"Based on the Stratasys 3D model, we were able to pre-empt potential complications and devise a more optimal means of treating Teresa's aneurysm,"

Dr. Adnan Siddiqui

Teresa Flint holds a 3D printed model of her cerebral aneurysm.

CASE STUDY

# 3D Printing for Vascular Health

## SHAPING BREAKTHROUGHS IN BRAIN ANEURYSM TREATMENTS

3D printing can be incredibly helpful in prototyping new medical devices and training new physicians, but its truly transformative power becomes apparent when a patient's life is on the line. Kaleida Health's Gates Vascular Institute (GVI), University at Buffalo, and the Jacobs Institute of Buffalo, New York, came together to offer Teresa Flint a second chance at life. A 49 year-old mother of three, Flint was referred to the GVI following an extended period of inexplicably diminishing vision, which they determined to be the result of a cerebral aneurysm – a life threating condition.

An aneurysm is the result of a weakened area within an artery filling with blood and putting pressure on nearby tissue. A brain aneurysm rupture can cause massive internal bleeding, stroke and even death. In many cases, doctors have several options for treatment, but because no two aneurysms are identical, success requires deep knowledge of the patient's unique vascular anatomy. "Right now we've prepared for complications on a theoretical basis," said Dr. Adnan Siddiqui. "Many times, despite the best theoretical planning, we are faced with circumstances where we don't know what to do." With the help of Stratasys 3D Printing, surgical teams now have an advanced tool to help them find the right method to isolate the patient's blood vessel, helping reduce risks associated with delays and potential complications with various surgical approaches.

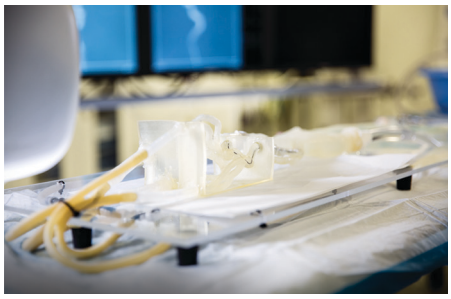
Dr. Adnan Siddiqui explains how the use of a Stratasys 3D printed model helped his team prepare for surgery.

## The Future of Vascular Surgery Planning

To better understand the unique anatomy and placement of Flint's aneurysm, Dr. Siddiqui worked with Dr. Ciprian Ionita, at the Jacobs Institute, to convert Flint's CT scans into a 3D computer model they could manipulate and print. Having a 3D printed model of her aneurysm would allow the surgical team to plan and test the best treatment for her specific situation and condition. "We wanted accurate vessels, down to the same resolution as the X-ray images. We were looking at the resolution of all the printers that were out there and we found the Eden 260V," said Dr. Ionita. The 3D printed model replicated the geometry of Flint's aneurysm, but more importantly, it also mimicked the feel of human tissue and vascular structure, giving the medical team greater confidence in how a surgical device would interact with her anatomy.

3D printed models based on actual patient CT scans, used both for pre-surgical planning and medical device testing.

The 3D model, printed using flexible TangoPlus™ photopolymer, gave the doctors the opportunity to not only inspect a life-sized replica of the aneurysm, but also conduct a series of pre-surgical tests against several treatment options.

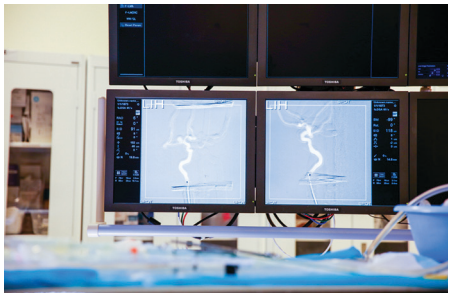


The team at Jacobs Institute tests surgical approaches using a guide wire and 3D printed model which accurately reflects the anatomy of the patient.

## Confidence in the Right Approach

Based on the 2D imaging, the team had selected an aneurysm embolization device as the first choice in treating Flint's aneurysm. The team deployed the chosen device into the 3D printed model. During this test they discovered the solution would not succeed. Based on the information from that test, Flint's doctors developed a new plan that successfully treated the aneurysm. "Based on the Stratasys 3D model, we were able to preempt potential complications and devise a more optimal means of treating Flint's aneurysm," said Dr. Siddiqui. Without the 3D model, the team wouldn't have realized the initial plan would fail until deploying the device during the procedure, which would have forced the team to quickly change plans and increase the length of the procedure, as well as its associated risk to the patient.

In the end, Flint's aneurysm was successfully treated thanks to her pioneering team of physicians at the GVI and the Jacobs Institute. Their innovative use of Stratasys 3D Printing solutions enabled the team to develop a treatment plan that improved the likelihood of this mother of the three having a positive outcome in an otherwise frightening situation. Equally important, it avoided having to change the treatment plan on the fly, when the patient was on the surgical table. For her doctors, it is a testament to the power of combining innovative thinking with advanced technology.



The team at Jacobs Institute tests out new devices in the surgical lab using a patient-specific 3D printed model designed to replicate both the look and feel of her anatomy.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