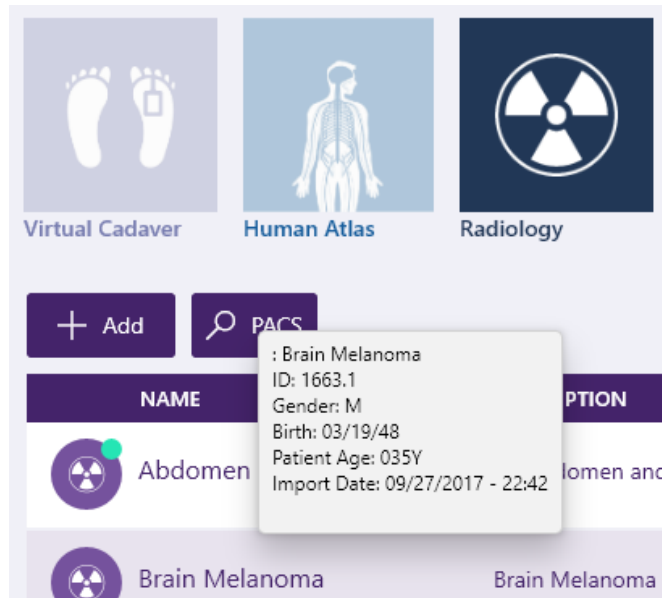


image 43 - Tooltip for radiological and photorealistic studies

4.11 Local Quick Search

The Athena has a search tab, which makes it possible to find a study already imported by name. The search displays all studies that have the word/letter somewhere in their name, in the search field. To access the local search, just type the desired term in the search bar located in the upper right corner (image 44).

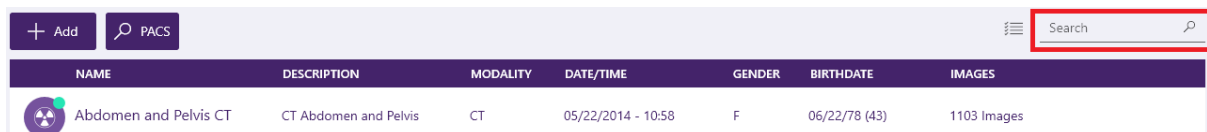


image 44 - local search bar location

4.12 Quick access

Quick access is a bar located to the left of the Athena Hub viewer, to facilitate opening content and other modules. For the modules 'Radiology', 'Photorealism' and 'Slides', you can access the most visited or most recent studies (image 45).

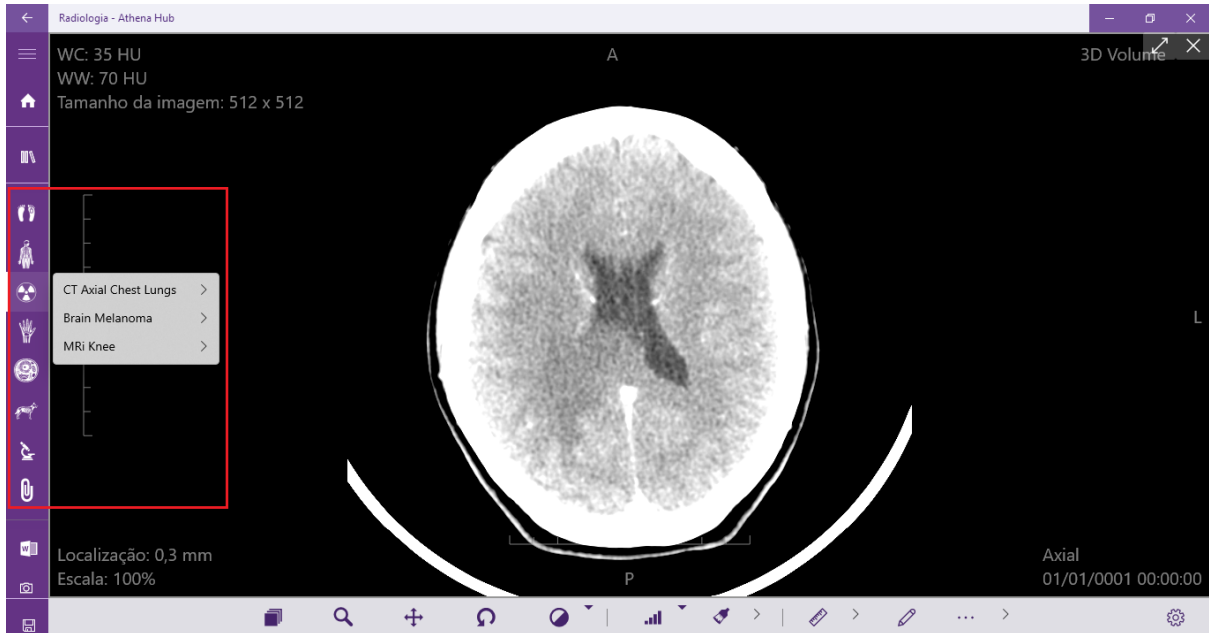


image 45 - quick access to Athena Hub modules

4.13 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 46).

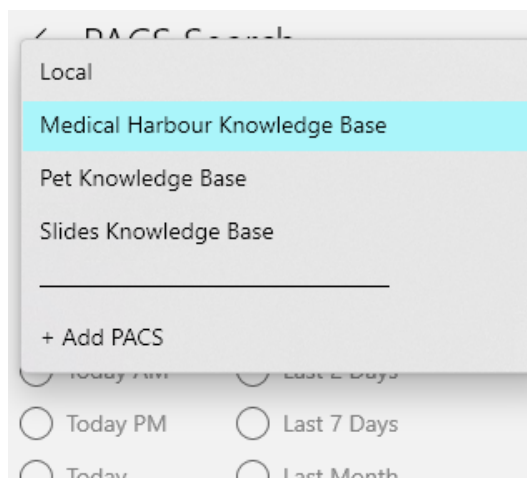


Image 46 - Athena Hub Knowledge Bases



5. Viewer

The Athena DICOM viewer is designed to be an advanced, dynamic, robust, and easy-to-use tool. It allows high productivity, helping and resulting in rich and lasting learning.

The viewer has different tools for each module available in Athena Hub. In addition, you can merge modules with the multi-series function, view several sections of the same imaging, and be guided by reference lines.

5.1.1 Multi-Series

Athena allows the visualization of several series simultaneously for all its modules. With the modules '**Virtual Corpse**', '**Radiology**' and '**Veterinary**', it is possible to compare the series of a study with other sections such as transversal, median, frontal or 3D reconstructions (X-ray, 3D MIP or Isosurface for DICOM studies) (image 47).

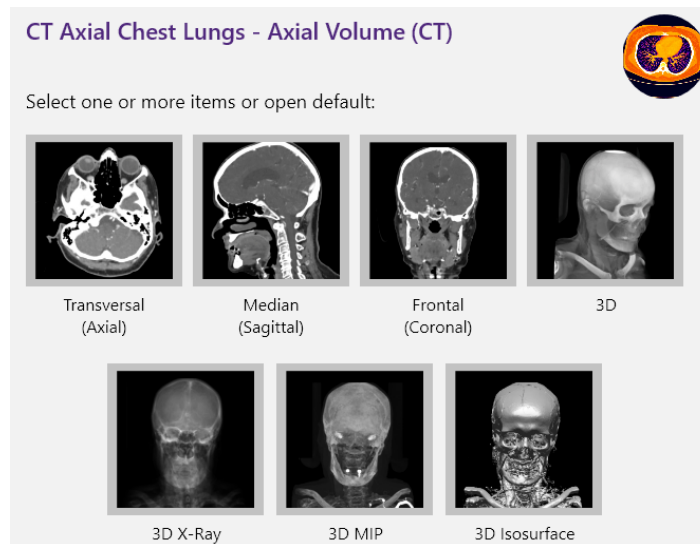


image 47 - Athena Hub multi-series opening

It is also possible to combine modules for an in-depth study of human and animal anatomy (image 48).

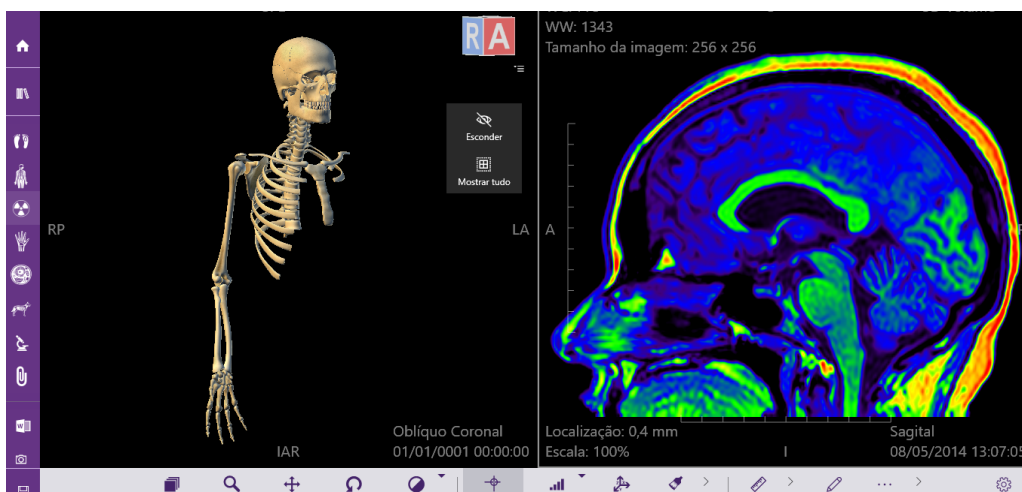


image 48 - visualization of two modules in Athena Hub



5.2 3D Mode

Athena Hub modules using DICOM (Radiology, Veterinary, and Virtual Cadaver) imaging can be built in 4 3D modes: Volume (default), MIP (Maximum Intensity Projection), XRay (X-Ray), and Isosurfaces. To access this function, just open the desired study and then choose the '3D' option for standard opening, or 'More Options' to choose the other options (image 49).

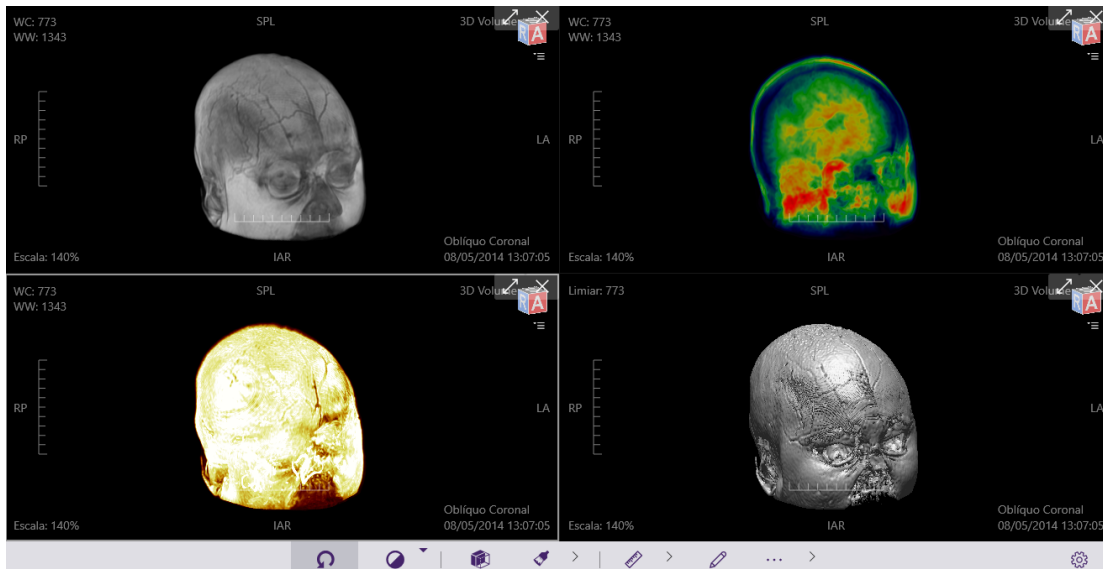


image 49 - Volumetric Reconstruction / X-Ray Reconstruction / MIP Reconstruction / Isosurface Reconstruction

Attention: For 'Virtual Corpse', only the default reconstruction is available.

5.5 Reference Lines

Wherever possible, Athena Hub will provide reference lines to guide users when viewing a study. Reference lines work with several variations of view combinations: transversal, median, and frontal (image 50).

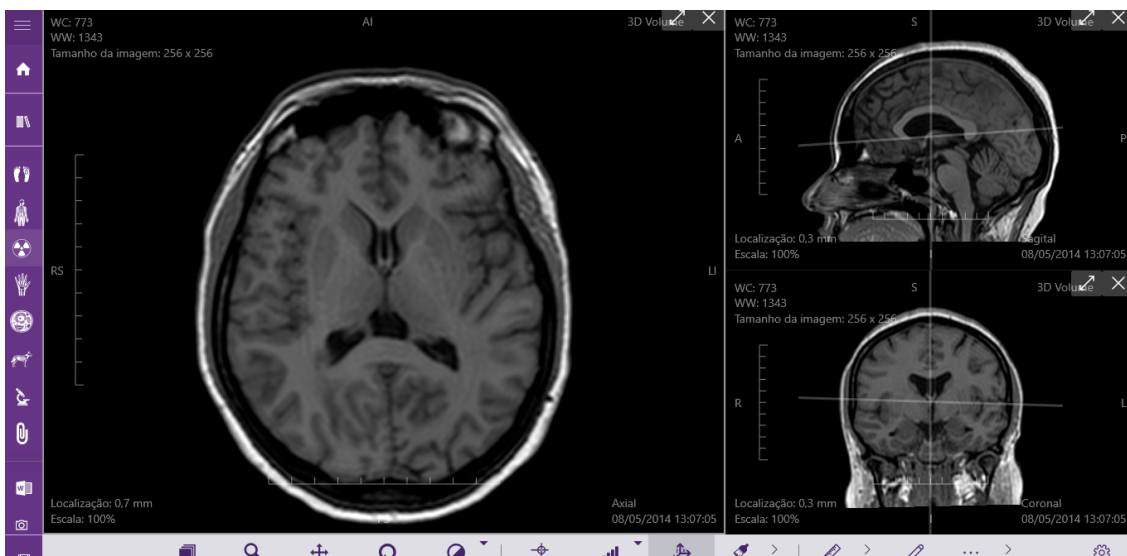


image 50 - Active reference lines



6. Workspace

While browsing Athena, you can save any visualization of 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 51).

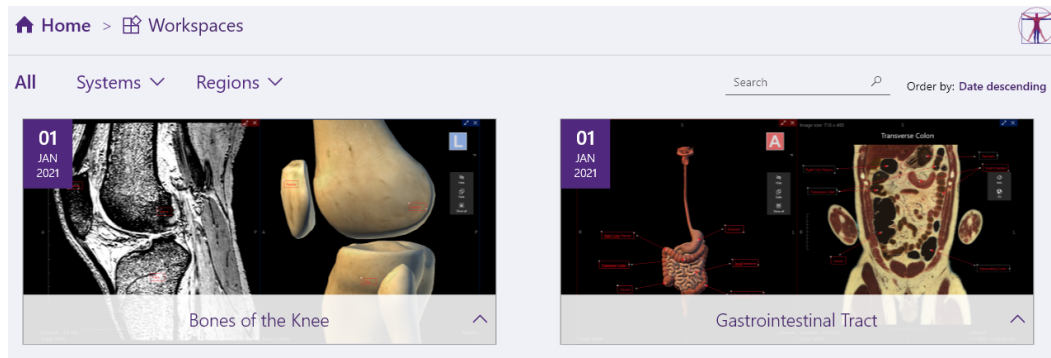



image 51 - Athena Hub Workspaces

6.1 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 52). 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.



Create Workspace

Name

Description

Systems

<input type="checkbox"/> Skeletal	<input type="checkbox"/> Muscular
<input type="checkbox"/> Digestive	<input type="checkbox"/> Respiratory
<input type="checkbox"/> Circulatory	<input type="checkbox"/> Nervous
<input type="checkbox"/> Urogenital	<input type="checkbox"/> Endocrine
<input type="checkbox"/> Lymphoid	<input type="checkbox"/> Articular

Regions

<input type="checkbox"/> Head and Neck	<input type="checkbox"/> Thorax
<input type="checkbox"/> Abdomen	<input type="checkbox"/> Pelvis
<input type="checkbox"/> Upper Limb Left	<input type="checkbox"/> Upper Limb Right
<input type="checkbox"/> Lower Limb Left	<input type="checkbox"/> Lower Limb Right
<input type="checkbox"/> Back	

image 52 - fillable fields for creating a Workspace

6.2 Workspace Knowledge Base

The Workspace Knowledge Base is an area with pre-selected studies that are already available when you download the software. To access them, just open the Workspace page and look for a study of interest. In the **Workspace Knowledge Base**, you can find studies of specific regions, combinations of contents, divisions by systems and regions, and even veterinary anatomical studies.

6.3 Import/Export Knowledge Base

To import a Workspace you will find a '+' icon in the lower right corner of the screen (image 53).

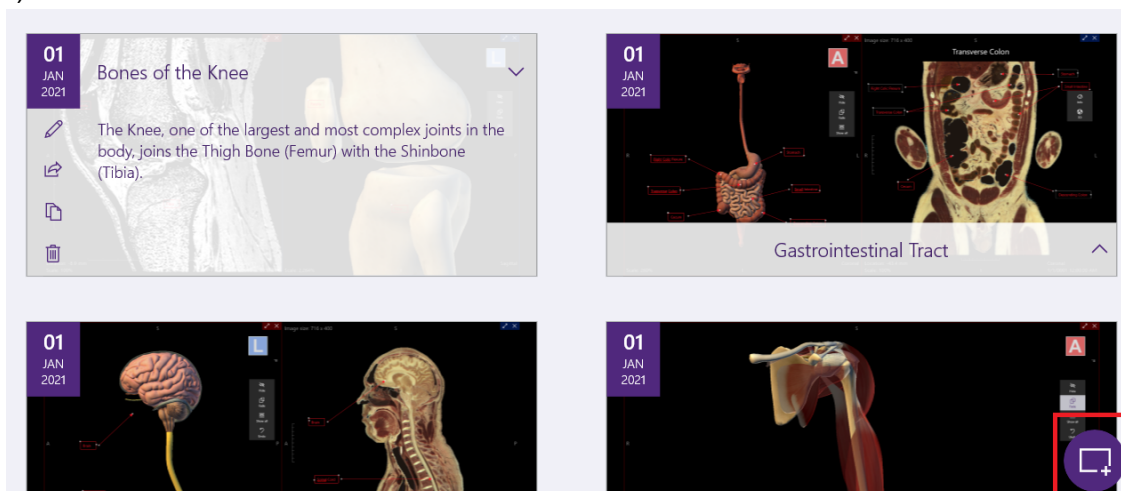


image 53 - location of 'add Workspace' tool on Athena Hub



You can only add space files with the .hub extension, which is the Athena Hub software's own, to the Workspace.

6.3.1 Export Workspace

To export a workspace, you must click on the arrow present in each space. Then select the 'Export' arrow (image 54).

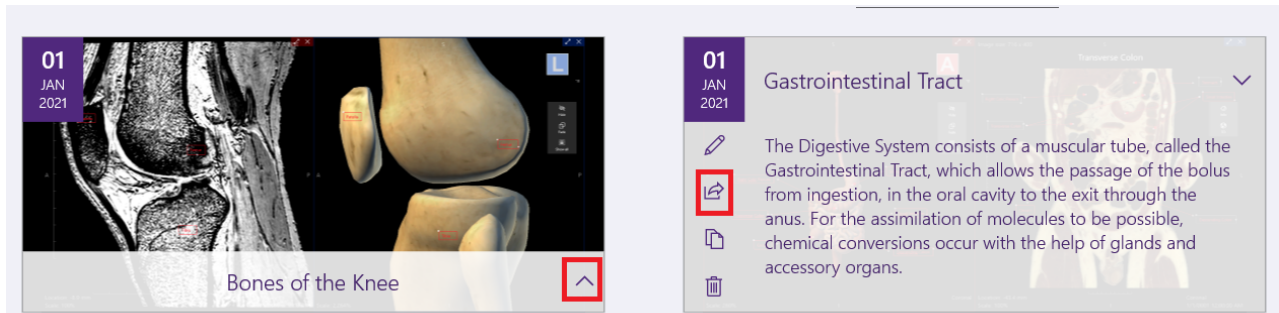


image 54 - 'more options' arrow present in each Workspace and 'export' icon

By clicking on '**Export**', you will have to choose which folder the file will be sent to. This folder will save a file with a .hub extension that can be opened on other computers that have Athena Hub installed (image 55).

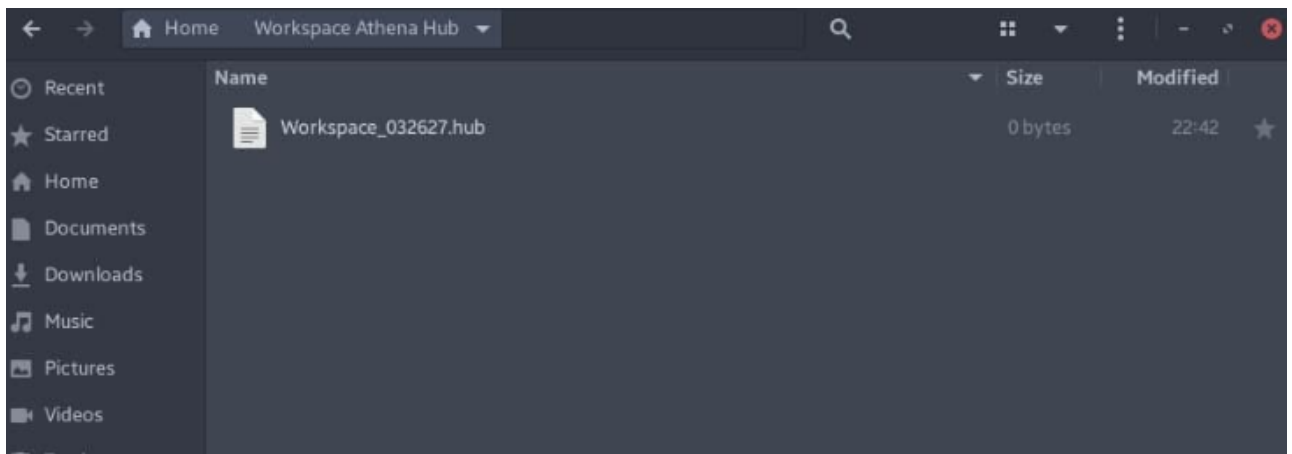


image 55 - Workspace imported to the selected folder

7. 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 56).



image 56 - toolbar in Athena Hub



7.1 Play

Play is a feature that allows you to automatically scroll all the imagings of a series. 'Play' can be played or paused in any view and any Hub module. To access it just click on 'More' and then on 'Play'. You can select the playback speed and restart it whenever necessary (image 57).

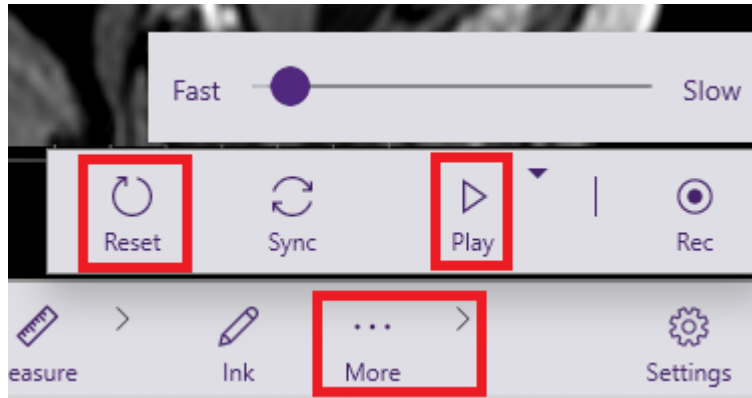


image 57 - play and restart tool

7.1.1 Record

With the 'Record' tool, it is possible to record on video all the modifications made to a study. It's a great tool to conduct video lessons and reinforce anatomy lessons. To access it just go to 'More' and then 'Rec'.

7.2 Zoom

You can zoom in on a study's imaging to make certain details easier to see. With this tool, it is possible to drag the zoom in any view without any intervention, as well as to reduce the imaging. To use the 'Zoom' function, just select it in the toolbar, click and drag the mouse on the preview screen (image 58).

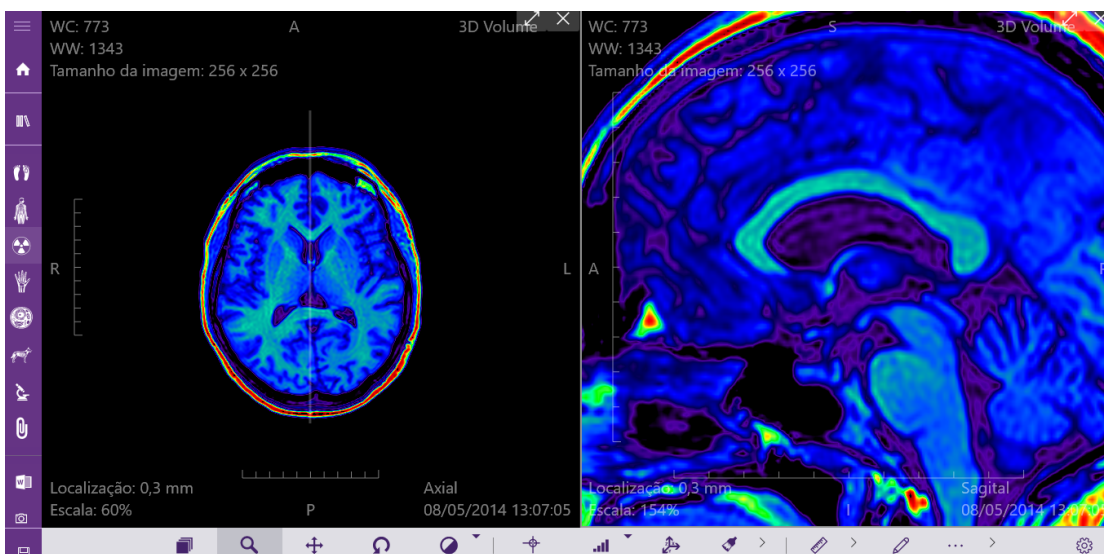



image 58 - 150% zoomed imaging



7.3 Copy to clipboard

In Athena, it is possible to copy the current image of a open view to the clipboard by simply clicking on the  left menu. In this way, you can paste the copied imaging into Word or any other desired document.

7.4 Basic tools


Athena's 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 59).



image 59 - Basic Athena Hub tools.


7.4.1 Scroll

The '**Scroll**' tool is available in any DICOM imaging opening mode. You can also select the

button  in the bottom menu, click and drag up or down on the viewer screen.


7.4.2 Move

The "**Move**" tool is available in all modes, including 3D. To use it is possible to select the

option  present in the lower menu of the tool, click and drag in any direction. It is also possible to apply the tool by using a two-finger touch and moving if your screen is touch-sensitive.


7.4.3 Rotate

The '**Rotate**' tool is also available in all modes including 3D. You can access this function by

selecting , in the lower menu, clicking and dragging in any direction. You can also "Rotate" by touching with two fingers and rotating, in case your screen is touch-sensitive. The behavior of this tool is different between 2D mode and 3D mode.

7.4.4 Windowing

The "**Windowing**" tool is available in all modes, including 3D. To apply this function it is

necessary to select the button  present in the lower menu, click and drag in any direction. Window width (WW) is applied by using the left-right direction and center of the window (WC) using the up and down direction.



7.4.5 Color Palettes (CLUT)

Athena provides a list of Color Palettes (CLUT) that can be applied to either 2D or 3D viewing modes. To access them, just click on '**Palettes**' and then choose the desired filter (image 60). It applies to the selected view, or all views if the sync function is active.

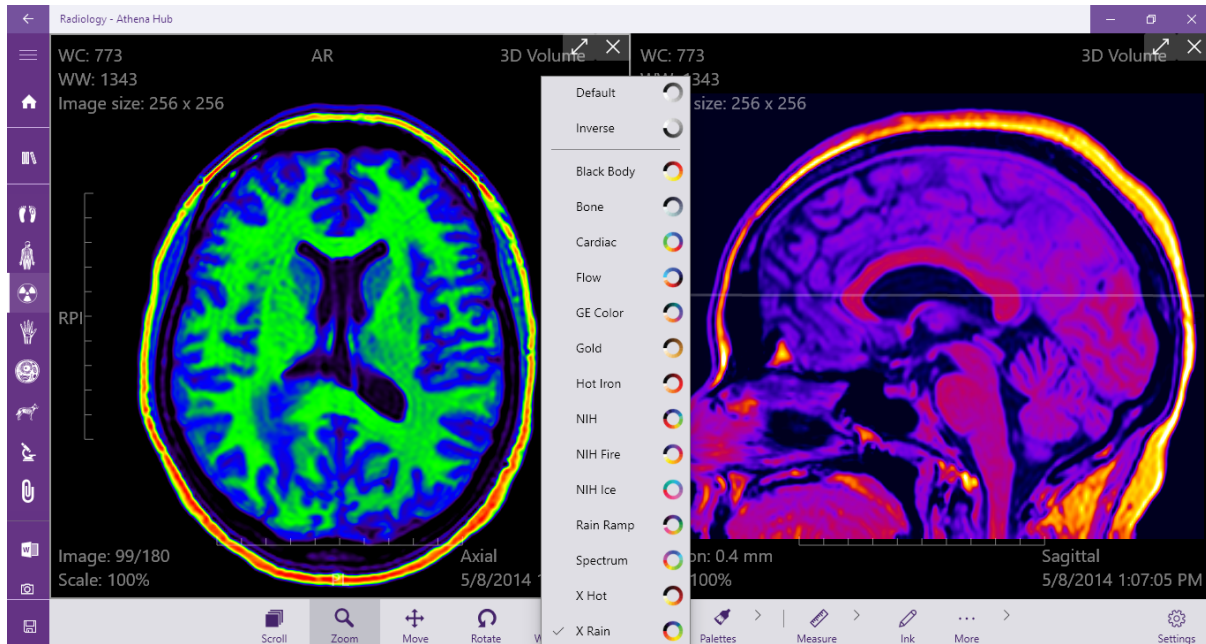



image 60 - palette options

7.5 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**.

7.5.1 Synchronization

Sync is a feature for zooming, scrolling, moving, rotating, windowing, and applying palettes for all open views. This functionality allows you to replicate the procedure for all views. To

enable it click  .

7.5.2 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 61).



image 61 - Athena POI (point of interest) tool

7.5.3 Cut 3D (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 62).

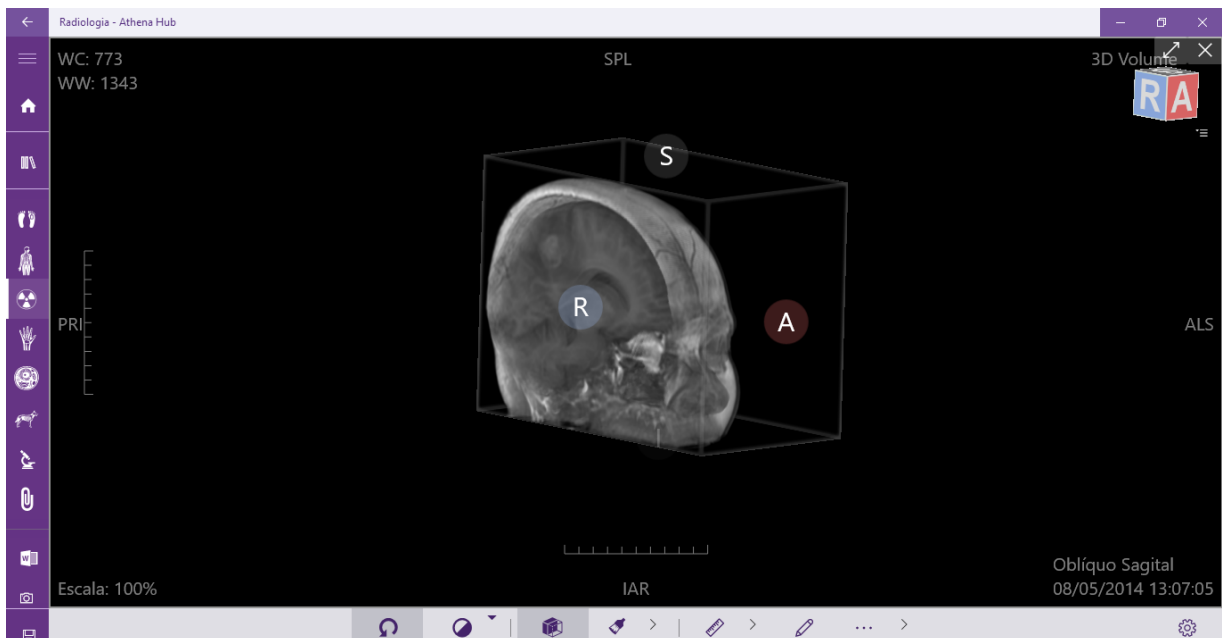


image 62 - Crop tool active in Athena viewer.



7.5.5 Maximum Intensity Projection (MIP)

MIP is a feature that designs the highest attenuated voxel on all views and volume for 2D imaging. With MIP, it is possible to find all hyperdense 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 63).



image 63 - Maximum Intensity Projection Tool (MIP) active in Athena

7.5.6 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" (Figure 64).

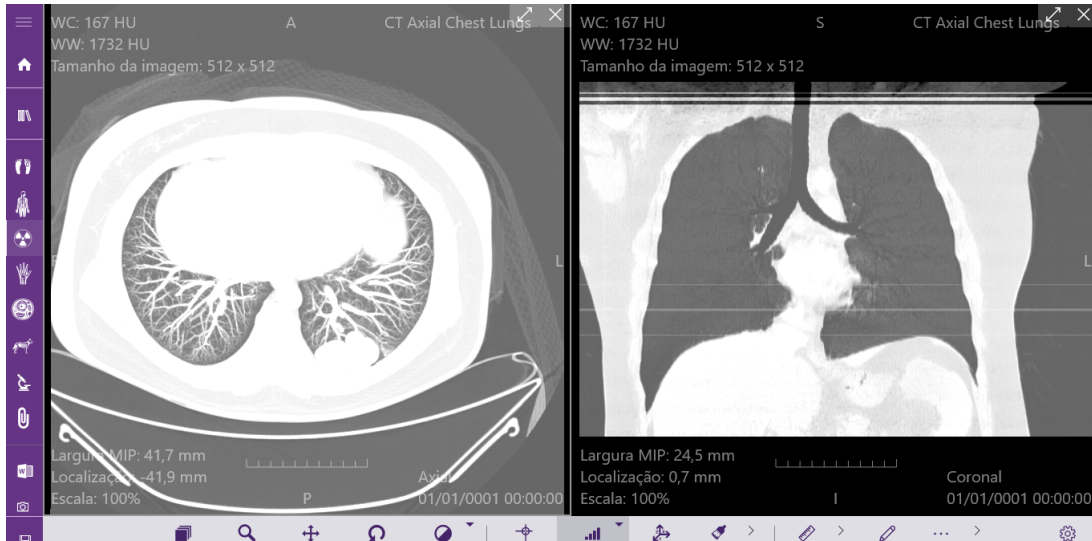


image 64 - Maximum Intensity Projection Tool (MIP) active in Athena

7.5.6 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 require different angles or positions.



To use click **Rotate MPR** 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 (image 65).



image 65 - Rotate MPR active on Athena Hub



6.9 Atlas Tools

The '**Human Atlas**', '**Cytology**' and '**Veterinary**' modules share some common tools. In them you will find the functions: Rotate, Explorer, Multiple, Isolate, Hide, Fade, Zoom and Show all.

7.6.1 Isolate

Isolate allows you to view only the selected anatomical part. This option allows one to carry out a specific study of the selected parts (image 66).

7.6.2 Zoom

The **Zoom option** enlarges the view at the selected anatomical part. This option facilitates detailed visualization of the anatomical part and helps to identify its location in the human body (image 66).

7.6.3 Hide

The **Hide** option hides selected anatomical parts, making it easier to see certain structures. This option is very useful for visualizing internal structures of the human body allowing the dissection in the Anatomical Atlas (image 66).

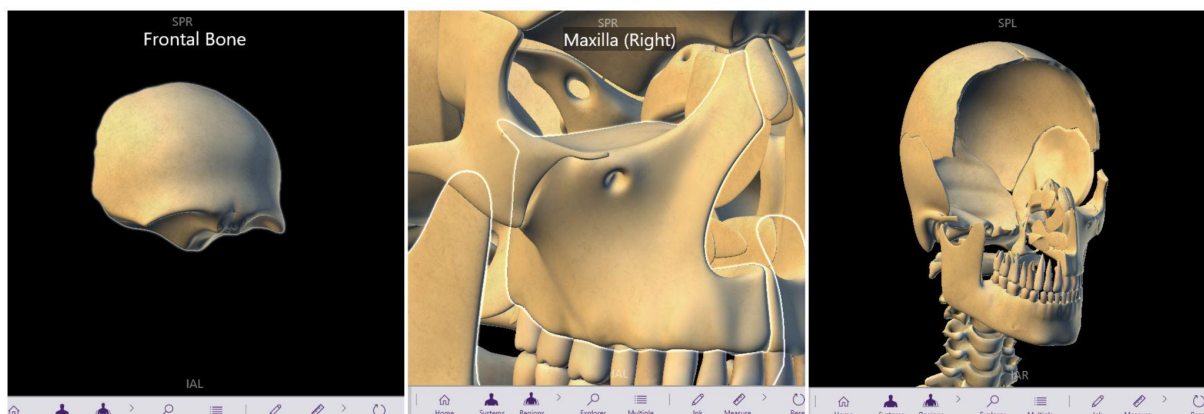


Image 66 - Anatomical Atlas View Menu: Isolated/Zoom/Hide Mode

7.6.4 Show all

The Show All option restores the visualization of the hidden anatomical parts.

7.6.5 Undo

The Undo function allows you to restore the view of the last hidden object.

7.6.6 Fade

With the 'Fade' tool, some parts of the atlas can be made transparent. To activate it, just select the desired part and then click on 'Fade' in the right side menu of the viewer (image 67).

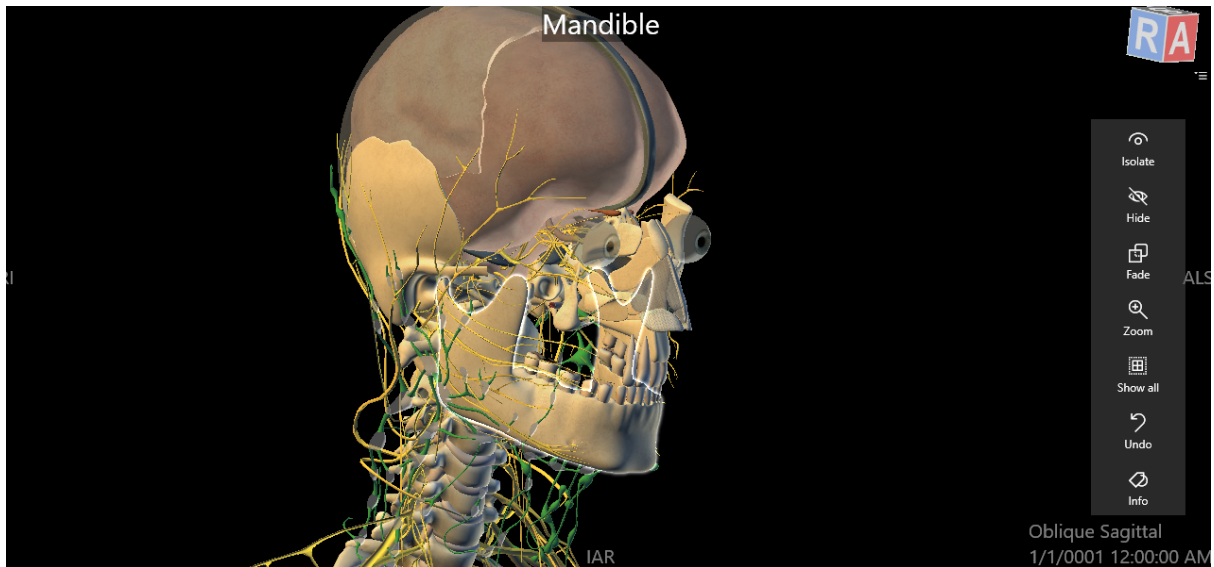


Image 67 - Fade tool active in Athena Hub

7.6.7 Explorer

The **Explorer** tool is a menu designed to search for specific anatomical parts. With this tool, you can use the search bar or explore the anatomical parts available in the menu. The menu displays only the anatomical parts for the active anatomical systems and according to the selected model (Male / Female) (Figure 68).

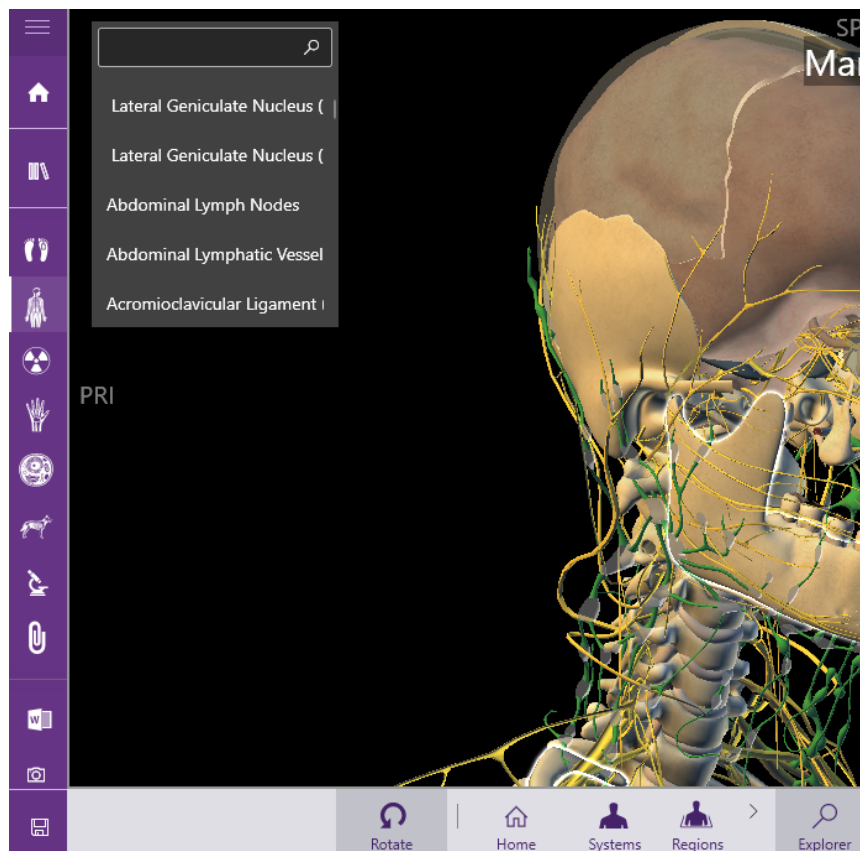


image 68 - explorer menu to search structures



7.6.8 Multiple

With the '**Multiple**' tool active, it is possible to select several anatomical parts and apply the functions available in the right side menu in preview mode (image 69).

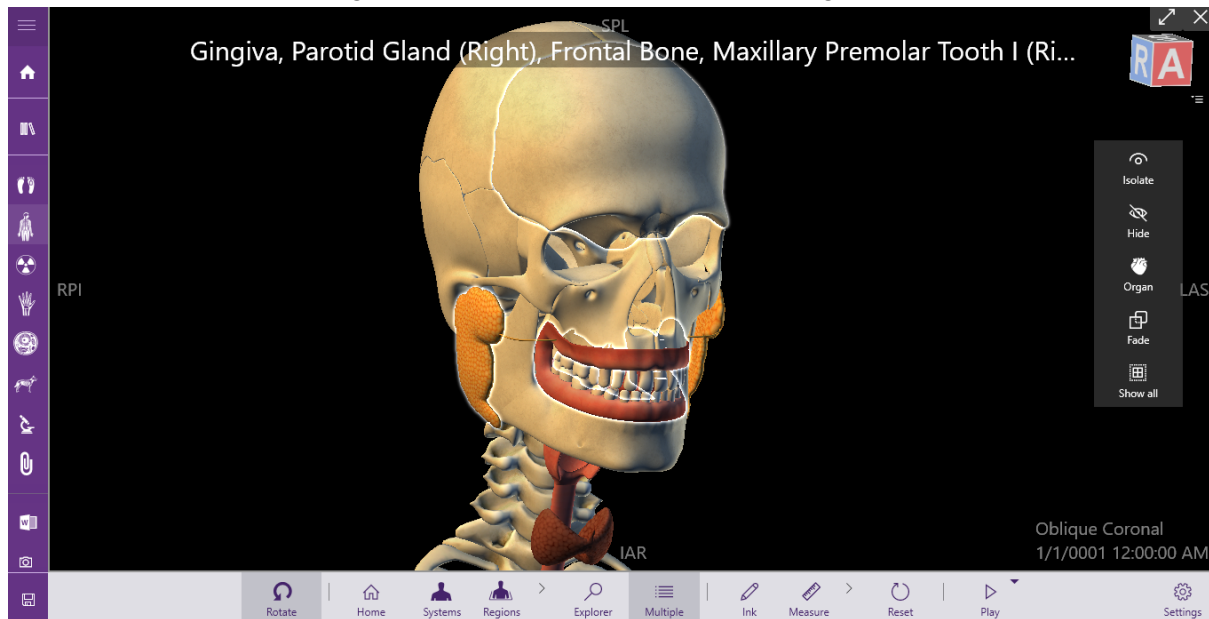


image 69 - 'Multiple' tool active

7.6.9 Rotate

The Atlas '**Rotate**' tool has the same objective as in other modules. With it, you can rotate the human, animal, or cell anatomy by selecting the option in the lower toolbar and dragging the mouse on the screen.

7.6.10 Human Atlas Tools

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

With 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 70). To access the other languages, it is necessary to change the software language and restart it.

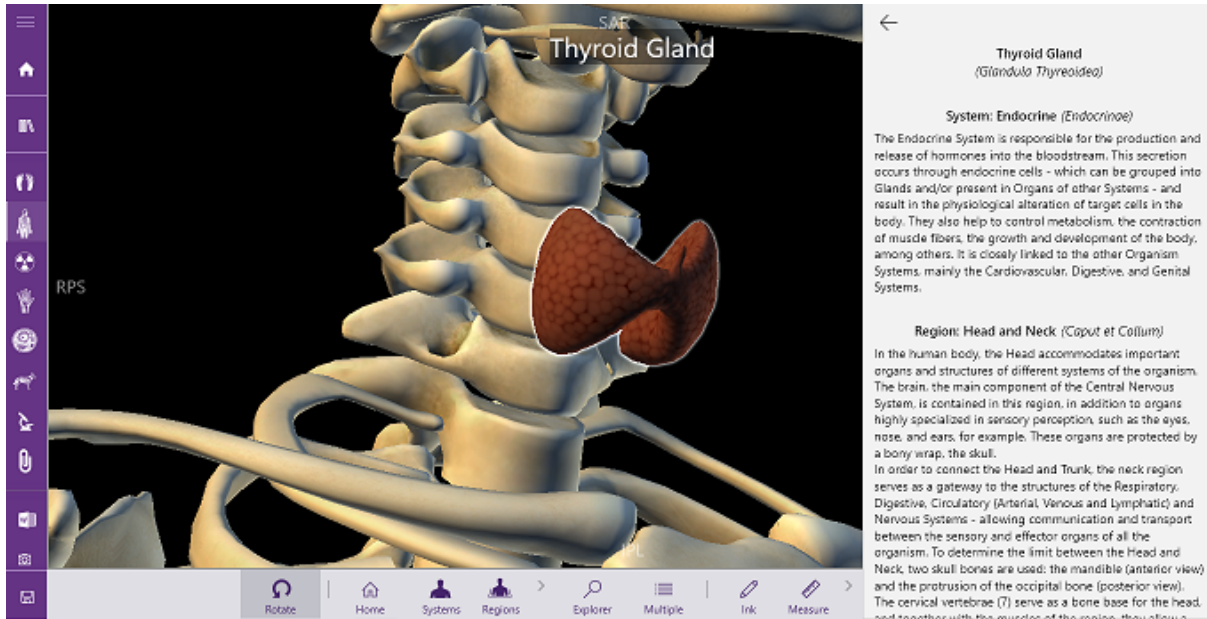


image 70 - Information from the thyroid gland and the Head and Neck region

7.6.11 Cytology Tools

The Cytology module has its own tool for visualizing structures. The '**Organelle**' tool works similarly to the 'Isolate' tool by separating only the cell's organelles to facilitate their study (image 71).

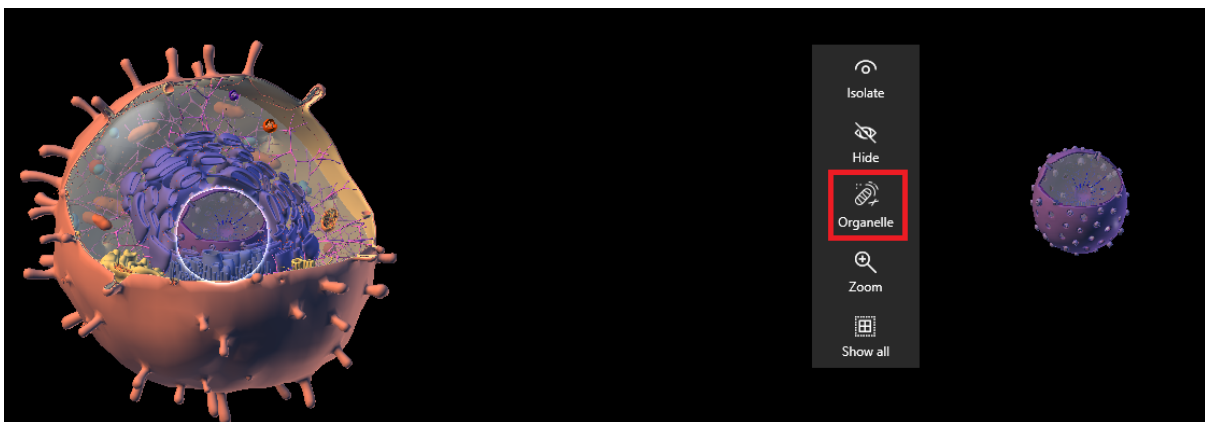


image 71 - organelle tool before and after being activated

7.7 Photorealism Tools

In addition to the transfer function and the Crop tool, the '**Photorealism**' module has the '**Dissect**' tool. It is essentially an Advanced Crop and with it, it's possible to crop in a freehand style specific parts of the imaging recreated with Photorealism. The '**Dissect**' tool has a menu to facilitate tool navigation (image 72).

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

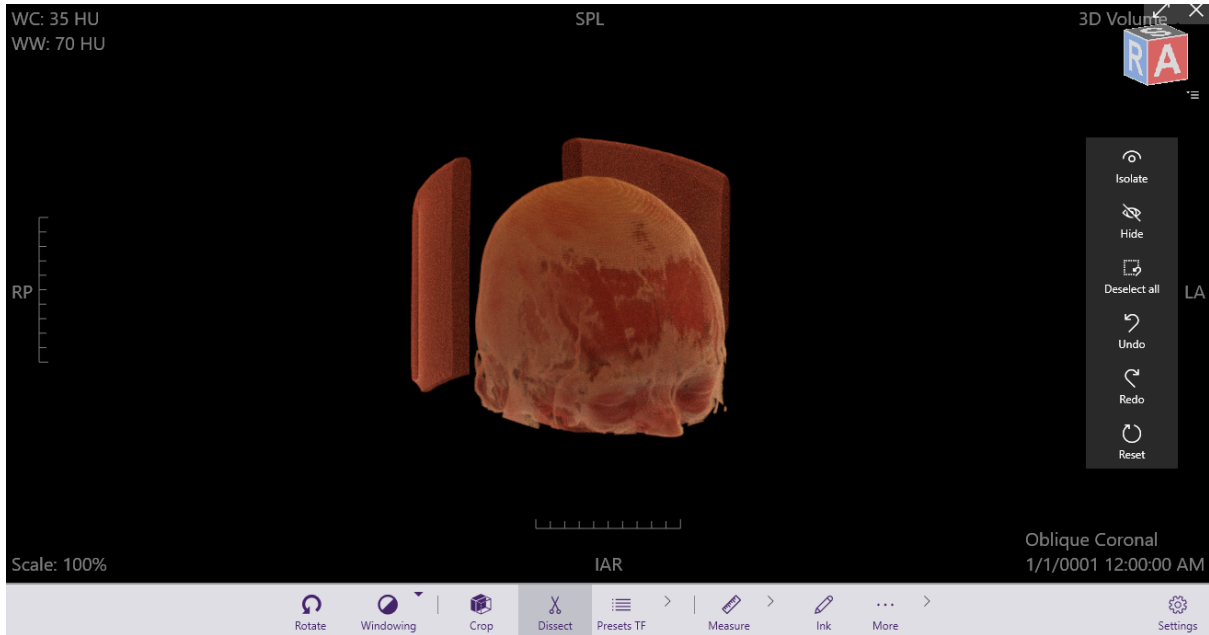


image 72 - Dissect tool and its menu

8. Annotations

Athena Hub has a set of very useful annotation tools, some of which contain measurements in millimeters, area, perimeter, minimum, maximum, medium, standard deviation, and even angles between consecutive or separate lines. You can add, edit or remove any annotation, even in 3D mode and in any module. To select a type of annotation just click on **'Measures'**

and select the desired annotation. To change the color, just go to  Color (image 73).

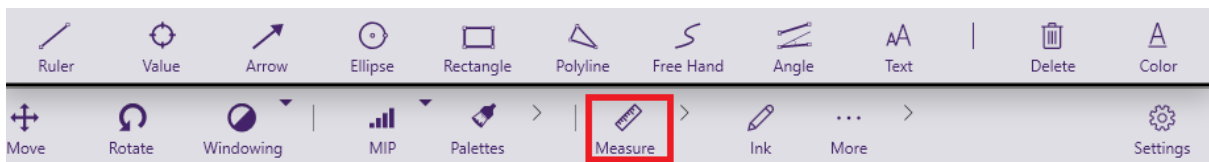



image 73 - Athena Hub measurement tools

8.1 Ruler

To access, simply click on the right arrow of the note selection button and select  Ruler . This annotation tool shows the measurement in millimeters of a line (image 74). To use this tool simply click and drag the annotation in the region of interest of the imaging and a line with the size value in millimeters will be displayed.

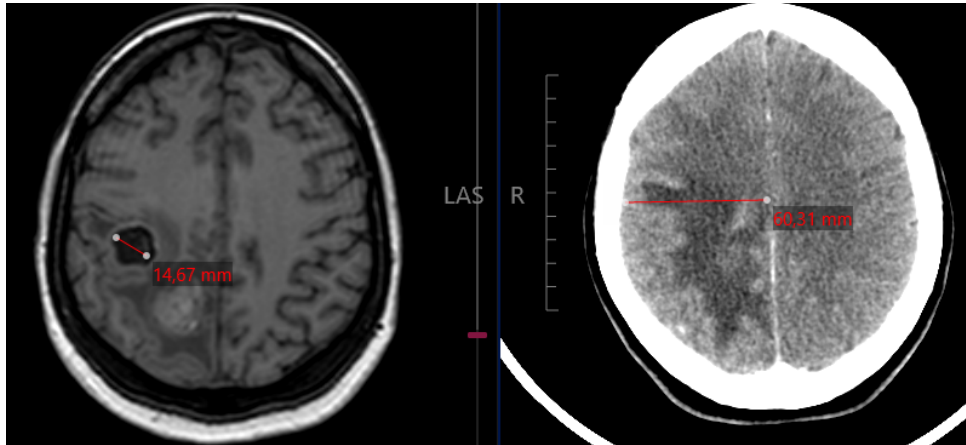


image 74 - Ruler tool positioned on a magnetic resonance image (left) and computed tomography (right) on the Athena.

8.2 Value

This annotation tool displays the Hounsfield value (TC) or gross value (other modalities) of a point (image 75). To access, simply click on the right arrow of the note selection button and



select **Value**. To use this tool click on the region of interest of the image and a cross will be positioned, indicating the region and a text box indicating the value.

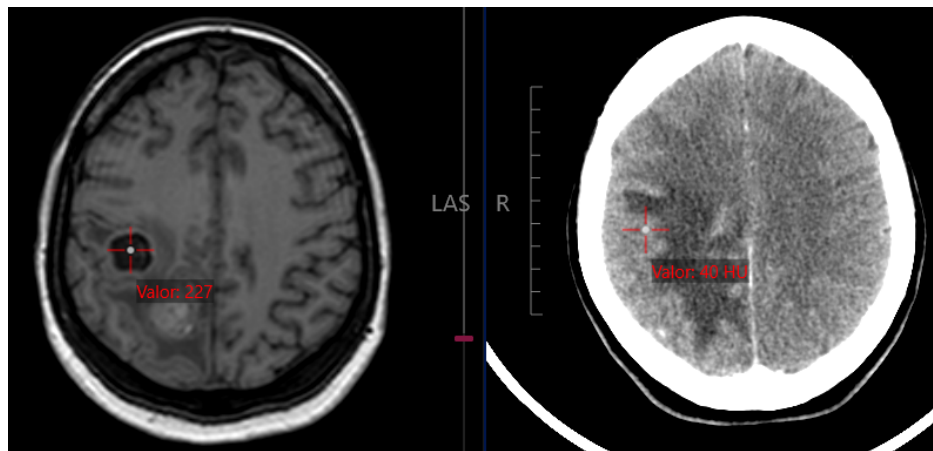



image 75 - Value tool placed on a MRI (left) and CT (right) image on the Athena.

8.3 Arrow

To access, simply click on the right arrow of the note selection button and select  **Arrow**. This annotation tool displays the Hounsfield value of a point with an arrow (image 76). To use this tool just click and drag the annotation in the region of interest of the image and the value referring to the arrow will be displayed.

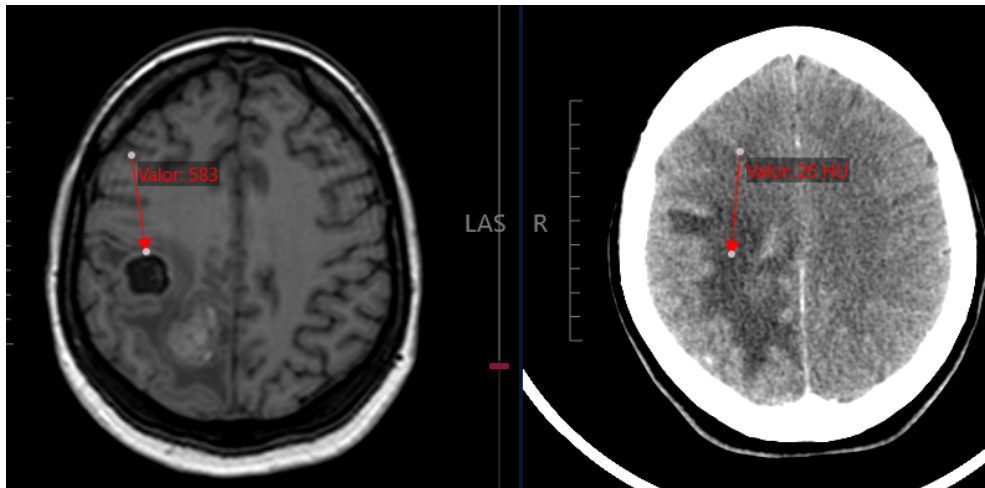



image 76 - Arrow tool positioned on a magnetic resonance image (left) and computed tomography (right) on the Athena.

8.4 Ellipse

This annotation tool displays an ellipse with its area, perimeter, minimum, maximum, medium, and standard deviation of the Hounsfield values within their boundaries (image 77).

To access, simply click on the right arrow of the note selection button and select  . To use this tool simply click and drag the annotation in the region of interest of the image and an ellipse and text box with information about the region will be displayed.

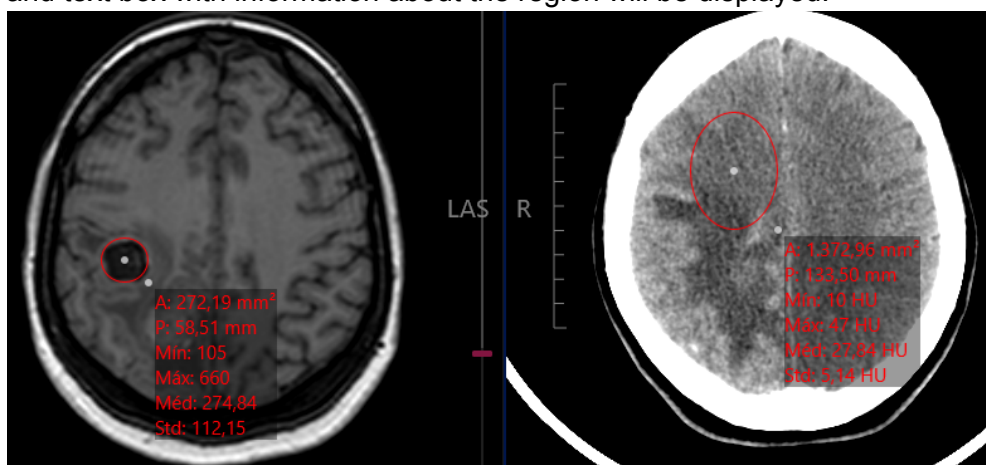



image 77 - Ellipse tool placed on an MR (left) and CT (right) image in Athena.

8.5 Rectangle

This annotation tool displays a rectangle with its area, perimeter, minimum, maximum, mean, and standard deviation of the Hounsfield scale within its limits (image 78). To access, simply

click on the right arrow of the note selection button and select  .

To use this tool simply click and drag the annotation in the region of interest of the image and an ellipse and text box with information about the region will be displayed.

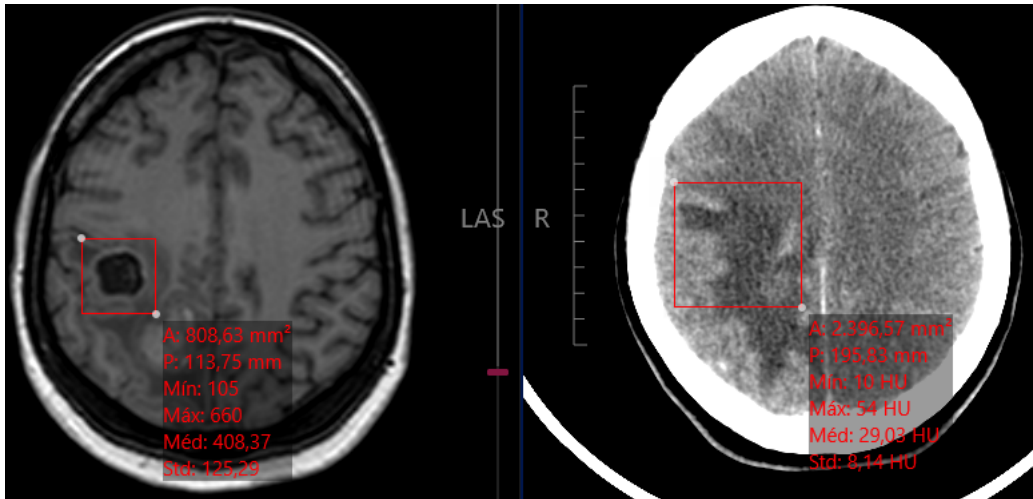



image 78 - Rectangle tool placed on a MRI (left) and CT (right) image on the Athena.

8.6 Polyline

This annotation tool displays an ellipse with its area, perimeter, minimum, maximum, medium, and standard deviation of the Hounsfield values within their boundaries (image 79).

To access, simply click on the right arrow of the note selection button and select  Polyline . To use this tool simply click and draw the annotation until you close the shape in the white circle. After that, the drawn form and a text box with the information about the region will be displayed.

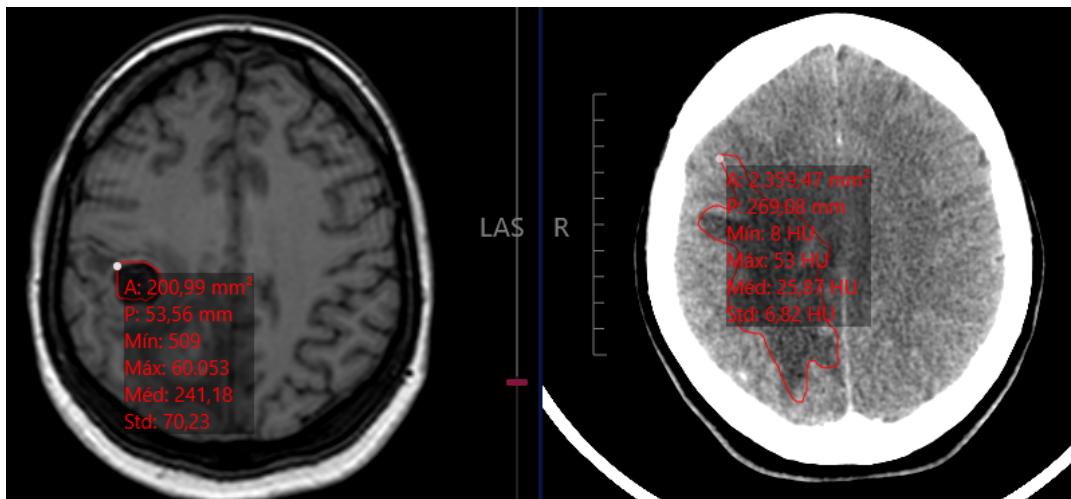


image 79 - Polyline tool positioned on an MRI (left) and CT (right) image on the Athena.

8.7 Freehand

This annotation tool lets you draw any shape on the screen, freehand and without values (image 80). To access, simply click on the right arrow of the note selection button and select



Free Hand . To use this tool just click and draw the desired shape.

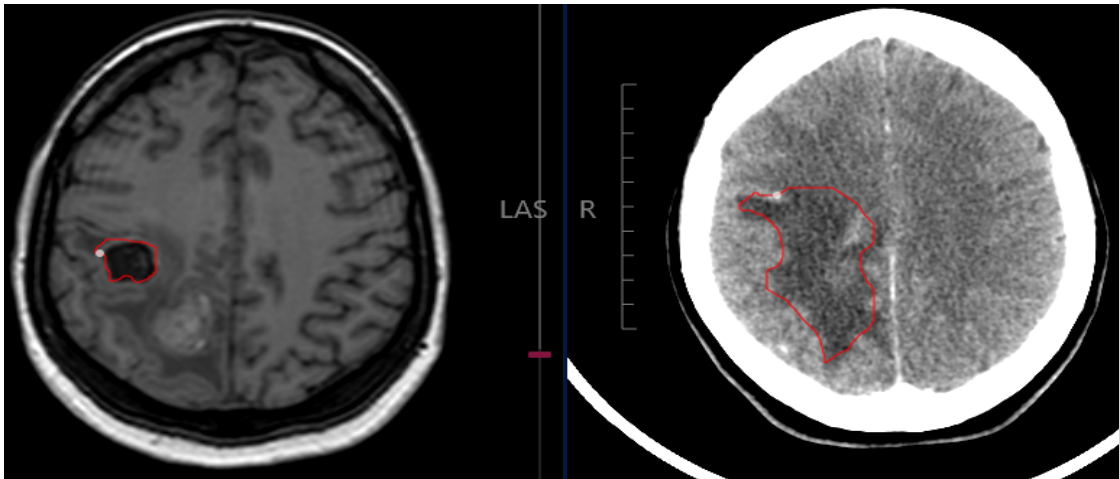


image 80 - Freehand tool positioned on an MRI (left) and CT (right) image on the Athena.

8.8 Angle

This annotation tool allows an angle measurement to be added between two lines formed over the image region of interest (image 81). To access, simply click on the right arrow of the



note selection button and select **Angle**. To use this tool just click and drag the first line, and then click and drag the second line again from the first formed point (white circle). The information of the angle formed between the two drawn lines will be displayed.

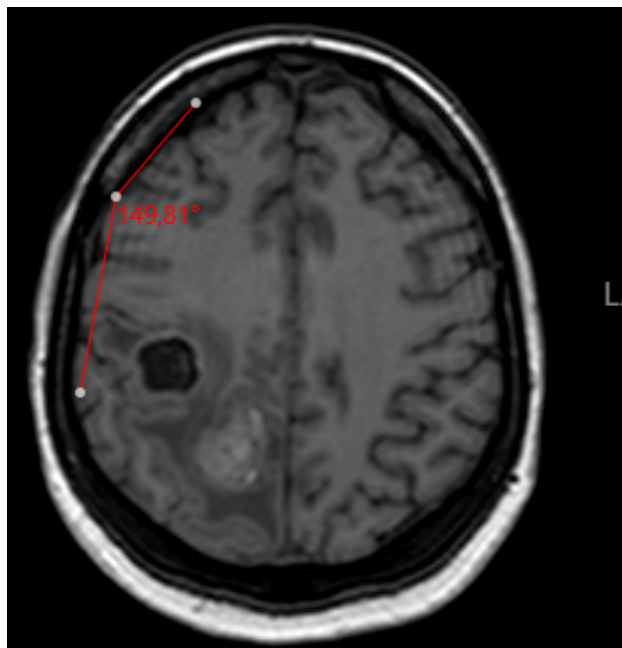


image 81 - Angle tool placed on an image in Athena.



8.9 Text

This annotation tool allows a text box to be added over the image region of interest (image



82). To access, simply click on the right arrow of the note selection button and select . To use this tool simply click and drag the annotation in the region of interest of the image and an ellipse and text box with information about the region will be displayed. To edit the text just click inside the text box and enter the information of interest.



image 82 - Text tool placed on an image in Athena

8.10 Delete




By selecting the function Athena Hub allows all annotations to be deleted with one click.

8.11 Ink



The annotation tool lets you draw and mark any image in the Athena viewer. This tool is very useful for sketching explanations directly on images.

You can use the pen , pencil , highlighter,  and eraser .

It also allows a ruler and protractor to be added to the image. To do this just click on the icon  (image 83). To change the angle of the ruler, just slide the mouse wheel and stop at the desired angle. The diameter of the protractor can be changed in the same way.

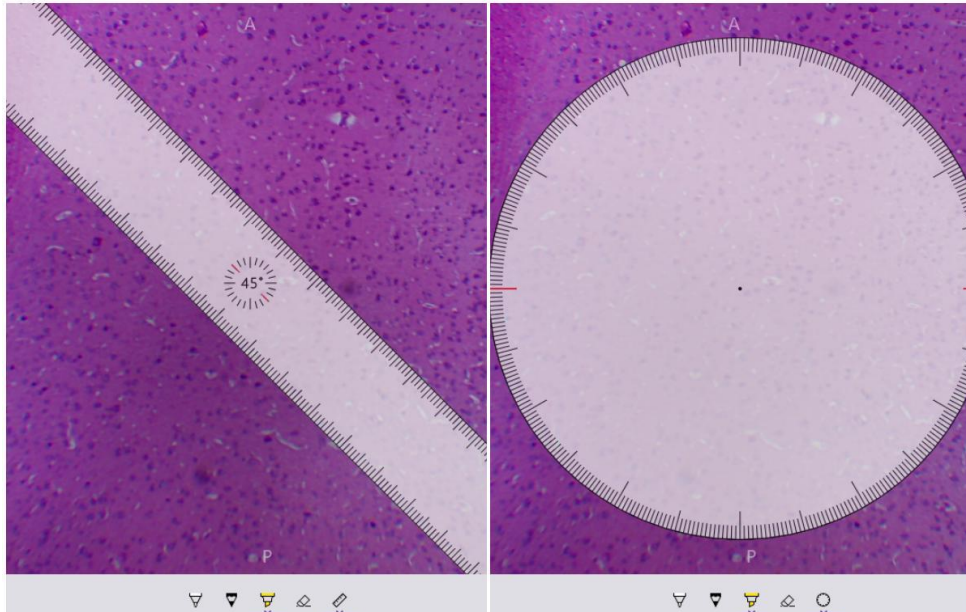


Image 83 - Ruler and protractor option

9. Shortcuts

Athena provides a list of shortcuts to be used in a keyboard and that can provide quick access to some tools and features.

9.1 Tools

top/right	scroll up
Bottom/left	scroll down
Key 1	Select scroll
Key 2	Select Zoom
Key 3	Select Move
4 key	Select Windowing
Key S	Synchronization
Ctrl+Z	Undo
Ctrl+Y	Redo



9.2 View Modes

CTRL + Tab	Next visualization
Backspace / Esc	Exit

9.3 Report

Add (+)	Add to Report
Ctrl+R	Report

9.4 Annotations

Key V	Select annotation value
Key A	Select annotation arrow
Key L	Select annotation line
Key R	Select annotation rectangle
E key	Select Annotation Ellipse
P key	Select annotation path
F key	Select Consecutive Annotations
G key	Select separated annotation angle
T key	Select annotation text
D key	Delete Annotations
H key	Hide Annotations

9.5 Color Palettes

F2 to F12	Color Palettes
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