Aubert and Hynynen first to show MRI-guided FUS alone increases neurogenesis and improves cognitive function in a mouse model of Alzheimer's disease.

Hynynen's lab shows in preclinical models that MRI-guided FUS on its own can dissolve blood clots caused by stroke without damaging the targeted blood vessels.

Aubert and Hynynen first to show that MRI-guided FUS can deliver gene therapy to targets in the brains of mice.

Aubert and Hynynen first to use MRI-guided FUS to deliver gene therapy to the spinal cord in preclinical models.

Sunnybrook researchers launch first North American trial of FUS surgery in people with obsessive-compulsive disorder.

Sunnybrook team completes world's first clinical trial, launched in 2015, using FUS to open the blood-brain barrier of patients with brain cancer noninvasively, showing it is safe and feasible.

Sunnybrook team completes world's first trial, launched in 2018, using FUS to open the blood-brain barrier of patients with amyotrophic lateral sclerosis noninvasively. Show that the technique can open the barrier in the motor cortex safely and reversibly.
Focused ultrasound (FUS) is a noninvasive, breakthrough technology. It uses sound waves to exert a therapeutic effect on tissue. It could change health care forever.

**THERMAL ABLATION: SCALPEL-LESS SURGERY**
High-intensity ultrasound waves are targeted at precise areas of the brain under MRI guidance. More than 1,000 beams converge to produce heat that destroys the unwanted tissue, all without cutting skin.

**THERAPY DELIVERY: STRAIGHT TO THE SOURCE**
Microbubbles are paired with low-intensity FUS under MRI guidance. Together, they cause the blood-brain barrier—which prevents 98% of drugs from getting into the brain—to open safely and reversibly. This lets therapy be delivered to a precise target inside.

**FOCUSED ULTRASOUND RESEARCH**
Sunnybrook Research Institute has the largest and most complete FUS research program in the world. Our scientists’ trailblazing work in biology, device development and clinical trials—from lab to patient—is having global impact.

- **20** Scientists and clinician-scientists in our core team
- **150** highly skilled research staff
- **50,000** square feet, including the world’s only Centre for Research in Image-Guided Therapeutics

**ALZHEIMER’S DISEASE**
In 2018, Sunnybrook completed the world’s first clinical trial using MRI-guided FUS to open the blood-brain barrier of patients with Alzheimer’s disease noninvasively and repeatedly, showing it is safe and feasible.

**BRAIN CANCER**
In 2019, Sunnybrook completed the world’s first clinical trial, launched in 2015, using FUS to open the blood-brain barrier of patients with brain cancer noninvasively, showing it is safe and feasible.

**ESSENTIAL TREMOR**
In 2012, Sunnybrook completed the first Canadian trial using FUS to treat severe essential tremor. It was then the only Canadian site in the pivotal, international trial, leading in 2016 to the technology being approved as a treatment in North America.

**AMYOTROPHIC LATERAL SCLEROSIS**
In 2019, Sunnybrook completed the world’s first clinical trial using MRI-guided FUS to open the blood-brain barrier of patients with amyotrophic lateral sclerosis noninvasively. The study showed that the technique can open the barrier in the motor cortex safely and reversibly in these patients.

**PARKINSON’S DISEASE**
Sunnybrook led the first Canadian trial of high-intensity FUS for Parkinson’s disease in 2015 and is part of the first international trial testing FUS to treat this and other movement disorders.

**PSYCHIATRIC DISORDERS**
Sunnybrook launched the first North American trials of FUS surgery to treat obsessive-compulsive disorder (2017) and major depression (2018).

Sunnybrook is a Centre of Excellence in Focused Ultrasound. Our researchers are internationally recognized experts in medical biophysics, biology and the clinical sciences. They are pioneering the development of FUS and its application to brain disorders, cancer, bone and joint disorders, and women’s health. sunnybrook.ca/research/FUS