

Smart catheters help doctors navigate the heart

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Joshua M. Cooper inserted a catheter through a vein in Janice McKemey's groin, up through her abdomen and all the way inside her heart.

From there, the Temple University Hospital physician pushed the slender device through a wall of tissue into the [left atrium](#), where the hard part began.

Cooper's delicate task: detect [heart cells](#) that had gone rogue and destroy them.

The procedure, called [catheter ablation](#), has been around for decades, and with advances in technology it has become quite safe, especially in the hands of a skilled practitioner. But with the condition Cooper was treating - a common type of abnormal rhythm called [atrial fibrillation](#) - it is not always effective. Symptoms such as palpitations, shortness of breath, and fatigue may come back in 30 percent of cases.

That is why he was using a new kind of "smart" catheter - one that told him whether he was making good contact inside McKemey's heart, thus delivering enough heat to ablate, or disable, any renegade cells that were triggering her erratic rhythms.

"It's like the Goldilocks phenomenon," said Cooper, the hospital's director of [cardiac electrophysiology](#). "You want to give exactly the right amount of energy at each specific spot. Too little, and you lose

effectiveness. Too much, and you could potentially damage an adjacent structure."

Atrial fibrillation - "a-fib" - can be treated with medication in most people, but when ablation is needed, Cooper is a fan of working smart. The new catheter contains sophisticated electronics and is mounted on a spring, enabling it to measure just how much force is applied at each moment and at what angle.

Previously, physicians had to rely on X-rays and other images to try to tell whether the catheter was in firm contact with the inside of the heart.

The Food and Drug Administration approved these catheters in February. They are made by Biosense Webster Inc. of Diamond Bar, Calif., a subsidiary of Johnson & Johnson.

A competing force-sensing catheter made by St. Jude Medical Inc. of St. Paul, Minn., awaits approval.

Modern medicine is marked by a nearly relentless pace in technological advances, drawing fire from those who seek to curtail rising costs. And Cooper's specialty, cardiac electrophysiology, is especially tech-driven.

But he and other physicians who use the smart catheters think they are a good bet for treating a-fib, likely to improve success rates while reducing time on the operating table. Biosense Webster declined to give an exact price for the devices, but Cooper said they cost about \$3,000 - perhaps 5 percent to 10 percent more than the non-force-sensing variety.

Medicare reimburses hospitals about \$12,400 for the overall procedure, a rate that will remain the same with the slightly more expensive catheters, Temple officials said.

Evidence so far suggests the devices will improve success rates, said Francis E. Marchlinski, director of electrophysiology for Penn Medicine, the University of Pennsylvania's health system.

Marchlinski was senior author of a study of the devices published last month in the *Journal of the American College of Cardiology* and funded by Biosense Webster. He and his co-authors found 72.5 percent of patients who received ablation with the devices were free from symptoms 12 months later - a few percentage points higher than is typically quoted for procedures with regular catheters.

What's more, physicians who consistently kept the catheters within the desired force range were four times more likely to be successful, the authors found.

David Frankel, a Penn colleague of Marchlinski's who was not involved in the study, said he had tried the catheters made by both companies and gave both a thumbs-up. He predicted success rates would reach 80 percent with practice.

"It's a legitimate, legitimate improvement," said Frankel, an assistant professor at Penn's Perelman School of Medicine.

Among other recent advances is the use of "jet" ventilation, delivering rapid little bursts of air to the patient instead of longer, deeper breaths so the ribcage remains relatively stable - a big help when one is trying to make contact inside a beating heart.

Cooper's performance of the procedure on McKemey this month illustrated the evolution of the technology. He first operated on McKemey more than a year before with a traditional catheter, attempting to wall off the region that was triggering her erratic rhythms, and had partial success.

But a year later, some of the rogue electrical signals were still getting through, so McKemey, a retired eighth-grade history teacher from Wyndmoor, returned for a re-do with the smart catheter.

Cooper's Goldilocks target was to keep the amount of force between 10 and 40 grams (although technically, grams are a unit of mass).

As he deftly maneuvered the device inside the patient's atrium, numbers fluctuated in the 20s and low 30s on a computer screen, well within the desired range.

After about three hours, the ablation was over and McKemey, 65, was home the next day. She felt weak and nauseated at first, but is improving and optimistic.

"I think things are on the upswing now," she said.

Months of observation will be needed to make sure. But for now, Cooper is confident the second ablation was a smart move.

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