eyesi
by VRmagic

Surgical Simulator

VRmagic

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Cataract Surgery Training

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 – independent of the patient flow.

Expertise Comes from Experience

The Eyesi Surgical simulator allows residents to accumulate surgical experience and refine essential cataract skills. Both surgical judgment and manual dexterity can be improved through frequent practice of a wide range of surgical tasks. Training modules available on Eyesi Surgical deconstruct complex surgical techniques into smaller learning steps. Simulations can be either abstract scenarios or actual surgical steps, such as capsulorhexis, hydrodissection, phaco, irrigation/aspiration, and IOL insertion. The abstract simulation tasks aim at refining basic skills such as microscope handling, proper pivoting at the incision, and understanding of spatial boundaries.

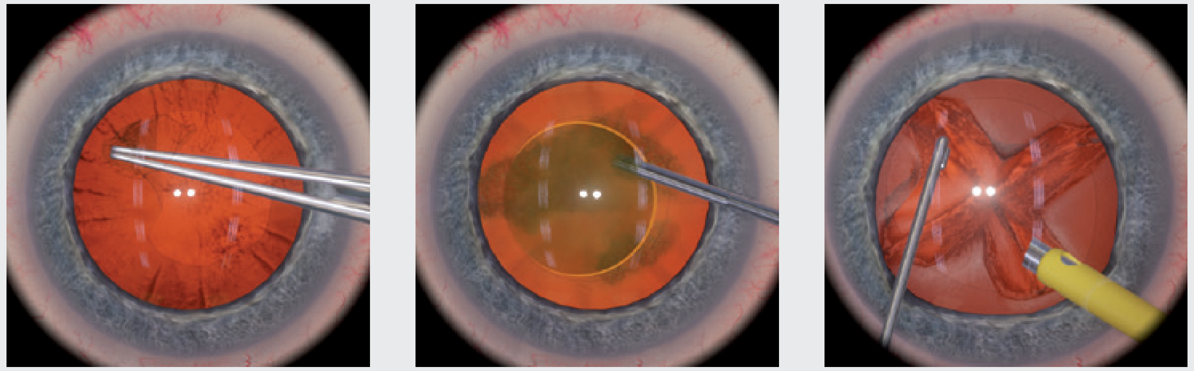
Lifelike Training Environment for Optimal Practice

The Eyesi Surgical simulator provides a cataract patient model head which can be operated on from a temporal or superior position. Trainees see the intraocular surgical field through an operating microscope. The view is in stereo and offers realistic depth of field. The focus and zoom can be altered by using the microscope foot pedal. The instrument handpieces are inserted through the incisions in the model eye.

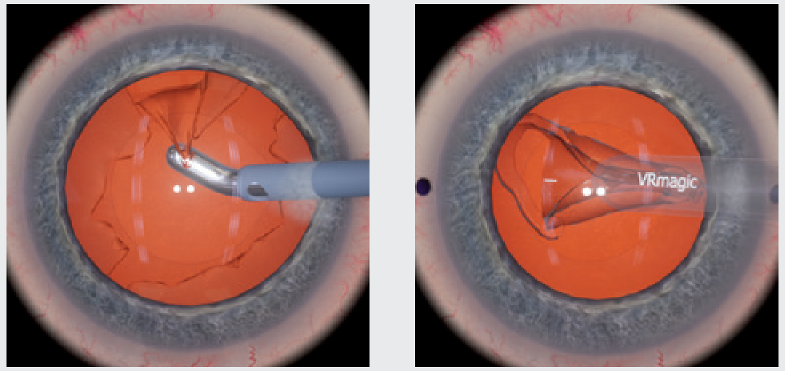
Phaco Machine and Instruments like in the OR

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.

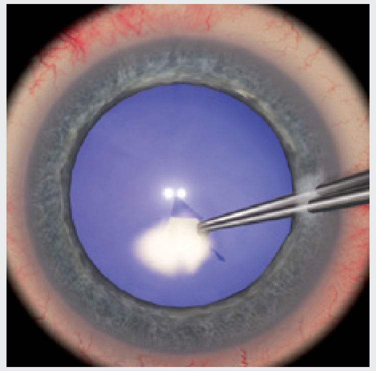
With a generic OR machine interface and phaco foot pedal, Eyesi Surgical offers a risk-free cataract training environment, in which trainees can explore appropriate fluidics for safe and efficient sculpting, quadrant removal and I/A.



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



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



Capsulorhexis performed on a milky-white cataract.

In the advanced courses of the Eyesi Courseware, trainees perform surgical tasks and are challenged by unexpected situations and complications.

Eyesi Courseware

Curriculum Ready for Use on Day One

It is easy to help a new resident to begin focused practice on Eyesi Surgical. A structured and ready-to-use training curriculum is provided in the simulator. 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 simulation task in the course.

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 ability. Compared to a 1st-year resident, a 3rd-year resident has different surgical training needs. Accordingly, the Eyesi Courseware consists of courses 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 the basic steps of surgery can train on complicated scenarios or learn more advanced surgical techniques.

Introductory	Anterior Chamber Navigation	Intracapsular Navigation	Bimanual Navigation	Instruments	
Beginners	Navigation and Instruments	Capsulorhexis	Intracapsular Tissue	Stop and Chop	IOL Insertion
Intermediate	Capsulorhexis	Divide and Conquer	Chopping	Irrigation/ Aspiration	
Advanced	Capsulorhexis Errant Tear	Weak Zonules and Capsules	Capsulorhexis Variantions	White Cataract	Capsulorhexis Capsular Plaques

Cataract courses of the Eyesi Courseware

Objective Assessment

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.

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.

Software version: Eyesi V2.8
System serial number: 042

User: Dr Best
Group: 3rd year
Handedness: right

CAT-A Anterior Chamber Navigation
Course type: Sequential

Course Score max. 1800								1580
Cataract Navigation Training - Level 1 req. 3x50					2011-08-11 13:59 78	2011-08-11 14:01 85	2011-08-11 14:03 79	2011-08-18 12:51 89

The Eyesi Surgical training report provides a condensed view of a user's skill development over time.

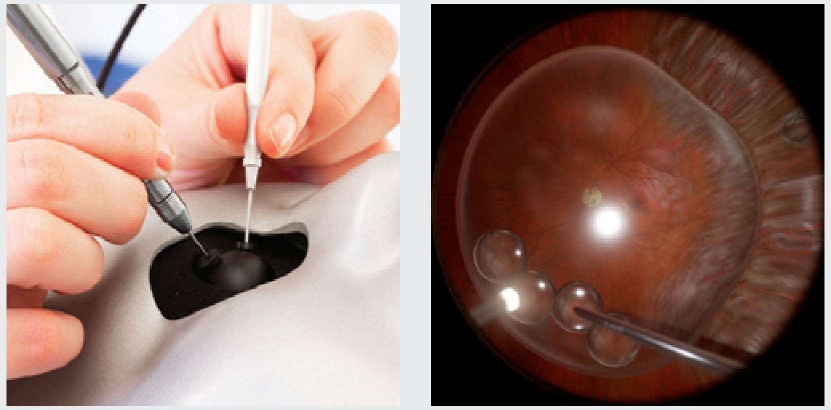
Vitreoretinal Surgery Training

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, peripheral vitrectomies, 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.

Dedicated to Excellence in Medical Training

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 for medical education. 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.

For more information on the Eyesi Surgical Simulator or on the Eyesi Indirect and Direct Ophthalmoscope Simulators, please contact:

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