

Complexity Science Applied to Hernias and Hernia Mesh

All implantable material has the potential to interact in unpredictable ways in the human body. Also, the same material can interact in a variety of ways in different patient subpopulations. For example, the same hernia mesh placed with the same technique might result in very different outcomes for two different patients. Over the past ten years, our materials lab has analyzed hundreds of hernia mesh explanted from patients who have had complications including chronic pain after hernia repair, recurrence and infection. The analysis includes surface chemistry, thermal analysis, scanning electron microscopy and mechanical testing including a test for compliance. Explanted meshes were tested by comparing them to the pristine mesh for each product.

In addition to mesh analysis, our hernia team has applied the principles of complexity science by implementing clinical quality improvement research for definable patient processes which can lead to the ability to predict which patients will do better (or worse) with specific types of hernia mesh. A variety of hernia processes and value-based outcomes measures have been defined. Potential complications related to mesh are recorded. Using complex systems data analytics, including predictive modeling, the data will be used for local process improvement and global data analysis. Results from the first two years of this research will be presented.