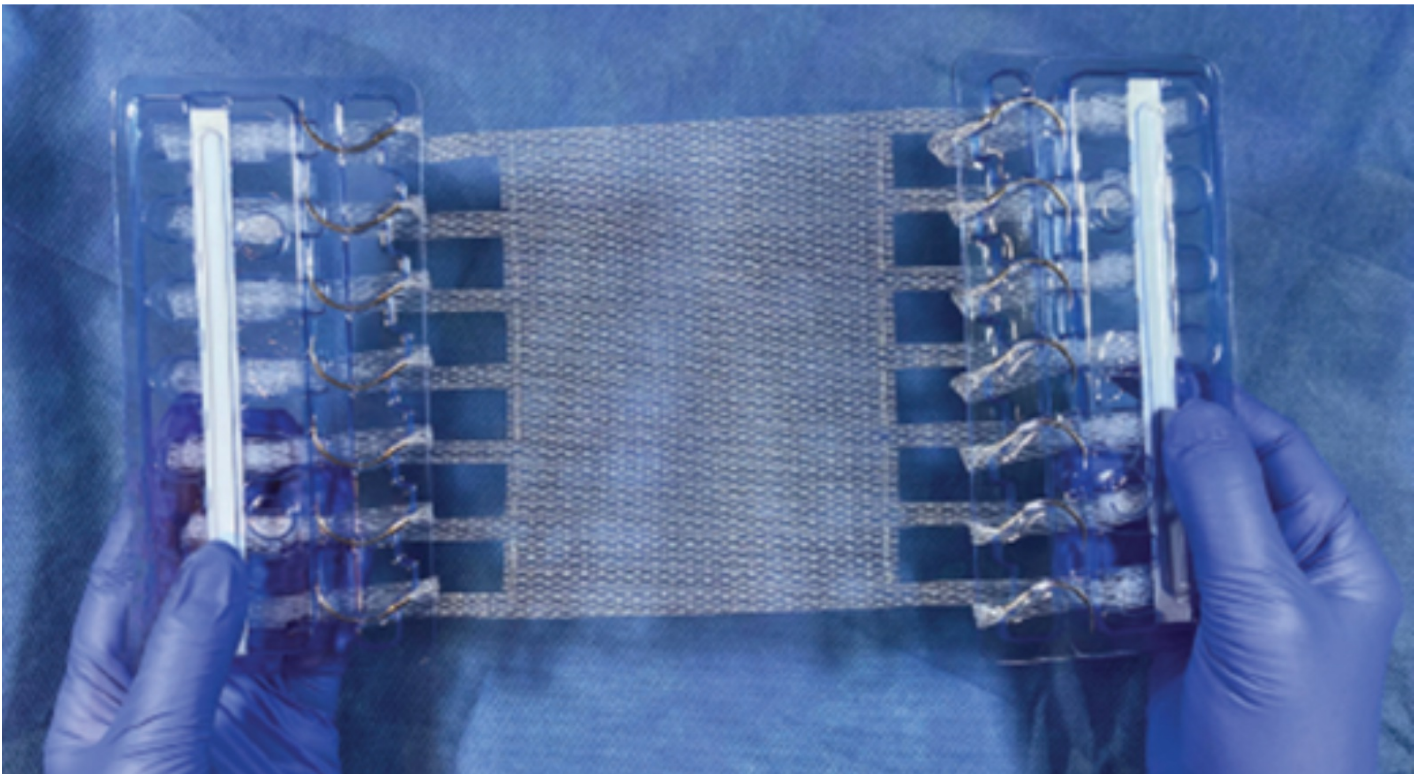


## Woven For Strength: A Breakthrough In Hernia Repair From North Carolina State University And Duke University

Duke University

North Carolina State University



More than 1.5 million surgeries are performed across the globe each year to repair the weakened muscle and connective tissue associated with hernias. Hernia patients often face the difficult reality that at any moment after surgery internal sutures could tear free from the repaired tissue, causing significant pain and potential long-term health complications. Together, North Carolina State University (NC State) and Duke University developed the T-Line Hernia Mesh, a novel ravel-resistant, warp-knitted mesh used to combat problems in tissue repair surgery.

NC State professor of textile engineering Dr. Jon Rust and former Duke University associate professor of surgery Dr. Howard Levinson recognized an opportunity to dramatically improve the comfort and safety of hernia patients and began working together in 2015 to create a novel mesh that would withstand the strain placed on repaired tissue after surgery.

Developing the mesh required several design changes. One key improvement included reshaping the point where the

mesh extensions connect to the body. The team replaced a sharp “V” shape with a flatter connection, making the mesh stronger and easier for surgeons to use..

To test their design, the doctors created a prototype and wove the mesh extensions through connective tissue in a pig specimen, then applied increasing tension to simulate the stresses of surgery. The results were striking: even when the tissue tore, the mesh itself remained intact. The technology transfer offices at both NC State and Duke helped to accelerate this innovation into the hands of surgeons who treat hernia patients. Both offices worked to facilitate connections with medical device companies to help Rust fully understand the market need and modify the technology accordingly. The doctors continued developing the technology and Levinson went on to found the company Deep Blue Medical Advances (Deep Blue) to bring the device to market. He remains the Chief Medical Officer at the company to this day.

The technology was licensed to Deep Blue in 2017 and integrated into a product, the T-Line Hernia Mesh. To continue development, Deep Blue secured more than \$4M in translational funds through Duke, the North Carolina Biotechnology Center, and the National Institutes of Health.

The company also received support from NC State’s Wolfpack Investor Network (WIN) and Duke Capital Partners (DCP), member-based investment groups of accredited NC State and Duke alumni investors, that invested in Deep Blue to accelerate its path to market. Both groups of investors have supported Deep Blue in multiple fundraising rounds and a DCP member sits on the company’s Board of Directors.

The T-Line Hernia Mesh product received regulatory approval from the FDA in 2020 and is now actively being used in clinical sites in the United States. With the success of this product, Deep Blue now plans to extend the technology to other clinical areas such as breast reconstruction.

While the commercial impact of his innovation can continue to grow, Rust is proud to have contributed so positively to the well-being of hernia patients that can now benefit from a more permanent solution to an agonizing problem.

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