

# Barrow Aneurysm and AVM Research Center



**IMAGINE GOING ABOUT** everyday life knowing there is a lesion in your brain that could burst at any moment, causing intense bleeding that could result in significant disability or even death. It would be terrifying. That is what it is like to have an aneurysm or arteriovenous malformation (AVM). Nearly one-half of aneurysm ruptures and one-fifth of AVM ruptures are fatal. However, most people don't know they have an aneurysm or AVM until a rupture occurs. Even when they are detected, the surgery to remove or repair aneurysms and AVMs can be extremely invasive. Depending on a variety of factors, including the type, size, and location of the lesion, the risks associated with operating can potentially outweigh the risk of a rupture. This puts patients in a very precarious position.

The Barrow Aneurysm and AVM Research Center (BAARC), led by Barrow Neurological Institute President and CEO Michael T. Lawton, MD, investigates the underlying genetics, formation, and rupture of aneurysms and AVMs in order to discover better ways to detect and treat them. BAARC pushes the boundaries of care, leading to the development of new, less invasive, and more effective treatments for patients around the world.



10

research studies  
funded by the  
Foundation



5,200+

aneurysm surgeries  
performed by  
Dr. Lawton

# BARROW NEUROLOGICAL INSTITUTE BY THE NUMBERS



## CLINICAL IMPACT

91,800+

total number of  
patient visits

20,900+

telemedicine visits

9,200+

brain and spine surgeries



## GLOBAL IMPACT

78

international  
research fellows and  
visiting scholars

## RESEARCH ADVANCEMENTS

■ **Aneurysm research:** Tomoki Hashimoto, MD, leads bench-to-bedside research at BAARC. Dr. Hashimoto and Jinglu Ai, PhD, have been studying the association between aging and increased risk of aneurysm rupture. Specifically, they are looking at cell senescence, when cells stop dividing due to aging and begin secreting inflammatory proteins, which can trigger an aneurysm rupture. Dr. Hashimoto and Dr. Ai are investigating the role of the molecule Sirtuin-1 (SIRT1) as a potential drug target to reduce cell senescence and prevent aneurysms from rupturing. Initial results have indicated that the activation of SIRT1 prevents aneurysm rupture, while the inhibition of SIRT1 promotes it.

Since many aneurysms go undetected until a rupture occurs, Dr. Hashimoto has been investigating ways to better diagnose them. Last year, he began a study that aims to find a blood test (i.e., a blood biomarker) to diagnose aneurysms. So far, he has collected blood samples from more than 40 patients, both before and after aneurysm clipping surgery. He will now apply an RNA sequencing technique to them to identify potential blood biomarkers.

■ **AVM research:** S. Paul Oh, PhD, studies the genetics and mechanisms that lead to AVM development and progression. A mutation in the KRAS gene that causes its overexpression has been linked to the formation of brain AVMs. However, scientists do not know whether the KRAS gene needs to be continuously overexpressed to sustain and maintain the AVM. Dr. Oh and his team have developed a new preclinical model to regulate the expression of the KRAS gene. The model will test whether the repression of this gene can stabilize or decrease the size of an already established AVM. If their hypothesis is true, then the team can try to target the gene with a class of inhibitors to induce AVM regression. Ultimately, this could lead to a pharmacological approach to stabilizing AVMs.

Additionally, Dr. Oh has developed a preclinical model that will allow his team to induce AVMs in a specific part of the brain. Studying AVMs similar in both size and location results in more consistent laboratory testing. This lays important groundwork for future studies to determine factors that influence the timing of AVM induction and rupture.

## EDUCATING THE NEXT GENERATION

Research is critical to developing innovative treatments for aneurysms and AVMs. Dr. Lawton and his team are committed to educating the next generation of leading cerebrovascular specialists. In addition to

working with residents and fellows, BAARC scientists also mentor high school and undergraduate students participating in the Barrow summer research programs. In 2022, they hosted one high school student and one undergraduate student, both of whom had the opportunity to participate in hands-on, real-world research under the mentorship of BAARC scientists.

## ON THE HORIZON

Dr. Hashimoto and Dr. Ai have submitted an application for a R01 research grant to the National Institutes of Health (NIH) to further their preclinical studies of SIRT1 in its ability to prevent aneurysm rupture. They plan to generate a manuscript and publish their findings from this study in a peer-reviewed scientific journal. Dr. Hashimoto also will continue his study investigating blood biomarkers for the diagnosis of brain aneurysms.

Dr. Oh and his team will use their new preclinical model to test the whether the repression of the KRAS gene can stabilize or decrease the size of an already established AVM. Dr. Oh will also perform tests to determine factors that influence the timing of AVM induction and rupture.

BAARC plans to recruit a new clinical research database manager to replace senior clinical research nurse Heidi Jahnke, RN, MSN. She retired in November 2021 after more than 30 years of service between St. Joseph's Hospital and Medical Center and Barrow Neurological Institute. Heidi had been leading efforts to build the Barrow Registry for Aneurysm and Vascular Outcomes, collecting data on all aneurysm and AVM patients entering the clinic for continued use in research and to drive better patient outcomes.



**“This experience has effectively prepared me to work in a laboratory environment. All my mentors answered my questions about the new techniques I was learning. They also allowed me to shadow them and trusted me to assist them with some important projects they were conducting. Through all this, I have become more confident in the laboratory and more knowledgeable about aneurysms and arteriovenous malformations.”**

Joseph Oh, BAARC undergraduate summer research intern

## BARROW NEUROLOGICAL INSTITUTE BY THE NUMBERS



### RESEARCH

**397**

active research studies

**791**

patients enrolled in clinical trials

**\$14 MILLION**

in federal research grant support



### DONOR IMPACT

**\$20 MILLION**

total distributed to Barrow Neurological Institute, including:

**\$3.5 MILLION**

designated to specific centers/programs

**\$15.4 MILLION**

for basic, clinical, and translational research

**\$1.5 MILLION**

in endowments



Dr. Lawton and Dr. Hashimoto work tirelessly to find better treatments for aneurysms.

## THANK YOU FOR YOUR SUPPORT

Numerous challenges still remain in the detection and treatment of brain aneurysms and AVMs. The support of donors like you allows BAARC to conduct vital research to explore the genetics, formation, and rupture of aneurysms and AVMs. Your generosity means that we can continue pushing the boundaries of care beyond our walls, leading to the development of groundbreaking new treatments that can benefit patients around the world. We also are able to dedicate our time and resources to mentoring the next generation of neuroscientists. Your critical support of our work is greatly appreciated.

With gratitude,

Michael T. Lawton, MD  
President and CEO, Barrow Neurological Institute  
Founder, Barrow Aneurysm and AVM Research Center

The mission of Barrow Neurological Foundation is simple: to be the catalyst of our donors' passion for transformation by providing the resources for Barrow Neurological Institute to achieve its mission of saving human lives through innovative treatment, groundbreaking research, and by educating the next generation of the world's leading neuroclinicians.

**Barrow**  
Neurological Foundation

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