

# *MoleMax* HD

## USER MANUAL



## 1. New Patient

This function is used for the first examination of a new patient. If the patient is already in the database always use **Select Existing (Patient)** function.

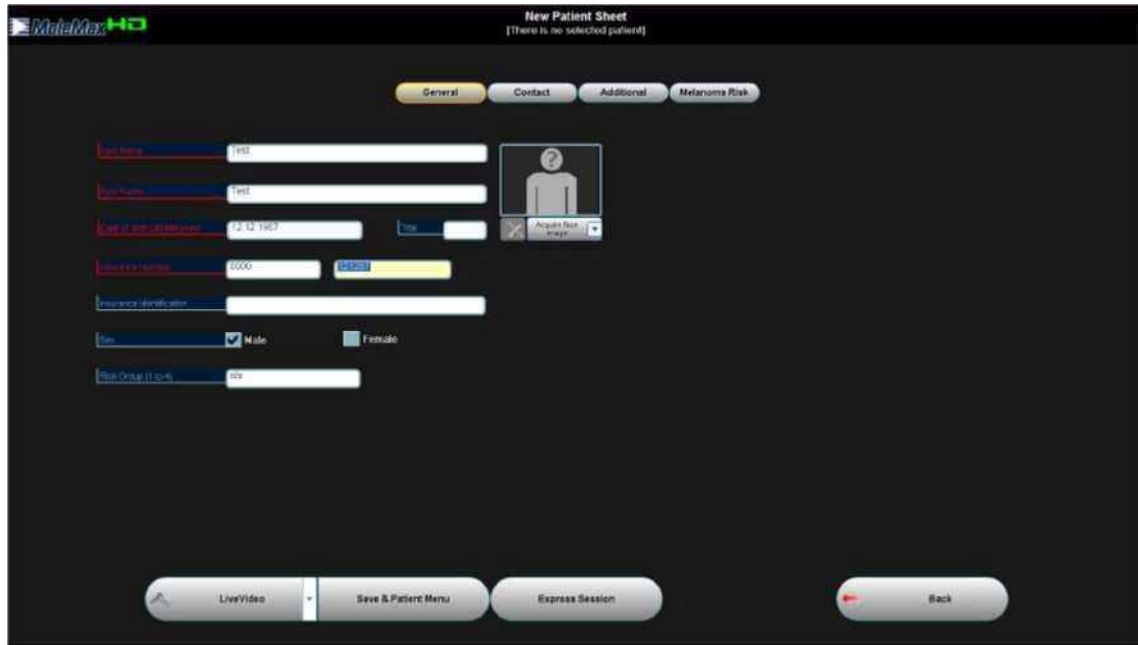
*Step 1:*

Select the icon **NEW PATIENT** in the main menu.

The software moves on to the New Patient window.

*Step 2:*

New Patient screen is shown below:



The screenshot shows the 'New Patient Sheet' interface for MoleMax HD. At the top, there are four tabs: 'General' (selected), 'Contact', 'Additional', and 'Melanoma Risk'. Below the tabs, there are several input fields. The first four fields are highlighted in red, indicating they are mandatory: 'Last Name' (containing '190'), 'First Name' (containing '190'), 'Date of Birth (YYYY-MM-DD)' (containing '12-12-1902'), and 'Insurance Number' (containing '0000'). There are also fields for 'Insurance Identification', 'Sex' (with 'Male' selected), and 'Risk Group II code' (containing '00'). A 'LiveVideo' button is on the left, and 'Save & Patient Menu', 'Express Session', and 'Back' buttons are on the right. A 'Acquire New Image' button is also visible next to a patient icon.

The following four lines are mandatory (red colored):

Last name

First name

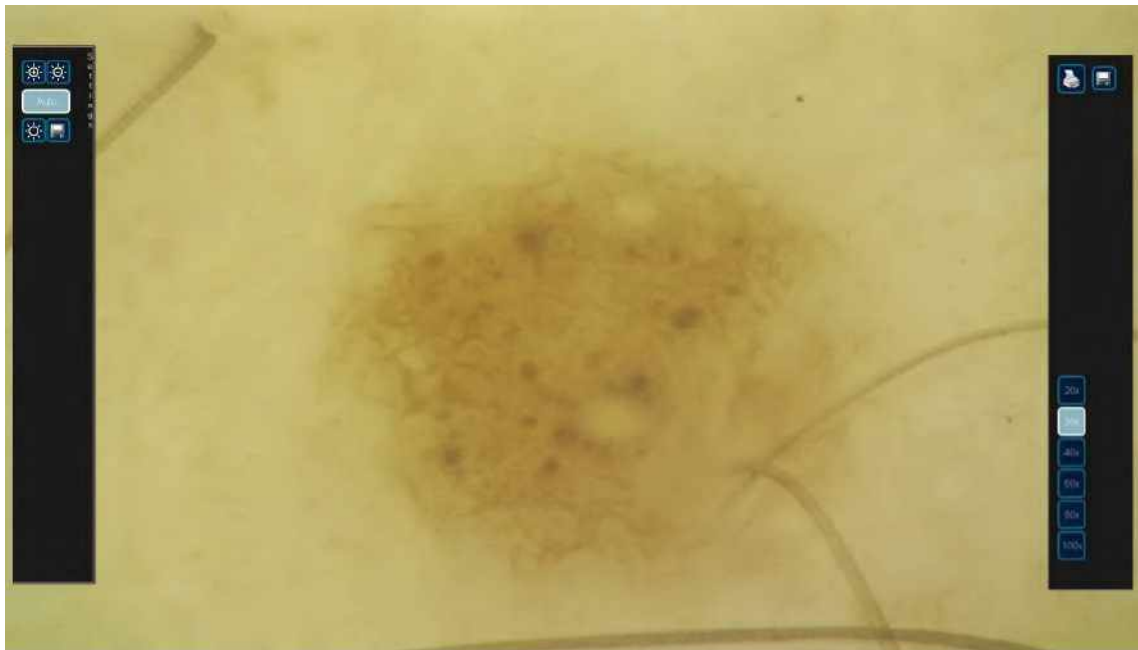
Date of birth (the format depends on the country settings, the year has to be typed in with 4 digits e.g. 1950, this is very important for patients born before 1929)

Insurance number

All other information is optional and can be typed in later too.

On dual screen system video is shown in the top screen.

Live Video always comes from the MoleMax HD System camera. If no ELM adapter is used camera is in macro imaging mode for taking macro images or close-up images. If ELM adapter is attached to the camera, camera is in micro imaging mode for taking ELM images. MoleMax HD software automatically recognizes the recording mode (macro/micro), no further user action is required to determine the camera mode.



If no ELM adapter is attached to the camera standard Live Video for macro imaging is displayed.

**Micro Mode:**

To switch to the DELM camera mode, simply clip the DELM adapter onto the front of the camera. The software automatically zooms to the standard 30x magnification. Make sure that the glass plate of the DELM adapter is properly cleaned. Touch the skin with the ELM camera using gentle touch.

**To select other optical magnification than 30x, move the mouse to the right to open selection screen and select one of following icons**



For the 60- 80- 100 times magnification clip the **silver, shorter** adapter on the camera.

If the brightness of the image is not optimal adjust the light by clicking on the sun symbols to the right of the Live Video frame.

It is possible to increase or decrease the light intensity or to reset it to the original value. To alter the contrasts of the image use the contrast symbols in the selection screen. Move the mouse to the left border of Live video screen to activate this menu.

**Brightness and Contrast.....LM81HM**

To increase or decrease the brightness of the image use the two buttons in the middle. Select the appropriate button and move the cursor into the center of the image until the mouse cursor has the same symbol as the brightness option. Select the image to alter the brightness and contrast.



**Auto .....**

To reset the brightness and contrast to automatical values click the button AUTO. By selecting this option button is illuminated and optimum values are determined by the camera. Click the button once again to return to manual values.

To reset brightness and contrast to defaults simply press

To change defaults set brightness and contrast to desired values and press

**Macro Mode:**



## Freezing the image:

To freeze the live video select **FREEZE** button on the bottom of the Live Video screen or move the cursor into the image and press **RB** or press the **Space** bar. If the frozen image is not satisfying simply redo. To return to the live video function either select **LIVE VIDEO**, press **RB**, or press the **Space** bar.

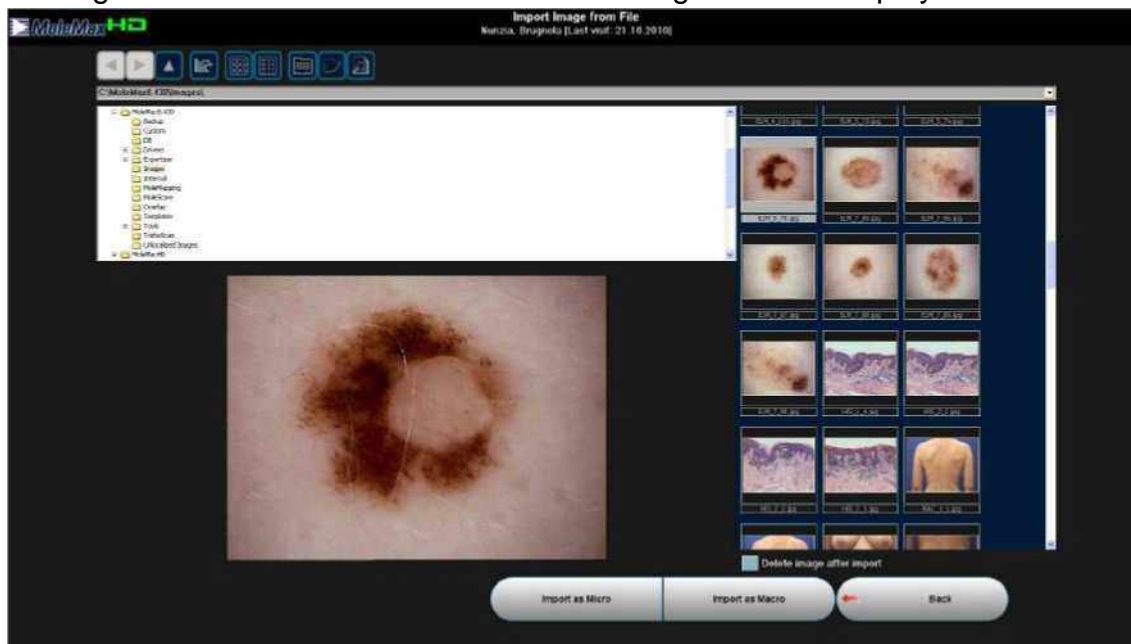
If the frozen image is satisfying, it can be **SAVED** in the following screen. To enter image saving screen press OK or press **LB** now. Image saving screen is activated. Proceed to *step 4*.

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### *step 3.2 (Taking images by using FILE IMPORT):*

Alternatively to Live Video functions all MoleMax HD systems offer an additional option of image acquire over **FILE IMPORT**. This function is identical in all MoleMax HD systems.

After selecting **IMAGE FILE IMPORT** function following screen is displayed:



Simply select the file location of the image to be imported and confirm if image is micro image or macro image by clicking on **IMPORT AS MICRO** or **IMPORT AS MACRO** buttons. Proceed to *step 4*.

Current path location is shown in the path bar on the top of the screen and selected image preview is displayed in the big frame. Preview of additional images is displayed in thumbnails on the right side. Arrow buttons on the top are used for the standard Windows Explorer navigation. The button with arrow refreshes the Explorer tree.

The functionality of last 5 icons (from left to right) is following: "Show images from the same folder as thumbnails", "Display only detailed list of the images from the same folder", "Image file properties (properties of selected image)", "Display image in external associated viewer" and "Open containing folder in Windows Explorer (in external window)".

### *step 4 (Saving image):*

After image is acquired (either using **LIVE VIDEO** or **FILE IMPORT**) it must be localized on the body before it is saved into the patient database. Optional comments and diagnose can be assigned to the image. This is done in **DETAILS** screen as shown on the image below.

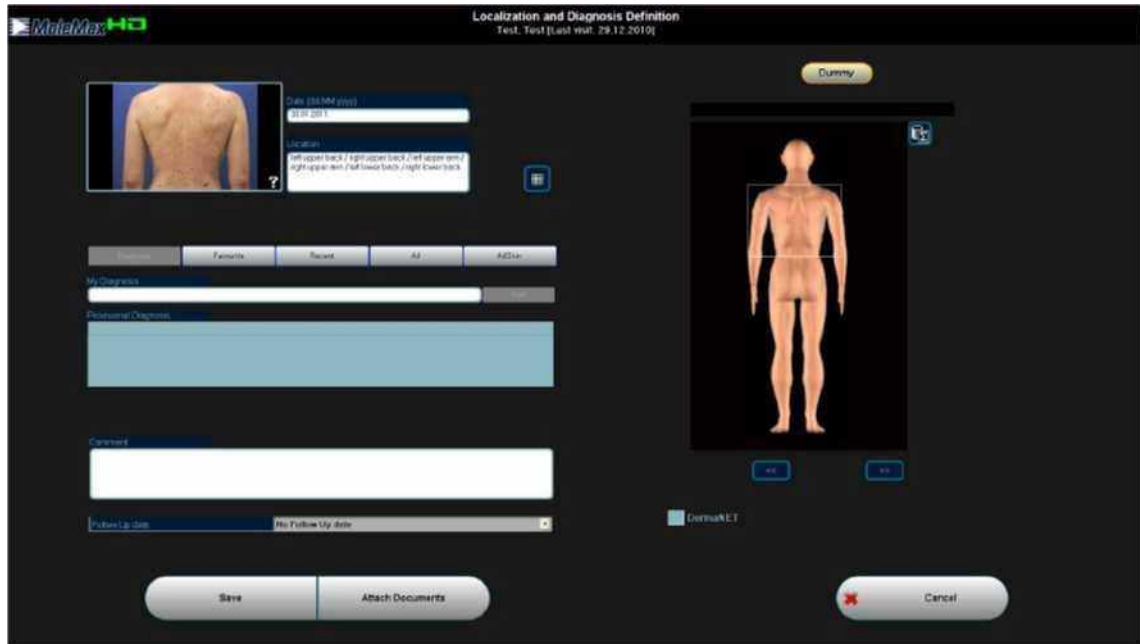
MoleMax HD systems differ between three basic types of the images: **MACRO**, **CLOSE-UP** and **MICRO** images.

#### (1) **Macro Image**

##### Defining the location

Specify the location by framing the corresponding body region on the Body Figure. Note that the Body Figure can be viewed from various directions. There are also separate displays of the

head, the hands and the feet. To see the different displays use the scroll icons under the Body Figure. As soon as the position is selected, the corresponding location text will automatically appear in the *Location* bar.



### *Giving a diagnosis:*

Usually the diagnosis is assigned immediately upon image acquire, but there is also the possibility to enter it later, whenever DETAILS screen is used.

To assign the diagnosis, simply select one of the diagnosis buttons and select one of pre-defined diagnosis by double-clicking on it, and then confirm it with SELECT DIAGNOSIS button! Or simply start to type your diagnosis into the diagnose text field: "MY DIAGNOSIS". Multiple diagnosis can be entered into this box.

There are five Diagnosis buttons: Diagnosis (contains all given diagnosis), Favorites (list of your favorite diagnosis), Recent (list of all recent given diagnosis), All (list of all diagnosis) and All Skin module (external module with the list of all diagnosis including image examples) For more information about All Skin module see Chapter *ALL SKIN*.

To pre-define and customize the list of diagnosis use "Diagnosis Configuration" option located in ADMINISTRATION.

If there is intention to send image over email check the DermaNet checkbox. This allows user to search later easily for images to be sent.

Additionally any type of document can be attached to the image record. Simply click the button **ATTACH DOCUMENTS** and file import screen will open. Document is stored as an addition to the image in the database. If original of the document should be deleted on the previous location after import simply select **"Delete original documents after import"**

For easy determination of a lesion size a millimeter grid can be displayed by selecting the grid sign next to the image. The size information can eventually be entered in the comments box. The grid will not be saved with the image.

Full screen view of the image can be recalled by clicking on to image thumbnail on the top left corner of the **DETAILS** screen.

In the Full Screen view image can be seen in the full screen size, can be zoomed in and out, scrolled in all directions as well as seen in a real size view (pixel per pixel view), by simply

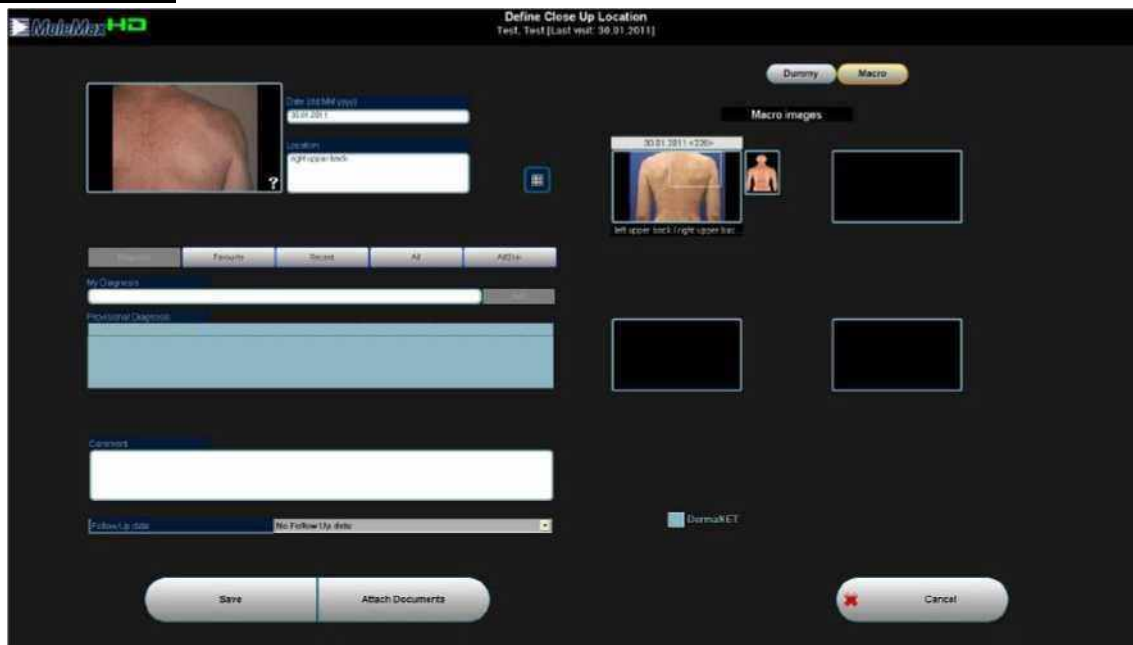
selecting appropriate icon on the right side of the image.

## (2) Close-Up Image

A close-up image is an additional macro image, which covers only a part of a pre-taken macro overview image.

To take a close-up image, repeat the same procedure (*Step 3*) as for the macro image. To turn on the close-up light press the black button in the left upper corner on the backside of the macro-camera.

### Defining the location



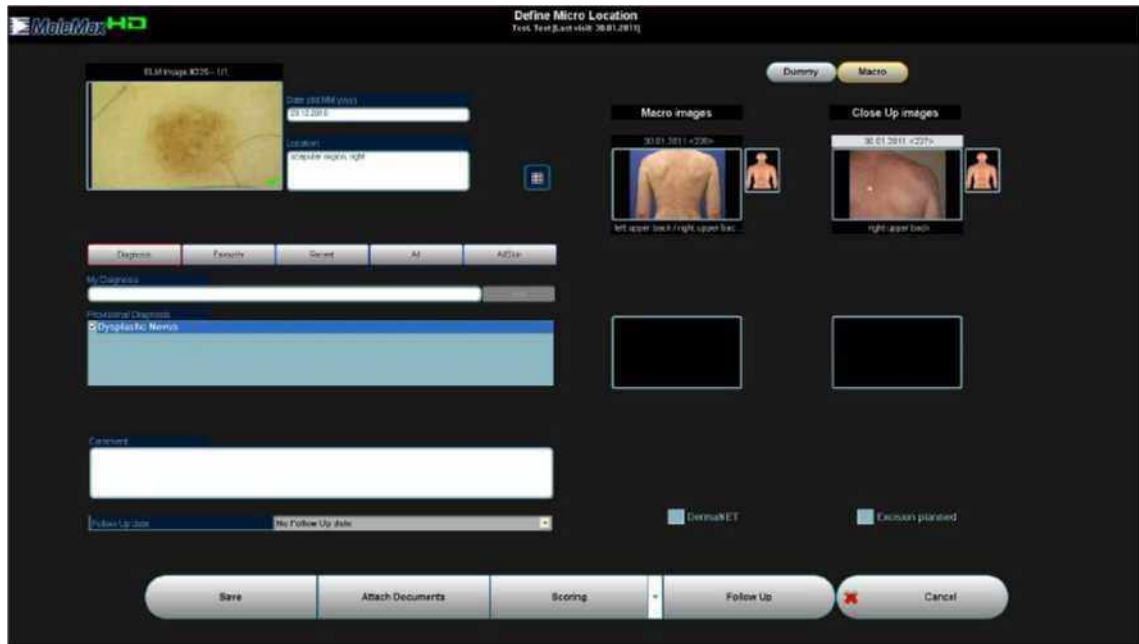
## (3) ELM Image

To take an ELM image follow the image taking guidelines in *step 3* using MoleMax HD camera with DELM adapter attached.

### Defining the location on the Body Figure:

Locations of the micro images are stored differently from locations of macro and close-up images. While macro and close-up images are marked and localized as an area on the body, micro images are determined and localized as a single spot on the body.





In order to localize micro image specify the location by marking the corresponding position of the body where the lesion is situated. Note that the Body Figure can be viewed from various directions. There are also separate displays of the head, the hands and the feet. To see the different displays use the scrollbar under the Body Figure.

As soon as the position is selected, the corresponding location text will automatically appear in the **Location** bar.

#### Defining the location on Macro or Close-up image

In order to make sure that the position is set on the correct macro or close-up image, the other images linked to the selected image are displayed to the right. If a macro image is selected the related closeup images defined on the macro overview image are listed. In the large view of the macro image the frames showing the positions of the close-ups as well as their image numbers are displayed. To localize the ELM on a better-suited close-up image select the appropriate close-up on the right and mark the ELM position on it.

If a close-up image is selected the related macro overview image and other close-ups also located on that macro image are listed. In the large view of the macro image the frames showing the positions of the close-ups as well as their image numbers are displayed. To localize the ELM on a better-suited close-up image or directly on the macro overview select the appropriate image on the right and mark the ELM position on it.

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#### Defining the location on a Body Mapping Image

If a correlating body mapping session was taken earlier, the location of the lesion can, in addition to the localization on the Body Figure, also be defined on that body mapping image. Select **BODYMAP** to define the lesion on a macro image taken in the **Body Mapping** function (this button is only visible if there is a Bodymapping series existing from the selected patient).

Use the scrollbar to see the next / previous body mapping images. Choose the appropriate bodymapping image and select it. Mark the corresponding lesion on the body mapping image and select **OK** to return to the **New Diagnosis** window.

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#### *Step 5 (Finalizing the patient)*

After all images are recorded exit to the Patient Menu Screen either by using F10 or Escape button. In the patient menu screen further actions (described later in this manual) can be performed.

If no other actions with this patient are planned simply exit to the main menu by using F10.

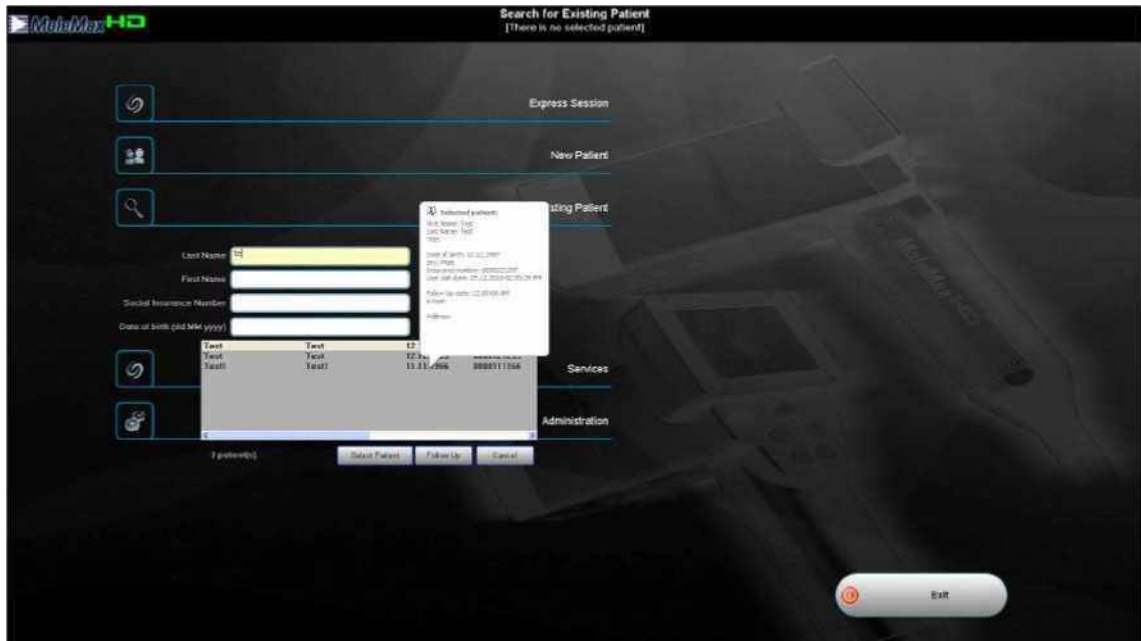
## 2. Select Existing (Patient)

From second patient visit on option **Select Existing (Patient)** may be used. No matter if patient record has images or not, if the patient is already in the database all patient-related functions can be performed from **Patient Menu** screen.

Existing Patient can be selected either directly from the **Main Menu** or over advanced search functions by clicking the button **SELECT EXISTING**

### (1) Fast patient search directly from the Main Menu

Any patient selection can be done directly from the Main Menu by using the search fields.





Input the patient data in one of the search fields and all matching patients will show up in the list automatically. If the patient is highlighted pop-up balloon with additional data will be shown. If there is face image acquired, this image will be shown right next to search fields.

Select the Patient and choose one of following options:

- Select Patient to enter **Patient Menu** screen.

(Further actions will be selected within this screen)

- Follow Up / Monitoring

(Follow Up screen is shown directly skipping Patient Menu screen)

The bar at the top of the screen indicates the selected and active patient. All functions entered will be saved to this patient's record. The date of the last visit of this patient is also displayed.

## (2) Advanced Search for a patient

Select button **EXISTING PATIENT** from the Main Menu. **SIMPLE** patient selection screen with following options is displayed:

Either select the button of the first letter of the patient's Last Name or

Type in parts of the last name and/or first name and/or insurance number in the corresponding line and select **SEARCH** or

Clear all input fields and select **SEARCH** to search the complete patient list.



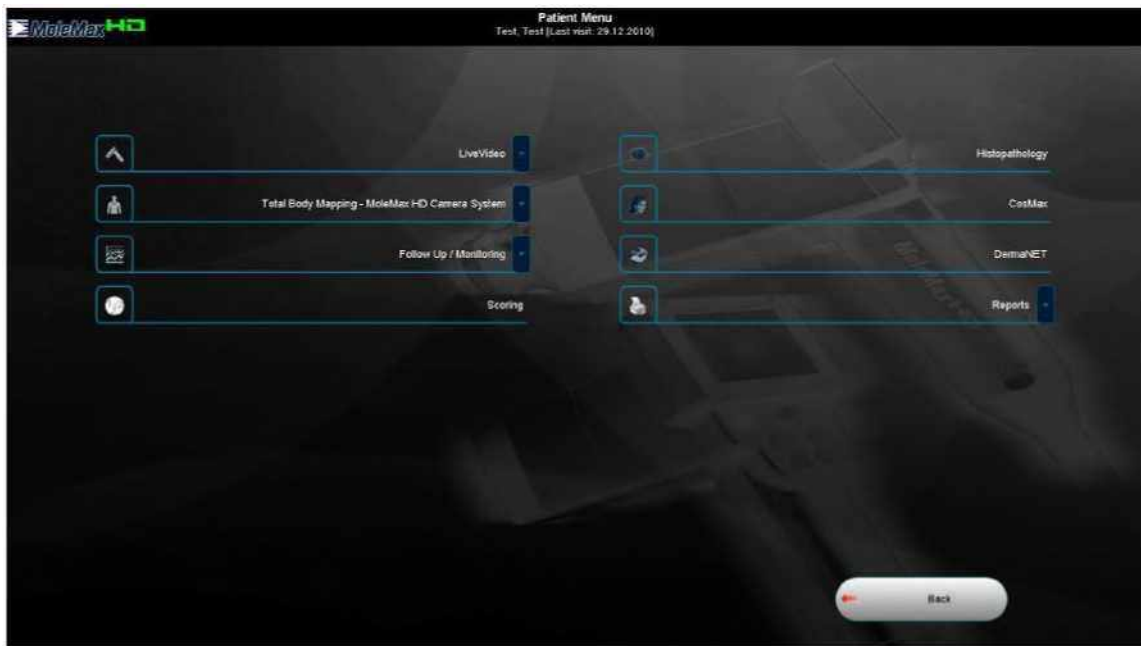
Every Query can be pre-defined and saved, to be used in the future by simple selection in advanced search screen.

After search is completed select the patient and confirm with **OK** to enter **Patient Menu**.

To exit **ADVANCED** search and go back to **SIMPLE** search click first button **CANCEL** followed by clicking the button **SIMPLE**.

## 3. Patient Menu Screen

After patient is selected following Patient Menu screen appears.



This is main and central patient switching point that contains all the necessary functions for a full and comprehensive patient management. All important functions can be accessed from this menu.

The bar at the top of the screen indicates the selected and active patient. All functions entered will be saved to this patient's record. The date of the last visit of this patient is also displayed.

The easy-to-use **icons** have the following functions:

#### **Live Video /**

<b>Image file Import</b>	Function for adding images of new moles to the existing patient
<b>Total Body Mapping</b>	Total body mapping function for complete body photography, using either MoleMax HD video camera or digital still camera
<b>Follow Up / Monitoring</b>	All follow up examinations of a patient (follow up of lesions, follow-up macro and close-up images as well as new images of new lesions and new macros and close-ups) enhanced with Trending function and Clinical Audit.
<b>Scoring</b>	
<b>Histopathology Report</b>	Interactive evaluation of the lesion according to the ABCD method or the 7- Point. Also to apply external TrichoScan, MoleMapping or MoleScore modules for automatical image evaluation.
<b>DermaNet</b>	
<b>CosMax</b>	Import and management of histopathological images

#### **Follow Up / Monitoring**

**This is essential function of any MoleMax HD system and is used for all follow-up visits of a patient.**

#### **4. Standard Follow Up | Monitoring**

That includes follow-up images of already examined ELM, close-up or macro images as well as new ELM, close-up and macro images that were not taken at the first visit. Furthermore Trending and Clinical Audit functions for complete and detailed evaluation of the development of one lesion over time are accessible thru Follow-Up option.

In the Follow-Up mode it is not only possible to compare two stored images but also to compare any stored image with an actual live video image.

#### **Step 1 (Image selection for Follow-Up):**

Select the button **FOLLOW UP** in the Patient Menu. Depending on the individual setting the

software moves on to the **3x3**, the **Macro and Close-Up** images, or the **Dummy** display of the patient's sheet.

**3x3 Display**



**Macro and Close-Up Display**



**Dummy Display**



Within the Follow Up screen it is very easy to switch fast between these three views. This is simply done by clicking on appropriate button located in the top right corner.

### **3x3 Display** .....

In the 3x3 Display, the macro images are displayed in the left column, the close-up images in the center column and the ELM images in the right column. Each row shows a specific link between a macro image and/or a close-up image and/or an ELM image. The images are sorted descending by the examination date of the ELM images. Use the arrows at the right bottom and the left top to see the next / previous images.

In the fourth column history of selected image is displayed. If there are more than three recordings in the history scrolling arrows are visible.

#### **Additional features**

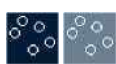
Finding and Selecting specific close-ups and ELM images/ Sorting

Filtering specific images

#### **Finding and Selecting specific close-up and ELM images**

##### **Selecting a specific ELM image**

If more than one ELM image was defined on the same macro or close-up image it might be useful to enlarge the specific image and directly select the lesion that should be followed-up.



In case close-up images as well as ELM images were defined on the same macro overview, select the DELM location symbol to see all positions of ELM images on the enlarged macro image. Select the specific lesion. The selected image appears green. Select **OK** to return. The selected image is highlighted.

##### **Selecting a specific close-up image**

If more than one close-up image was defined on the same macro image it might be useful to enlarge the specific image and directly select the close-up image that should be followed-up.

#### **Sri**

In case close-up images as well as ELM images were defined on the same macro overview, select the close-up location symbol to see all positions of close-up images. Select the specific closeup. The selected image appears in color on the black and white macro. Select **OK** to return. The selected image is highlighted.

#### **Sorting**

It is possible to sort the images descending by the macro image examination date, the close-up image examination date or the ELM image examination date (default setting).

Select **Macro**, **Close-Up**, or **ELM** buttons located on the top to see all images sorted from the last image taken to the first image taken according to the examination dates in that column. The respective button above the columns is highlighted.

### Filtering specific images

In the case of patient files with many images it can be helpful to have only images of a specific category displayed to find a specific image more easily. The following categories can be selected:

ALL	All images (default setting)
LV	Images taken at Last Visit
PD	Images with Pending Diagnoses
R	Lesions at Risk (not available in the "Macro and Close-Up images" display)
PE	Planned Excisions (not available in the "Macro and Close-Up images" display)
T	Images selected for Teleconsulting per DermaNet
TBM	Total BodyMap images

**M+C**

### Macro and Close-Up images Display .....

In the Macro and Close-Up images display, only the macro and close-up images of this patient are shown. The macro images are framed in white color, the close-up images in green. The latest macro is displayed on the left top corner. The other macros follow to the right in descending order according to their image number. If close-ups are defined on a macro overview image they are shown right after the corresponding macro. Use the arrows at the right bottom and the left top to see the next / previous images.

To select a specific close-up move the cursor over the corresponding macro overview image and press **RB** to enlarge it. Select the specific close-up. The selected image appears in color on the black and white macro. Select **OK** to return. The selected image is highlighted.

### Filtering specific images

In the case of patient files with many images it can be helpful to have only images of a specific category displayed to find a specific image more easily. See above for the functions of the various filters.

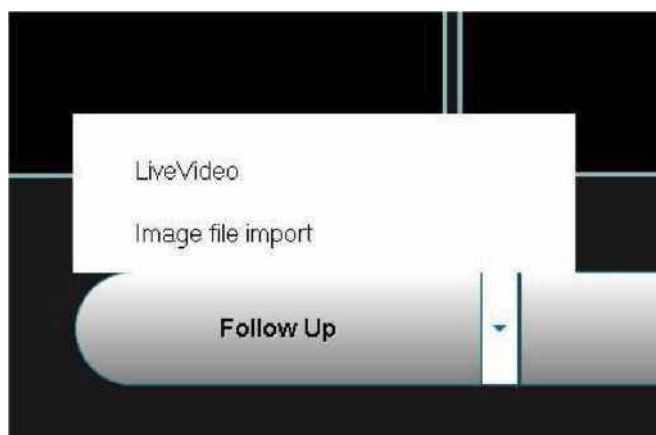
### Dummy (Body Figure) Display .....

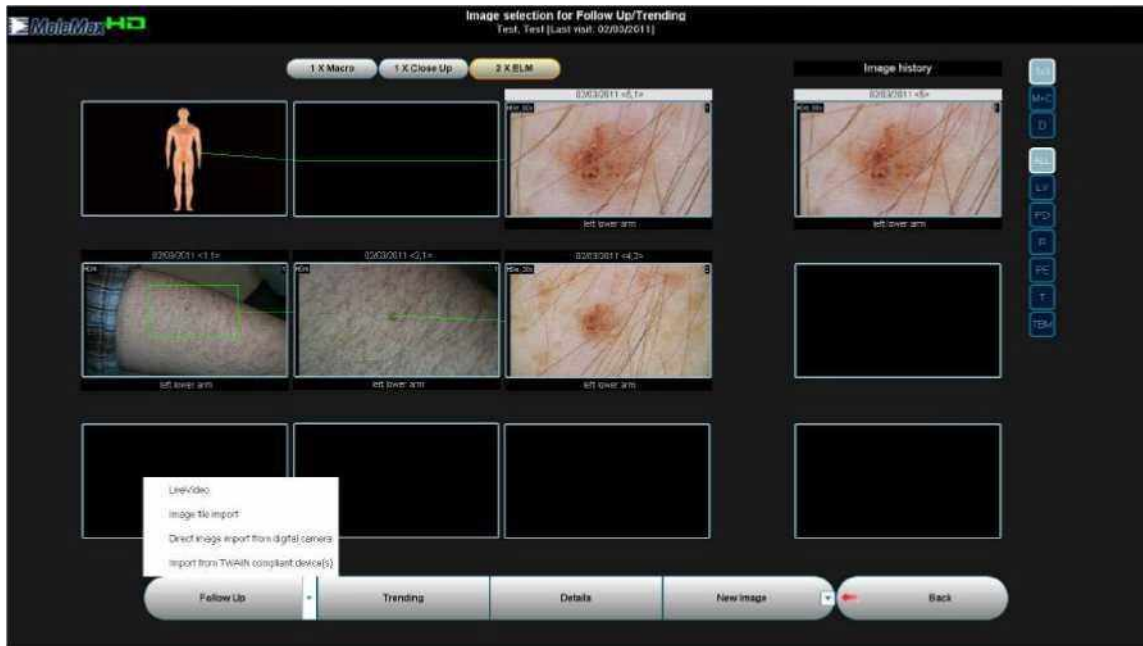
In the Dummy Display, only the locations of the ELM images of this patient are displayed either by crosses or by circles if they correspond with a macro image. The selected lesion is indicated by the dark blue cross or circle and is displayed in the right upper corner. To change to another Body Figure display select the appropriate small view on the side and it is enlarged in the center.

### Step 2 (Follow Up With Live Video):

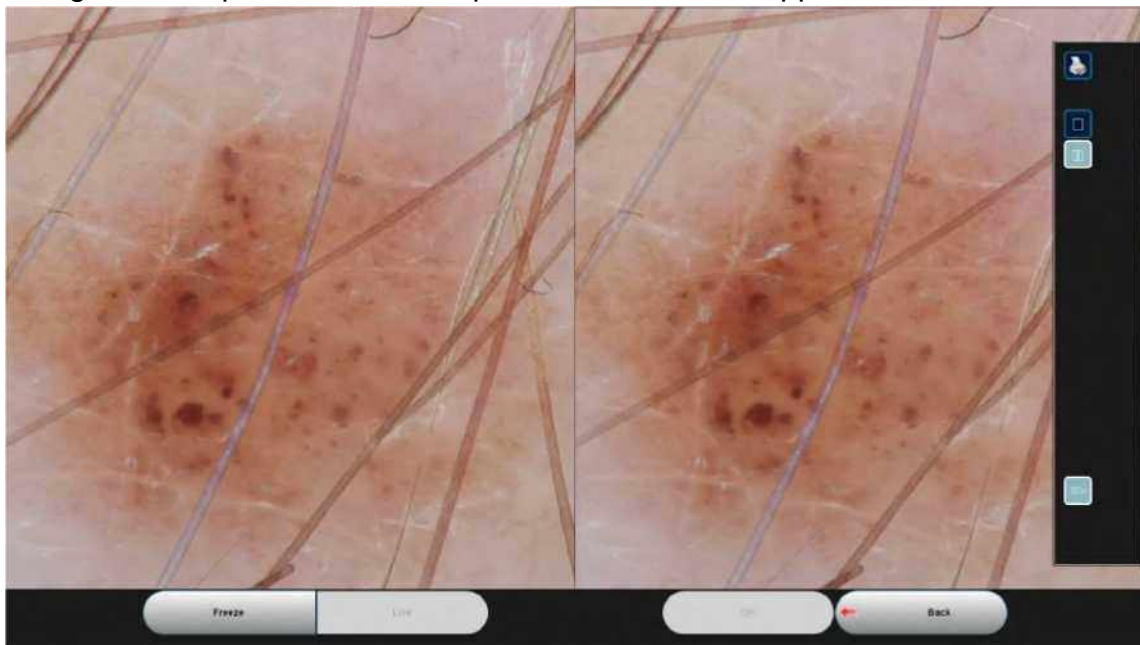
Find and select the image to follow-up by using instructions from above. Select **FOLLOW UP** button to proceed.

If follow-up is to be done with different camera than originally first select appropriate follow-up mode by clicking arrow on the right side of Follow-Up button (located on the left bottom corner of Follow-Up screen) and then select Live Video or Image File Import.



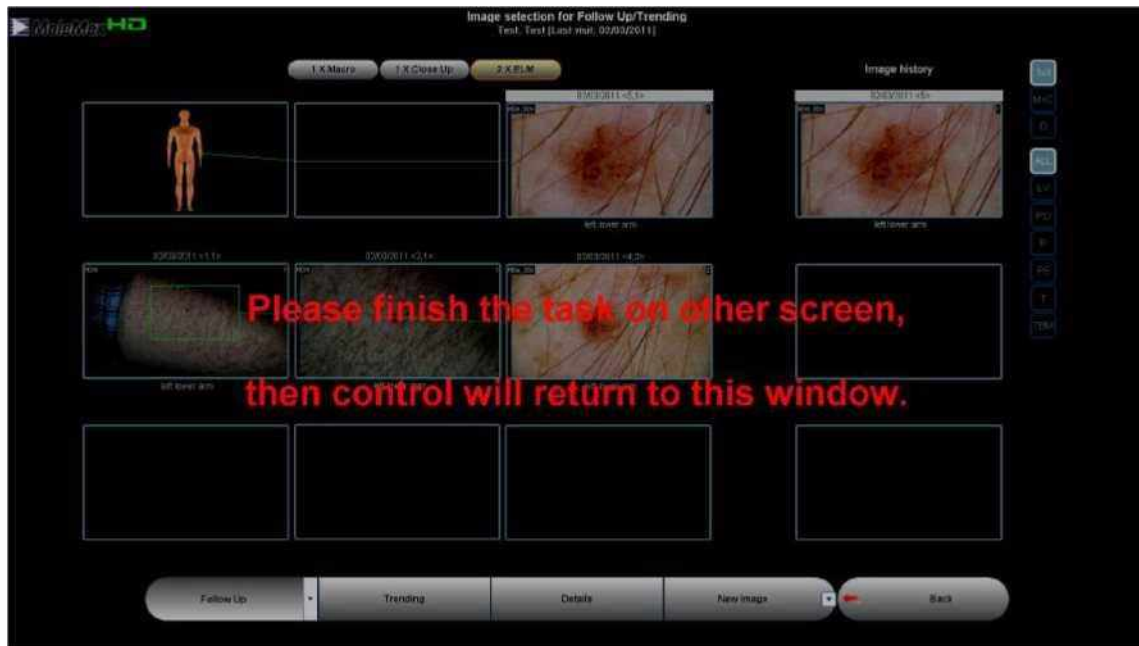


After clicking Follow-Up button Follow-Up Live Video screen appears.



Please note, when using two screens, while taking Follow-Up image the lower screen is blocked and following image appears:





Screen is activated again after the task (taking image or canceling the action) in top screen is finished.

**step 3 (Saving the image):**

After clicking **OK** button DETAILS screen is shown.

To save time in the follow up examinations the mouse pointer is positioned automatically on the next logical step.

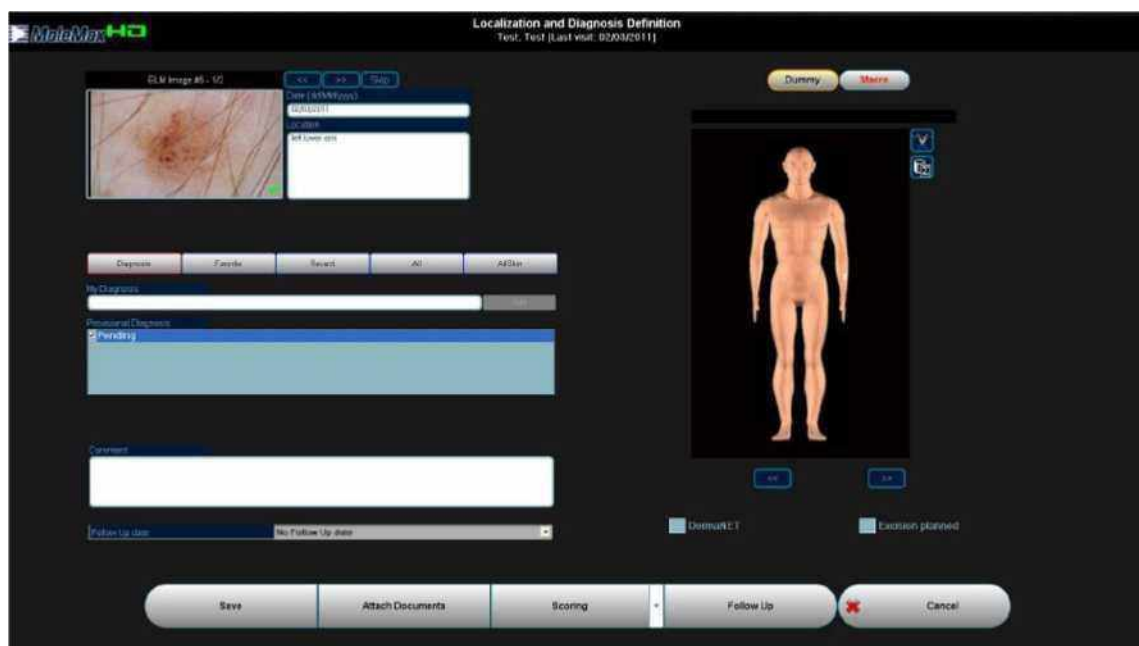
Select either **OK** to save the image.

The program returns to the Image Listing window and the next image is automatically selected. Redo Steps 2 to 4 to follow up this image.

**5. Guided Follow Up / Monitoring**

The faster option to do follow-up (for experienced users) is called **Guided Follow-Up**.

For following up all images of a specific type (ELM, macro or close-up) this guided follow-up procedure is available. Select an ELM, macro or close-up image in the patient's sheet and select **DETAILS**. Starting by selecting latest image is recommended because of numeration of images within guided follow-Up.



Select **FOLLOW UP** to start the examination procedure. Take the follow up image as described in previous section (Standard Follow-Up). By clicking the right mouse button the live video image gets frozen and clicking on the left mouse button afterwards brings you to the next step in the examination routine (Mouse has to be within live video to enable these **LB** and **RB** shortcuts).

To save time in the examination the mouse pointer is positioned automatically on the next logical step, which eliminates the time-consuming mouse movements. The steps in the examination just have to be confirmed by clicking the left mouse button.

After entering back the DETAILS screen new image is ready to be saved.

Select **SAVE** and the next image to follow up is shown and mouse moves automatically to FollowUp button. Repeat the procedure until the last image is followed up and the software returns to the patient's sheet.

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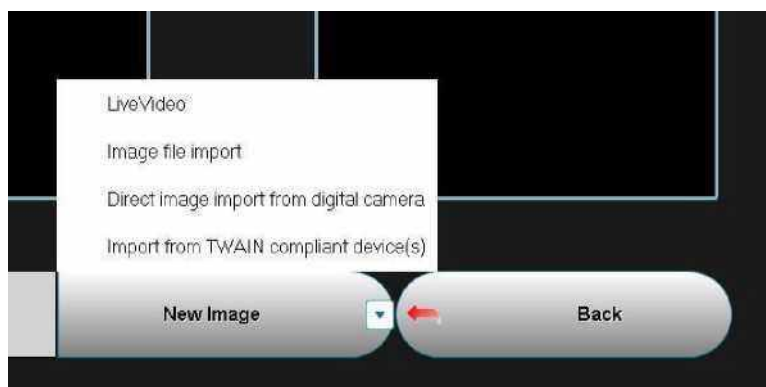
## 6. New image within Follow Up

### New Image

In order not having to switch between functions it is possible to record new images during a follow up visit of a patient directly within the Follow Up function. In such a case, select **NEW IMAGE** button in the patient's sheet to get to the live video mode.

Click on the **arrow** located on the right side of **NEW IMAGE** button to select between LIVE VIDEO and IMAGE FILE IMPORT, as well as "Direct Import from digital camera" and "TWAIN Import" if available and enabled within Administration screen

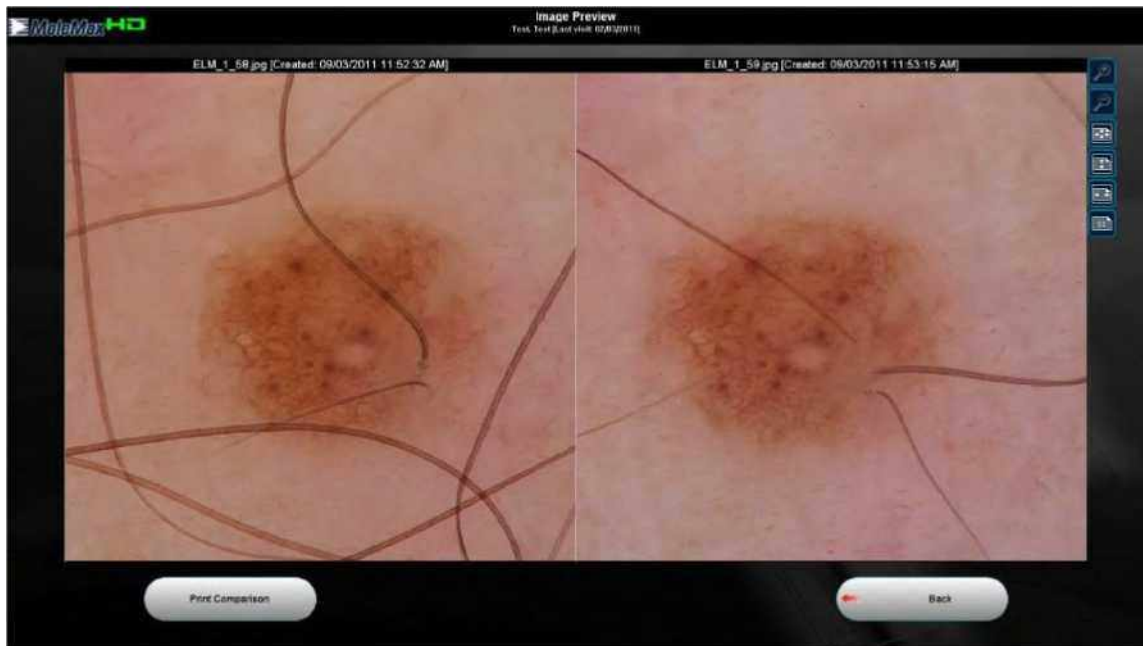
Take the new macro, close-up and/or ELM image as described in New Patient section in the beginning of this manual.



## 7. Compare Saved Images

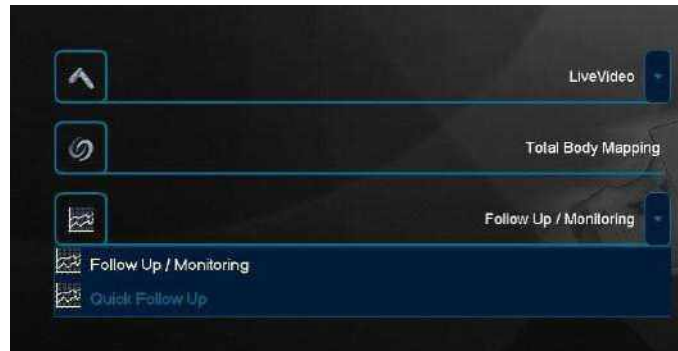
In order to compare two already saved images select two recordings in the fourth (history) column in Follow-Up selection screen. As soon as two images are selected button **COMPARE** appears instead of button DETAILS in the middle of the bottom bar. By clicking this button following screen appears:





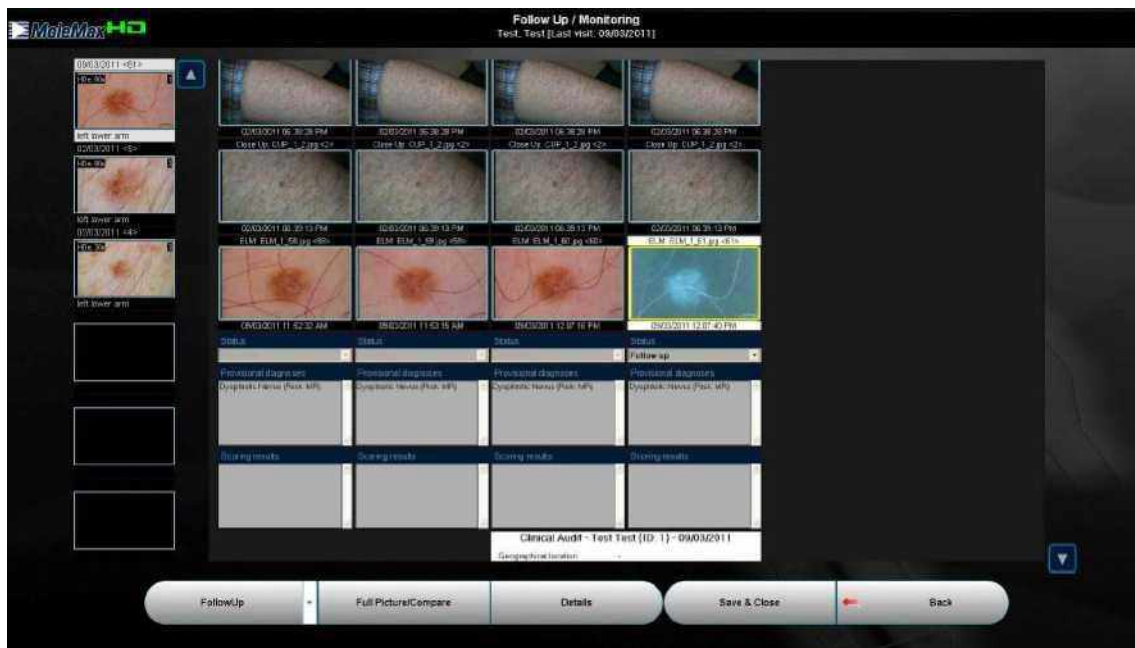
## 8. Quick Follow Up

Another alternative to Standard Follow Up or Guided Follow Up is “Quick Follow Up” option. To Select **Quick Follow Up** from the Patient Menu simply click on the arrow next to **Follow-Up/Monitoring** button and select **Quick Follow Up** as shown on the following image:



After clicking the **Quick Follow Up** button new screen, similar to T rending screen is displayed. Use the column on the left side to select the ELM image to follow up and then selected the recording of this image on the right side that should be controlled. By default latest image is automatically selected.

Click Follow Up button in the bottom left corner to perform follow up of this lesion. Functionality is identical as described in Chapter 7.7.1



Live Video screen is activated upon clicking on Follow Up button.

**Compare mode (default)** .....

To get into the Compare Mode select the corresponding symbol to the right of the live video frame. On the left picture-half the stored image is shown. To freeze the live video select **FREEZE**. Select **OK** to proceed.

**Step 3 (Saving the image):**

After clicking **OK** button DETAILS screen is shown.

To save time in the follow up examinations the mouse pointer is positioned automatically on the next logical step.

Select either **OK** to save the image.

to go back to the Main Screen

**9. New image**

**New Image** can also be obtained directly from the Patient Main menu. When entering Patient Main menu (right after patient selection) **Live Video** is active and shown inside top left icon on the screen.

To obtain the new image by using Live Video function (using MoleMax HD video camera) click on **LIVE VIDEO** button.

To obtain new image by using alternative method click on the **arrow** located on the right side of the icon and select between **LIVE VIDEO** and **IMAGE FILE IMPORT**, or Direct Camera Import or TWAIN import (if available and enabled within Administration Menu)

LiveVideo

 Image file import

Direct image import from digital camera

Import from TWAIN compliant device(s)

Take the new macro, close-up and/or ELM image as described in the New Patient section in the beginning of this manual.

### 10. Manual Scoring (Expertizer ABCD and 7-Point Rules)

The Expertizer software was developed in co-operation with the Department of Dermatology at the Medical School Vienna. It is designed to be an interactive learning add-on module to the standard MoleMax HD Software.

It draws presently on a pool of more than 700 selected reference images that were recorded with the MoleMax HD systems at the Vienna Medical School, Department of Dermatology. Those images chosen among 25.000 ELM images should help those users who are not so familiar with the technique of ELM to train them in that method. The reference images are grouped according to their diagnoses and to the ELM criteria they exhibit.

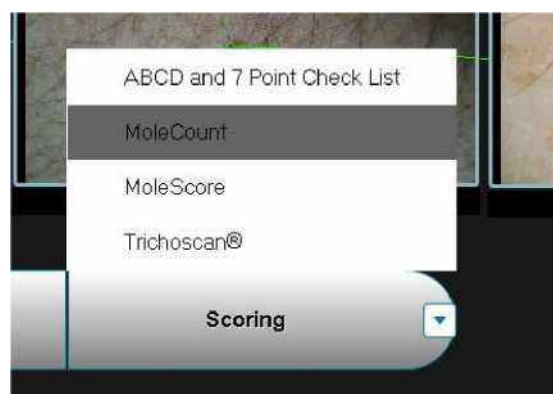
The software package contains state-of-the-art image analyses functions and aids in the classification of lesions according to the clinically approved ABCD-rule and the extended ABCD-E (where E stands for the evolutionary change of the nevus) method. A newer scoring method, the Seven-Point Checklist (also known as Argenziano Score), is also implemented in the Expertizer to give a diagnostic support. But, it cannot be emphasized enough that the MoleMax-Expertizer is not a provider of simple black-box diagnosis. It is a sophisticated aid to the doctor to improve his diagnostic accuracy - this is the primary purpose and philosophy behind the creation of the MoleMax-Expertizer.

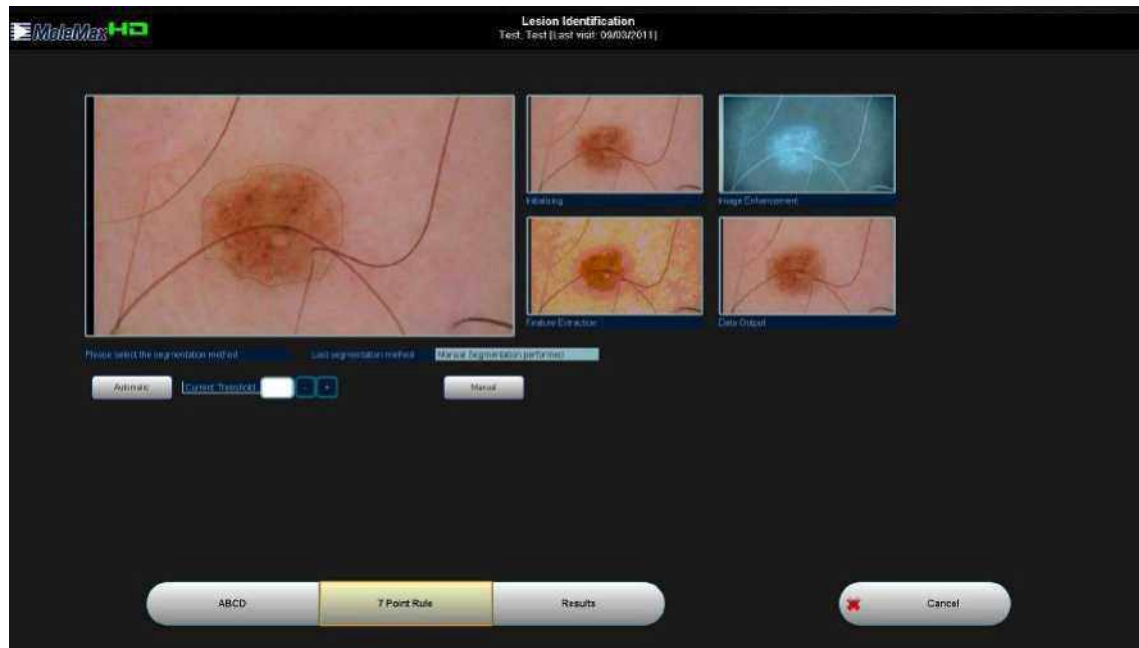
To strengthen this idea, the Expertizer offers a self-assessment module, where the doctor can test his diagnostic accuracy. By receiving the proper feedback, he can further improve his ability to diagnose pigmented skin lesions. Also full detailed list of different criteria and diagnose examples are available.

Expertizer software is divided into two parts. While **rule** are integrated into MoleMax SCORING menu, **Self Assessment, Diagnose examples** and **ELM Criteria examples** are available in SERVICES Menu and are described in "Services" Chapter of this manual.

To score the image by using Expertizer **ABCD rule** or **7 Point Check List** first select the image in the 3x3 screen and click appropriate button in the scoring menu (**ABCD and 7 Point Check List**).

Prior to scoring image must run through segmentation process to obtain mathematical and statistical interpretation of the image. Segmentation screen will appear as shown on the image below:





There are two methods of segmenting a lesion from the surrounding skin: Automatic or Manual.

### Automatic

1. To start the automatic segmentation Select **AUTOMATIC**. The automatic segmentation will be executed in four steps: Initializing, Image Enhancement, Feature Extraction and Data Output. It takes approximately 20 seconds for the software to segment the lesion.
2. In case the size of the lesion has not been correctly recognized, the current threshold can be adjusted. Select **+** to increase the threshold if the lesion is larger than the segmentation proposal. Select **-** to decrease the threshold in case the software segmented a larger area than the actual size of the lesion. Keep the button pressed and the threshold value will increase/decrease until the button is released. The threshold has to be adjusted depending on how much the proposed area differs from the actual area of the lesion. The threshold can also be typed in manually.
3. Select **AUTOMATIC** again to get the new segmentation area by the software.
4. Repeat Steps 2 and 3 until the correct area is segmented.

### Manual

However, the automatic identification will not always provide the best results, like in some cases with hair strings in the lesion image.

In those cases the segmentation needs to be done manually.

1. Select **MANUAL** and the image will be zoomed to the original size.
2. Circle the lesion as good as possible. To do so click with the left mouse button around the lesion. At least eight connection points have to be specified.
3. Press the right mouse button to close the circle. If not pointed correctly, Select **RESET** to redo.
4. Select **OK** to start the segmentation process. The program returns to the lesion identification window.

For your information the last segmentation method and the value of the current threshold are displayed on the screen.

After having segmented the lesion from the surrounding skin select **RESULTS** to get some mathematical parameters calculated by the software.

Select **SAVE** to save the segmentation results in the file. This file is called segres.txt and is located in the folder where MoleMax HD software is installed.

Select **PRINT** to print-out the results and/or **CANCEL** to return to the Segmentation screen.

## **Following Results are calculated within this module:**

### **Form Factors**

- Area (area of the lesion, given in mm<sup>2</sup>)
- Perimeter (the length of the border line of the identified lesion)
- Min. Diameter (minimum diameter of the lesion)
- Max. Diameter (maximum diameter of the lesion)
- Elongation (ratio of the maximum and minimum lesion diameter - perfectly smooth lesions will have an elongation of 1)
- Roughness (measurement of the irregularity of the border of the lesion ± perfectly smooth lesions will have a roughness of 1)
- Center of Gravity (x/y) (mathematical lesion center given in pixels counted from 0/0 pixel point in the top left corner)
- DCircle (the diameter of a circle with an equal area)

Form Factor (measurement for the circularity of an object ± it is calculated by the following equation:  $\text{FormFactor} = 4 \pi (\text{Area} / \text{Perimeter}^2)$ )

### **Gray Value Factors**

#### **Histogram**

The Histogram shows how many pixels in the lesion have certain gray values (y-axis: number of pixels 0-307200max, x-axis: gray value scale 0-255).

After segmentation is performed ABCD rule o 7 Pont Check List can be applied.

### **11. ABCD-Score**

The ABCD rule of dermatoscopy is a worldwide accepted classification method based on a semi- quantitative analysis of four criteria: A stands for the Asymmetry of the lesion, B for the Border of the lesion, C for the Color(s) in the lesion and D for Differential Structural Component(s) found in the lesion.

#### *step 1:*

Select the symbol **ABCD** in the Segmentation screen. First step / screen of ABCD method is displayed.

During each step of the evaluation process reference images are displayed on the right side of the screen. Those images are already evaluated on the base of the ABCD criteria and are sorted according to their single ABCD values. In the image description box the specific ABCD criteria seen in the lesion are described. The histological proven diagnosis can be found above the image. Select the + or - buttons under the image description to see the next or the previous image.

In each step of the evaluation the software tries to find similar reference images based on the criteria that you selected.

At any time during the ABCD-Method it is possible to select **BACK** to go back one step in the evaluation process.

#### *step 2:*

First, evaluate the asymmetrical characteristics of the lesion:

Choose one out of three options:

Lack of asymmetry in both axes if the lesion is fully symmetrical, Asymmetry in one axis if the lesion exhibits an asymmetry in one axis, Asymmetry in both axes if the lesion is fully asymmetrical.

Select **OK**.

step 3: Second, evaluate the number of segments with an abrupt cutoff of pigment pattern:

Choose the number of segments (1 to 8) in which the lesion has a clearly defined and sharp border to the surrounding skin.

Select **OK**.

step 4: Third, evaluate the different colors in the lesion:



Select the specific colors of the lesion. There are six options offered. Note that more than one selection can be made.

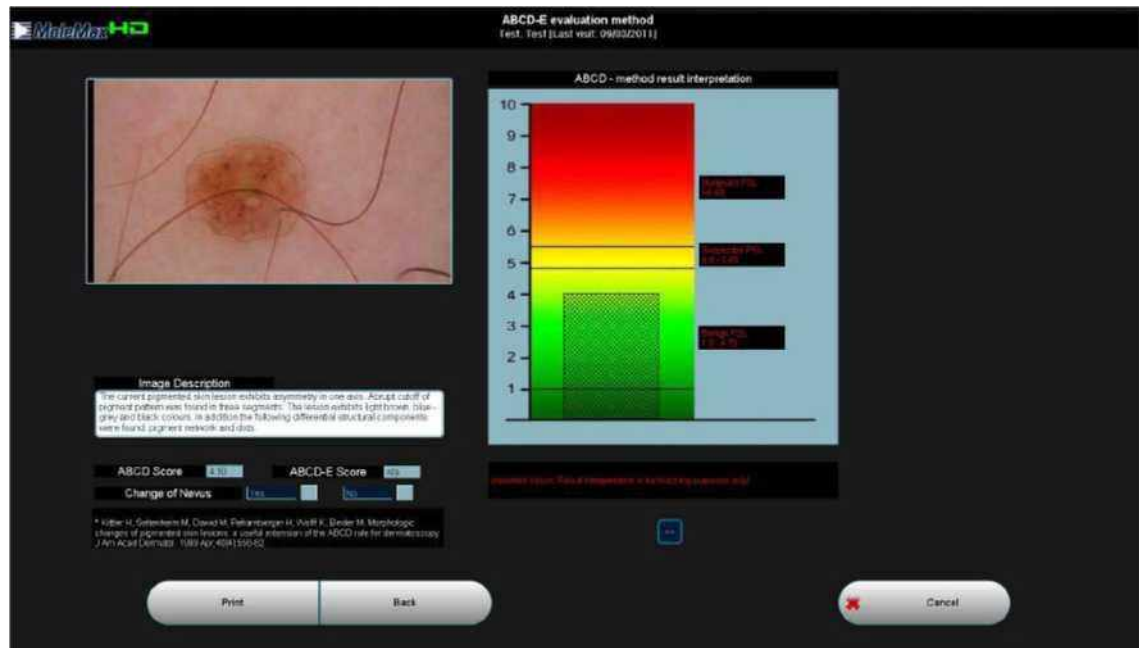
Select **OK**.

step 5: Last, evaluate the differential structural components in the lesion:

Select differential structural components in the lesion. There are five options offered. Note that more than one selection can be made.

Select **OK**.

step 6: The **ABCD SCORE** is displayed by the bar chart at the right side of the screen. The corresponding ABCD total score and the description of the identified ABCD criteria are shown below the lesion.



Next to the ABCD total score, the extended ABCD-E score is displayed. The extension to the traditional ABCD method, E, stands for the evolutionary change of the evaluated lesion. To calculate the extended ABCD -E score answer the question whether the particular lesion has changed or not.

Step 7;

Select **CANCEL** to return to the Segmentation screen.

When returning to the MoleMax main menu the program asks whether or not to save the calculated ABCD-score. Select **YES** to store the ABCD-score in the database. It will be displayed in the comments box when opening the corresponding image and it also can be viewed in scoring field within TRENDING function.

## 12. 7-Point Checklist

The Seven-Point Checklist is the newest approach to the analysis of criteria in pigmented skin lesions. It is based on a blind study of 342 malignant lesions (117 melanomas and 342 malignant lesions). The doctor has to identify major and minor criteria. In criteria with several variables, the variables that had a significant influence in the diagnosis of melanoma were determined. Significant major criteria receive two points each and significant minor criteria receive one point. A score of three or greater has a 95 percent sensitivity of being a melanoma.

Step 1: Select the symbol **7-Point Check List** in the Segmentation screen. First step / screen of 7 Point Check List is displayed.

During each step of the evaluation process reference images are displayed on the right side of the screen. Those images are already evaluated on the base of the 7 Point criteria and are mainly used to as example for the answer checked on the left side in one of Check Boxes. The histological proven diagnosis can be found above the image. Select the + or - buttons under the image description to see the next or the previous image.

In each step of the evaluation the software tries to find similar reference images based on the

criteria that you selected. At any time during the 7 Point Check List it is possible to select **BACK** to go back one step in the evaluation process.

*Step 2:* Identify the major criterion atypical pigment network.

Only a prominent & irregular network in a lesion receives two points; a network that is absent, regular, irregular or prominent, is, according to the study of Argenziano, not significant in the diagnosis of melanoma.

Select **OK**.

*Step 3:* Identify the major criterion Gray-blue areas (Blue-whitish veil).

Gray-blue areas are defined as irregular, confluent, gray-blue to whitish-blue zones and are not associated with red-blue lacunes or maple leaf pigmentation.

Select **OK**.

*Step 4:* Identify the major criterion atypical vascular pattern.

Atypical vascular patterns are defined as linear, dotted or globular red structures and are irregularly distributed outside of areas of regression. These patterns are associated with other malignant structures.

Select **OK**.

*Step 5:* Identify the minor criterion Streaks (pseudopods/radial streaming).

Radial streaming or streaks are defined as radially and asymmetrically arranged linear bulbous extensions at the edge of the lesion. Only irregular Streaks in a lesion receive one point; streaks that are regular, are, according to the study of Argenziano, not significant in the diagnosis of melanoma. Select **OK**.

*Step 6:* Identify the minor criterion Irregular pigmentation/blotches.

Blotches appear as brown, gray or black areas of diffuse pigmentation with irregular shape or distribution and abrupt ending.

Select **OK**.

*Step 7:* Identify the minor criterion Dots and globules.

Irregular dots and globules appear as black, brown, or blue round structures irregularly distributed within the lesion. Only irregular Dots and globules in a lesion receive one point; Dots and globules that are regular, are, according to the study of Argenziano, not significant in the diagnosis of melanoma. Select **OK**.

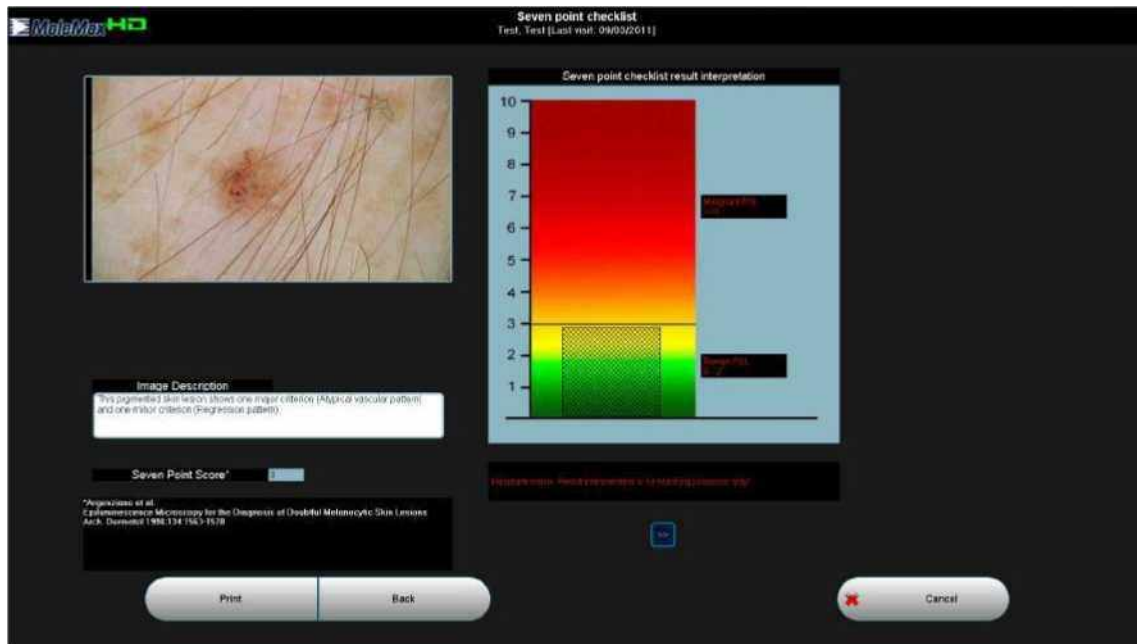
*Step 8:* Identify the minor criterion Regression pattern.

A regression pattern appears as scar like depigmentation or sometimes as speckled blue-gray dots within a hypopigmented area (i.e. peppering).

Select **OK**.

*Step 9:* The Seven-Point Checklist result is displayed by the bar chart at the right side of the screen. The corresponding Seven-Point total score and the description of the identified criteria are shown below the lesion.





Step 10: Select **CANCEL** to return to the Segmentation screen.

When returning to the MoleMax main menu the program asks whether or not to save the calculated ABCD-score. Select **YES** to store the ABCD-score in the database. It will be displayed in the comments box when opening the corresponding image and it also can be viewed in scoring field within TRENDING function.

### 13. Trichoscan

A unique option for hair analysis is available with an external software called TrichoScan. It is an addition to MoleMax HD software and must be purchased separately. Start this module by clicking **TRICHOSCAN** button located in the scoring bar.

The TrichoScan software allows you to automatically measure biological parameters of hair growth in situating the images taken with the MoleMax DELM camera. For the automatic analysis with TrichoScan a certain hair area needs to be shaved (ca. 1.8 cm<sup>2</sup>), dyed and digitally documented at a 30x magnification.

The patient should be recalled in **three days** where one image with 30x magnification has to be taken and the TrichoScan Analysis has to be performed.

In contrast to the traditional Trichogram, TrichoScan is painless, reproducible and allows a digital documentation. It enables to compare different capacities of hair growth promoting substances (anagen/telogen) and can be used for monitoring the treatment through MoleMax.

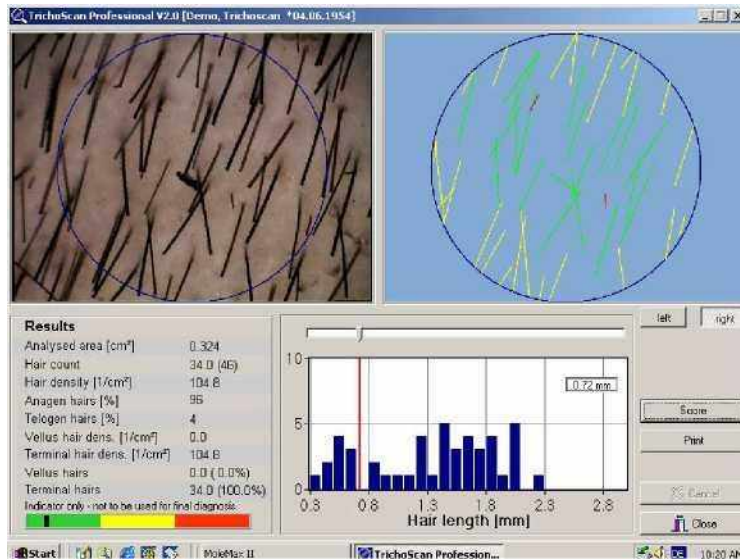
The TrichoScan program package is available on all MoleMax systems as add-on module or for later installation.

Trichoscan Software provides unique hair count system and hair growth detection with mathematical evaluation.

After the button **TRICHOSCAN** is selected Tricho-Analysis is being performed automatically.

In order to see the Trichogramm, click on button "**Trichogramm**"

Typical TrichoScan screen is shown on the following image.



In order to see the score, click the button **Score**. The Score is presented as a traffic light bar. If the marker is in the green zone hair growth is in normal zone, if the score bar is in the red zone it needs medical treatment.

The output values of TrichoScan module are:

Analyzed area

Corrected number of hairs (In the brackets uncorrected number of hairs)

Hair density (number of hairs per area)

Anagen hairs (percentage of normally growing hairs)

Telogen hairs (percentage of non-growing hairs)

Vellus hairs density

Terminal hairs density

Number of Vellus hairs (percentage in brackets)

Number of Terminal hairs (percentage in brackets)

Diagram shows frequency of distribution of the hair length. Red marker signs the maximum length defined for Telogen hairs.

Indicator bar (green - normal Trichogram; yellow - mild Telogen effluvium; red- distinctive Telogen effluvium)

With every TrichoScan Software delivered one set for hair coloration is delivered as an optimum result is achieved when hair is colored.

After exiting the module calculated score can be saved in the database, and viewed at any time in the comment bar in DETAILS screen or in SCORE field within TRENDING screen.