Q&A

Dr. Bradley MacIntosh

Dr. Bradley MacIntosh is a scientist at Sunnybrook Research Institute in the Brain Sciences Research Program, a neuroimaging scientist at the Heart and Stroke Foundation Centre for Stroke Recovery at Sunnybrook Health Sciences Centre, and an assistant professor in medical biophysics at the University of Toronto. He spoke with Eleni Kanavas about his research.

What's your main research area?
My research is motivated by stroke, and my expertise is in using functional magnetic resonance imaging (fMRI) to look at brain activation patterns. I work with MRI to study both the large and the small blood vessels in the brain.

Why did you choose to study the brain?
I've always been interested in studying the brain and brain diseases, specifically stroke. I decided to pursue a PhD at Sunnybrook Research Institute (SRI) with Dr. Simon Graham [an imaging scientist at SRI], who is taking the technology to a clinical forefront. At the time, it was uncharted territory, and we were successful in developing tools to make fMRI more useful for clinical populations.

How have imaging techniques improved diagnosis for brain diseases?
One excellent example of our ability to visualize stroke is the discovery of diffusion-weighted imaging, an MRI technique that produces images of preferential water movement. In acute stroke, where the cells are swollen and injured, the water is unable to move around as freely compared to a healthy brain tissue. We refer to this as brain regions showing "restricted diffusion." The diffusion-weighted image is bright where the stroke has occurred, and the effect is very dramatic from a 30-second scan. That's an example of an MRI technique that has totally changed clinical practice. It's the definitive way of finding an acute ischemic stroke in the brain.

What do researchers know about brain diseases today compared to 10 years ago?
There has been a decade of discovery on brain reorganization after injury, motivated by the observation that the brain has regenerative potential and there are ways we can maximize brain health through biological processes that build connections and grow brain regions. At the same time, we're still working on the immense number of brain connections and what each brain region does. Recovery after stroke is one area we know a lot more about, and there is a sense of optimism that we can do more. There is a lot of research attention on Alzheimer's disease, which I think has helped to put the brain on people's radar. In Alzheimer's disease, we are still trying to understand the interventions that are going to have a positive effect, whereas in stroke, there are strategies that we know work. For example, constraint-induced therapy is an intensive physical therapy that has been shown to improve motor function after a stroke.

How do your research projects relate to clinical work?
I'm an imaging scientist, but I'm closely tied to clinical endpoints. My work is still in the discovery phase within a clinical population to try and gain insight into what's going on with brain diseases. I'm leading a project on chronic stroke patients that looks at how exercise can be considered a stimulant and neuroprotective agent and catalyst to brain changes.

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What does the future of neuroimaging look like?
The neuroimaging field has advanced rapidly in the last little while, as has the field of genetics. The next 10 years will have all kinds of discoveries that come from forming connections between these domains. We can learn a lot by bringing these fields closer together, which means working with people that have different expertise. If we continue to do this in the stroke world, then I think it will really help us advance recovery from brain injury.

MacIntosh's research is supported by the Canadian Institutes of Health Research, the Heart and Stroke Foundation Centre for Stroke Recovery, and the Natural Sciences and Engineering Research Council of Canada.

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