



# Eyesi Surgical Simulator



High-End Virtual Reality Simulator for Intraocular Surgery Training

# Cataract Surgery Training

Practice all Steps of Intraocular Cataract Surgery

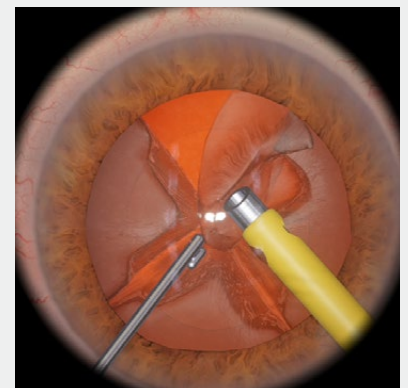
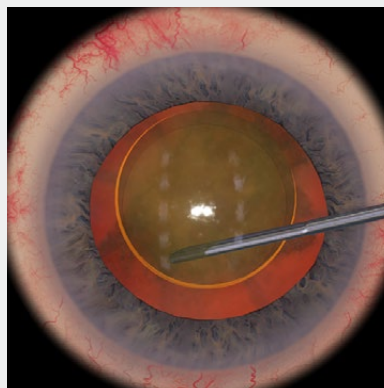
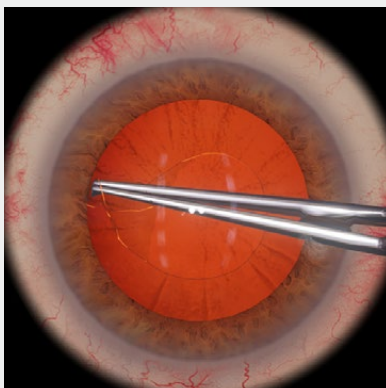


## Taking the Patient Out of the Surgical Learning Loop

Eyesi® Surgical is a high-fidelity virtual reality simulator for intraocular surgery training. The highly realistic simulation of cataract and vitreoretinal procedures increases the residents' surgical experience without the risk of complications for patients. Residents can practice on their own or under guidance from a mentor. With Eyesi® Surgical, realistic and reproducible training is available at any time.

## Expertise Comes from Experience

The Eyesi® Surgical simulator allows residents to accumulate surgical experience and refine essential skills through frequent practice. The available training tasks break down complex surgical techniques into smaller learning steps. Abstract training tasks foster basic skills like microscope handling or understanding of spatial boundaries. The surgical tasks include capsulorhexis, hydrodissection and hydrodelineation, phaco, irrigation/aspiration, and IOL insertion. Trainees also have the opportunity to practice complications, such as anterior vitrectomy or the insertion of a Malyugin ring.



All steps of intraocular cataract surgery can be practiced on Eyesi® Surgical: capsulorhexis, hydrodissection and hydrodelineation, lens segmentation using phaco and chopping techniques, phacoemulsification, ...

## Lifelike Training Environment for Optimal Practice

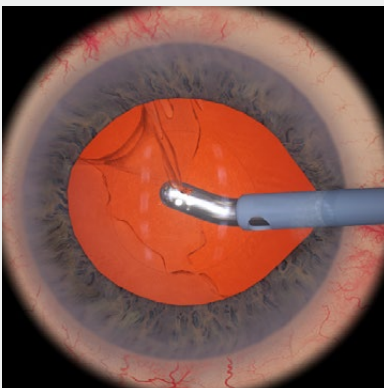
The Eyesi® Surgical simulator provides a cataract patient model head which can be operated on from a temporal or superior position. Trainees see the surgical field through a binocular featuring mechanical and optical systems from Haag-Streit. The microscope offers a precise stereo visualization of the surgery simulation with 1080x1080 pixels resolution per eye. The focus and zoom can be altered by using the microscope foot pedal. The instrument hand-pieces are inserted through the incisions in the model eye.

## Phaco Machine and Instruments like in the OR

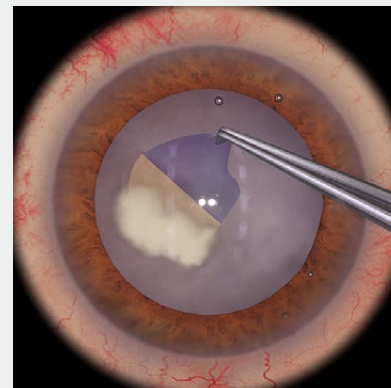
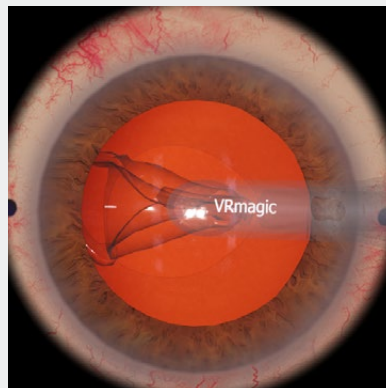
Cataract instruments, such as forceps, visco cannula, cystotome, and phaco probe are available during virtual surgery. Just as in real surgery, discreet instrument movements are required to avoid undue wound stress, loss of viscoelastic, or diminished red reflex. Eyesi® Surgical provides an OR machine interface and a two-axis phaco foot pedal to control fluidics. Trainees must select appropriate phaco parameters in order to safely and effectively complete a surgical procedure.



With an OR microscope, instruments, and phaco/microscope foot pedals, Eyesi® Surgical offers a complete cataract training environment.



... irrigation/aspiration, and insertion of different types of intraocular lenses.



Capsulorhexis performed on a milky-white cataract.

# Vitreoretinal Surgery Training

Realistic Training of Posterior Segment Surgery

## Lifelike Vitreoretinal Surgery Interface

The Eyesi® Surgical platform can be equipped with a vitreoretinal eye interface and instrument set for posterior segment surgery training. In order to further enhance the lifelike training environment, it is also possible to integrate a BIOM/SDI hardware mimic, which is operated just like a real BIOM in the operating room. The complex interactions of auxiliary optics are accurately reproduced.

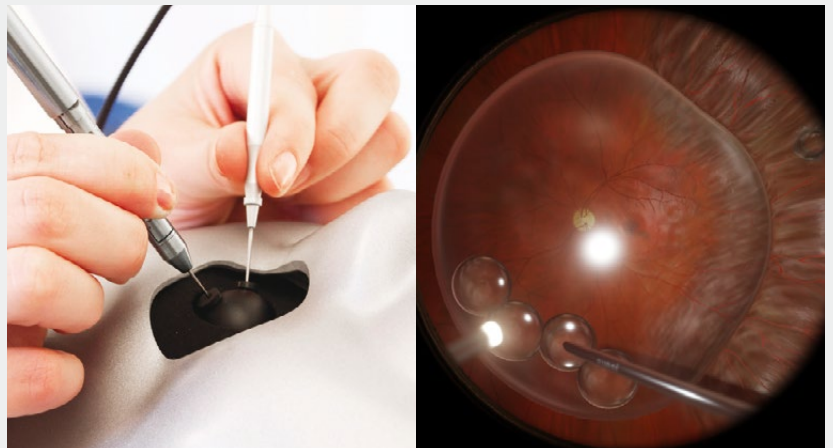
## Posterior Segment Training Modules

The retina training modules are designed to help new fellows develop essential vitreoretinal surgical skills and manual dexterity. Frequent practice will improve proficiency in complex tasks such as posterior hyaloid detachment, internal limiting membrane peeling (ILM), the removal of epiretinal membranes, or the treatment of retinal detachments with oil or gas endotamponades. A realistic posterior segment simulation environment is provided through the use of scleral indentation, a vitrectomy machine, variable illumination intensity of the light pipe and an endolaser.



Left: Patient model head with vitreoretinal interface

Right: Retinal detachment training; PFC fluid is injected to reattach the retina prior to lasering retinal tears and applying an oil or gas tamponade.



# Eyesi® Surgical Courseware

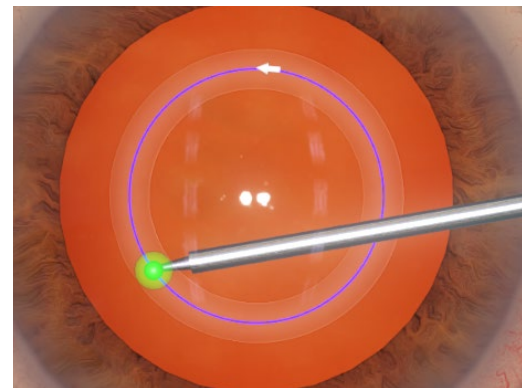
The Built-In Curriculum for Training of Eye Surgery

## Ready for Use on Day One

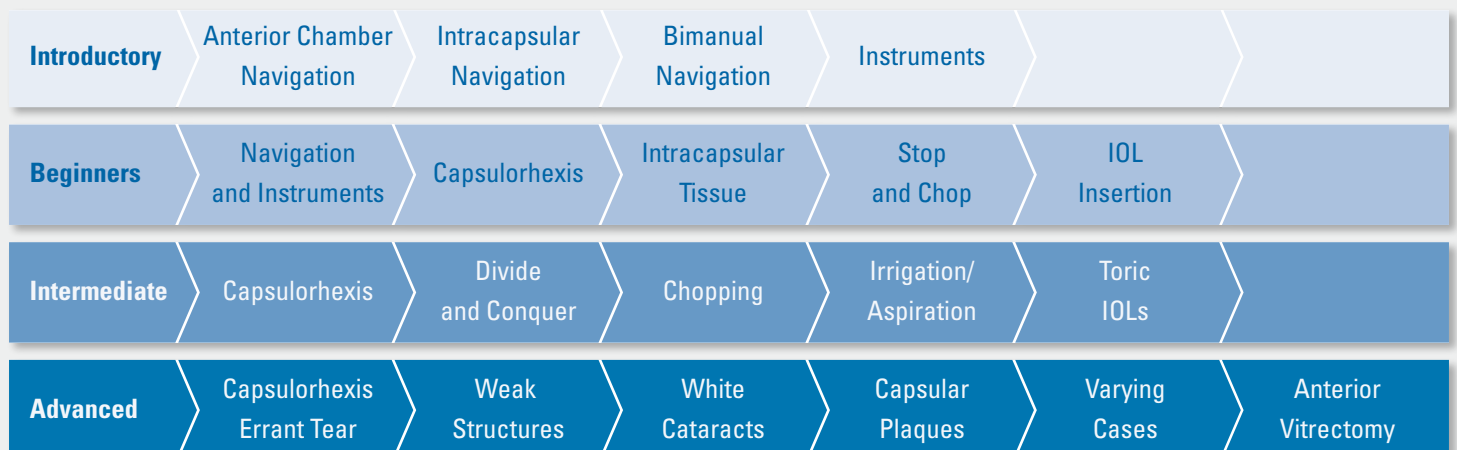
The Eyesi® Surgical Courseware is a structured and ready-to-use training curriculum pre-installed on the simulator. The curriculum makes it uncomplicated for educators to deploy Eyesi® Surgical in their institution and easy for residents to begin focused simulator practice. For example, the Eyesi® Courseware teaches aspects of cataract surgery by combining basic skills training with surgical procedure training in a sequential, structured setup. To advance through a course, trainees must meet a required performance level on each task.

## Training at the Appropriate Level of Difficulty

The Eyesi® Courseware allows residents to practice cataract and retinal surgery at a level of difficulty appropriate for their current abilities. Compared to a 1<sup>st</sup>-year resident, a 3<sup>rd</sup>-year resident has different surgical training needs. Accordingly, the Eyesi® Courseware consists of tiers with ascending levels of difficulty. Novices can practice before they enter the OR. Residents who are already starting to perform surgery can take the surgical skills taught to them in the OR by a mentor and practice the technique to achieve full competency. In addition, senior residents who are comfortable with eye surgery can train on complicated scenarios or learn more advanced surgical techniques.



The simulator curriculum ranges from basic skills training using abstract tasks to complication management, such as anterior vitrectomy.



# Objective Assessment

Performance Evaluation for Systematic Skill Improvement



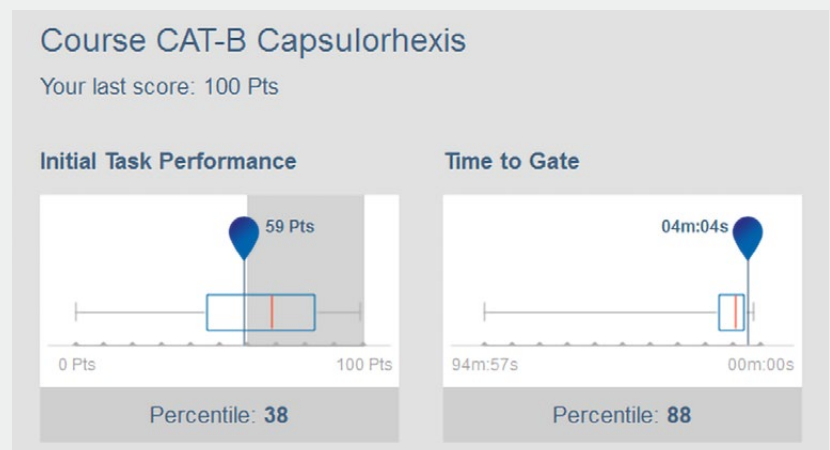
## Immediate Feedback after each Task

At the end of each training task, Eyesi® Surgical presents the trainee with a detailed performance summary. Various parameters relating to instrument and microscope handling, surgical efficiency and tissue treatment are recorded by the training system. This allows trainees to focus on weaknesses and systematically improve their skills.

## Monitoring Skill Development Over Time

By providing formal training reports, Eyesi® Surgical allows educators to objectively assess each resident's skill acquisition over time. The detailed performance evaluation provided by Eyesi® Surgical allows educators to control the individual learning process and to establish measurable proficiency standards. Based on the objective assessment, training contents can be individually tailored to meet the needs of trainees relative to their current skill level.

In addition to a detailed performance summary after each surgical task, trainees can view a comparison that ranks the individual performance against other users. The presentation with box-and-whisker plots allows for judging the own performance at a glance.



# Excellence in Medical Education

Over 300 Installations Worldwide

## About VRmagic

VRmagic first introduced Eyesi® Surgical in 2001 as a training simulator for vitreoretinal surgery procedures. In 2003 Eyesi® Cataract was presented. Since then, the training content available on the simulator has been continuously expanded. Teaching concepts for integrating simulator-based training into the medical curriculum have been developed and are constantly evaluated. Today, VRmagic is the world market leader for simulators used in ophthalmic training. With the ophthalmoscope simulators Eyesi® Indirect and Eyesi® Direct, VRmagic has introduced a product series of simulators for procedural and diagnostic training of retinal examinations.

## Partners from Around the World

VRmagic cooperates closely with health professionals from around the world to continuously enhance simulation technology. Only through scientific exchange and the effort and commitment of our partners are we able to successfully develop and implement innovative and sustainable teaching concepts for medical education.

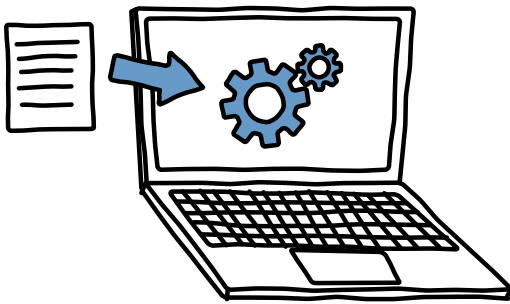


Eyesi® Drylabs were established in 2003 as an educational format where hands-on surgical training is provided on Eyesi® Surgical simulators. Today, Eyesi® Drylabs are conducted regularly at ophthalmological conventions worldwide.

# Get More out of Surgical Simulation

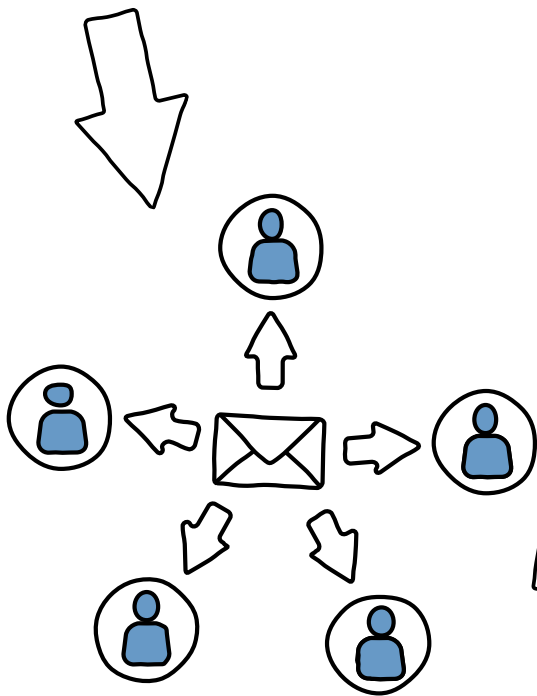
Online User Administration and Training History

## VRmNet in a Nutshell



### #1 Automatic User Creation

You can create user accounts with only a few clicks. All you need to do is upload a list with names.



### #2 Automatic Email

An automatic email with an individual user account and a link to the VRmNet website is sent to each student.

## VRmNet – The New Web-Based Training Portal

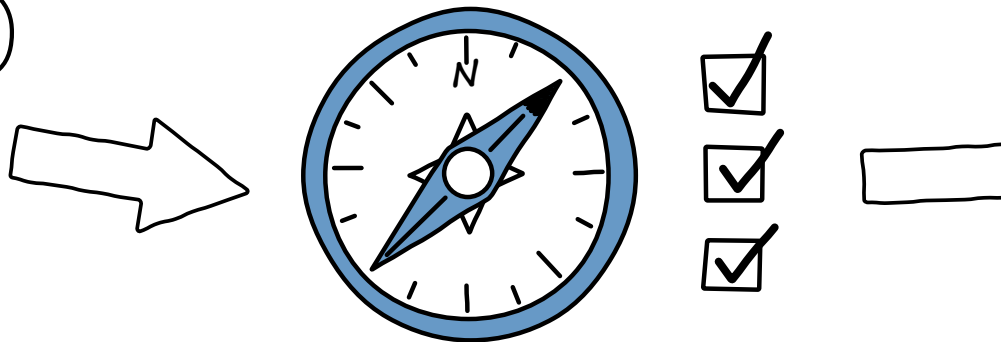
VRmNet is a new web-based training portal from VRmagic. Through the networking feature of VRmagic's simulators, all user and training data can be stored on a central server and securely accessed via any PC or mobile device 24/7. Students log in into VRmNet to access an online orientation course, their training history, and medical content. Educators can use VRmNet to comfortably set up users, manage courses, and monitor their students' training progress.

## Comfortable Administration and Monitoring for Educators

Educators can create and edit user accounts and manage training courses comfortably through the secure VRmNet website. As soon as students have received their user accounts via an automatic email, they can start training. Additionally, automatic reports and notifications on important milestones keep educators informed on their students' progress.

## Monitoring of Training Data

Educators can view their residents' training history online and compare their results to peer group training data. Configurable notifications and reports keep teachers informed on important milestones.



### #3 Online Orientation

Trainees log in to the VRmNet website and complete an online orientation to activate their user accounts for simulator access.



# VRmNet

## Continuous Training through Data Synchronization

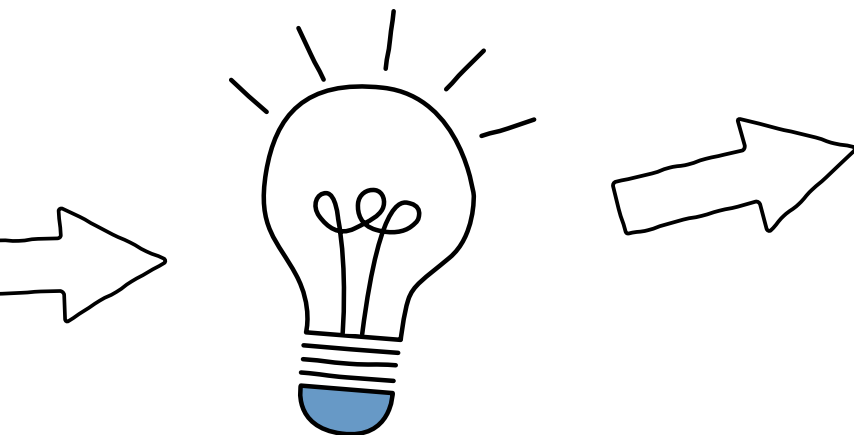
By networking all simulators of an institution through the VRmnet platform, training data is synchronized between devices. Trainees can continue their training on any connected simulator at any time.

## Online Orientation and Medical Content for Students

To prepare students for their first training session, VRmNet provides an online orientation with short videos on simulator handling and courseware features for self-guided training. Students also have access to their training history and medical content from any browser.

## Automatic Software Updates

The simulator software undergoes continuous enhancement. To ensure that trainees always benefit from the latest developments, the simulators connected to VRmNet are kept up to date with automatic software updates.



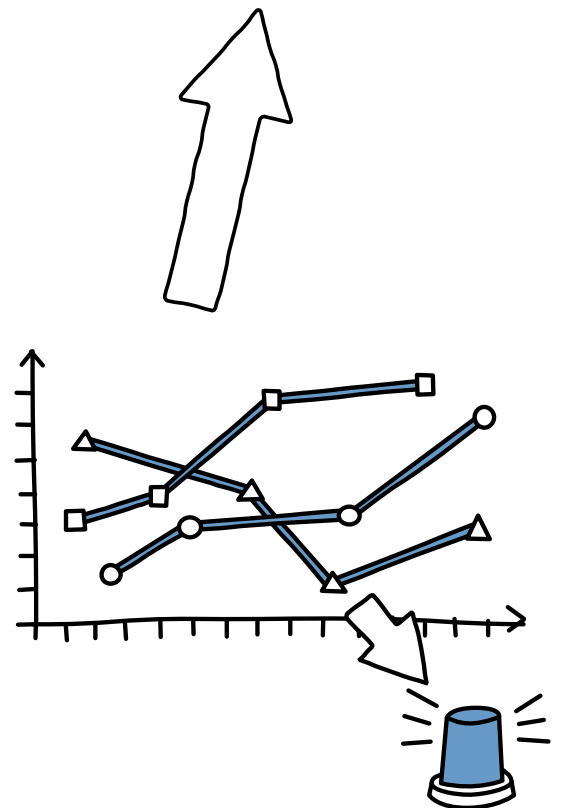
### #4 Independent Practice

Trainees start training independently and receive immediate, objective feedback on their performance.



### #6 Certificate and Assessment

Students automatically receive a certificate after completion, and can view an objective assessment of their skills.



### #5 Monitoring and Notifications

You can monitor your students' training progress online. Configurable notifications and reports keep you informed on important milestones.

# Reasons for Eyesi® Surgical

Peer-Reviewed Intraocular Surgery Training with Validated Concept

## 1 Less Complications in Intraocular Surgery

Eyesi® Surgical is a technically mature training system for eye surgery. Several studies prove that unexperienced surgeons who trained on Eyesi® Surgical have lower complication rates during intraocular surgery than peers who did not have the opportunity to train on Eyesi® Surgical. View the list of publications on our website.

## 2 Highly Realistic Training Experience

Eyesi® Surgical offers a highly immersive, lifelike training environment without risk to patients. The simulator integrates all aspects of a real operation scenario. A global community of hospitals and universities have come to embrace this efficient way of training.

## 3 Pre-Installed Simulator Curriculum

Expert surgical performance can only be gained through intense practice. Starting with basic skills, the training curriculum Eyesi® Courseware permits independent and repetitive practice of isolated steps, which leads trainees step-by-step to proficiency in cataract and vitreoretinal surgery.

## 4 Competency-Based Assessment

Eyesi® Surgical provides trainees with immediate, competency-based performance feedback after each task, so that they can systematically improve their skills. The feedback contains various parameters relating to instrument handling and surgical efficiency. The training results form an individual learning curve for each resident.

## 5 Online Teaching Solution with VRmNet

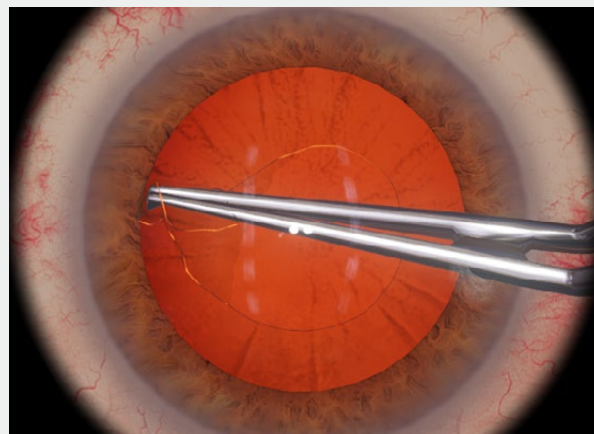
The online features of VRmNet help you to keep track of your residents' skills. Manage user accounts with the web-based user administration, get trainees up to speed quickly using the online orientation, and have their training progress always at your fingertips via a user-friendly web interface.

### Test-Drive Eyesi® Surgical

Come and try out the Eyesi® Surgical Simulator live at the next conference, or take part in a drylab. Visit [www.vrmagic.com](http://www.vrmagic.com) for an overview of the upcoming events, or contact us by email or phone.



ILM peeling: creating a flap in the membrane



Capsulorhexis complication: peripheral tear-out



HAAG-STREIT

SWISS MADE

OCULUS RIFT S



VRmagic

elo



VRmagic GmbH  
Turley-Str. 20  
68167 Mannheim  
Germany  
Phone +49 621 400 416-0  
Fax +49 621 400 416-99

[info@vrmagic.com](mailto:info@vrmagic.com)  
[www.vrmagic.com](http://www.vrmagic.com)

VRmagic Inc.  
245 First Street, 18<sup>th</sup> floor  
Cambridge, MA 02142  
USA  
Phone +1 617 444-8761  
Fax +1 617 444-8405

© 05/2019 VRmagic GmbH  
All rights reserved.