inkbit

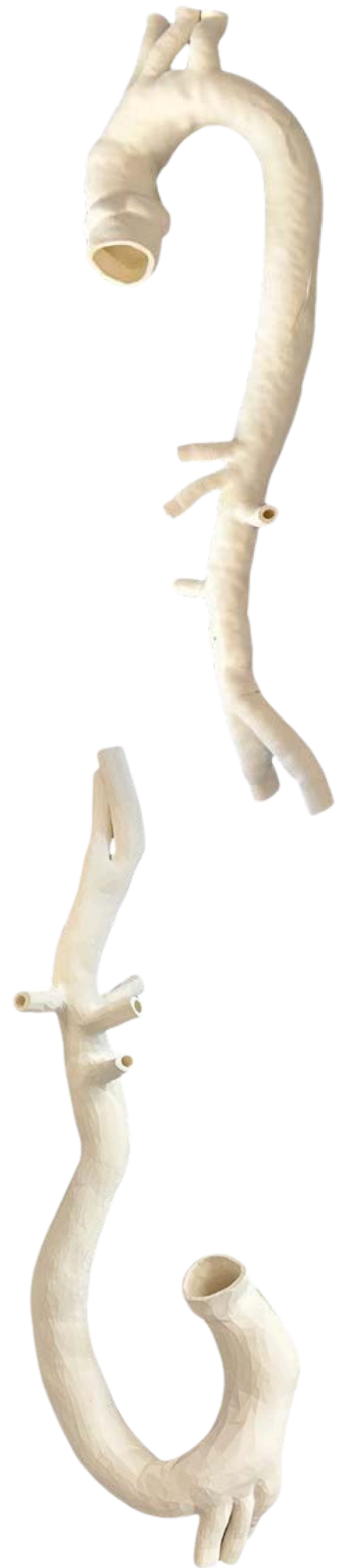
Medical Case Study

High-Fidelity Vascular Models for MIT's Intravascular Ultrasound Research

Researchers at MIT, working on advanced intravascular ultrasound (IVUS) techniques, needed a fast and reliable way to produce patient-specific vascular phantoms that could support realistic imaging and simulation.

Traditional prototyping methods were limited by material flexibility, geometric scalability, and long lead times. By partnering with Inkbit, the team was able to rapidly create anatomically accurate, ultrasound-compatible models.

This collaboration accelerated their benchtop testing and laid the foundation for future innovations in medical imaging and simulation.



inkbit

The Challenge

Patient-Specific Vascular Phantoms for IVUS Research

A research group at MIT focused on medical imaging and device innovation needed to produce patient-specific vascular phantoms to support their studies using intravascular ultrasound (IVUS), a well-established imaging technique that provides cross-sectional views of blood vessels from within. These phantoms had to closely replicate the geometry, mechanical behavior, and acoustic properties of human vascular tissue.

Traditional 3D printing methods fell short, often producing parts that were either too rigid, too small, or incompatible with ultrasound imaging. The team required a more advanced fabrication approach to support their benchtop studies and to build toward future in vivo research.

The Solution

TEPU™ 30A & VCJ for Biomimetic Vascular Phantoms

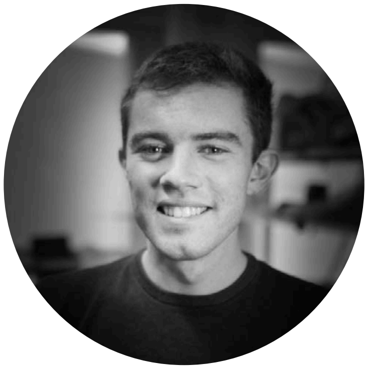
To meet the demands of this research, the MIT team partnered with Inkbit and utilized its Vision-Controlled Jetting (VCJ) technology along with the proprietary TEPU™ 30A soft elastic material. This combination allowed the researchers to produce life-sized, anatomically accurate vascular phantoms based on patient imaging data. These models worked exceptionally well for intravascular ultrasound (IVUS) imaging and for simulating realistic blood flow conditions in the lab.

Inkbit's printing process made it possible to manufacture complex vascular geometries with speed and precision. This streamlined the workflow significantly by enabling rapid design iterations and timely fabrication of new phantom models. By integrating patient-specific data, the team was able to simulate IVUS imaging conditions in a highly realistic and reproducible setting.

The TEPU™ 30A material used in Inkbit's Vista system provided a balance of softness, durability, and acoustic compatibility. These properties made it especially effective for use with ultrasound, supporting clear imaging results and allowing the phantoms to endure repeated flow simulations. The material's mechanical response closely mimicked that of native vascular tissue, which was essential to the success of the benchtop experiments.

"Inkbit's material properties were a perfect match in every way, including mechanical performance, acoustic compatibility, and geometric accuracy. It has been instrumental in advancing our IVUS experiments."

Tom Dillion



PhD Student
Mechanical Engineering
Massachusetts Institute of Technology

inkbit

Key takeaways

MIT Researchers Accelerate Ultrasound-Based Innovation

By collaborating with Inkbit, MIT was able to:

- Create patient-specific, life-size vascular phantoms optimized for IVUS
- Reduce turnaround time for new models from weeks to days
- Achieve superior mechanical and acoustic properties over other printing methods
- Opening doors for further research in medical imaging, device development, and simulation

The collaboration between Inkbit and MIT demonstrates how advanced 3D printing technology can accelerate biomedical research by enabling the rapid development of complex, anatomically accurate models.

By delivering high-fidelity, functional prototypes suitable for imaging and simulation, Inkbit's platform helps bridge the gap between laboratory research and future clinical applications.