LUNG

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17 Lung: Projection To Planars

17.1 General

Figure 184 Lung: Projection to Planars application

This application allows automatic extraction of two sets of up to eight frames each into planar static images for combined display and for storage into the patient database. You can then process the resulting images in, for instance, the lung quantification program.

17.2 Acquisition

Any projection file, 64 x 64 or 128 x 128

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17.3 Processing

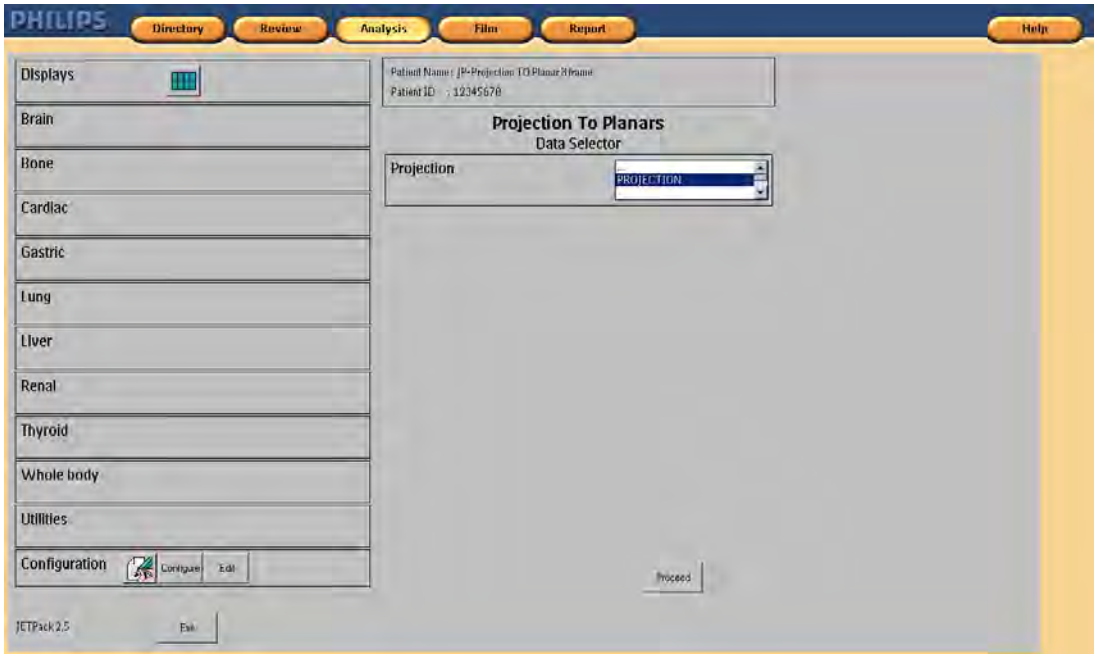

Figure 185 ISP JETPack panel, Projection to Planars application selected

If required adjust the selected file in the data bucket and click Proceed.

Figure 186 Result screen, eight extracted images labeled with user defined text

If you enter the injected dose later, the text appears near the right bottom corner in the Study Info panel. You can print or save the screen as a secondary capture as usual. The Save button allows saving of the eight images to the patient database for processing in, for instance, the lung quantification application.

Use the A/B button to switch between the two sets of extracted frames.

17.4 Button Panel and Region Control

See Chapter 1, “Getting Started.”

Set Defaults: Select method for processing now and as default.

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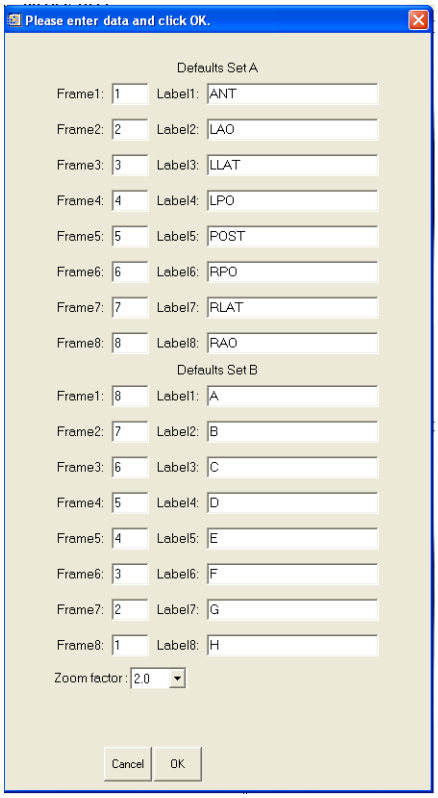

Figure 187 Default entry panel

The frame numbers of the desired frames that will be extracted from the projection file appear on the left side, and the corresponding labels that are to be displayed appear on the right side of the panel. The labels become the view ID when you save the images to the database using the button with the floppy disk symbol.

Enter 0 (zero) in a frame field to disable extraction of that frame.

You can select the preset zoom factor from the dropdown menu near the bottom of the panel.

The panel allows entry of two sets of frame numbers and labels, for instance, you can use one set for ventilation, while the other set is used for perfusion.

Save the new entries, and then exit the application and restart to make the new selections effective. When you load a projection file, these defaults are used to generate the final screen (see Figure 186).

Click the A/B button on that screen to toggle between the two sets of extracted frames.

The preset zoom factor is selected from the dropdown menu near the bottom of the panel. Upon clicking the Save button the default settings are saved for subsequent automatic selection of the frames, labels and zoom. On loading a projection file these defaults will be used to generate the final screen.

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17.5 Cine and Splash Page

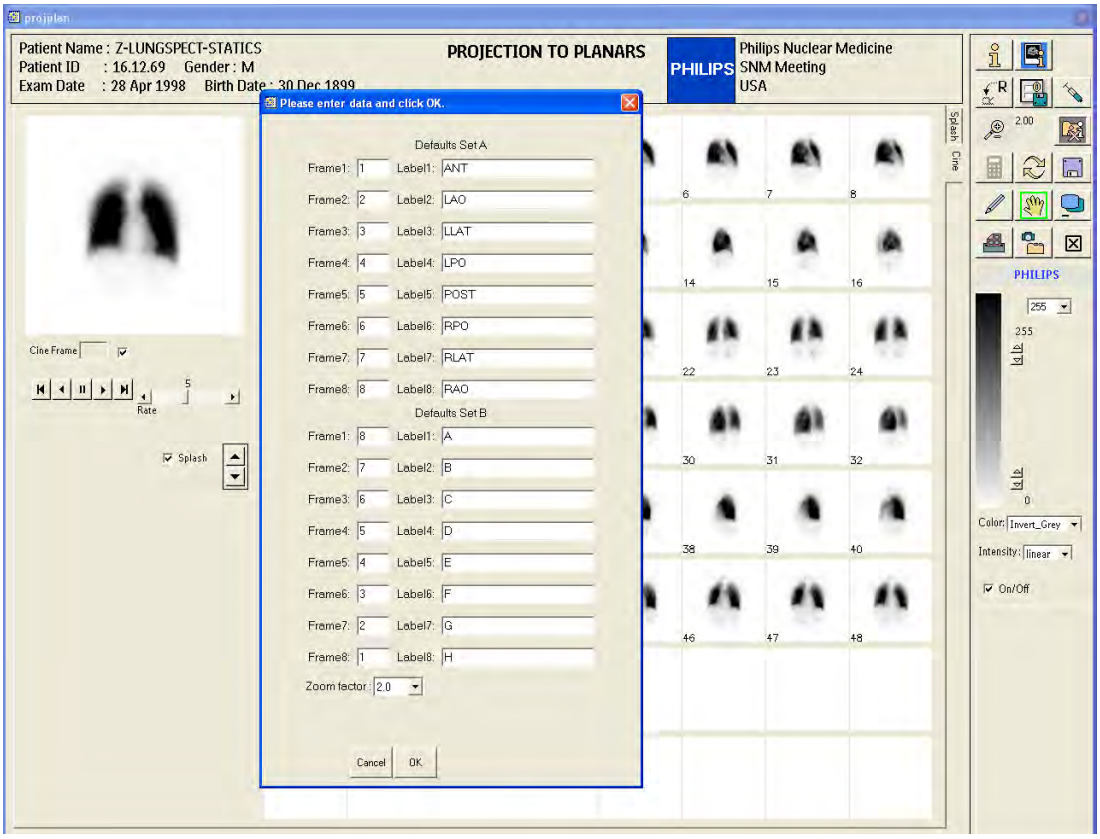

Figure 188 Cine and Splash page

The **Cine** page allows you to inspect the projection file in both cine mode and in a splash display.

The splash display shows all frames of the projection file. In Figure 188, the Set Defaults button was pressed, and the defaults entry panel appears. The cine and splash display with frame number display allow for an easy selection of the frame numbers for entry in the defaults panel. You can print and save the Cine and Splash page as secondary capture as usual.

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18 Lung Unpack

18.1 General

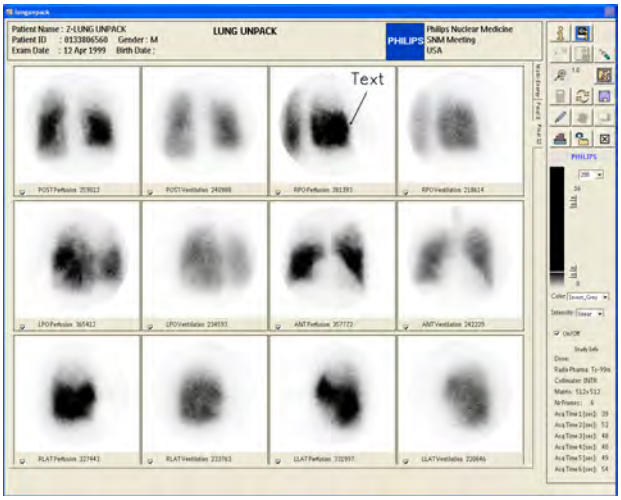

Figure 189 Lung Unpack application

The application unpacks ventilation and perfusion images from dual isotope multi-energy images. It assumes the following input images in case of:

- **Four views:** Posterior, RPO, LPO and anterior
- **Six views:** Post, RPO, right lateral, LPO, left lateral and anterior

18.2 Acquisition

Input images are static 512 x 512 multi-energy.

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18.3 Processing

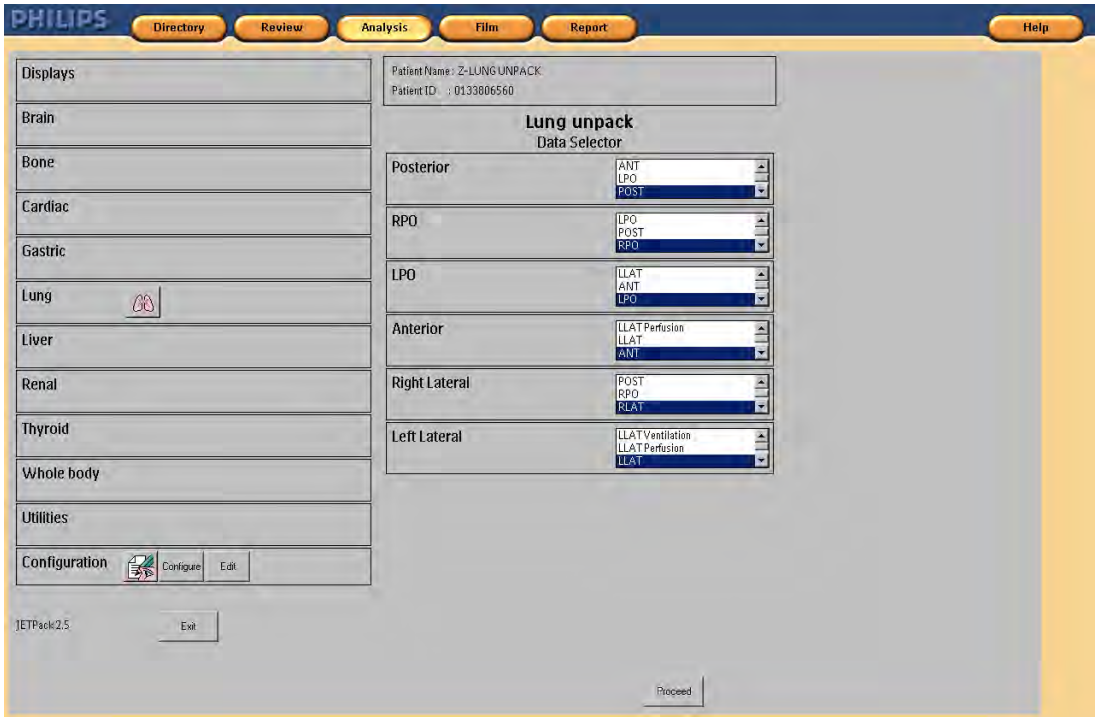

Figure 190 ISP JETPack panel, Lung Unpack application selected

If required adjust the selected files in the data buckets and click **Proceed**.

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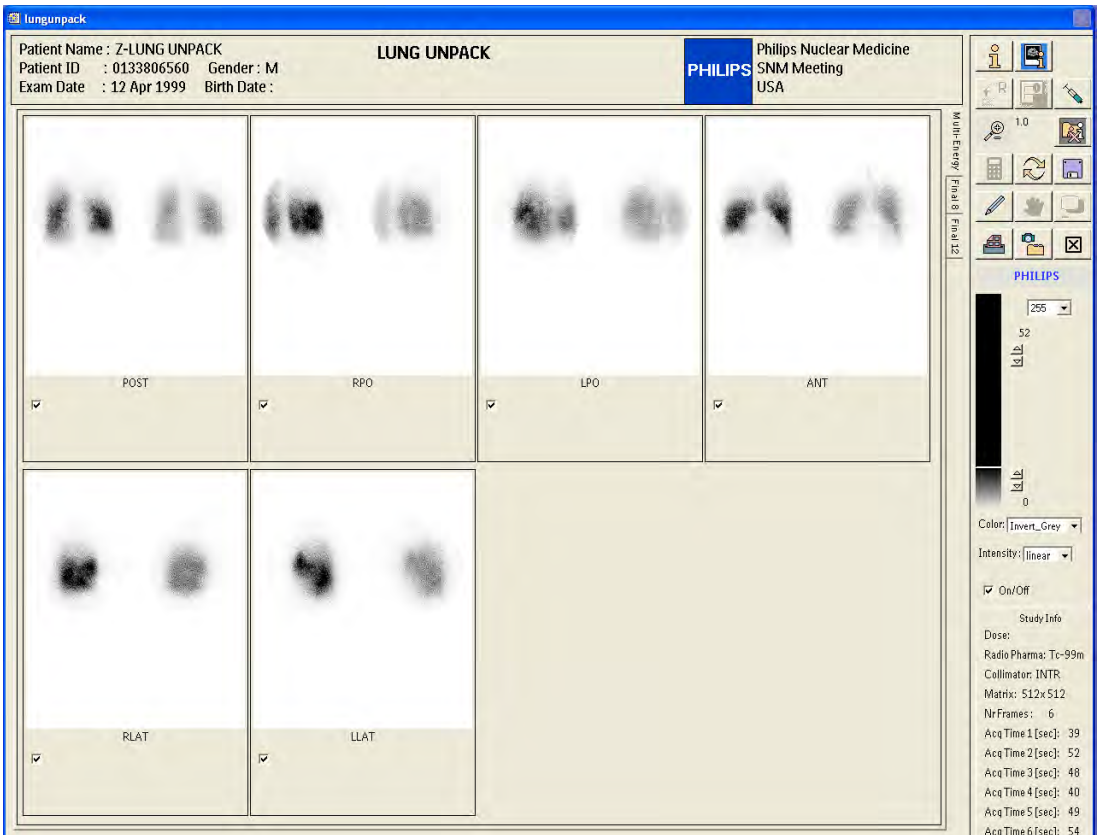

Figure 191 Multi-energy page with example of six input images.

The multi-energy images contain two images each, acquired with different energy window settings. In this example, both ventilation and perfusion were acquired simultaneously.

The purpose of the Lung Unpack application is to allow automatic separation of the combined images into individual images for further display and processing.

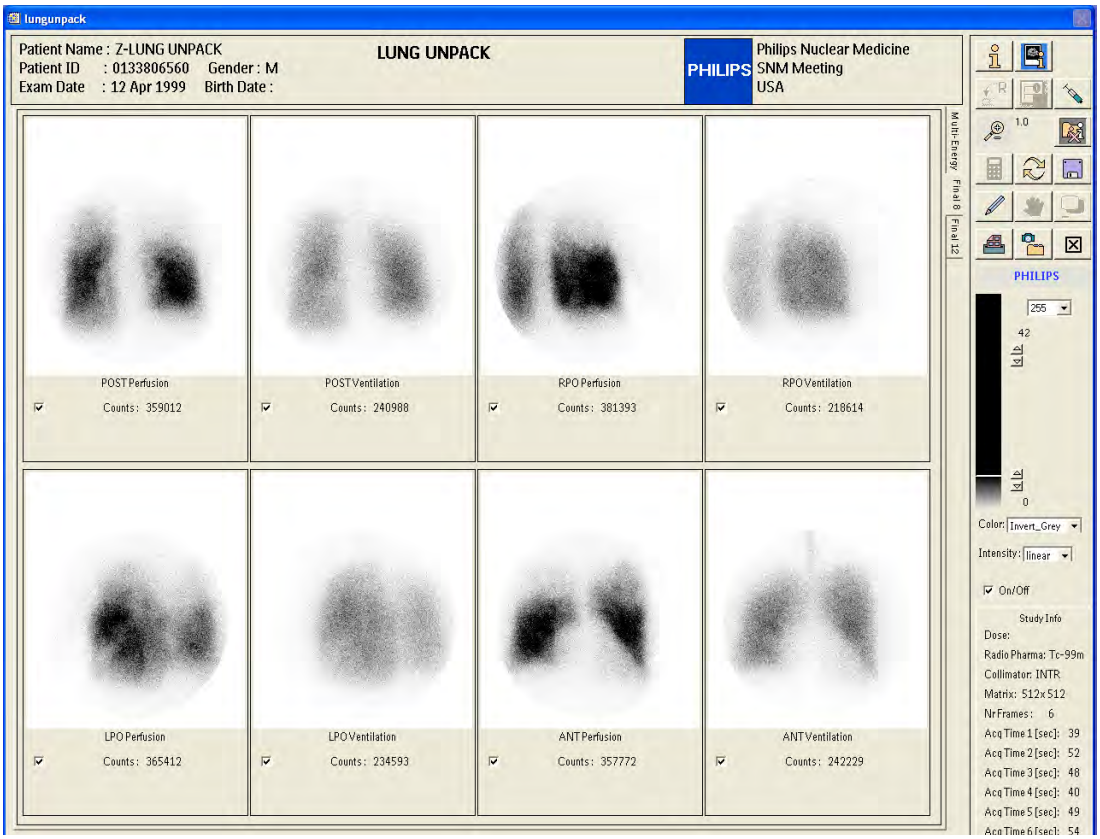

Figure 192 Result screen, eight images

The multi-energy images are automatically separated into ventilation and perfusion images and displayed in either a twelve or eight viewport layout, depending on the selection of six or four input images respectively.

Click **Save** (floppy disk icon) to save the separate images to the patient database for further processing.

18.4 Button Panel, Image Control, and Annotation

See Chapter 1, “Getting Started.”

18.5 Final Page

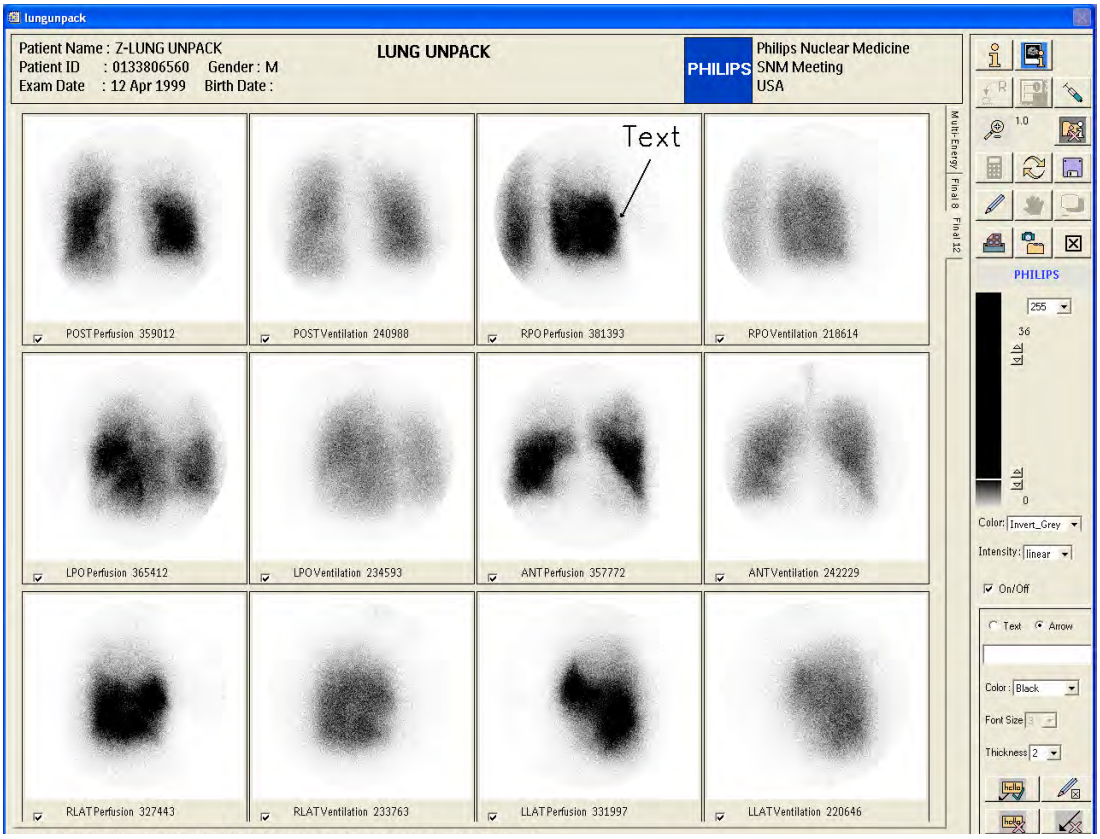

Figure 193 Final page

The checkmarks allow all twelve images to be individually adjusted for image contrast, color scale and intensity. The total counts of each image is calculated and displayed with the image view label.

Click **Save** (floppy disk icon) to save the separate images to the patient database for further processing.

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19 Gallium Scoring

19.1 General

The Gallium scoring application allows calculation of the Gallium score from three static images using 10 ROIs with equal size. The counts in the eight lung ROIs are used to calculate geometric mean counts from the anterior and posterior view and determine ratios of count activity with respect to ROIs put on the Thigh. The user can preset the radius of the circular ROIs. Gallium scores for male and female are determined from ratios of activity in the individual ROIs on the lungs and the average activity of the ROIs on the Thigh.

19.2 Acquisition

Static acquisition of Posterior, Anterior and Anterior Thigh view in 256x256 matrix. Acquisition duration is typically 5 minutes.

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19.3 Processing

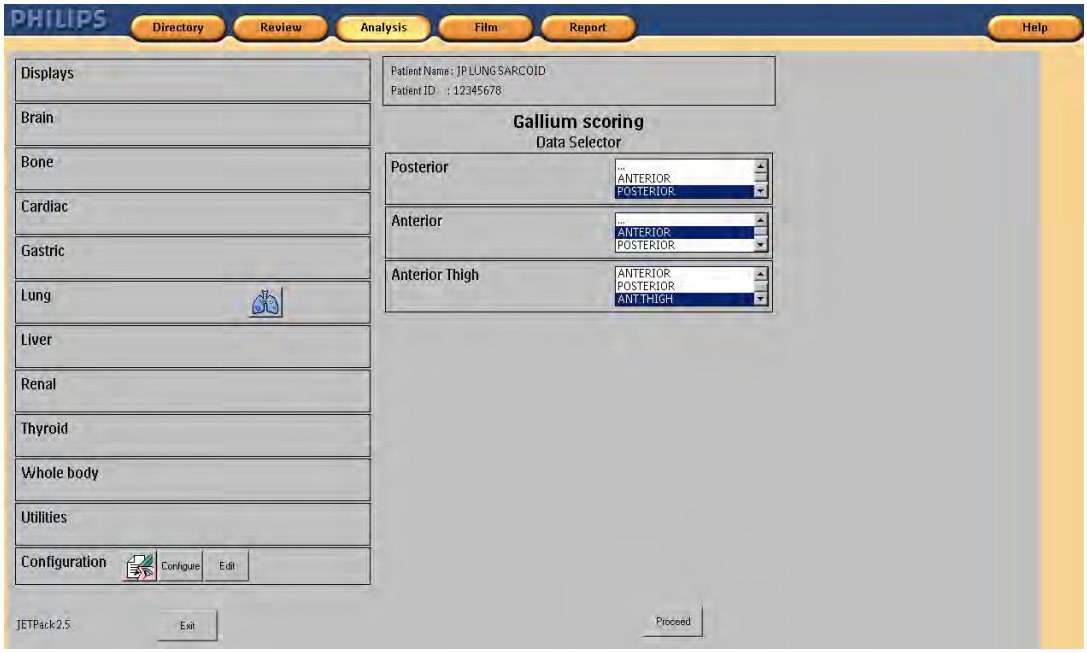

Figure 194 ISP JETPack panel, Gallbladder EF application selected

If required adjust the selected file in the data bucket and click **Proceed**.

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19.4 Regions Page

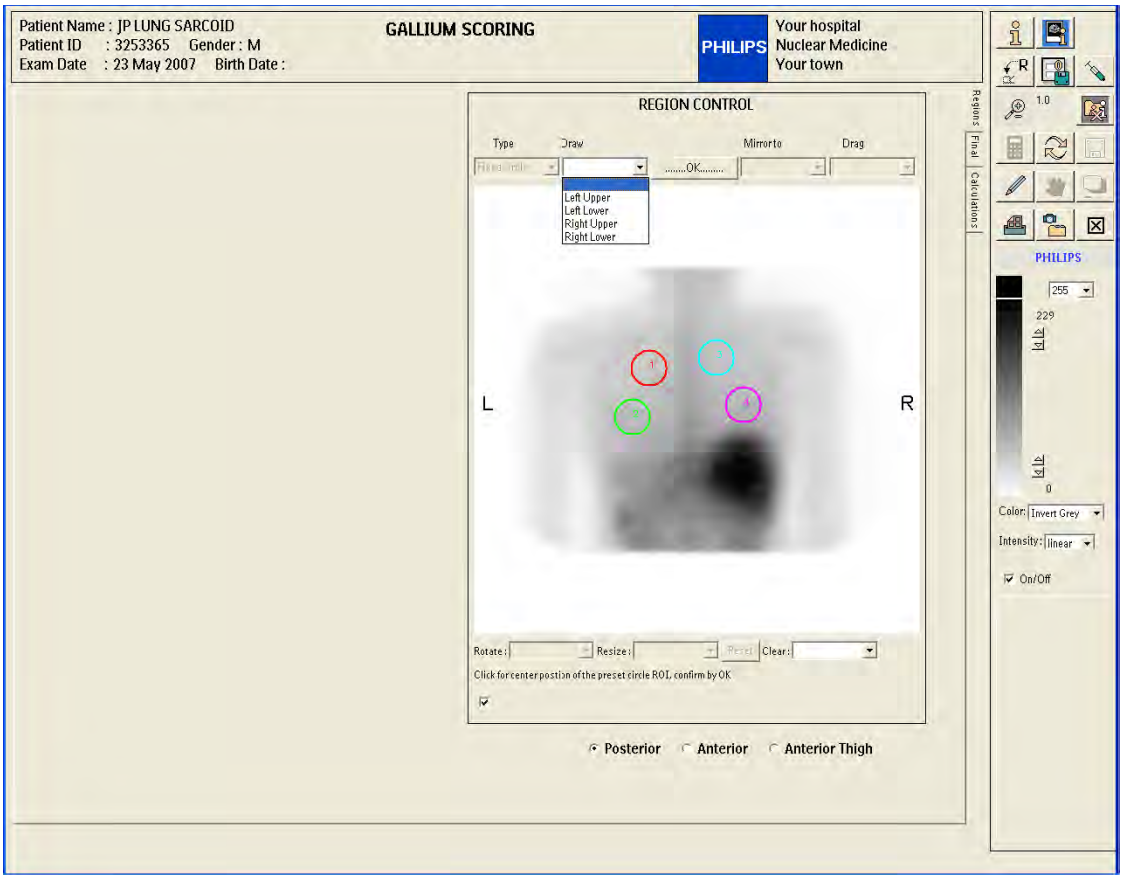

Figure 195 Regions page with ROIs selected on the Posterior image.

On the Regions page the radio-button set below the Region control panel allows you to select the Posterior, Anterior or Anterior Thigh image. On the Posterior and Anterior view four ROIs, Left upper, Left lower, Right upper and Right lower must be placed. Select the ROI that you want to draw then click on the image to mark the center of the circular ROI. The circular ROI will be drawn automatically upon release of the mouse button. You can adjust the position by selecting a different position. When the ROI is placed correctly, click on the OK button to confirm the ROI position. Repeat the ROI selection for the remaining three ROIs. Next select the Anterior image and place the four ROIs on that image.

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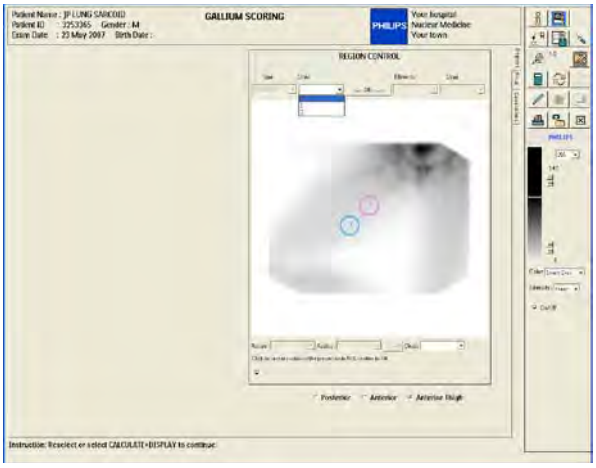

Figure 196 Regions page, ROIS selected on the Anterior Thigh image.

On the Anterior Thigh image position the two circular reference ROIs are placed, see the example.

19.5 Final Page

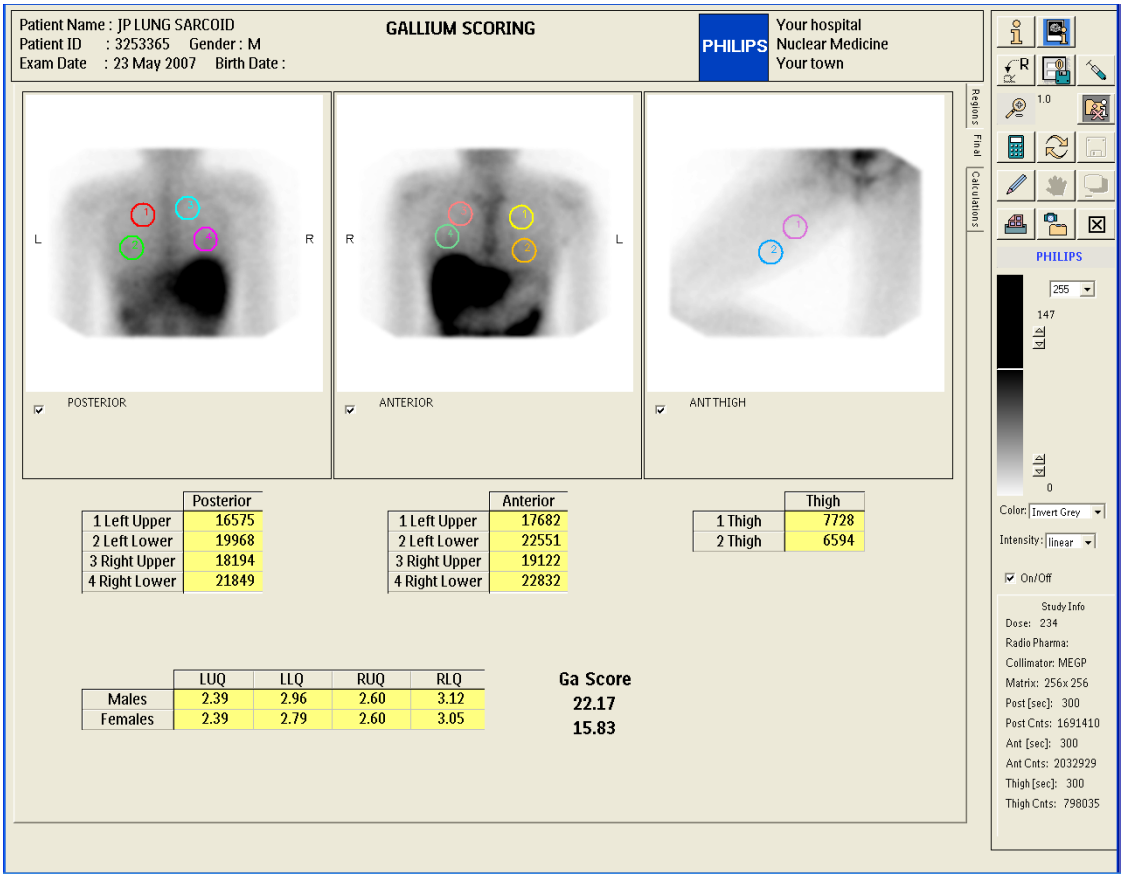

Figure 197 Final page: Input images , ROIs and calculated results.

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The final page shows the three input images with the ROIs as selected. Below each image a table shows the raw counts per ROI, notice that the numbers 1,2,3 and 4 as displayed inside the ROIs agree with the rows marked in the table e.g. 1 Left Upper.

The table near the bottom displays the Left upper quotient (LUQ), Left lower quotient (LLQ), Right upper quotient (RUQ) and the Right lower quotient(RLQ). Notice the quotients and Gallium score are displayed for both the male and female situation.

The images on the final screen may be zoomed in and/or out and Annotated using the standard tools provided. The counts and the acquisition duration of each static image is displayed on the study info panel at the bottom right side of the screen.

19.6 Button Panel and Region Control

See the General description for an explanation of the various buttons.

Set Defaults: Click this button to bring up the panel below:

Figure 198 Default entry and Current Defaults display

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The defaults that can be set are shown in Figure 198. When this panel is launched it displays the current defaults. You enter a different radius and use it immediately, there is no need to exit and restart the application. The next time the application is started the new default value will be used.

19.7 Calculations Page

Patient Name : JP LUNG SARCOID
Patient ID : 3253365 Gender : M
Exam Date : 23 May 2007 Birth Date :

GALLIUM SCORING

```
INTERMEDIATE and FINAL RESULTS of Gallium Scoring


REGION COUNTS  Posterior     Anterior  GeometricMean =sqrt (P*A)
 left .upper:      16575        17682         17120.30
 left .lower:      19968        22551         21220.63
 right upper:      18194        19122         18652.61
 right lower:      21849        22832         22335.22

 Thigh 1 and 2:       7728         6594   Average =      7161.38

 Male quotients ; geometric mean / Average thigh
 LUQ =      17120.30 /      7161.38 =  2.39
 LLQ =      21220.63 /      7161.38 =  2.96
 RUQ =      18652.61 /      7161.38 =  2.60
 RLQ =      22335.22 /      7161.38 =  3.12

 Female quotients ; geometric mean / Average thigh
 LUQ =      17120.30 /      7161.38 =  2.39
 LLQ =      19968.75 /      7161.38 =  2.79
 RUQ =      18652.61 /      7161.38 =  2.60
 RLQ =      21849.25 /      7161.38 =  3.05

SCORES PER ROI
 Sc1 .Left Upper Posterior=      16575.75 /      7161.38 =  2.31
 Sc2 .Left Lower Posterior=      19968.75 /      7161.38 =  2.79
 Sc3 Right Upper Posterior=      18194.50 /      7161.38 =  2.54
 Sc4 Right Upper Posterior=      21849.25 /      7161.38 =  3.05

 Sc5 .Left Upper Anterior =      17682.75 /      7161.38 =  2.47
 Sc6 .Left Lower Anterior =      22551.00 /      7161.38 =  3.15
 Sc7 Right Upper Anterior =      19122.25 /      7161.38 =  2.67
 Sc8 Right Lower Anterior =      22832.00 /      7161.38 =  3.19

GALLIUM SCORES
Male score =Sc1 + Sc2 + Sc3 + Sc4 + Sc5 + Sc6 + Sc7 + Sc8 = 22.17
Female score =Sc1 + Sc2 + Sc3 + Sc4 + Sc5 + Sc7 = 15.83
```

Figure 199 Calculations page

The Calculations page allows you to verify the result data as displayed on the Final screen.

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19.8 Reference

Prashant Kumar Rohatgi, e.a., Quantitative Gallium Scanning in Pulmonary Sarcoidosis.

Respiration 1983; 44: 304-313

19.9 Calculations

Raw counts of all 10 ROIs are determined.
LUA = left upper anterior
LUP = left upper posterior
RUA= right upper anterior
RUP = right upper posterior
LLA = left lower anterior
LLP = left lower posterior
RLA = right lower anterior
RLP = right lower posterior
Thigh1 = counts roi1 on thigh
Thigh2 = counts roi2 on thigh

Average counts of the two Thigh ROIs; AvT = (Thigh1 + Thigh2) /2

Geometric mean of Anterior and Posterior;
LUGeo = Sqrt(LUA * LUP)
LLGeo = Sqrt (LLA * LLP)
RUGeo = Sqrt(RUA * RUP)
RLGeo = Sqrt(RLA * RLP)

Calculate the score ratios of anterior and posterior ROIs as:
Sc1 = LUP / AvT
Sc2 = LLP / AvT
Sc3= RUP / AvT
Sc4 = RLP / AvT
Sc5 = LUA / AvT
Sc6 = LLA / AvT
Sc7 = RUA / AvT
Sc8 = RLA / AvT

Gallium Score

Male score: add all score ratios: Sc1+Sc2+Sc3+Sc4+ Sc5+Sc6+Sc7+Sc8

Female score, leaves out Anterior Lower Left and Right;
Sc1+Sc2+Sc3+Sc4+ Sc5+Sc7

Quadrant ratios for males

LUQ = LUGeo / AvT
LLQ = LLGeo / AvT
RUQ = RUGeo / AvT

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RLQ = RLGeo / AvT

Quadrant ratios for females, excludes anterior lower left and right counts because of breast tissue

LUQ = LUGeo / AvT
LLQ = LLP / AvT posterior counts only
RUQ = RUGeo / AvT
RLQ = RLP / AvT posterior counts only

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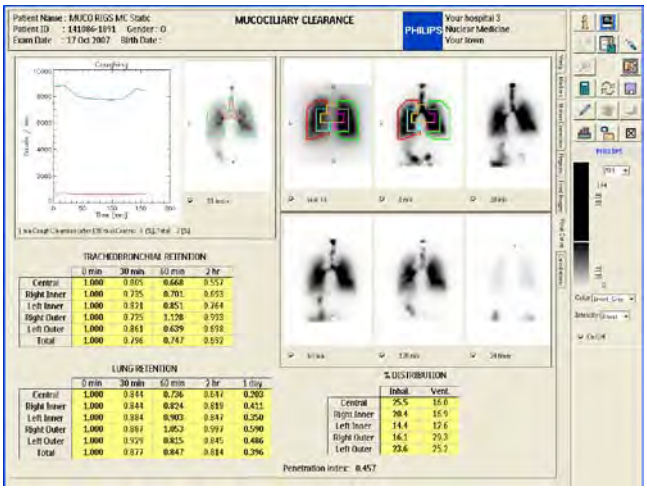
20 Mucociliary Clearance

20.1 General



This method measures the retention of an inhaled and deposited radio aerosol in the lungs over time. Removal of activity over time is an indication of the transport of mucus from the lungs. Five regions are used to generate retention curves from the input images, Left_Outer, Left_Inner, Central, Right_Inner and Right_Outer region.

A “penetration index” is calculated and applied in a formula to yield the “Retention” number in % of the initial deposition and the predicted values. An estimate of the “Cough clearance” is calculated from an optional Cough image with regions applied over full and central lung areas. The application is based on work by Dr. J. Mortensen of the Rigs Hospitalet in Copenhagen Denmark.

20.2 Acquisition

During the acquisition of the following images two Cobalt markers (Co-57) are placed on the back of the patient for alignment. All images are acquired in Posterior, supine position.

20.2.1 Two Methods

There are two acquisition methods possible. These are indicated during processing as Static Images and Dynamic Images. All images are acquired in a 128 x 128 matrix.

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20.2.2 Static Images

This is a combination of Static and Optional Dynamic images during the first hour. See the table below.

Time of acquisition	Image Name	Isotope	Type	Duration	
- 5 min	Background	Tc^{99m}	Static	5 min	
0	**Inhale Test**	Tc^{99m}	Static	10 sec	Optional
0 – 5 min	**0 Min**	Tc^{99m}	Static	5 min	
6- 30 min	**Dynamic 1**	Tc^{99m}	Dynamic	25 min 2.5min/frame	Optional
30 –35 min	**30 Min**	Tc^{99m}	Static	5 min	
36 – 60 min	**Dynamic 2**	Tc^{99m}	Dynamic	25 min 2.5 min/frame	Optional
60 min – 65 min	**30 Min**	Tc^{99m}	Static	5 min	
	Ventilation	**Kr^{81}**	Static	1 min	
120 min – 125 min	**120 Min (2hr)**	Tc^{99m}	Static	5 min	
126 min – 129 min	**Cough**	Tc^{99m}	Dynamic	3 min, 20 sec/frame	Optional
24 hour – 24h 15 min	**24 hour**	Tc^{99m}	Static	15 min	Optional

20.2.3 Dynamic Images

The static and dynamic images of the first 65 minutes are combined into a single dynamic image.

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Time of acquisition	Image Name	Isotope	Type	Duration	
- 5 min	Background	Tc^{99m}	Static	5 min	
0	**Inhale Test**	Tc^{99m}	Static	10 sec	Optional
0- 65 min	**Dynamic**	Tc^{99m}	Dynamic	65 min 1 1 min/frame 65 frames	
	Ventilation	**Kr^{81}**	Static	1 min	
120 min – 125 min	**120 Min (2hr)**	Tc^{99m}	Static	5 min	
126 min – 129 min	**Cough**	Tc^{99m}	Dynamic	3 min, 20 sec/frame	Optional
24 hour – 24h 15 min	**24 hour**	Tc^{99m}	Static	15 min	Optional

Background — Before inhalation of the Aerosol (Tc99m) ; a 5 minute, Static image in 128x 128 is acquired. This picture is used to correct for background on each subsequent static image.

Inhale Test — INHALE and acquire a 10 sec Static image of the radio-aerosol in the lungs to check that the deposition in quantitatively sufficient (> 0,5 kc/s else perform additional inhalations) .

Ventilation image — Static Krypton image. 1 minute, 128*128 matrix, 191 KeV. This Kr^{81} image could also be made at another time e.g. at 24 hour.

Cough Image; — Optional Dynamic image, 128*128, 3 min duration, 20 sec/ frm. The image is needed to calculate the lung cough clearance percentage.

24 hour image: — Static image of **15 minutes** duration. 128x128 matrix**.** This image must be acquired much longer to get better “statistics”.

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20.3 Processing

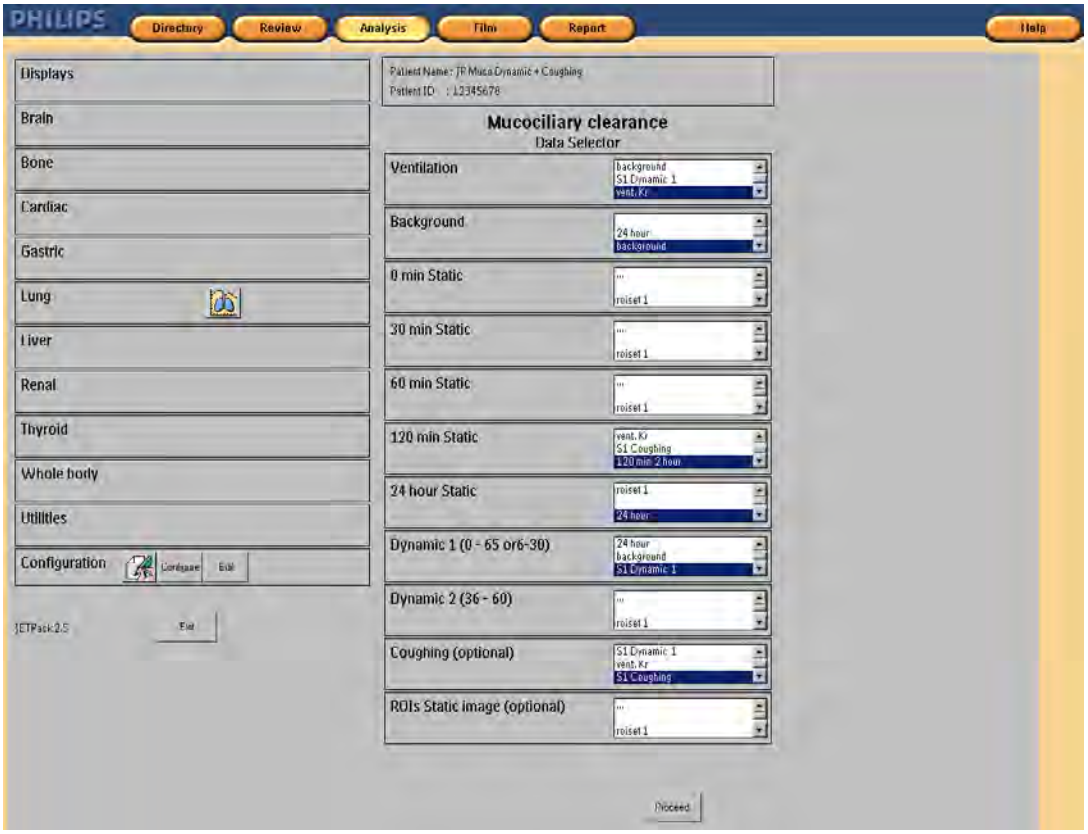

Figure 200 ISP JETPack panel, Mucociliary Clearance application selected

If required adjust the selected files in the data buckets and click **Proceed**.

If a Region set was saved in an earlier session you can load an image that contains the region set.

The load process can be automated if the following names for the images object are used. (* is a any character)

Image	Object Name	Image	Object Name
Ventilation	*Vent*	1 Day/ 24 Hr	*24*Hr*
Background	*Back*	Dynamic 1	*Dynamic*1*
0 Min Static	0*Min*	Dynamic 2	*Dynamic*2*
30 Min Static	30*Min*	Coughing	*Cough*

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60 Min Static	60*Min*	Roiset	*roi*
120 Min/ 2 Hr Static	120*Min		

The so-called include strings can be modified in the Configuration screen of the JETPack Panel.

20.4 Verify Page

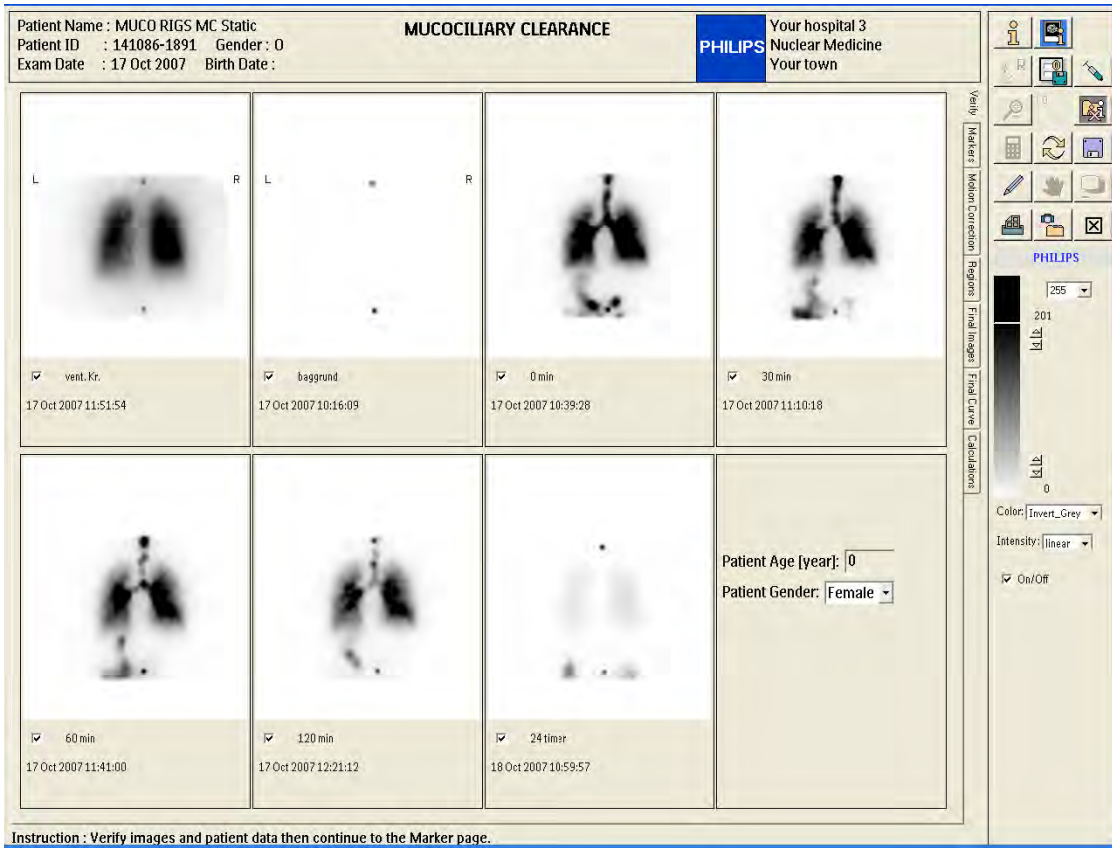


Figure 201 Verify page

On this page verify the selected images for proper load sequence. In the Dynamic acquisition mode the images for 0Min, 30-Min and 60-Min are automatically generated from the Dynamic 1 image. The Dynamic 1 image must in that case span 65 minutes from the time of 0 min through 64 min.

If the Patient age is not provided or incorrect enter the correct value at the field Patient Age [year]. The Gender is set according to information in the image header, if needed select a different value from the menu.

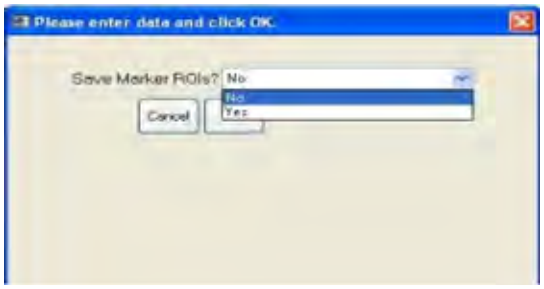
20.5 Button Panel and Region Control

See the General description for an explanation of the various buttons.

Figure 202 Zoom control

The images on the "Final Images" and "Final Curves" pages can be zoomed. To zoom in on the selected images click the left mouse button on the picture of the looking glass. To zoom out click the right mouse button on the picture. Notice that the picture does not display pushbutton behaviour, it acts like an image. The zoom range is from 1.0 through 2.0 in steps of 0.1 (10%). It is recommended to first zoom the images then adjust the image contrast.

Set Defaults: Click this button to bring up the panel below.



Save Marker ROIs allows saving of the circular Marker ROIs for re-use as “preset” markers.

The marker ROIs can be re-used between patient studies. When the next patient study is processed, the saved marker ROIs can be reloaded via the 'preset' selection in the ROI type menu on the Marker page. The user can drag the preset ROIs to fit the marker activities of the new patient study.

Important You must exit the application and then restart to activate the new default setting.

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20.6 Marker Page

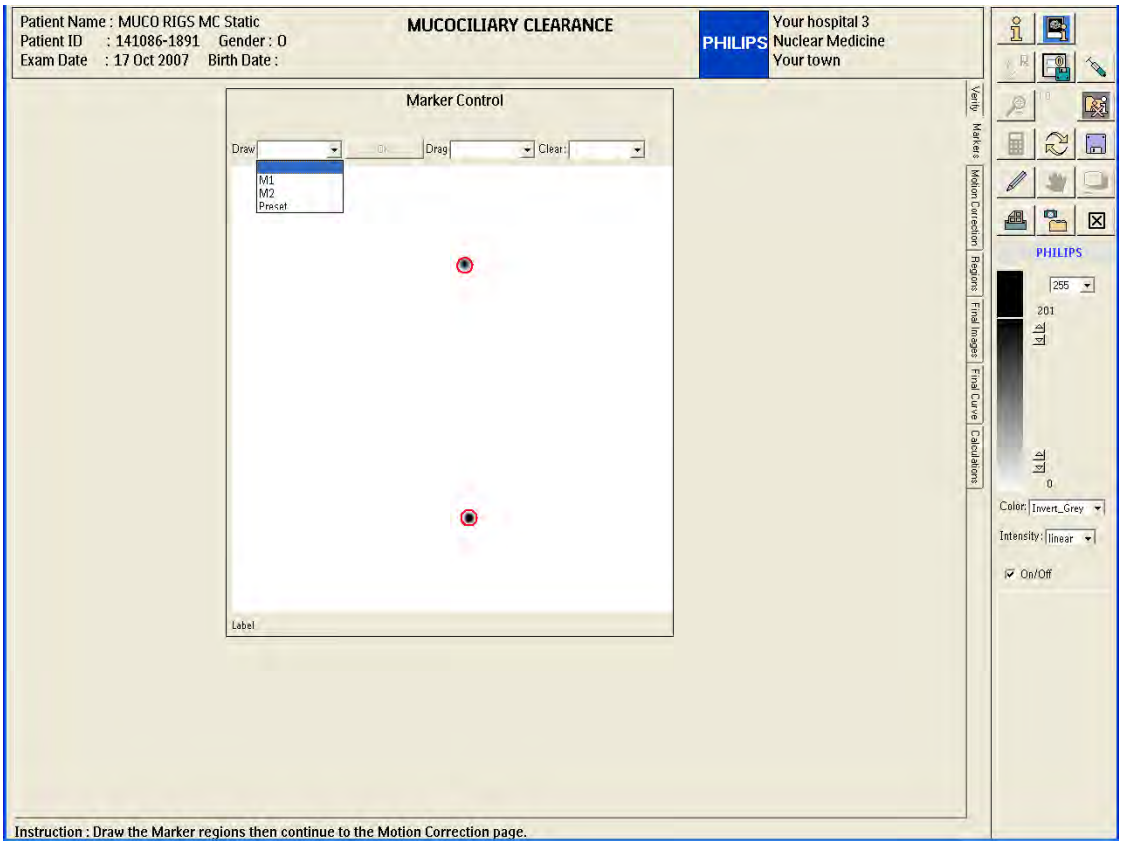

Figure 203 Marker page

The marker page displays the Background activity image with the two Co^{57} markers. Draw the M1 and M2 reference markers or use the preset markers if available. You can drag the markers to the proper locations by clicking on the Drag menu then the desired marker. To generate the preset markers you must first draw these ROIs here then select Defaults and save the marker regions there.

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20.7 Motion Correction Page

Figure 204 Motion correcton page

The Static images of 0-Min, 30-Min, 60-Min, 120-Min and optional 24hours are displayed with the Marker regions superimposed.

Align each image with the circular marker regions as follows: Click and drag with the Left mouse button pressed to move in horizontal or vertical direction. To rotate an image press the Right mouse button then move to the left for CW or to the right for a CCW rotation.

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20.8 Regions Page

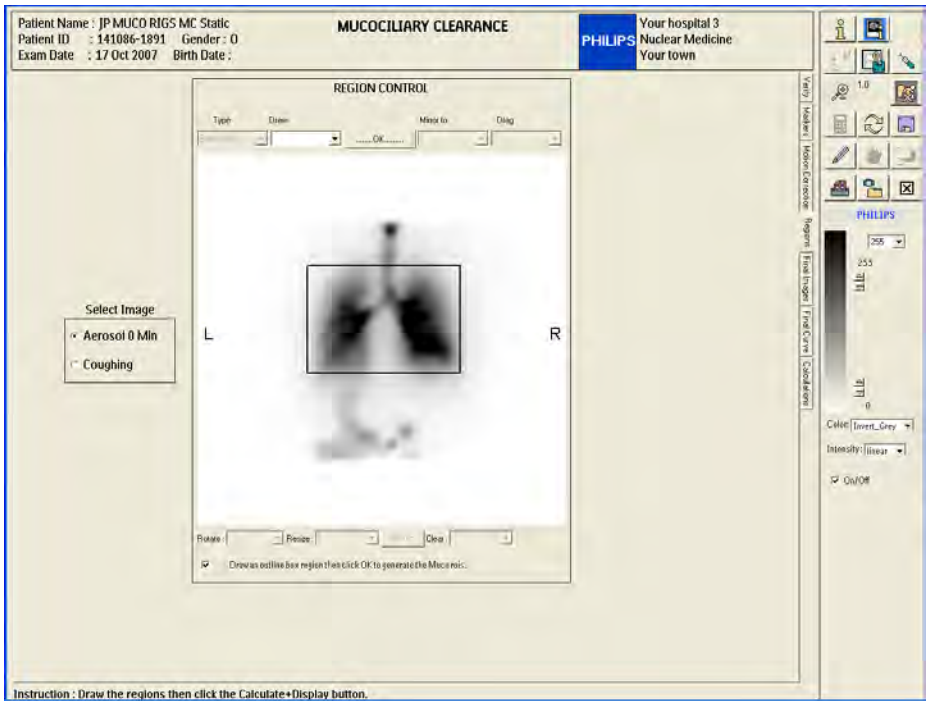

Figure 205 Regions page: Outline box drawn for semi-automatic roi set generation

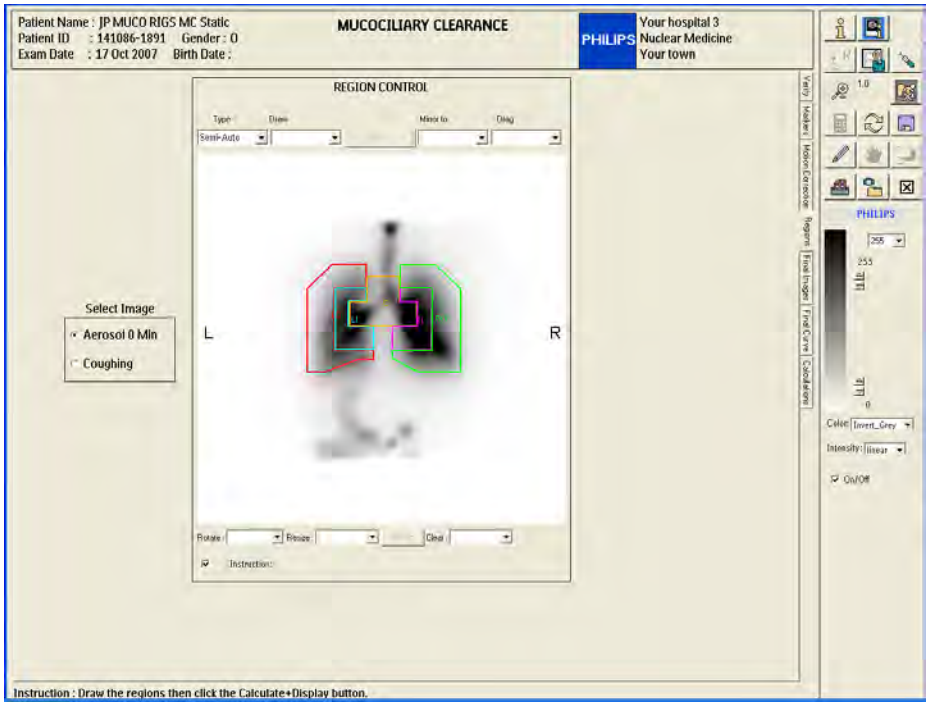

Figure 206 OK button pressed generates the Left Outer, Left Inner, Centre, Right Inner and Right Outer ROIs

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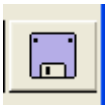
On the Ventilation image draw the five ROIs in polygon or freehand mode. It is possible to automatically generate these regions from a region outline box in semi-automatic mode.

If you previously generated a region set for this patient and loaded a region set image then the “restore” selection from the Type menu allows you to return the saved region set to the screen.



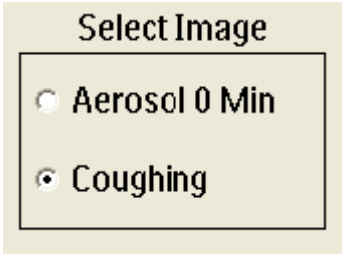
To save a set of ROIs to the database, click on the Save button at the right side of the screen to bring up the panel shown below.

Enter the name of the ROI set. Once the application exits, a static image by that name will appear in the ISP database. Inside the image, the contours of the five ROIs are saved.

Note

The Save operation is only allowed once per processing session. If you need to re-save the ROI Set, the only solution is to exit and restart the application.

If a “Coughing” image was loaded from the database you will find a radio button switch that allows switching between the Ventilation and a composite image of the dynamic “Coughing” image.



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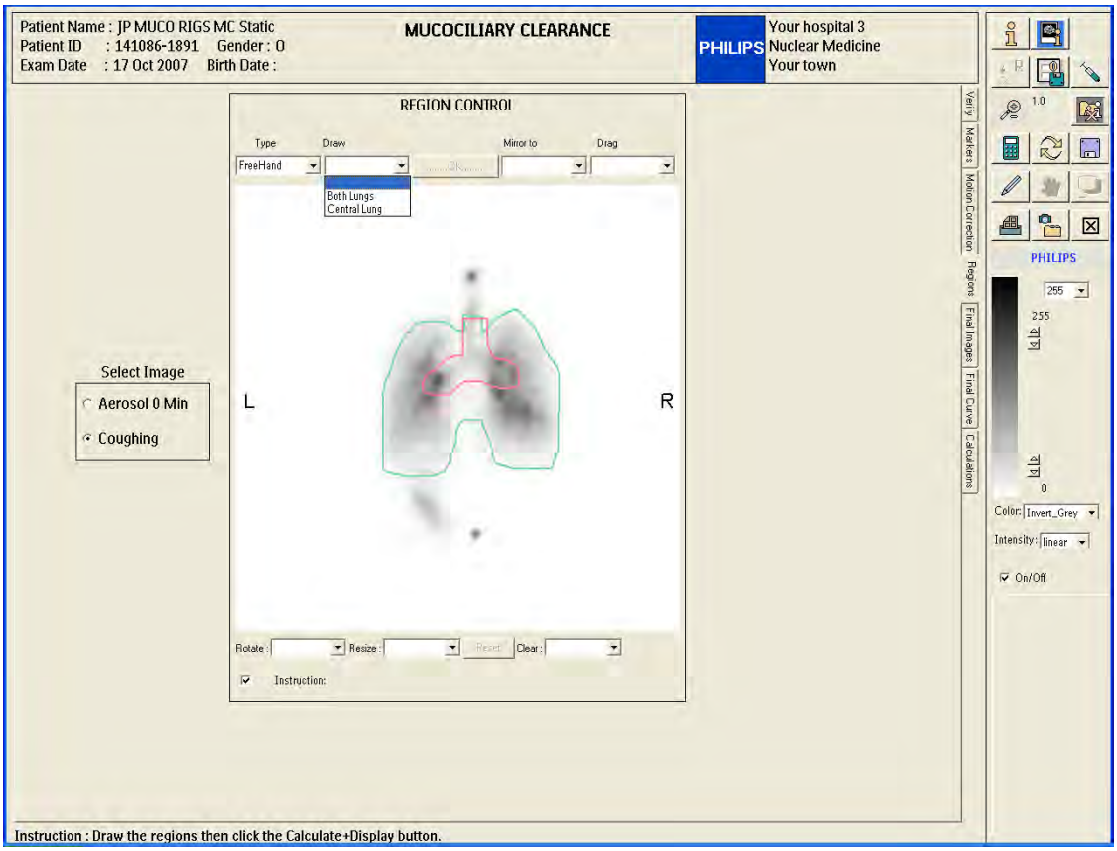

Figure 207 Regions page, Coughing image selected and the ROIs for Both Lungs and Central Lung drawn.

After all ROIs have been drawn, five on the ventilation image and two on the composite lung image, the Calculate &Display button becomes active. Click that button to generate the ratios and the curves as displayed on the final pages.

20.9 Final Images Page

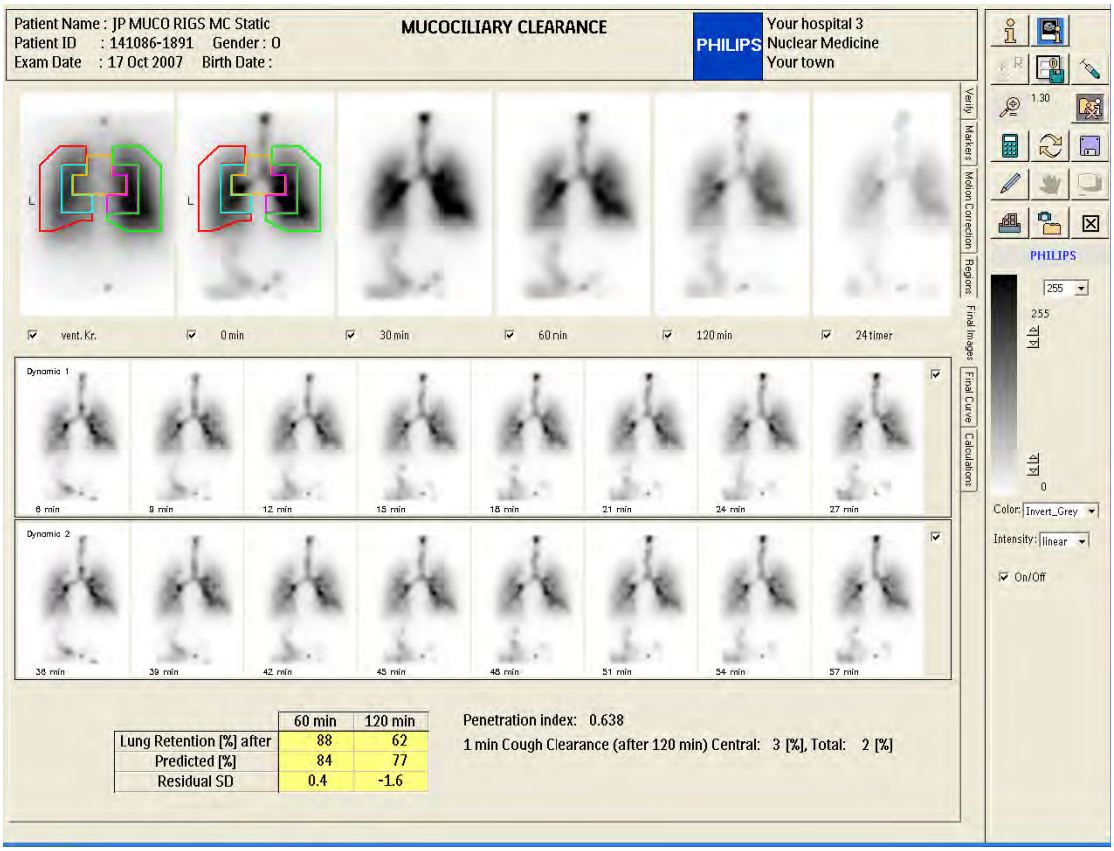

Figure 208 Final images page

At the top row of images notice the Ventilation (Kr) and Inhalation images at 0,30,60, 120 and optional 24 hour.

The Dynamic 1 and 2 rows of images are either acquired as separate dynamic images between the 0-Min, 30-Min and 60-MinStatic images, see the acquisition table, or they may be extracted from a single Dynamic 1 image of 65 minutes duration.

If neither of these Dynamic images is available the dynamic 1 and 2 image rows are greyed out. The images were zoomed by a factor 1.3. Click on the zoom looking glass picture with the left mouse button to increment or with the right mouse button to decrement the zoom factor.

20.10 Final Curves Page

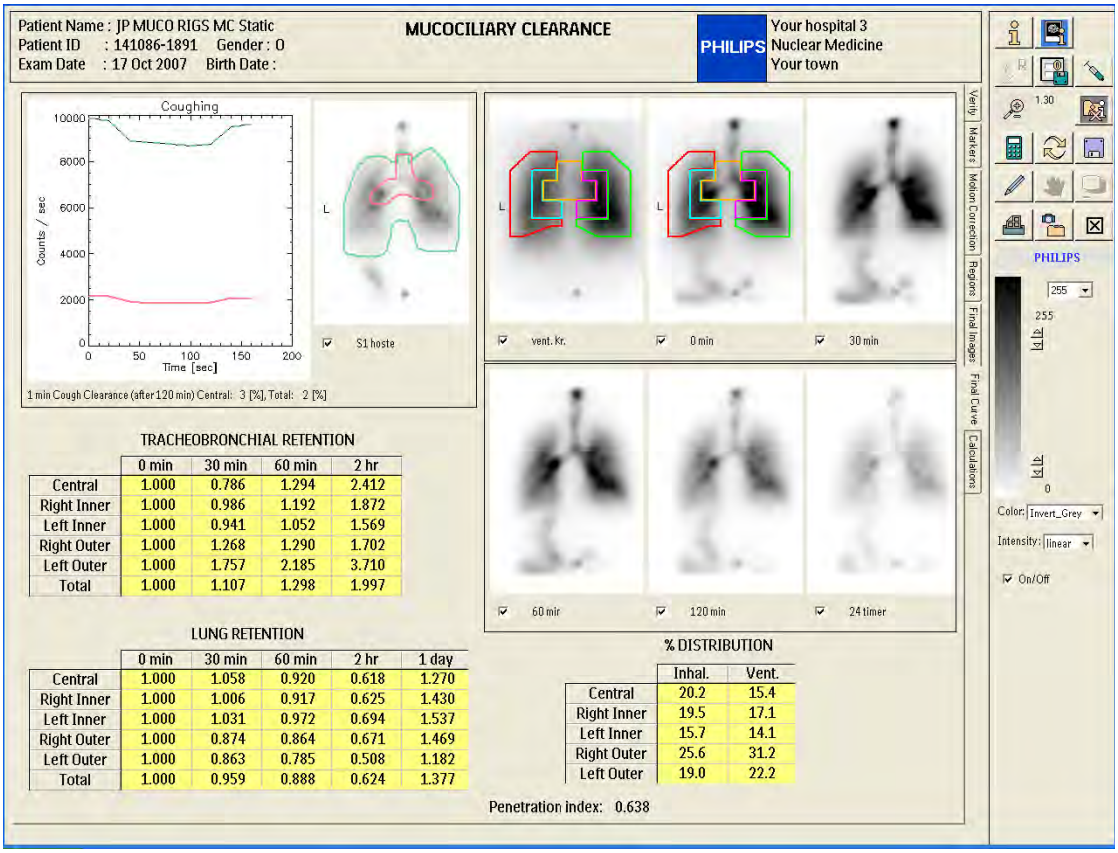

Figure 209 Final curves page

If the 24 hour inhalation image was loaded the Tracheobronchial retention values are calculated and displayed in the table shown above.

The curve set as generated from the dynamic Coughing image and the composite image with Lung regions superimposed are near the top left of the screen. (Notice that this coughing image is a fake image.)

If the images were zoomed on the previous page you will find the same zoomed images on this page, however the composite cough image will not yet be zoomed. While on this page click the zoom button picture again to get all images zoomed and displayed in the desired size.

Annotation of images on the Final Images and Final Curves page is possible when you click the pencil button.

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20.11 Calculations Page

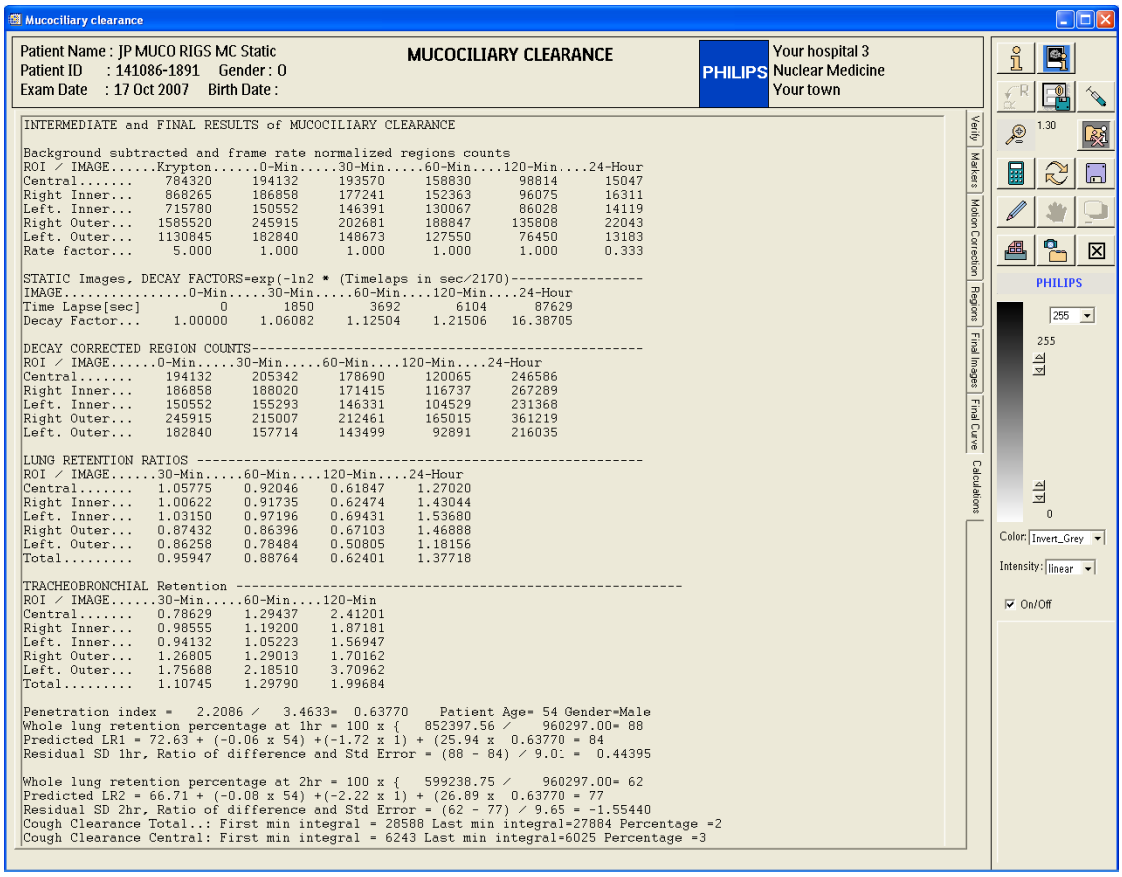

Figure 210 Calculations page.

Use this page to verify the results as displayed on the Final Image and Final Curve pages.

20.12 Calculations

20.12.1 0 Min , 30Min , 60 Min images

In case of a Dynamic acquisition scheme the 0-Min, 30Min and 60Min images are generated from the Dynamic image by building composite images.

20.12.2 Background subtraction

The Background image is subtracted from the 0Min, 30Min , 60Min and if available 120Min and 24 Hour images.

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20.12.3 Region counts

The 5 regions, Left_outer, Left_Inner, Central, Right_Inner and Right_Outer are applied to the 0Min, 30Min, 60Min, 120Min and 24hour images to get the counts per region per image.

20.12.4 Decay correction

The region counts are corrected for decay. The correction factors are calculated for Tc^{99m} and the actual time lapses between the 0Min image and the 30 Min, 60Min, 120Min and 24Hour images.

20.12.5 Lung retention ratios

Per region the retention ratio is calculated for the 30Min, 60Min, 120Min and 24 Hour image as for example:

$$\text{Retention ratio} = \frac{\text{Decay corrected counts at 30Min}}{\text{Counts at 0Min}}$$

20.12.6 Tracheobronchial ratio

If the 24 hour image is available the Tracheo bronchial ratios are calculated per region, for example:

$$\text{Trach. Ratio} = \frac{\text{Decay corr. counts at 30Min} - \text{Decay corr. counts at 24 hour}}{\text{Counts at 0Min} - \text{Decay corrected counts at 24 hour}}$$

20.12.7 Penetration Index

This index is a ratio of the Tc and Kr ratios as calculated on the 0-min image for Tc99 and on the Ventilation image for Kr81.

$$PI = \frac{\dfrac{\text{TC-aerosol counts in both peripheral ROIs together}}{\text{TC-aerosol counts in the central ROI}}}{\dfrac{\text{Kr counts in both peripheral ROIs together}}{\text{Kr counts in the central ROI}}}$$

20.12.8 Predicted Values

Predicted value for Lung Retention = intercept + age * k1 + S * k2 + PI * k4 +/- SE

Where

age = patient age (yrs),
S = Sex: M = 1 F = 2,
PI = Penetration index,

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	1 Hour LR1h	2 Hour LR2h
Intercept	72.63	66.71
K1	-0.06	- 0.08
K2	-1.72	- 2.22
K4	25.94	26. 89
Standard Error SE	9.01	9.65

Residual Standard Deviation

Residual SD = (LR2h - predicted LR2h) / Standard Error LR2h , e.g. (90% - 60%) / 9.65 = + 3.1

See table 5 and appendix in Eur J Nucl Med 1994

20.12.9 Cough clearance

The Whole lung (Both) and Central lung curves are generated from the dynamic Cough image and the two regions as drawn on the composite image. The Lung clearance percentage is calculated from the Integral of the first and of the third minute of each lung curve.

$$\text{Lung clearance \%} = \left(\frac{(\text{First integral} - \text{Third integral})}{\text{First integral}}\right) \times 100$$

20.12.10 % Distribution

Inhalation : The activity in percent of total is listed per ROI of the Tc Aerosol 0 min image.

Ventilation : Lists the activity in percent of total per ROI of the Krypton Ventilation image.

For instance:

$$\text{Inhalation \% Central} = 100 \times \frac{\text{Central}}{\text{Central} + \text{L Inner} + \text{R Inner} + \text{L Outer} + \text{R Outer}}$$

20.13 References

Mortensen J et al. Lung mucociliary clearance. Eur J Nucl Med 1994; 21; 953-61.

Mortensen J. Mucociliary clearance in the lung. Revista Medico-Chirurgicala 1990; 94; 9-18.

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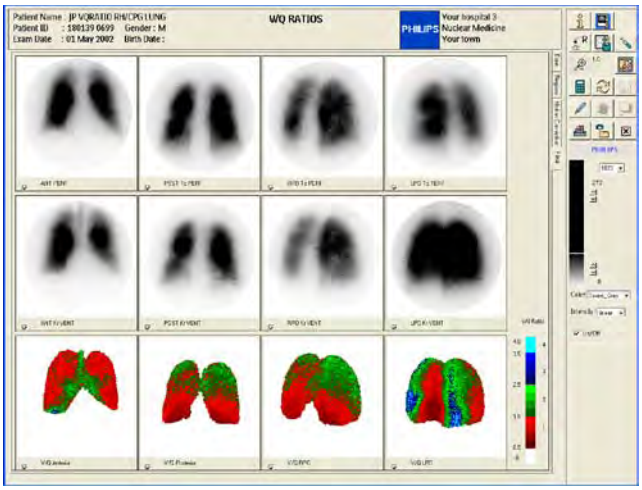
21 V/Q Ratio

21.1 General



The V/Q Ratio application displays the Perfusion, Ventilation and V/Q images of Anterior, Posterior, RPO and LPO views. The V/Q image per view is the ratio image where the maximum of the Ventilation image is normalized to the maximum of the Perfusion image. The resulting ratio image of V/P is then multiplied by 100, hence the name V/Q. A special color map for V/Q functional images is applied.

21.2 Acquisition

Matrix 128x128 : Anterior, Posterior , RPO and LPO views both Perfusion and Ventilation acquisitions , a total of eight images.

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21.3 Processing

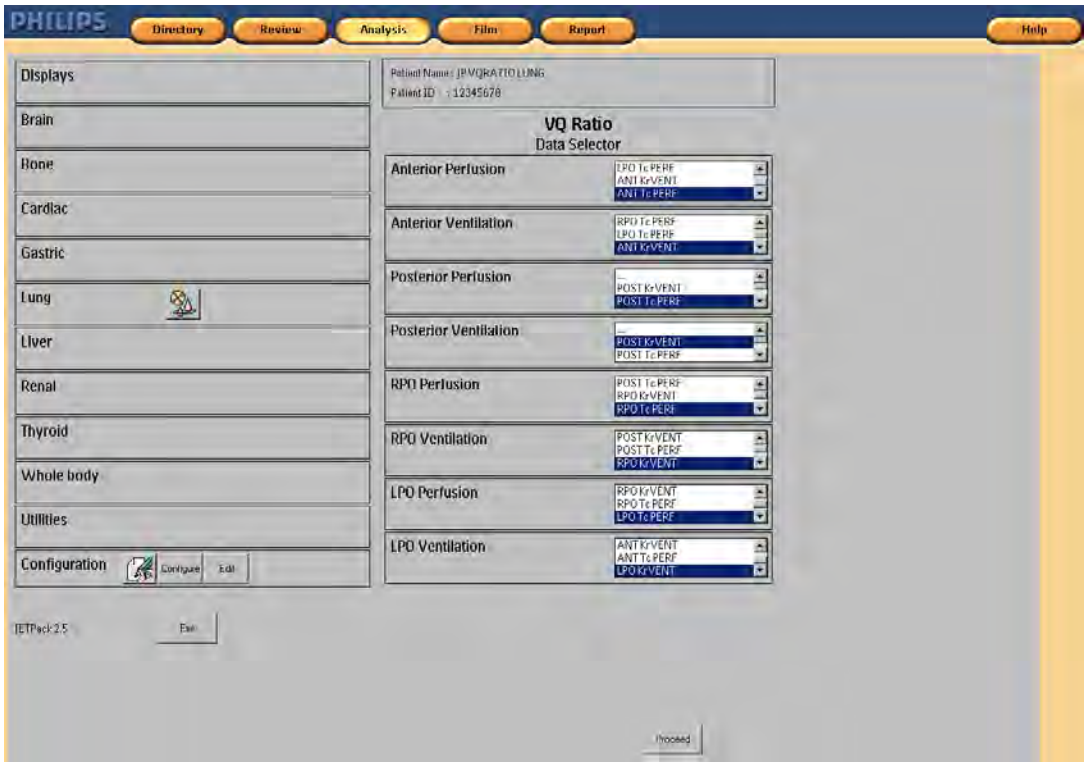


Figure 211 ISP JETPack panel, VQ Ratio application selected

If required adjust the selected files in the data buckets and click **Proceed**.

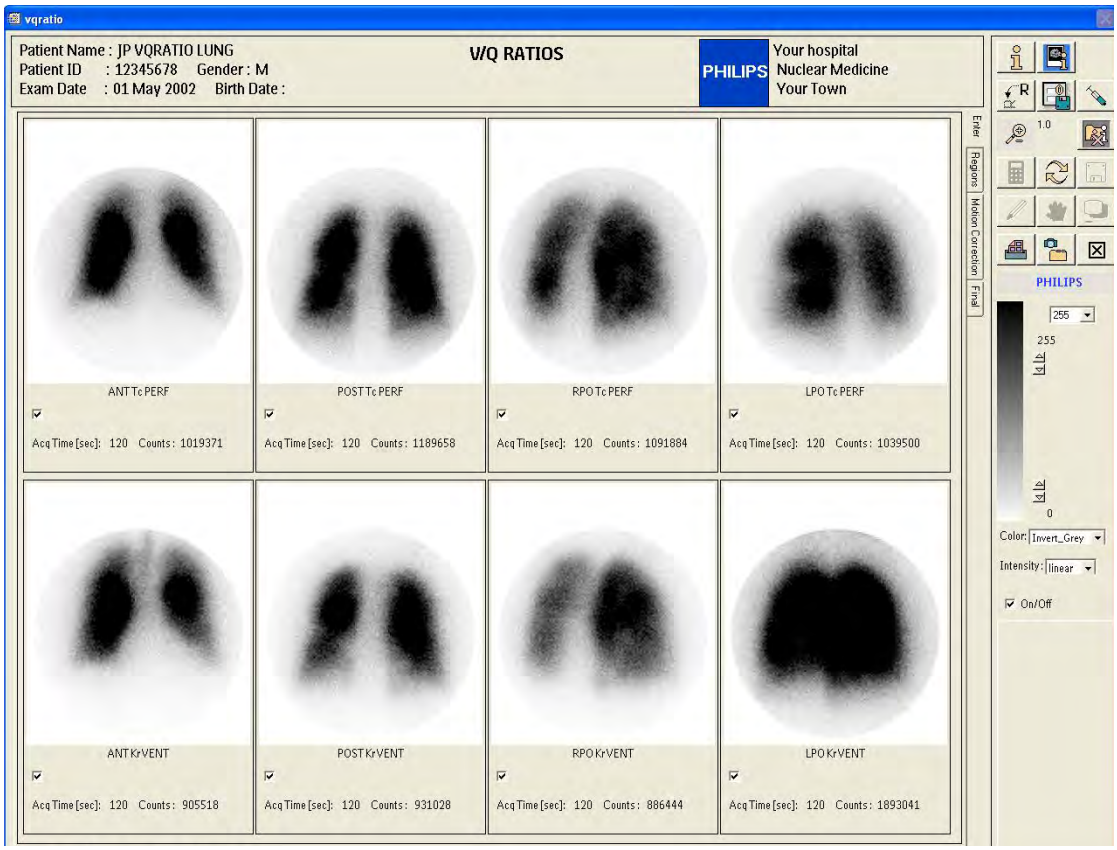


Figure 212 Input page, More file information selected.

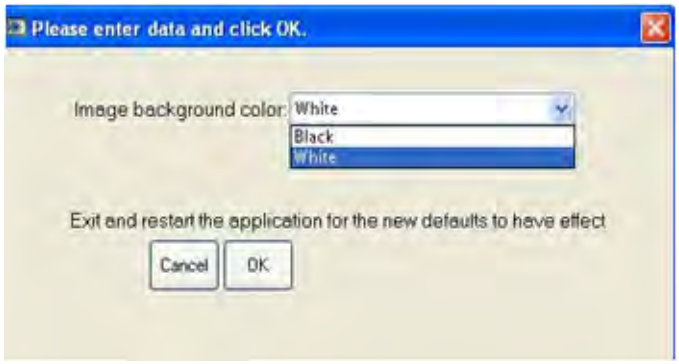
The Input page displays the eight selected ventilation and perfusion images. Verify that the top row contains the Perfusion images the bottom row must contain the Ventilation images.

You can use the Annotation to add text and/or arrows before printing or capturing the screen.

21.4 Button Panel

See the General description for an explanation of the various buttons.

Set Defaults: Click this button to bring up the default selection panel for the image background color.



The V/Q functional images can be displayed with either a black or a white image background. Make the proper selection here for the actual display and to save it as the default setting.

21.5 Regions Page

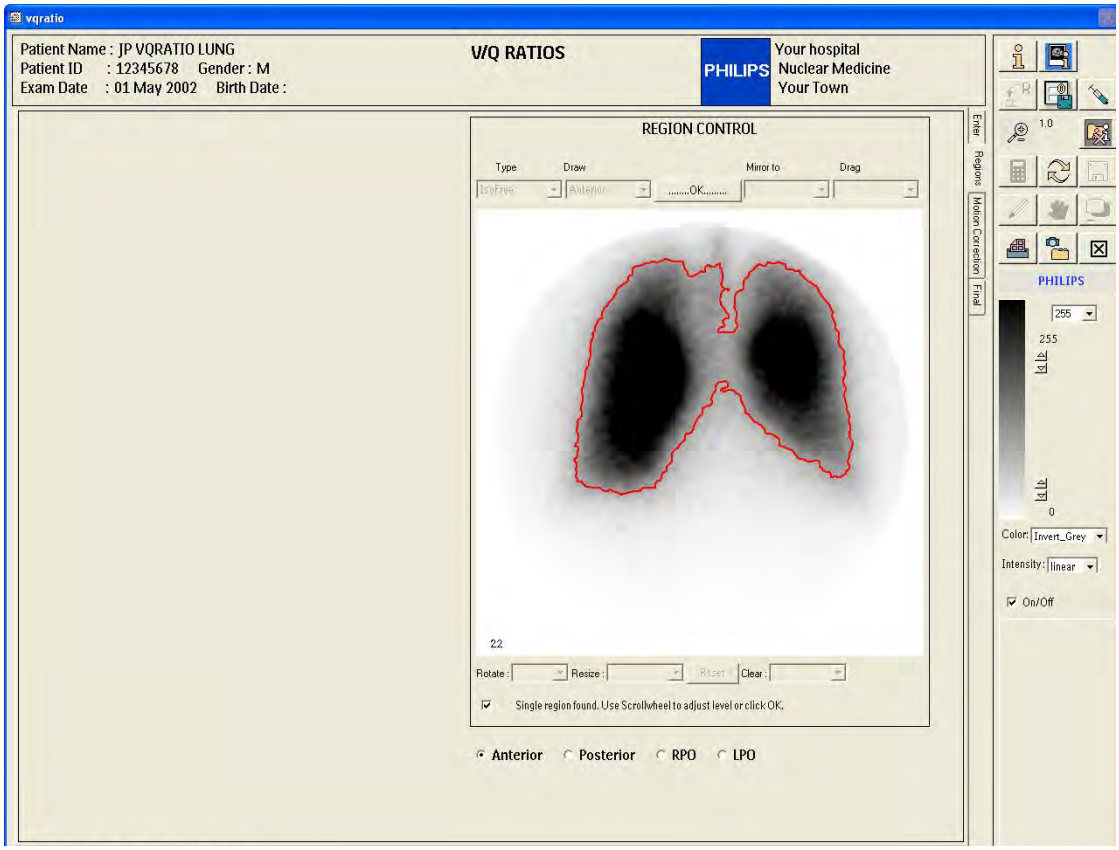


Figure 213 Regions Screen, Regions control.

Draw the lung ‘outline’ region encompassing both lungs on the Anterior ventilation view and continue to draw that region on the Posterior, RPO and LPO ventilation views. The ROI on each image is used for alignment of the ventilation and perfusion images and to define the areas of these images that will be extracted for building the V/Q images.

When all regions have been drawn continue to the Motion correction page.

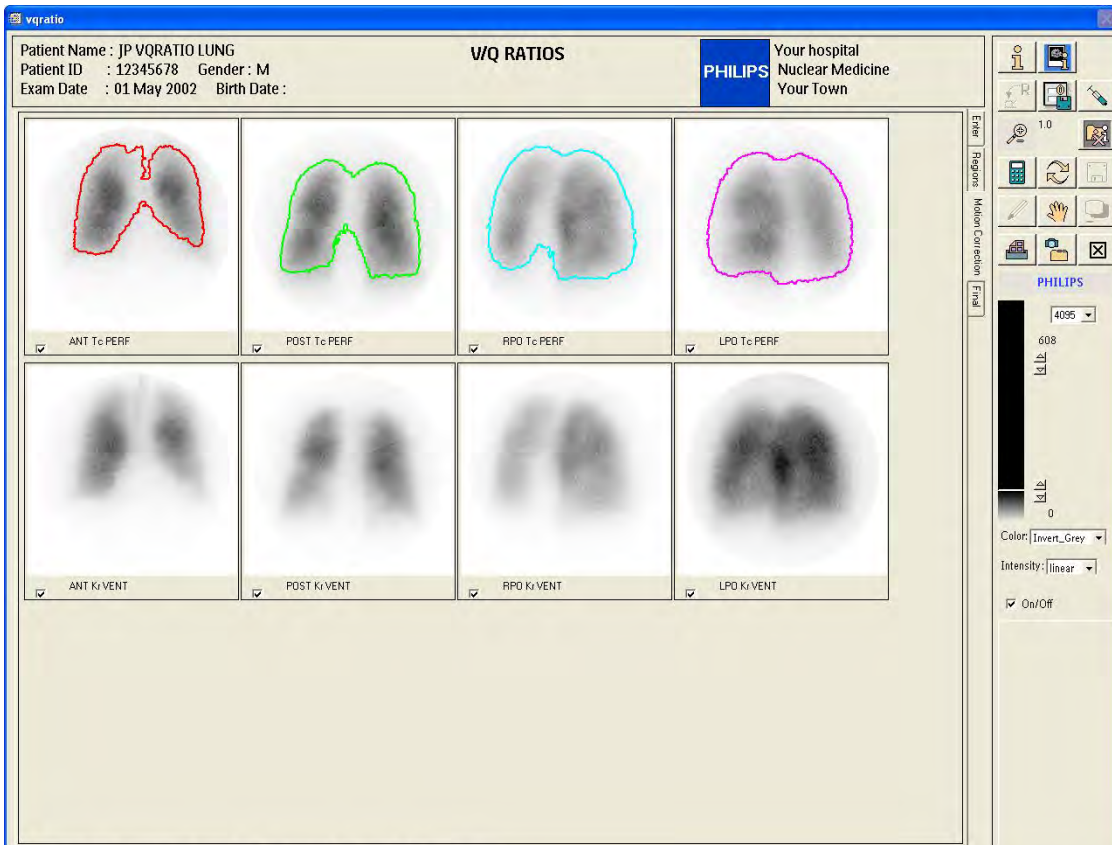


Figure 214 Motion correction screen.

The regions as drawn on the ventilation images are superimposed on the perfusion images.

You can click on a perfusion image to align that image with the region if required. Check all four images for alignment then click on the Calculate & Display button to continue to the final page.

21.6 Final Page

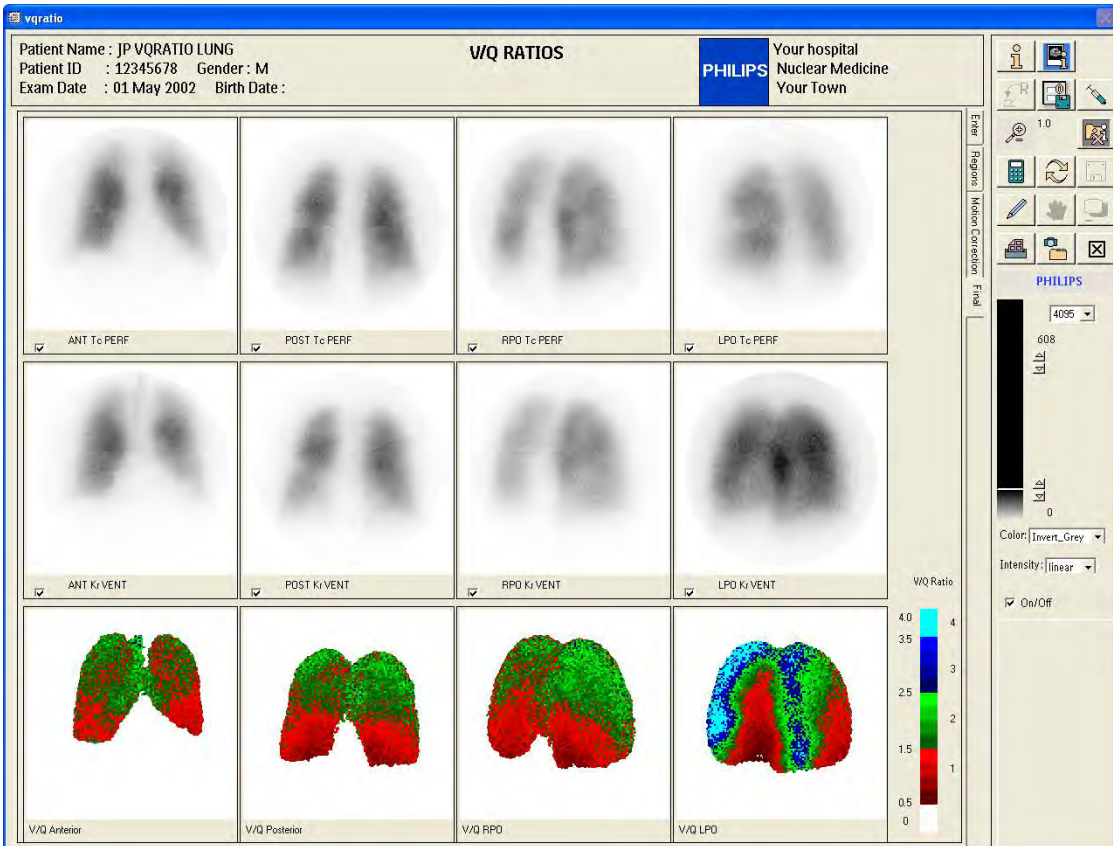


Figure 215 Final page

The perfusion images are displayed on the top row. The middle row shows the ventilation images and the bottom row shows the V/Q image per view. Notice the white background of the V/Q images. You can change this background via the Defaults select button.

All ventilation and perfusion images can be adjusted for contrast, intensity and color map. For the V/Q images the contrast and intensity are fixed, the color map can be displayed with either a black or white background as determined by the default setting. The V/Q ratio color scale that is displayed next to the V/Q images, is divided into three ranges: 1 (red) where ventilation is less than the perfusion, 2 (green) where ventilation and perfusion are similar and 3 (blue) where the ventilation activity is more than the perfusion activity.

21.7 Calculations

For all four views the same method is applied. The maximum value within the region of perfusion image is determined as Pmax, the maximum of the ventilation image is determined as Vmax. The

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Ventilation image maximum is normalized to perfusion image maximum by multiplication of the ventilation image by the factor Pmax/Vmax. The ratio of the normalized ventilation image divided by the perfusion image is then multiplied by a factor 100 to allow for better color scale spreading.

$$\text{V/Q image} = \frac{100 \times \text{Ventilation image}}{\text{Perfusion image}}$$

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