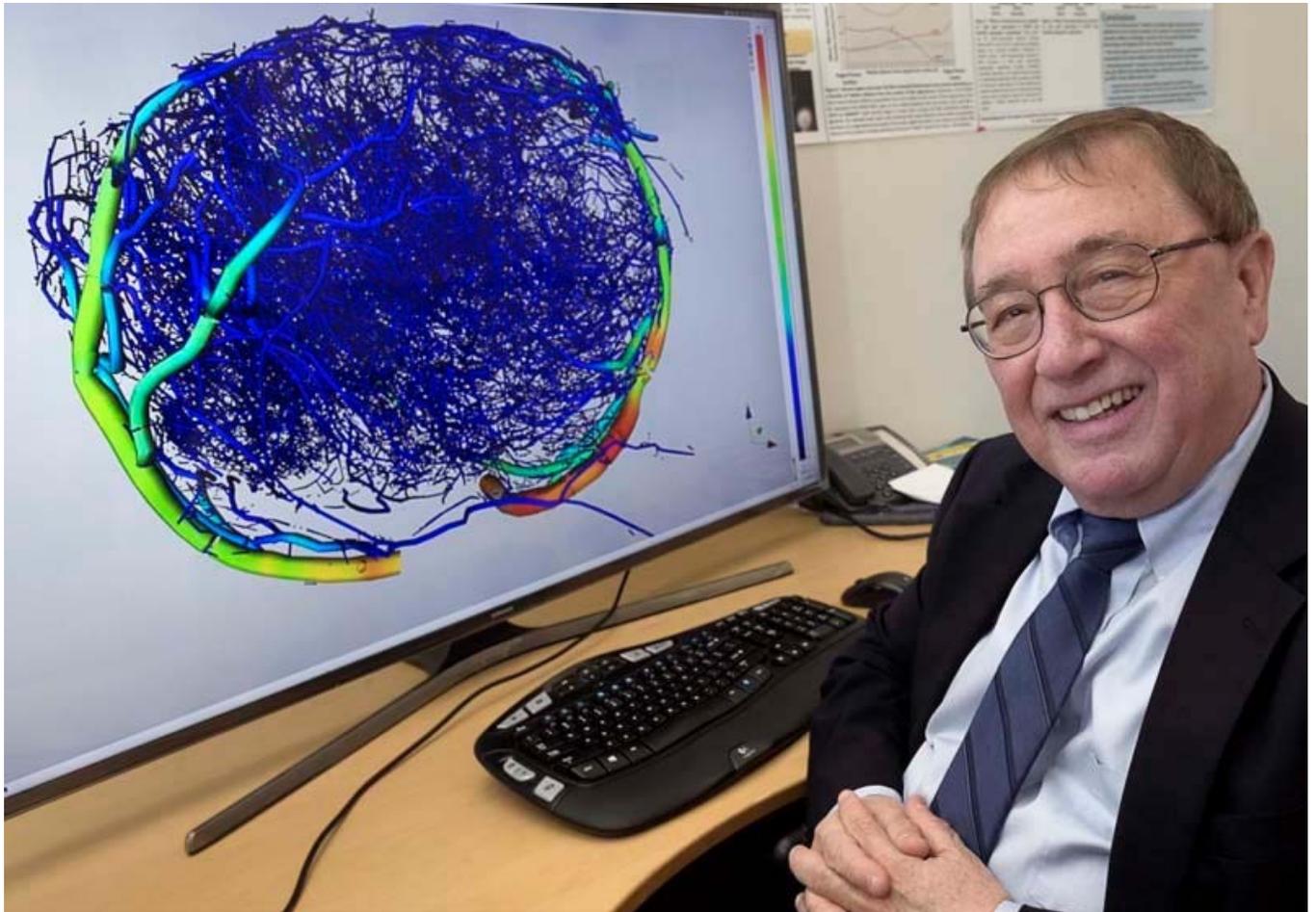Technology

Blood-vessel patterns can detect diseases

EYE ON VASCULOMICS: Raul Brauner, founder and CEO of Bio-Tree Systems Inc., is seen in his Providence office. The image on his computer screen is that of a 3-D CAT imaging scan of a brain tumor that has been treated with Avastin. PBN PHOTO/ MICHAEL SALERNO

Raul Brauner describes himself as an entrepreneur and engineer searching for the presence of diseases in a new way.

Brauner, of Framingham, Mass., is the founder of Bio-Tree Systems Inc., a Providence life sciences company that created and trademarked a new medical field called Vasculomics – a

broad platform that uses technology to detect minute changes in micro-blood vessels of organs to indicate diseases.

The shape, geometry and "population organization of blood vessels," he said, "can give a signal" showing whether an organ is healthy or not.

That's where Vasculomics comes in, as it reveals blood-vessel patterns.

Brauner said his technology is novel, as "nobody really looked at the concept of the overall shape of vasculature and of vascular trees" before.

The company, which was formed in 2005, originally focused Vasculomics on analysis and informatics extraction of three-dimensional, microvascular geometric patterns of cancer tumors.

While that is still an area of focus, the company has since branched out into other medical areas, such as brain diseases and complications with diabetes, specifically looking at retina vasculature.

"I always considered diabetes to be a major strategic market for us because all of the complications of diabetes are vascular complications," Brauner said.

Using computer-based automation applications to create precise 3-D models of organ vasculature, Brauner said his technology opens the possibility for significantly higher sensitivity and specificity, as well as earlier disease detection and monitoring.

Bio-Tree initially raised $1.1 million in seed funding in 2005, the same year it formed an alliance with Brown University and Boston Children's Hospital to focus on analyzing cancer tumors for oncology drug discovery; the oncology business is continuing through a collaboration with the MD Anderson Cancer Center in Houston and Boehringer Ingelheim in Europe.

Katherine Gordon, managing director of the Technology Ventures Office at Brown University, said her office is helping the company look at applications in neurology and neurodegenerative diseases, as well as oncology.

"We're delighted to be partnering with Bio-Tree and look forward … to working together to expand the field of Vasculomics – a powerful technology for investigating blood-vessel growth in various disease conditions," Gordon said.

Last year, the company, through its OptoTree unit, began concentrating on retina vasculature – as the retina can hold clues to the early presence of diseases such as Alzheimer's and diabetes. OptoTree is raising between $2 million and $3 million to propel it to the next level.

Brauner showed how the technology works by showing 3-D retina scans created using Optical Coherence Tomography Angiography imaging, a new type of scanning modality in the ophthalmology field. The 3-D images of the retina vasculature are inputted into the Vasculomics computer where the retina micro-vessels are analyzed. As examples, he presented retina images of a healthy 27-year-old, a healthy elderly patient and another elderly patient with Alzheimer's.

The Vasculomics-processed scans show markedly different appearances in the vasculature among the three people, results he says that can be used to show early-onset diabetes, Alzheimer's or evidence of macular degeneration.

Brauner said his company has formed partnerships with Joslin Diabetes Center in Boston and also is working with Dr. Peter Snyder at Lifespan.

Eyes, he said, often are the organ that is the earliest affected, as diabetic retinopathy can cause blindness. Often, he said, the diagnosis comes too late, and irreversible damage already has been caused.

That's how Vasculomics can help.

He said they will be able to screen large numbers of people by using the new technique of combining OCT-A machines with Vasculomics. That will allow the diagnosis of diabetic retinopathy on a much-earlier basis, Brauner said. The noninvasive technology can be brought to ophthalmology centers and global health clinics focused on diabetes, he said.

Brauner said the company employs less than 10, including some part time. He hopes to have the Vasculomics technology on the market with Joslin for the third quarter of 2018, after receiving U.S. Food and Drug Administration approval.

"It's a way to diagnose diseases much earlier and with much higher confidence, leading to improvement in the outcome of care while lowering the cost," Brauner explained.

"This technology can create an index for healthy aging, and for the effects of disease at any age," Brauner added.