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Device to tie tiny blood vessels

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As five Northeastern University mechanical engineering students geared up to select their senior capstone last summer, they desired a challenging project with a profound real-world application. A month later, as they observed a live reconstructive procedure at Brigham and Women's Hospital (BWH) lasting many hours, they realized the immense global impact their work ahead could have to advance medical care.

The students worked with Dr. Lifei Guo, an inventor and reconstructive microsurgeon at BWH, on designing an "anastomotic coupler" to bind tiny blood vessels only millimeters in diameter. Guo said the current surgical process is "very tedious, technically demanding, and error prone" because doctors must carefully hand-sew sutures thinner than hair follicles, and each vessel could take more than an hour to reconnect.

"If you're looking at this project on paper, you say, 'I have to connect this tube with that tube.' Then you see this (surgery) and think, 'Wow, this is someone's life,'" said Nick Cote, one of the student researchers.

To surmount the steep medical learning curve, the students — Cote, Ryan Myers, Matthew Ouellette, Jessica Patel and David Schecter — immersed themselves in preparatory research. They discovered that many injured soldiers lose their limbs because the surgery is lengthy and military field medics don't have the same expertise and access to state-of-the-art facilities that specialized surgeons do.

"It was motivating to know we could make the surgery a lot quicker," Patel said.

The project also aligns strongly with Northeastern's commitment to use-inspired research that addresses global problems, particularly in health.

After Guo initially came up with the new concept to improve vessel anastomosis, Northeastern's Office of Technology Innovation and Commercialization and BWH's Office of Research Ventures & Licensing discussed ways in which the institutions might collaborate on prototype development, with the ultimate goal of improving patient care.

That partnership facilitated the collaboration between Guo and mechanical and industrial engineering professor Jeffrey Ruberti, who served as the students' advisor. Both Ruberti and Guo offered the students invaluable guidance along the way, and Guo called Northeastern and its capstone program a natural fit for his idea to be further explored.

In the students' theoretical chosen design, the procedure could be performed in minutes rather than hours, and Guo said this work opened new frontiers not only for his future research but potentially for a paradigm change in reconstructive microsurgery.

"I think the students did a fantastic job," Guo said.

"This group was phenomenal," added Ruberti. "They were very motivated, practical, and analytical."

Provided by Northeastern University

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