

Mark Humayun, MD

Dr. Humayun marks his 20th year of involvement in the development of an artificial retina.



1. How did you become interested and involved in developing an implantable, artificial retina?

There were a couple of motivators for me with this project. On a personal level, my grandmother, who was instrumental in raising me, went blind from diabetes. Seeing that occur just before I entered medical school had a huge impact on the direction I took in medicine. But why this project, and why specifically retina? During my time studying at top-notch hospitals like Duke and Johns Hopkins, I continually saw people who were going blind or were already blind from retinal diseases; we couldn't offer them any solutions. This motivated me to try and do something for patients for whom there was no foreseeable cure.

2. Since you began working on the artificial retina project, what has been your greatest challenge?

The biggest hurdle with the project was convincing funding agencies and others that this was a worthwhile investment. When you have something extremely innovative, it is difficult to secure funding until you have proven the concept. Additionally, we started from scratch with this idea. It was very challenging to conceptualize and then create a workable technology with no previous blueprint.

3. What are the greatest successes of this project?

As a physician, I feel the greatest success has been watching these devices bring some element of vision to blind patients. The first time our first blind patient could see, even for only a few minutes, remains one of the best experiences of my career.

The second greatest success has been the interdisciplinary convergence from the fields of engineering, chemistry, and biology, as well as surgeons and clinicians, on this project. We have more than 200 students and 50 faculty and researchers involved. There is a great energy and

enthusiasm when you get them all together.

I am also exceptionally grateful to my colleagues for giving me the latitude to be able to develop these out-of-the-box ideas.

4. What has had the most impact on you while developing this technology?

It is the joy of the patients who regain some vision that keeps us going day in and day out. When we first began, the patient questioned whether he could see a dim flickering light that we told him about. We found that because of the amount of time that had passed since he had gone blind, his whole visual system had to warm up. After that point, there was a real sense of excitement.

Another patient with retinitis pigmentosa told us that before the implant she had not seen anything that far out in her peripheral vision since she was 20 years old.

We have also learned that the human brain has the incredible ability to take very little information and fill in the missing gaps. Not many people believed that the 16-pixel spots of light we had created in the visual field would amount to anything. Surprisingly, we have found that even when a small fraction of the information is presented, the human brain is able to fill in enough of the remaining information to differentiate objects. Patients who have been blind for 30 to 50 years can now differentiate between a fork, plate, and cup, or walk toward a door—that is the real excitement.

5. What is the time frame for this technology?

This year, we began working on clinical trials with a 60-channel implant. This includes multiple centers in the United States, as well as international centers.

From there, we will continue working through whatever regulatory hurdles we face to get this device through the market approval process so that it can be sold commercially. The ultimate goal is for reimbursement by a third-party payer in order to further help our patients.

Bonus Question. What advice would you offer to future ophthalmologists?

Aim high and do the best you can for your patients. If your strengths are to be a good clinician and doctor, then strive to be the best. If your strength is to develop new technologies, then pursue that. Do not be frustrated by what people say because, believe me, there were plenty of naysayers when I began with this project. Instead, be true to yourself. I have done this, and I can honestly say that I am excited to get up and go into work every day. ■