

New study recommends change in treating pulmonary embolisms

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William Kuo, MD, was the on-call interventional radiologist one Friday night three years ago when he received a call from the intensive care unit at Stanford Hospital & Clinics. He was asked to attend to a 62-year-old woman who had collapsed at home and was rushed to the emergency room with massive blood clots in her lungs.

"I get very emotional when I think about what happened," said Kuo, assistant professor of radiology at the Stanford University School of Medicine. "I could immediately see the patient was not doing well. She was dying, and the ICU team had notified the family that she was going to die very soon."

What happened that night would set Kuo on a three-year mission to design and implement studies to reveal the safety and effectiveness of a new treatment called catheter-directed therapy or catheter-directed thrombolysis for massive blood clots in the lungs.

The results of the Stanford study, a meta-analysis of scientific data from around the world, showed that when this therapy was used to treat dangerous blood clots, it saves lives. In fact, the data indicated that the catheter procedure was life-saving in 86.5 percent of the cases studied, prompting Kuo and his co-authors to call for making the procedure the first-line treatment for pulmonary embolism. The study will be published Oct. 30 in the *Journal of Vascular and Interventional Radiology*.

"I remember that night so vividly," Kuo said of the events that led to his

research. "The patient was by far the sickest I had ever seen on my angiography table. She couldn't breathe on her own. She was barely alive. There was no time to waste."

As in most cases of pulmonary embolism, blood clots had first formed in the patient's legs, then traveled to her lungs, interfering with oxygenation and the heart's ability to pump blood into the lungs. Because of the massive blood clots, she was quickly suffocating to death. The ICU staff had already done everything they could to save her.

She had been given an intravenous infusion of potent clot-busting medicine, a treatment called systemic thrombolysis, but that had already failed.

Kuo was initially consulted to perform a minor procedure — placement of a special filter in the major abdominal blood vessel to prevent more clots from traveling from the legs to the lungs, but he knew it would do little to save her. And then an idea came to him.

"I had been reading about experimental catheter-based treatments to remove these clots from the lungs," Kuo said. "I told the staff, 'We can do more than just insert a filter. We can go after these clots using specially-designed catheters.' The ICU staff was at first skeptical, but I just kept insisting because I knew it might save her life. We quickly obtained consent from the family and went ahead with it."

As a vascular and interventional radiologist, Kuo is experienced in guiding and maneuvering catheters and wires through blood vessels using real-time radiologic imaging. He uses these techniques to reach diseased areas and to treat a variety of conditions without open surgery. Kuo knew how to perform this type of targeted, less-invasive treatment.

He quickly made a small incision in the patient's neck, inserted a

catheter — a thin plastic tube — into the blood vessel. He then used real-time X-ray images (fluoroscopy) to guide the catheter, navigating through the heart and finally reaching the blood clots within the lungs. First, he injected clot-busting medicine through the catheter directly into the clots. Then, he used the catheter to mechanically break up the clots. Finally, he suctioned them out.

"It was quite a rush of adrenaline," he said.

The results were immediate. The patient's oxygenation improved, her blood pressure started to rise and she no longer required the potent blood-pressure drugs to keep her alive. The angiogram showed that blood was now able to flow into her lungs and the massive blood clots were much smaller.

"We just stood there," Kuo said, "and we were amazed that the treatment had saved her life. She walked out of the hospital nine days later."

But that was just the beginning for Kuo.

"That one case changed my views on the existing treatment algorithm for this deadly disease, and I suddenly realized the limited options available for life-threatening pulmonary embolism. At that moment three years ago, I recognized that this was a potentially life-saving procedure; but I also realized that few physicians were aware of it. The experience from that case really inspired me to begin my clinical research."

The labor-intensive study involved collaboration with other expert interventional colleagues, a pulmonologist adept at meta-analysis, statisticians, medical librarians and interpreters to initiate a global search of scientific literature. The researchers sifted through 18 years of data collecting information on cases involving the use of catheter-directed therapy for treating massive pulmonary embolism.

"I wanted to know if other interventional physicians had recorded this experience," Kuo said. "Were they getting the same results we were seeing at Stanford?"

Kuo's research team discovered 594 patients in 18 countries who had undergone this therapy between 1990 and 2008. After statistically analyzing the data, they found that not only was the treatment effective, but it also appeared much safer than injecting the high-dose thrombolytic drug systemically or directly into the bloodstream where it can circulate throughout the body and cause dangerous bleeding in up to 20 percent of patients. By targeting [blood clots](#) directly, the catheter-based procedure was associated with only a 2.4 percent chance of major complications, and the procedure was life-saving in 86.5 percent of the 594 patients dying from PE.

The catheter-based technique involves targeted drug delivery, which typically uses a much lower dose of the potent thrombolytic drug because it is injected directly into diseased areas. Thus, it can be useful in patients who cannot tolerate the high-dose systemic drug treatment, which carries a significant risk of bleeding.

The researchers concluded that "modern catheter-directed therapy is a relatively safe and effective treatment for acute massive pulmonary embolism and should be considered as a first-line treatment."

Among the 530,000 to 600,000 cases of massive pulmonary embolism diagnosed each year in the United States, an estimated 300,000 patients die. If initiated early, catheter-directed therapy could save many of those lives. According to Kuo, "It's a matter of life and death. Catheter-directed therapy for acute [pulmonary embolism](#) saves lives, and we need to raise awareness not only among the general public but also within the medical community. This treatment saves lives."

Source: Stanford University Medical Center ([news](#) : [web](#))

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