You can see clearly now

Heidelberg Retina Angiograph 2

HRA 2

HEIDELBERG ENGINEERING

Wishes come true

- **Highest image contrast and detail**
- **Lowest light exposure**
- **Simultaneous FA and ICGA**
- **Infra-red and Blue Reflectance**
- **Autofluorescence**
- **Dynamic high speed angiography**
- **Stereo and Widefield imaging**
- **3-D Scanning**
- **Compact**

Milestones of a Pioneer

1991
First scanning laser system for routine glaucoma exam
Heidelberg Retina Tomograph (HRT)

1994
New Technology for retinal microcirculation
Heidelberg Retina Flowmeter (HRF)

1994
New Technology 3-D Scanning Laser ICG Angiograph
Heidelberg Retina Angiograph (HRA/ICG)

1996
New Technology Simultaneous, 3-D Scanning
Laser Fluorescein/ICG Angiograph
Heidelberg Retina Angiograph (HRA/C)

1999
New open software platform for digital
ophthalmic imaging and archiving
Heidelberg Eye Explorer (HEE)

1999
First miniaturized scanning laser system
for routine glaucoma exam
Heidelberg Retina Tomograph II (HRT II)

2002
New application to quantify Macular Edema
Macular Edema Module (MEM)

2002
First compact dynamic, 3-D Scanning
Laser Fluorescein/ICG Angiograph
Heidelberg Retina Angiograph 2 (HRA 2)

The way ahead is clear

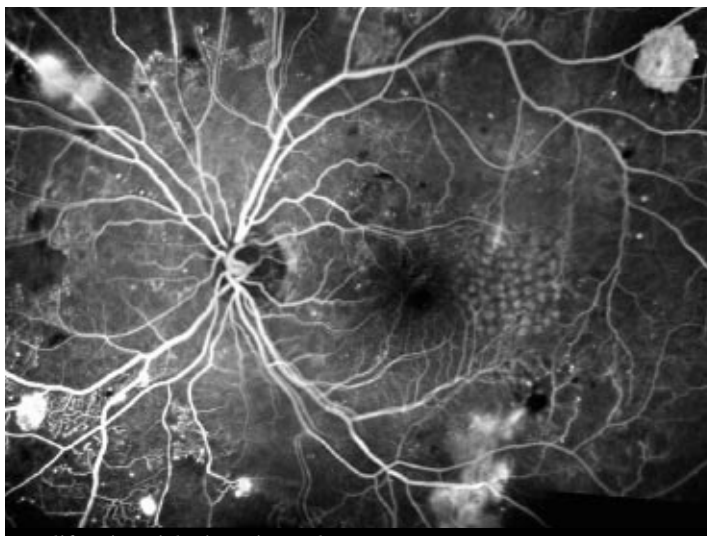
Heidelberg Engineering has spent over 10 years working closely with the world's leading doctors and imaging specialists to develop new technologies to prevent sight loss. Most major research centers and teaching hospitals use our products as well as a rapidly increasing number of general clinics and private practices. When it comes to retinal imaging and scanning laser technology there is simply no company with more experience.

The Heidelberg Retina Angiograph 2 (HRA 2) brings innovative design and enhanced features to our established scanning laser technology and provides unmatched detail and contrast in angiography images of both the retina and choroid.

Unique simultaneous digital Fluorescein Angiography (FA) and Indocyanine Green Angiography (ICGA) images with three-dimensional resolution improve the diagnosis of retinal and choroidal pathologies such as diabetic retinopathy and AMD. High Speed ICG (HSICG) dynamic imaging can identify feeder vessels and retinal choroidal anastomoses for safer treatment of CNV.

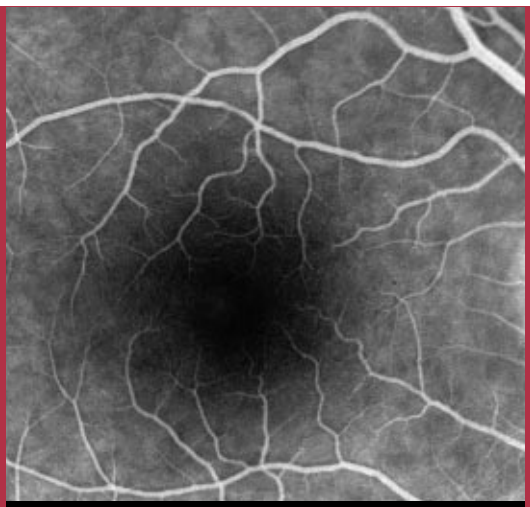
Autofluorescence imaging and fundus reflectance imaging with blue and infra-red light offer new ways of identifying various manifestations of retinal disease. The HRA 2 provides real benefits for all concerned. Ophthalmologists can make better diagnoses and provide safer treatment. The low light levels used in scanning laser technology mean that examinations are much more comfortable and safer for patients.

Design, software and special applications mean photographers will save time and find the HRA 2 easier to use. And the wide range of applications and effective use of technology mean that the HRA 2 can both optimize time and avoid unnecessary or repeat procedures. This could have a significant impact on cost and efficiency for any busy hospital or practice.



Proliferative Diabetic Retinopathy

See more with HRA 2



FA with Fundus Camera, file size 0.41 MB

See the Difference

Two FA's of the same patient at the same visit.
To see the quality difference for yourself, cover the right image with your hand and make your diagnosis on the left image, taken with a high quality digital Fundus Camera.
Now look on the right HRA 2 image.
Have you made the right diagnosis "Macular pucker with macular hole"?

FA withHRA 2 – 512 x 512 px, 10 µm, file size 0.26 MB

Confocal optical efficiency – note the smaller file size of HRA 2 compared to standard fundus camera

Confocal Optical Efficiency – High Image Contrast

The HRA 2 provides a 768 x 768 pixel image with a 30 degree field of view. This is optimally matched to the resolving power of the human eye. In addition, the HRA 2 offers a high resolution mode with 1536 x 1536 pixel images with 30 degree field of view. However, it is important to know that it is not the number of pixels which determines the quality of image, contrast and detail.

Enhanced image contrast, detail and sharpness are provided by confocality. The principle of a confocal scanning laser system allows scattered light and light originating from structures outside the focal plane to be efficiently suppressed.

The illumination of one individual pixel at a time, point by point, without the "pollution" of scattered light, produces a very high image contrast which is superior to that seen on images from standard fundus cameras – even though they may be rated at 1000 x 1000 pixels or more.

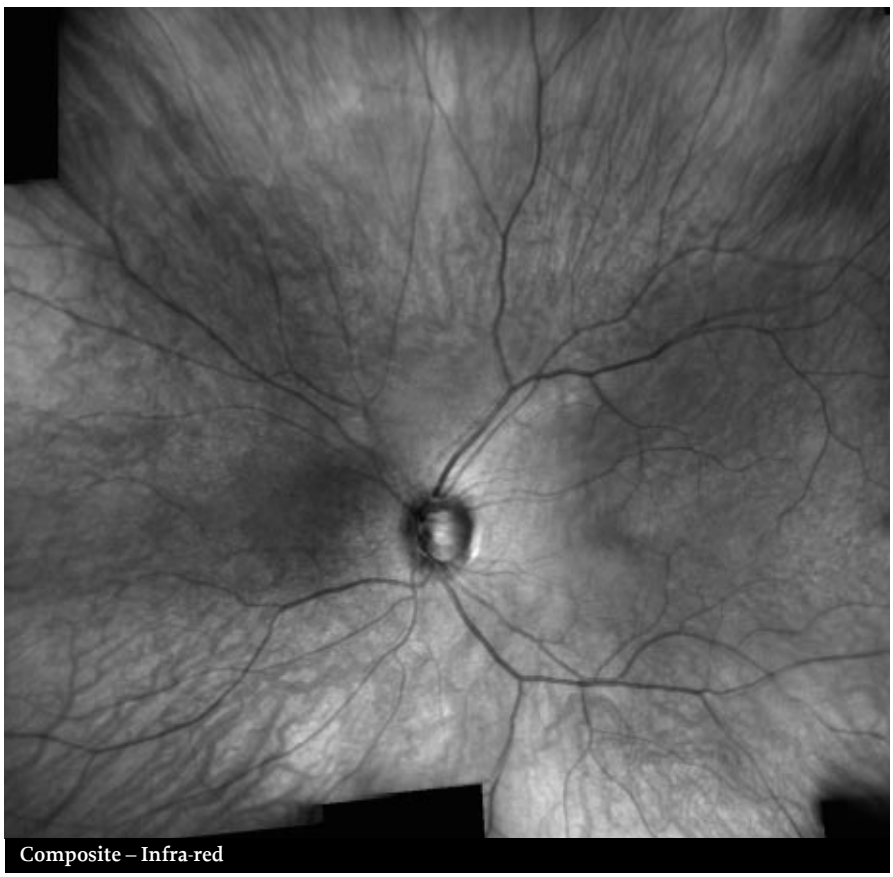
HRA 2 – compact design for daily routine practice

Low light exposure – maximum patient comfort

Composite – Diabetic Retinopathy

Fluorescence dyes are excited in relatively narrow wavelength bands. Therefore, using a laser is most efficient for excitation, since all the energy is concentrated at one specific wavelength rather than in a broad continuum as with ordinary flash light.

The retinal light exposure required for angiography on the HRA 2 is only about 1% of the exposure necessary with a photographic system, so it is much safer for patients.



Composite – Infra-red

Imaging through undilated pupils

The confocal scanning laser principle allows us to image the retina with non or poorly dilated pupils.

This is especially important for diabetics because they typically do not dilate very well and account for a large number of patients seen in the retina clinic.

This is a tremendous advantage compared to imaging with standard fundus cameras because the contrast and detail on these patients are far better.

Non-invasive applications
1. Infra-red and Blue Reflectance

Infra-red light (820 nm) is barely visible and so this makes it very patient friendly. Infra-red imaging allows viewing of the fundus with extremely light sensitive patients such as children.

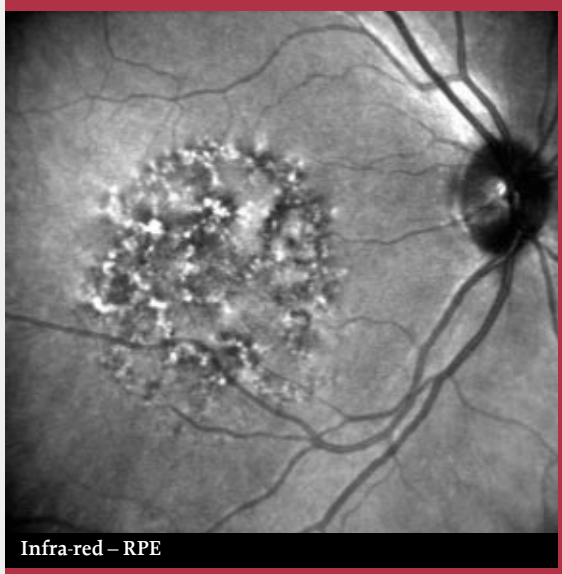
- **Viewing through cataract**
  With cataract you can use infra-red to both align the camera and view the fundus for epi-retinal membranes and CME.

- **Better visualization and follow-up of choroidal nevus**
  It is useful for diagnosis of nevus because you can see better than with either a red-free or colour picture. It's "non-invasive" because you don't need fluorescein and ideal for follow-up of nevi and other choroidal lesions.

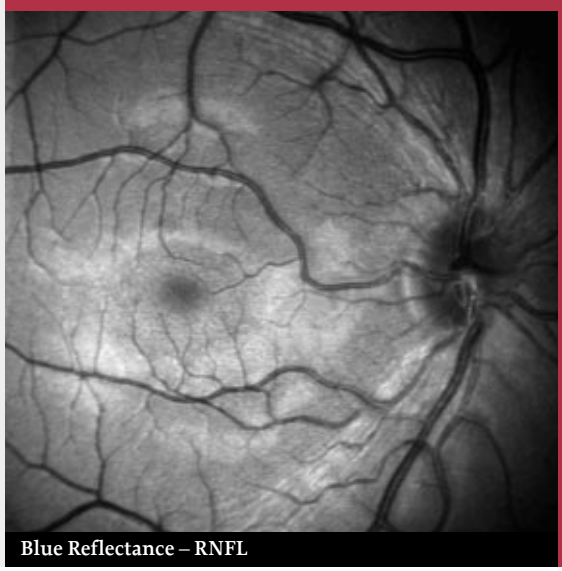
- **Evaluation of RPE health**
  You can also see the status of the RPE because it is visible. If there is something changing you can visualize this to assess the integrity or health of the RPE.

- **Blue Reflectance ("Red free")**
  Blue Reflectance images can be used to show the nerve fiber layer.

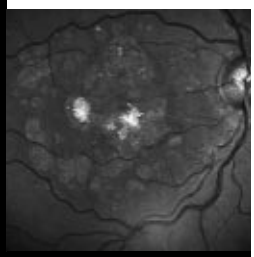
Infra-red – Epi-Retinal Membrane

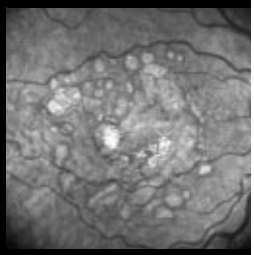


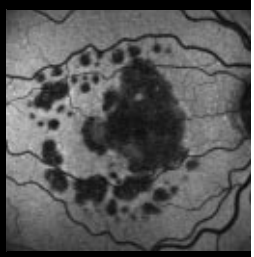
Infra-red – RPE

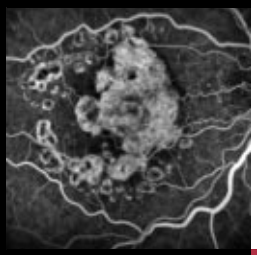


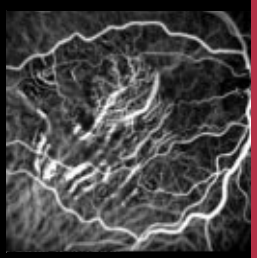
Blue Reflectance – RNFL


Blue Reflectance


Infra-red


Autofluorescence


FA

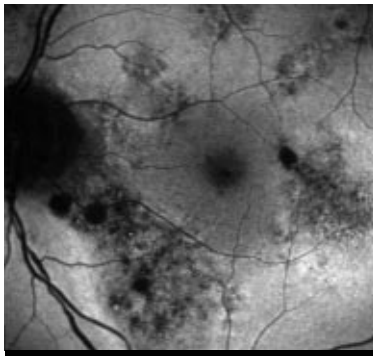

ICGA

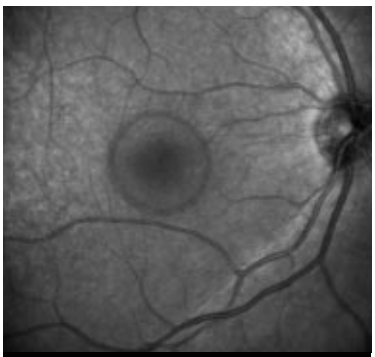
Non-invasive applications
2. Autofluorescence

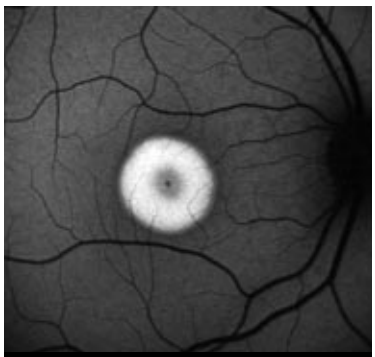
The HRA 2 enables you to perform autofluorescence (488 nm) imaging with high quality.

Using the normal FA settings, but without the injection of fluorescein, autofluorescence imaging can increase physician confidence by confirming the diagnosis in such conditions as macular holes, pseudo-vittelliform lesions, RPE atrophy, central serous Chorioretinopathy and Best's disease.

It's also a promising new technique for the study and follow-up of inherited diseases such as Stargardt's Dystrophy.


Central Serous Chorioretinopathy


IR – Best's Disease


Autofluorescence – Best's Disease

References:

von Ruckmann A, Fitzke FW, Fan J, Halfyard A, Bird AC; Abnormalities of fundus autofluorescence in central serous retinopathy; Am J Ophthalmol 2002 Jun; 133(6):780-6

for RPE atrophy and AF:
Holz FG, Bellman C, Staudt S, Schutt F, Völcker HE; Fundus autofluorescence and development of geographic atrophy in age-related macular degeneration; Invest Ophthalmol Vis Sci 2001 Apr; 42(5):1051-6

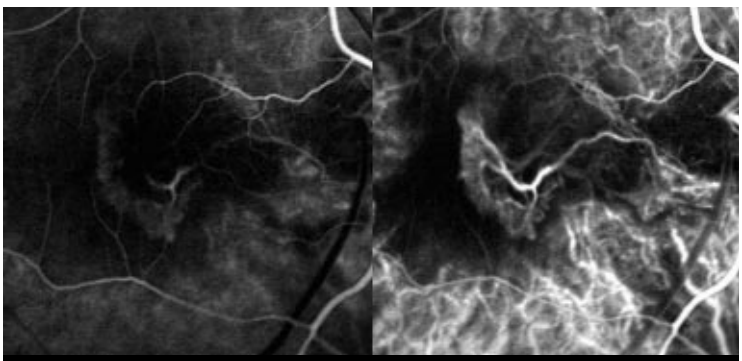

Autofluorescence – Pseudo Vitteliform Lesion

Dynamic High Speed Angiography

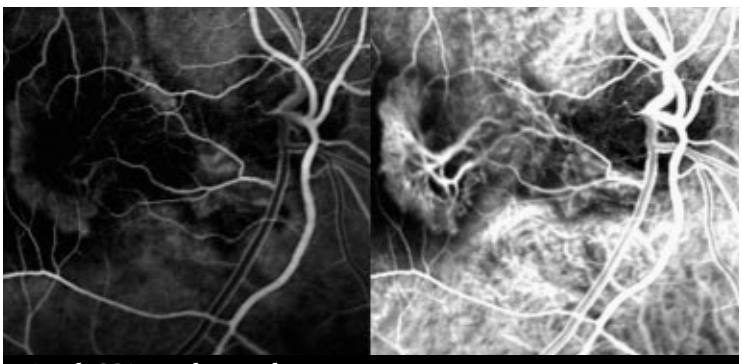
A unique feature of the HRA 2 is the ability to acquire dynamic, high-speed movies (up to 16 frames per second) in both Fluorescein or ICG Angiographies. This is especially important in the early stages of FA's when documentation of the very early filling stages is necessary. In ICGA this feature enables better detection of CNV characteristics such as feeder vessels and RCA/RAP's.

It's great for teaching. Never before have you been able to see dynamic angiography sequences and the movie feature allows a retrospective review of your angiographies. Every time you review a movie it's like being there at the time of the procedure – even if you weren't! While going over the acquired image series you can extract single images from the sequence which can be viewed and printed if necessary.

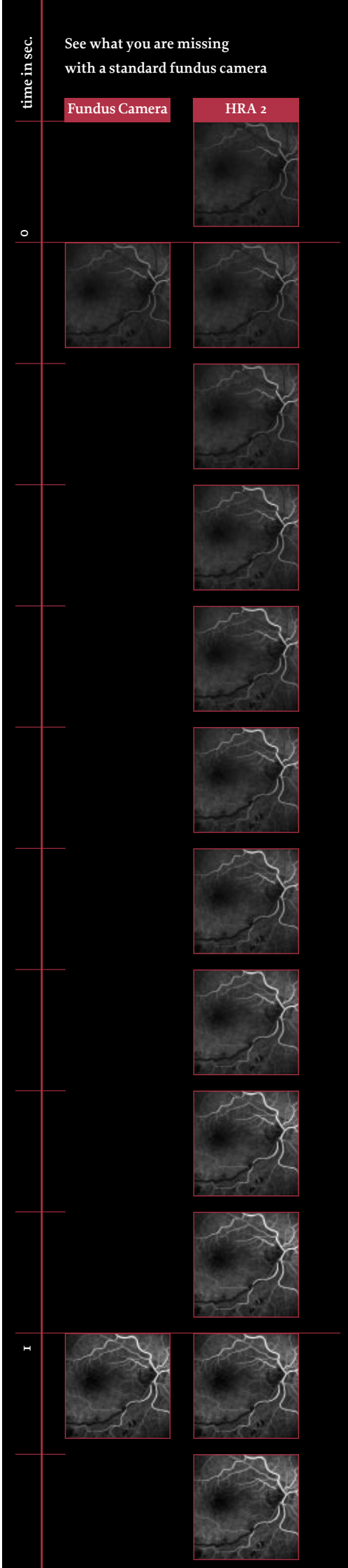
Ruth Axer-Siegel, MD, Dan Bourla, MD, Ethan Priel, Yuval Yassur, MD, Dov Weinberger, MD; Angiographic and Flow Patterns of Retinal Choroidal Anastomoses in age-related macular degeneration with Occult Choroidal Neovascularization; Ophthalmology 2002 Sept; 109 (9):1726-36



FA and ICGA – Feeder Vessel



FA and ICGA – Feeder Vessel



Simultaneous Images

FA – Sub Foveal CNV leakage

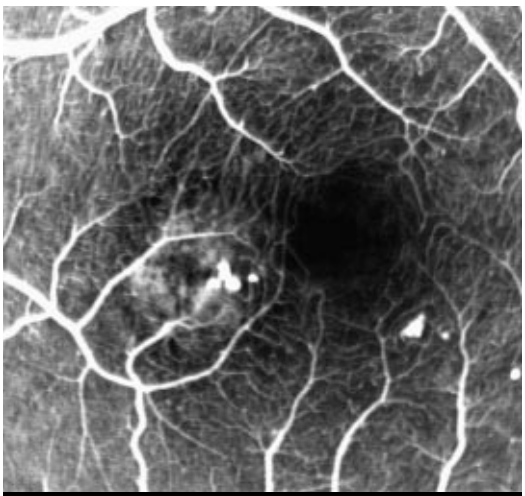
ICGA – Retinal Choroidal Anastamosis (RCA)

ICGA outlines the size, type and location of CNV

Simultaneous acquisition of both FA and ICGA images, another unique feature of the HRA 2, enables you to positively correlate choroidal pathology seen on ICGA with the retinal landmarks seen on FA.

This angiography mode, utilizing two lasers, images the eye through a single objective lens at the same time. Both images are shown side by side on the monitor thus aiding diagnosis and saving considerable time during your busy clinic. Infra-red images can also be acquired simultaneously with either FA or ICGA.

High Resolution

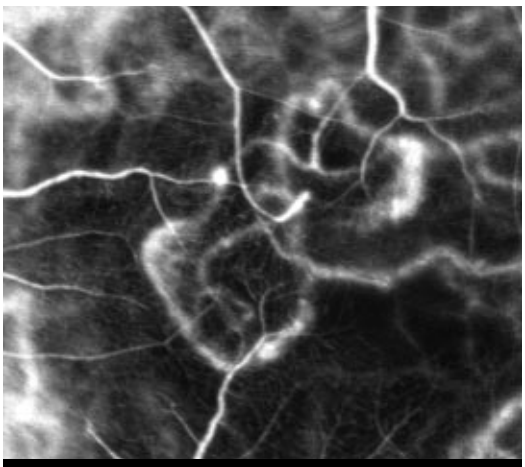


High resolution FAZ

The HRA 2 offers high quality images with a resolution down to 5 µm.

Retinal Choroidal Anastomosis/ Retinal Angiomatous Proliferation (RCA/RAP)

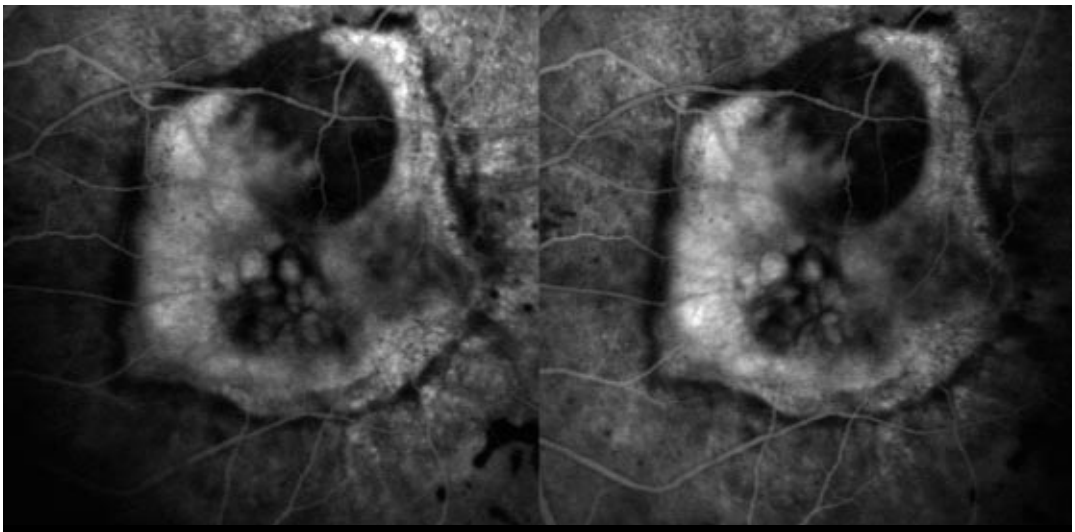
Imaging movies (16 frames per second) can show RCA/RAP's in AMD. Laser treatment outcome in these conditions is known to be quite poor so accurate identification is important when considering treatment options and prognosis.



ICGA – RCA

Stereo Imaging

Stereo pairs are rapid and easy to acquire on the HRA 2 compared to a standard fundus camera. There is no time lag between consecutive images and no patient eye movement as a result of the bright flash.

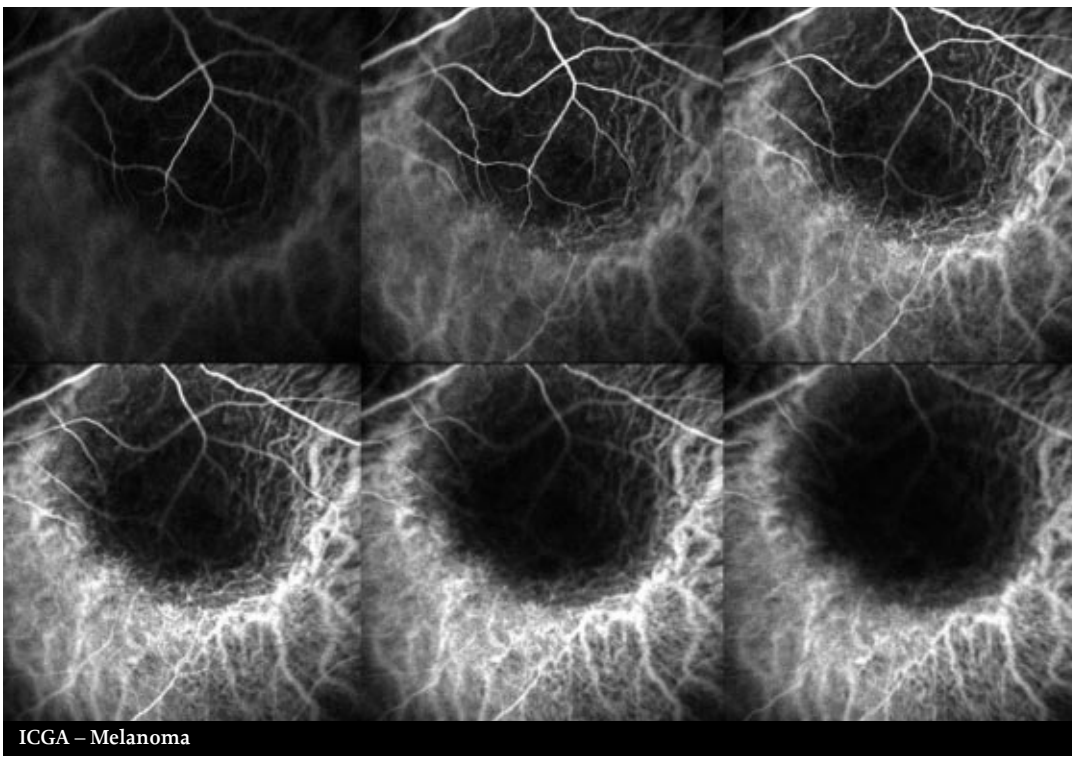


FA Stereo – Serous detachment, Macular Cysts and CNV

3-D Scanning

Confocality of the HRA 2 allows the acquisition of images in up to 64 consecutive focal planes to a depth of 8 mm.

The result is a dramatic 3-D image series which can be especially useful in studying choroidal melanomas among other entities.



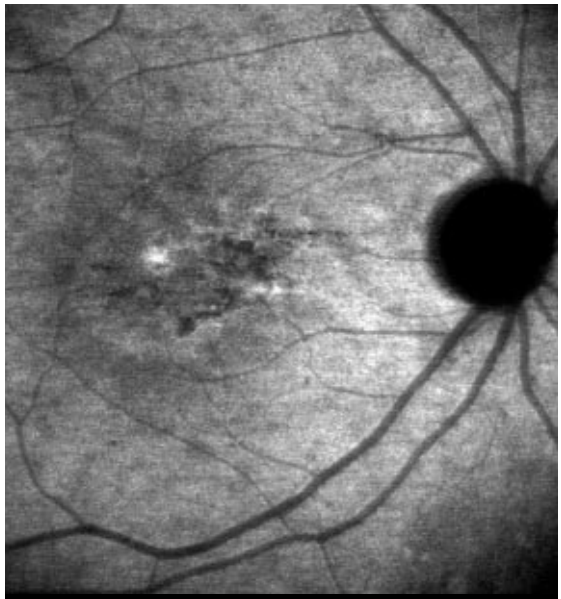
ICGA – Melanoma

Müller AJ, Bartsch DU, Schaller U, Freeman WR, Kampik A; Imaging the microcirculation of untreated and treated human choroidal melanomas; Int Ophthalmol 2001; 23(4-6):385-93

Late Phase Images

The HRA 2 delivers exceptionally high quality late stage ICGA images outlining both the retinal vasculature and choroidal findings. This is achieved without a second, "landmark injection" which is necessary when using a standard fundus camera.

Brucker AJ, Brant A, Nyberg W. "Landmark injection" for localization of choroidal lesions using indocyanine green angiography; Retina, 1994; 14(1):82-3.

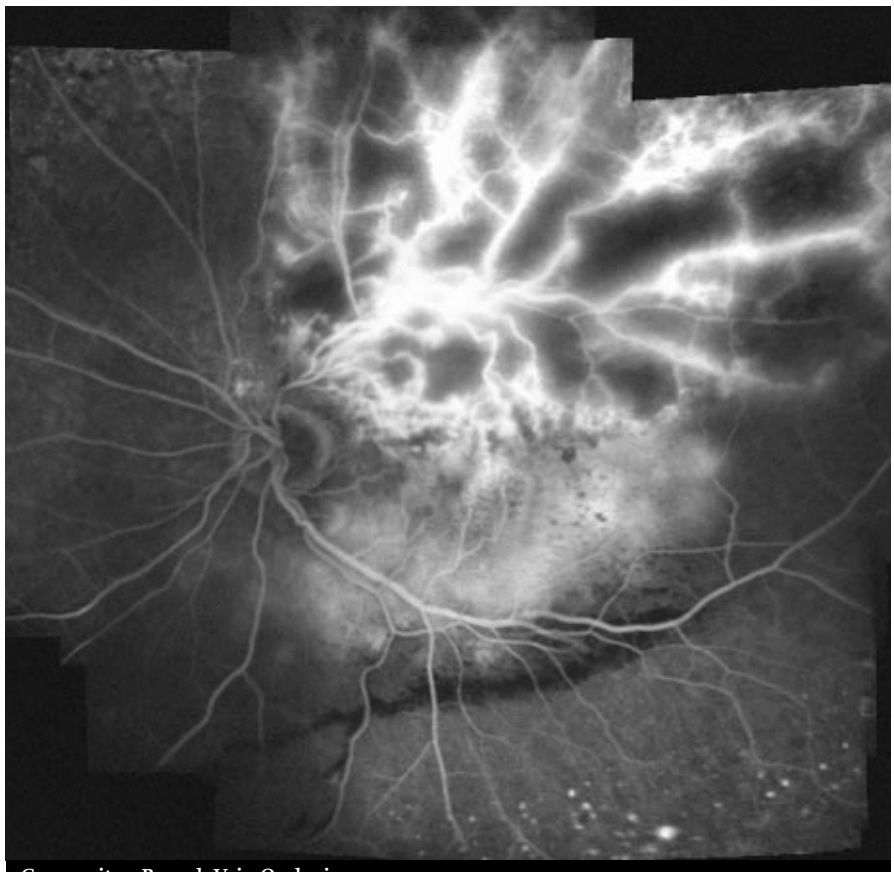


ICGA – Late phase 40 minutes

Wide Field Imaging

Composite Images

Wide-angle images (up to 120 degrees) can be easily produced in a few seconds by automatically combining multiple images taken of the posterior pole and the periphery.



Composite – Branch Vein Occlusion

Technical Specifications

Systems Options	**Confocal Laser Scanning System as** ■ **HRA 2 Combination System** ■ **HRA 2 FA (**Upgradeable to Combination System**)** ■ **HRA 2 ICGA (**Upgradeable to Combination System**)**		
Field of View	30° x 30°, 20° x 20°, 15° x 15°, super wide field composite images up to 120°		
Focus Range	-12 to + 12 dioptres spherical, increments of 0.25 dpt		
High Resolution Mode			
Scan Size	30° x 30°	20° x 20°	15° x 15°
Digitized Image Size (pixels)	1536 x 1536	1024 x 1024	768 x 768
Max. Image Frequency (Hz)	5	7	9
Scan Time/Image	96 ms to 192 ms		
Digital Resolution	5 µm/pixel		
Z-Scan Depth	max. 8 mm		
High Speed Mode			
Scan Size	30° x 30°	20° x 20°	15° x 15°
Digitized Image Size (pixels)	768 x 768	512 x 512	384 x 384
Max. Image Frequency (single/s)	9	12.5	16
Max. Image Frequency (pairs/s)	5	7	9
Scan Time/Image	48 ms to 96 ms		
Digital Resolution	10 µm/pixel		
Z-Scan Depth	max. 8 mm		
Imaging Modes	■ **Fluorescein Angiography (FA)** ■ **ICG Angiography (ICGA)** ■ **Blue Reflectance (BR)** ■ **Infra-red Reflectance (IR)** ■ **FA + ICGA, simultaneous** ■ **FA + IR, simultaneous** ■ **ICGA + IR, simultaneous**		
Fixation	internal 3 x 3 diodes		
Control Panel	Touch Screen, easy to clean		
Pupil Diameter	≥ 3 mm		
Laser Source	ICG excitation: Diode Laser 790 nm, class I IR reflectance: Diode Laser 820 nm, class I FA excitation and Blue Reflectance: solid state laser, 488 nm, class I		
Software	HRA 2 Viewer (processing and archiving software) on HEE platform ■ Small image size ■ Network capability ■ Open interface description for integration in practice management software ■ Export-/Import function ■ Examination reports ■ Overlays (text, area measurements, lesion contour etc.) ■ Image enhancement tools ■ Stereo image acquisition and viewer		

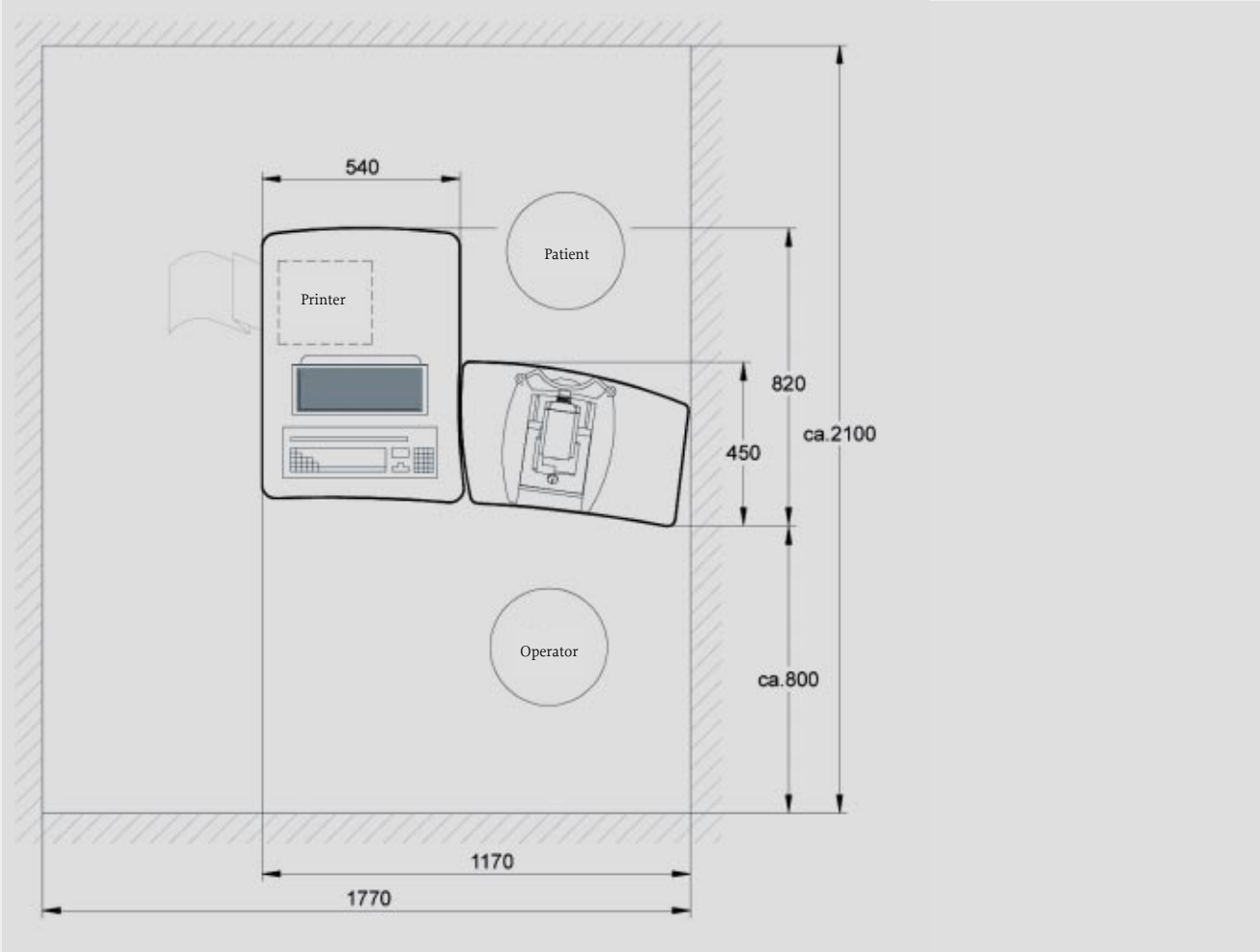
System Components

- Heidelberg Retina Angiograph 2 Camera, Solid State Laser Unit, Head Rest Assembly, Touch Screen Panel
- Heidelberg Eye Explorer (HEE) software platform for Windows 2000/XP including Image Acquisition, Processing and Archiving software, networking capability and image importation
- Latest standard PC, Heidelberg Frame Grabber, CD-RW, 2 ext. Fire Wire Data and Archive HDD, Remote Control Module for Online-Support, Flat Screen Monitor with 1600 x 1200 pixel, Colour Printer
- Heidelberg Power Lift Table (64 – 89 cm), right or left

Accessories

HRA 2 Lens Set

- Astigmatism correction lenses, -1 to -6 dpt
- Myopic lens, -10 dpt
- Lens for Iris Angiography
- Staurenghi Wide Field lens, 150°



Maximum necessary space for HRA 2 system (in mm)

Technical specifications are subject to change without notice.

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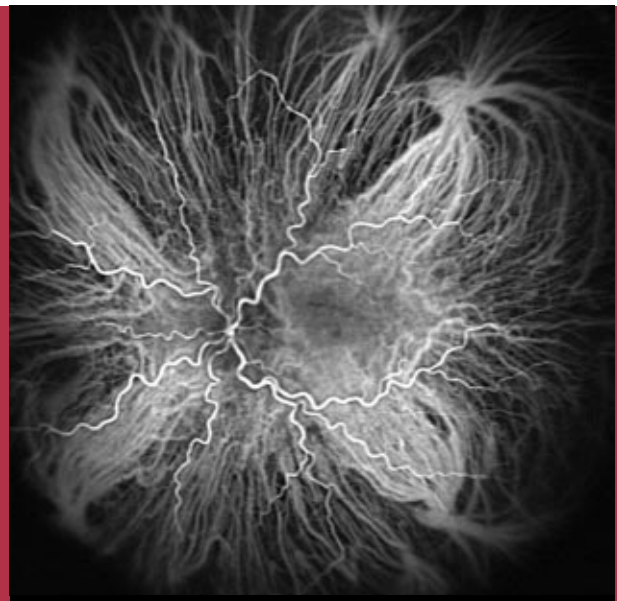
99950-E02.

HRA Accessory Lens Set

Use of the accessory lenses allows you to correct for astigmatism up to 6 diopters, acquire extremely wide-angle 150 degrees images, perform iris angiographies and image high myopes up to –20D.

FA with Staurenghi Wide Field Lens



ICGA with Staurenghi Wide Field Lens

Staurenghi Wide Field Lens

A new wide field lens developed by Professor Giovanni Staurenghi of University of Brescia, Italy for specific use with the HRA allows a spectacular 150 degrees single shot view of the fundus.

Iris Angiography

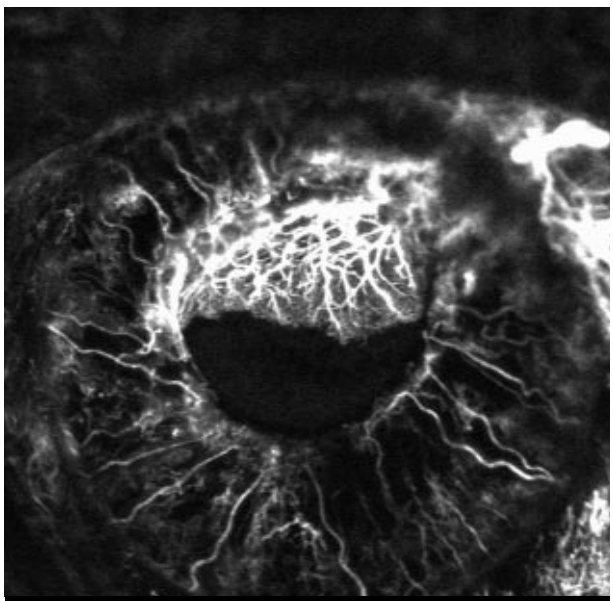
A new lens for Iris Angiography gives the HRA even greater flexibility.

High Myope Lens

Image high myopes up to –20 diopters

Astigmatism Lenses

Correct for astigmatism up to 6 diopters.



Iris Angiography – Neovascularization in PDR