

Customized device tailored to patient's individual anatomy now used to repair abdominal aortic aneurysm without surgery

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An abdominal aortic aneurysm - a bulge in the large artery that carries blood away from the heart - can be immediately life-threatening if it grows large enough to rupture. The chance of survival when it ruptures is less than 10 percent.

Many people who find out they have that risk are able to have a minimally invasive repair. But up to 30 percent instead face a major open surgery with a long recovery because of the location of the aneurysm. Now a new graft customized to their individual anatomy allows them, too, to have a quick recovery. The Johns Hopkins Hospital is one of the first hospitals in the United States now offering the procedure.

Ronald Rolett, a retired physician from North Carolina, learned that he had an [abdominal aortic aneurysm](#) four years ago from a routine ultrasound screening. He then had follow-up ultrasound tests every six months and the bulge continued to grow. In September 2012, it had reached a critical size: 5.9 centimeters, and he says, "That was the alarm bell. I decided that something had to be done."

On January 11, 2013, Rolett became the first patient at The Johns Hopkins Hospital - and at any hospital in the mid-Atlantic region - to have an aneurysm repaired in a minimally invasive way using a graft that was made to fit his specific anatomy. Because of the location of his aneurysm, without that customized graft, he would have needed a much more extensive, open surgery with a long recovery. He also faced a greater risk of kidney failure with an open operation since his [kidney function](#) was abnormal.

There are two methods to repair an abdominal [aortic aneurysm](#) to prevent it from rupturing:

- The traditional "open" surgery approach that requires several months to recover.
- An endovascular repair - a minimally [invasive procedure](#) that has become more common in recent years. Doctors attach a synthetic graft to a [catheter](#) and then feed it through an artery in the groin to the damaged section of [aorta](#) to prevent the vessel from rupturing. The grafts commonly used today come in different sizes and are pulled off the shelf.
- Previously, many of those people who were fortunate enough to have their aneurysm identified prior to rupture could not have the [endovascular repair](#) because their aneurysm was located too close to the renal arteries. For them, the only option has been open surgery, which carries higher risk of heart attack and [kidney failure](#).

"We need at least 5 millimeters to 10 millimeters of length between the renal arteries and the aneurysm in order to secure the stent-graft in place in most patients," says Johns Hopkins vascular surgeon James Black.

Only a few dozen surgeons nationwide, including Black, have been trained to repair abdominal aortic aneurysms with a new type of graft that was FDA-approved in April 2012. Johns Hopkins is one of a select group of hospitals in the United States now offering this new approach to patients.

The new graft looks similar to the traditional endovascular graft made of a polyester fabric encased by a stainless steel scaffold. However, it is different from the off-the-shelf graft because of fenestrations—two tiny holes fabricated in the graft to accommodate the renal arteries, helping to keep the graft in place, as well as a scallop-shaped cut to supply blood to the superior mesenteric artery,

which carries blood to the intestines.

"We do a substantial amount of planning before the endovascular operation to ensure that the graft will be engineered correctly to match the patient's individual anatomy," says Black. "The planning process includes making a 3-D image and model of the patient's aorta using computed tomography (CT)."

The fabrication of each graft takes about five weeks, but for patients it's worth the wait to have a less invasive repair. They can go home from the hospital three days later and get back to their normal activities in two weeks compared with a four- to eight-week recovery following open surgery. Patients have a CT scan one to two months after the procedure and then are followed annually.

Patients who are eligible for the new customized graft repair include those whose aneurysms approach within 5 millimeters of the renal arteries and have large enough vessels to deliver the stent-graft to the appropriate location.

"At Hopkins, we perform close to 100 open abdominal aortic aneurysm repairs each year for patients who are not eligible for the minimally invasive option," says Black. "With the new fenestrated stent-graft, we will be able to spare many of those patients a big operation and a long recovery."

Rolett is pleased that he was able to have his abdominal aortic aneurysm repaired in the minimally invasive way. "I spent three nights in the hospital, and after two weeks, I no longer had any discomfort and was able to get back to my normal activities."t back to my normal activities."

Provided by Johns Hopkins University

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