

Using Sound Waves To Destroy Liver Tumors

University of Michigan



Histotripsy, a term coined by University of Michigan (U-M) researchers, is a technique that uses sound waves to break down diseased tissue. Designed as a noninvasive alternative to surgical procedures, the novel technology uses focused ultrasound to mechanically disrupt target tissue (cancerous tumors), as opposed to thermal ablation.

The high-amplitude, pulsed sound waves induce “bubble clouds” that mechanically destroy and liquefy targeted liver tumors. Histotripsy avoids the ionizing energy of radiation, heat damage from thermal modalities, and incisions or needles from traditional treatments.

The technology may provide significant advantages to patients, including the ability of the treatment site to recover and resorb quickly. After being diagnosed with ocular melanoma within a week of a family vacation in 2020, Danet Peterson’s cancer metastasized with three spots on her liver. After laparoscopic surgery, which left her in immense pain and involved a longer hospital stay than expected, Danet found out that a spot had been missed. She learned about histotripsy and wanted to explore an option that would provide the least amount of damage to her liver.

Knowing that the physicians were watching in real time due to histotripsy being an image-based procedure was incredibly reassuring to Danet. Upon waking up from her histotripsy procedure, Danet's physician quickly came to let her know that they had successfully destroyed the spot on her liver. Within a couple hours she was sent home. The next day, Danet was at the beach with her family, which was a night and day experience from her previous surgery. She knows that if needed, she can do another histotripsy procedure and have the quality of life she's been pursuing the last few years since her diagnosis.

"I really appreciate that I have the opportunity to experience those kind of normal everyday moments because there were times that I wasn't sure I would get them," Danet said. "Because I've navigated my diagnosis on my terms I have today and I have tomorrow and I really believe those tomorrows will add up."

Histotripsy was invented by researchers in U-M's Biomedical Engineering department, a joint program between the College of Engineering and Michigan Medicine. Innovation Partnerships—the university's nexus of research commercialization—worked with the team and shepherded them through the commercialization process providing mentorship, resources, and collaborating with other programs (including the Coulter Program) to mature the technology. In 2010 HistoSonics, a U-M startup company, was launched to commercialize the technology.

"We are grateful for the support we received from the University of Michigan on our journey to invent histotripsy and develop it into a platform that can be leveraged broadly to treat patients," said Zhen Xu, a professor of biomedical engineering at U-M. "We would not have accomplished all that we have and come as far as we have without Innovation Partnerships—they have been with us every step of the way and helped us go from an inventor mindset to commercialization."

HistoSonics has developed the Edison® System, which is a platform technology to utilize histotripsy. The Edison System received FDA clearance in October 2023 for the non-invasive destruction of liver tumors, including unresectable liver tumors, using a non-thermal, mechanical process of focused ultrasound and is the first and only histotripsy platform available in the United States. Today, their Edison® System is being used to treat patients at more than 30 hospitals and clinics.

HistoSonics is overseeing multiple clinical trials that are investigating histotripsy for other tumors including renal and pancreatic adenocarcinoma.

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