

Building the Future of Ophthalmic Surgery Together

How do you train the next generation of ophthalmic surgeons without their first real experience taking place on a patient? That question inspired computer scientists **Shervin Deghani** and **Michael Sommersperger** to develop an innovative solution. Together with senior vitreoretinal surgeon, Medical Lead and co-inventor **Koorosh Faridpooya**, they developed an advanced surgical simulator for training ophthalmic surgeons.

While Deghani and Sommersperger are responsible for the technological development, Faridpooya contributed the clinical expertise and designed the surgical workflow, training strategy and medical principles on which the platform is based. Today, they work closely with the Research & Innovation Department at Het Oogziekenhuis Rotterdam to further develop the simulator.

"We want to give young surgeons the opportunity to build confidence in a safe environment first. Ultimately, patients are the ones who benefit."

From a Bedroom Project to an International Collaboration

What began as an idea during their PhD research at the Technical University of Munich grew into the innovative start-up **SynthesEyes**. Shervin and Michael had spent years working on medical imaging, artificial intelligence and surgical technology but lacked a realistic environment in which to develop and test new techniques.

"New surgical technologies often take many years before they reach the operating theatre," says Shervin. "We wanted to create an environment where both innovations and surgeons could safely learn, practise and develop."

At an international conference, they met Koorosh Faridpooya from Het Oogziekenhuis Rotterdam. That meeting marked the beginning of a close and productive collaboration.

"From our very first conversation, it was clear that we shared the same ambition: to advance ophthalmic surgery by combining technology with clinical expertise."

Practising on a Virtual Patient

The simulator enables real surgical procedures to be recreated in a virtual environment. Young ophthalmic surgeons use the same instruments as they would in the operating theatre and practise on virtual patient cases based on real surgical procedures. This allows them to develop complex surgical skills before performing them on patients.

"Many surgeons currently learn step by step during live surgery. Our simulator allows them to gain valuable experience before they ever enter the operating theatre."

According to the developers, this not only increases confidence among young surgeons but also makes surgical training more efficient and ultimately contributes to even safer patient care.

Developing Together in Rotterdam

Since last year, the simulator has been undergoing evaluation at Het Oogziekenhuis Rotterdam. Surgeons, fellows and ophthalmology residents have been testing the system and providing detailed feedback. According to Shervin and Michael, this collaboration has been invaluable.

"We are the technical experts, but surgeons know exactly how an operation should feel. Only by working closely together can we develop a simulator that truly reflects real-life surgery."

According to Shervin and Michael, the collaboration with Het Oogziekenhuis Rotterdam has been of tremendous value.

"Everyone has been incredibly open to sharing ideas and trying new technology. We receive feedback from both experienced surgeons and surgeons in training. That combination is exactly what helps us continue to improve the simulator."

The Next Step

Together with Koorosh Faridpooya, Shervin and Michael are now developing a dedicated training module for **retinal membrane peeling**. The module not only teaches the technical aspects of the procedure but also guides surgeons' step by step through the surgical strategies used by experienced vitreoretinal specialists. It is based on the surgical techniques and clinical expertise that Faridpooya has developed throughout his years of experience as a vitreoretinal surgeon, translating his knowledge into a realistic and accessible learning environment for the next generation of ophthalmic surgeons.

"Our ambition is for young ophthalmic surgeons to learn directly from the expertise of experienced surgeons, even when those experts are not physically present in the operating theatre."

Bridging Human Expertise and Artificial Intelligence

The simulator serves another important purpose. By analysing thousands of virtual surgical procedures, it generates valuable data for the development of artificial intelligence and future **robot-assisted surgery**. According to Shervin, the surgeon will always remain at the centre of this technological evolution.

"AI should support surgeons, not replace them. That's why we first need to understand how experienced surgeons make decisions. Only then can we develop intelligent systems that are both reliable and safe."

The collaboration between Het Oogziekenhuis Rotterdam and SynthesEyes demonstrates how medicine, technology and artificial intelligence can reinforce one another, all with a shared goal: delivering better care for the patients of tomorrow.