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**Thunder Bay Regional
Research Institute**



World-first dual-site centre uses sound waves instead of scalpels to perform surgery

MRI-guided, focused ultrasound surgery centre opens in Toronto and Thunder Bay

November 24, 2010 (Thunder Bay, ON) – Thunder Bay Regional Health Sciences Centre in partnership with Sunnybrook Health Sciences Centre have launched a unique dual-site Centre that stands to revolutionize surgery through non-invasive treatments for complex health concerns including cancers.

“Congratulations to Sunnybrook and to their partners in Thunder Bay on yet another example of leadership in health care innovations. New technologies like this will not only put Ontario on the world stage as an innovator, but also will improve the quality of health services for patients,” says Deb Matthews, Minister of Health and Long-Term Care.

Teams of clinicians and scientists at both sites of the Centre are pioneering new developing new treatments using MRI (magnetic resonance imaging) guided, focused ultrasound. Patients with complex health concerns would benefit greatly from surgery but in many cases traditional operations pose high risks due to the delicate area where the intervention would occur.

With MRI-guided, High Intensity Focused Ultrasound therapy (also referred to as HIFU), many of these risks can be overcome by the simple fact that the procedures are performed without ever making a surgical incision and without the use of needles.

In the Centre’s first clinical trial for this approach, teams have chosen to apply the procedure to uterine fibroids. Uterine fibroids are non-cancerous tumours that most often affect women in their 40s and early 50s. While most fibroids are asymptomatic, they can grow and cause heavy and painful menstruation, bloating, urinary frequency and urgency, constipation and painful sexual intercourse.

Current treatment options involve medical therapy with drugs, surgery, and embolization or shrinking the fibroid by blocking its blood flow. MRI-guided focused ultrasound therapy involves no significant discomfort and very little recovery time. Early results from these trials have shown the treatment to be safe and effective with no serious side effects.

MRI-guided focused ultrasound therapy uses heat generated from high intensity ultrasound waves, focused to the target tissue and guided by MRI.

Dr. Kullervo Hynynen, director of imaging at Sunnybrook Research Institute pioneered the MRI-guided, focused ultrasound technology that is at the

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core of the Centre's work. He is a co-investigator on the fibroid trials in Toronto being led by Dr. Elizabeth David, an interventional radiologist at Sunnybrook. Dr. Laura Curiel leads the research at Thunder Bay Regional Research Institute with clinical leads Dr. Neety Panu, radiologist at Linda Buchan Centre, Thunder Bay Regional Health Sciences Centre, and Dr. Andrew Siren, obstetrician and gynecologist, Thunder Bay Regional Health Sciences Centre.

"These clinical trials are significant both in future treatment availability in Canada, and in informing our imminent work in the new year on non-invasive treatments for cancer patients," says Dr. Hynynen, a Professor in the Department of Medical Biophysics at the University of Toronto.

The researchers will expand their new therapy team with trials with clinicians at Sunnybrook's Odette Cancer Centre and at Thunder Bay Regional Health Sciences Centre, for the treatment of patients with bone metastases, recurrent breast tumours, head and neck tumours, and rectal tumours. Work will also involve using the technology in new research to increase the effectiveness of chemotherapy and to enhance the effects of radiation therapy.

"Partnerships are fundamental to the success of this pivotal HIFU study. It is the first in the combined history of Thunder Bay Regional Health Sciences Centre, Thunder Bay Regional Research Institute, Sunnybrook Health Sciences Centre and the Sunnybrook Research Institute. Our dual HIFU sites are shared, offering better access in both Northern Ontario and Southern Ontario, allowing more patients to receive improved care much closer to home," says Michael Power, CEO of Thunder Bay Regional Research Institute, Vice President Cancer and Diagnostic Services, TBRHSC, and Regional Vice President Cancer Care Ontario in the Northwest.

A number of industry and government partners have come together to make the dual-site Centre with Thunder Bay and Sunnybrook a reality. Funding from FedNor, Natural Sciences and Engineering Research Council of Canada - Discovery Grant for HIFU Guidance, the Ontario Ministry of Research and Innovation – ORF grant and Philips Healthcare have been fundamental to the success of this leading edge procedure. The technology being used is the Philips Healthcare Sonalleve and Ariel MRI-guided HIFU system. The MR-guided, focused ultrasound surgery centre at the Sunnybrook site is part of the Centre for Research in Image-Guided Therapeutics, funded by the Canada Foundation for Innovation.

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Harnessing the Power of Technology To Improve Health Care

What is this centre, and who is involved?

This is the only dual-site focused ultrasound surgery centre in the world. It pairs a Philips 3T magnetic resonance (MR) imaging device with focused ultrasound technology. The two suites, one at Sunnybrook Health Sciences Centre and the other at Thunder Bay Regional Health Sciences Centre, are mirror facilities.

This technology is based on the groundbreaking work of Dr. Kullervo Hynynen, director of imaging at Sunnybrook Research Institute and a Canada Research Chair in Imaging Systems and Image-Guided Therapy. At Thunder Bay Regional Research Institute, Dr. Laura Curiel, once a postdoctoral fellow of Dr. Hynynen's, leads this research. They each are working with teams of researchers, as well as clinicians who are leading the centre's clinical trials.

We are excited about the launch of this Centre, because we can now do clinical trials on MR-guided focused ultrasound surgery, a critical step in the research process. In the first trial, now underway, we are evaluating the Philips MR-guided focused ultrasound system to treat uterine fibroids. These fibroids are noncancerous tumours that affect up to 50% of women of childbearing age. Symptoms can be severe (pain, heavy bleeding), and result in missed family and work time. Many treatments are invasive; a main one, hysterectomy, results in infertility.

What is focused ultrasound surgery?

Focused ultrasound surgery will revolutionize medicine. One of its most potent applications is as a noninvasive way to destroy tumours using MR-guidance and heat. It is referred to as "scalpel-less surgery," because no incision is required to remove the tumour. There is also no radiation.

It works by pairing MR with high-intensity focused ultrasound to a target within the body, such as a tumour. The ultrasound energy is applied precisely to that spot, where it heats the tumour and causes cell death, destroying the tumour tissue. During the treatment, MR functions as a "map" for the doctor. It is used first to identify the target, to plan the treatment. It is then used to guide the focused ultrasound as it is applied. Finally, it is used to determine right away if the treatment worked.

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What are the benefits for patients?

The uterine fibroid treatment is an outpatient procedure that requires no general anesthetic. Patients go home the same day, and are able to return to their family and work routine quickly. These benefits translate into economic and health systems benefits for all residents of Ontario. With dual-sites in Toronto and Thunder Bay, patients across the province benefit from improved access to this procedure.

What's next?

We're excited at the vision for this dual-site facility, which at Sunnybrook is part of our \$160-million Centre for Research in Image-Guided Therapeutics. Over the next year, teams of clinicians and researchers will do trials in breast, bone, head and neck, and rectal cancer. While this work is still at the research stage, the pathway to the bedside is getting shorter.

Both sites will continue to strengthen their partnership, which is a model for regional collaboration in health research and care, ensuring that patients from the north to the south of the province who are eligible to participate in the clinical trials can do so - removing the barrier of distance in a shared a vision of future health care.

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The Technology

The technology uses heat to destroy tumours. Using high intensity focused ultrasound, instead of low intensity ultrasound used in imaging, these ultrasound waves are focused and monitored by MR Imaging to produce focused energy or heat. The Philips Healthcare Sonalleve and Ariel MR-HIFU systems that are being used in the uterine fibroid clinical trials feature a unique volume-based thermal mapping process to produce a more focused and powerful beam that shows promise in facilitating faster ablation of tumour volume and potential shorter treatment times.

About Thunder Bay Regional Research Institute (TBRI)

TBRI is an independent, not-for-profit research corporation partnered closely with Thunder Bay Regional Health Sciences Centre. Scientists and clinicians work together with academic and industry partners to bring advanced diagnostic technology to our patients. World-class research is conducted under three platforms: Advanced Detection Devices, Imaging Guided Interventions and Probe Development and Biomarker Exploration. TBRI strives to improve the quality of patient-centred healthcare by advancing new standards of excellence in the clinical investigation of novel molecular imaging-based diagnostic technologies. For further information, please visit our website at www.tbri.com

About Sunnybrook Health Sciences Centre

Sunnybrook Health Sciences Centre is inventing the future of health care for the one million patients the hospital cares for each year through the dedication of its more than 10,000 staff and volunteers. An internationally recognized leader in research and education and a full affiliation with the University of Toronto distinguishes Sunnybrook as one of Canada's premier academic health sciences centres. Sunnybrook specializes in caring for Canada's war veterans, high-risk pregnancies, critically-ill newborns, adults and the elderly, and treating and preventing cancer, cardiovascular disease, neurological and psychiatric disorders, orthopaedic and arthritic conditions and traumatic injuries. For more information about how Sunnybrook is inventing the future of health care please visit us online at www.sunnybrook.ca

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The Scientists

Dr. Kullervo Hynynen, Centre Lead, and Director of Imaging, Sunnybrook Research Institute

Dr. Kullervo Hynynen is the Director, Imaging Research Discipline at Sunnybrook Research Institute and a Professor in the Department of Medical Biophysics at the University of Toronto. He completed his Ph.D. and postdoctoral training at the University of Aberdeen, and served as an assistant/associate professor at the University of Arizona Health Sciences Centre before moving to Harvard in 1993. He is also the Canada Research Chair in Imaging Systems and Image-Guided Therapy (Tier 1). His research has focused on investigating the effects of ultrasound beams on tissue and their utilization in therapy. He is investigating the use of focused ultrasound for noninvasive surgery, vascular surgery, targeted drug delivery and gene therapy. Dr. Hynynen pioneered MRI-guided focused ultrasound technology, harnessing ultrasound and MR technology into an image-guided tool. He is the first in the world to have shown pre-clinically that focused ultrasound could pass through intact bone. He is also the first to have shown in the lab that MR imaging can effectively monitor tissue death during ultrasound thermal activity.

Dr. Laura Curiel Scientist, Thunder Bay Regional Research Institute (TBRI)

Dr. Laura Curiel leads High Intensity Focused Ultrasound (HIFU) research at TBRI. Dr. Curiel's research is focused on developing further site applications for HIFU to achieve the safest and most effective treatment results for patients. She is also an Adjunct Professor, Electrical and Computer Engineering at Lakehead University. Dr. Curiel holds a Bachelor of Engineering in Electronic Systems from the Instituto Tecnológico y de Estudios Superiores de Monterrey in Mexico and a Master of Science in Biomedical Engineering from Université de Lyon I Claude Bernard in France. She earned her Ph.D. in Imaging and Systems from Institut National de Sciences Appliquées in France.

Dr. Samuel Pichardo, Junior Scientist, Thunder Bay Regional Research Institute

Dr. Samuel Pichardo's research activity is centered on the use of ultrasound to propose minimally invasive therapeutic applications based in focused ultrasound. Dr. Pichardo's work aims to seek out better modeling tools that help scientists and clinicians have an accurate prediction and control of therapy. Some of Dr. Pichardo's previous works include the study of using focused ultrasound to treatments. He is an Adjunct Professor in the Department of Electrical Engineering at Lakehead University. Dr. Pichardo is holds a Bachelor of Engineering in Electronic Systems from the Instituto Tecnológico y de Estudios Superiores de Monterrey in Mexico. He earned both his Master Science in Imaging and Ph.D. in Imaging and Systems from the Institut National de Sciences Appliquées in France.

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The Scientist-Clinicians

Dr. Elizabeth David, Principal Investigator, Uterine Fibroid trial Interventional Radiologist, Sunnybrook Health Sciences Centre

Dr. David is a Radiologist within the Interventional division within Radiology at Sunnybrook Health Sciences Centre. She completed her MD at the University of Toronto, her residency in Radiology in Toronto and her Interventional Radiology fellowship at St. Michael's Hospital. Her focus is in minimally -invasive techniques related to women's health with a special interest in the treatment and management of uterine fibroids.

Dr. Neety Panu Lead Radiologist for the Linda Buchan Centre, Thunder Bay Regional Health Sciences Centre Clinician Scientist, Thunder Bay Regional Research Institute Principal Investigator, Uterine Fibroid trial

Dr. Neety Panu completed her undergraduate studies at Lakehead University, medical school at the University of Toronto and residency at the University of Saskatchewan. She has worked at the Thunder Bay Regional Health Sciences Center since 2007. Last year, she completed a Breast/Body/Oncological Imaging Fellowship at Memorial Sloan-Kettering Cancer Center in New York City. She is currently the Medical Imaging Lead for the Linda Buchan Center and is also the Cancer Care Ontario Imaging Lead for the Northwest region. She is a Clinician-Scientist with the Thunder Bay Regional Research Institute and is a Principal Investigator with the HIFU clinical trials. She is a Lecturer at the Northern Ontario School of Medicine.

Dr. Andrew Siren Obstetrician/Gynaecologist, Thunder Bay Regional Health Sciences Centre Clinician-Scientist, Thunder Bay Regional Research Institute Principal Investigator, Uterine Fibroid trial

Born in Thunder Bay, Andrew returned after completing his medical training in obstetrics and gynaecology in Ottawa. He has worked at the Thunder Bay Regional Health Sciences Centre since September 2002. He is now a Principal Investigator with the HIFU clinical trials.