neuroArm: Robotic Arms Lend a Healing Touch

NASA

"*Where the robot entered my head,*" *says 21-year old Paige Nickason, the first patient to have brain surgery performed by a robot as she points to an area on her forehead. "Now that neuroArm has removed the tumor from my brain, it will go on to help many other people like me around the world.*" *(Jason Stang)*

The delicate touch that successfully removed an egg-shaped tumor from Paige Nickason's brain got a helping hand from a world-renowned arm -- a robotic arm, that is. The technology that went into developing neuroArm, the world's first robot capable of performing surgery inside magnetic resonance machines, was born from the Canadarm (developed by MDA for the US Space Shuttle Program), as well as Canadarm2 and Dextre, the Canadian Space Agency's family of space robots performing the heavy-lifting and maintenance on board the International Space Station.

neuroArm began with the search for a solution to a surgical dilemma: how to make difficult surgeries easier or impossible surgeries possible. MDA worked with a team led by Dr. Garnette Sutherland at the University of Calgary to develop a highly precise robotic arm that works in conjunction with the advanced imaging capabilities of MRI systems. Surgeons needed to be able to perform surgeries while a patient was inside a magnetic resonance (MRI) machine, which meant designing a robot that was as dexterous as the human hand but even more precise and tremor-free. Operating inside the MRI also means it had to be entirely made from non-magnetic materials (for instance, no steel) so that it would not be affected by the MRI's magnetic field or adversely affect the MRI's images. The project team developed novel ways to control the robot's movements and give the robot's operator a sense of touch -- both essential so that the surgeon can precisely control

the robot and can feel what is happening during the surgery.

Since Paige Nickason's surgery in 2008, neuroArm has been used to successfully treat dozens more patients. The neuroArm technology has since been purchased by IMRIS Inc. a private publicly traded medical device manufacturer based in Winnipeg, Manitoba. MDA and IMRIS are advancing the design to commercialize a two-armed version of the system to allow surgeons to see detailed three-dimensional images of the brain, as well as surgical tools and hand controllers that allow the surgeon to feel tissue and apply pressure when they operate. A clinical trial led by Dr. Sutherland is currently underway at Calgary's Foothills hospital using the first generation of the robot on a group of 120 patients. IMRIS anticipates being in a position to seek regulatory approval for the robot as early as 2012.

MDA is also continuing to apply its space technologies and know-how to medical solutions for life on Earth. The company has partnered with the Hospital for Sick Children (SickKids) in Toronto, Ontario, Canada, to collaborate on the design and development of an advanced technology solution for pediatric surgery. Dubbed KidsArm, the sophisticated tele-operated surgical system is being specifically designed for operating on small children and babies. KidsArm is intended to be used by surgeons, in conjunction with a high precision real-time imaging technology, to reconnect delicate vessels such as veins, arteries, or intestines.

In collaboration with The Centre for Surgical Invention and Innovation in Hamilton, Ontario, Canada, MDA is also developing an advanced platform for use in early detection and treatment of breast cancer. The image-guided autonomous robot will provide increased access, precision and dexterity resulting in more accurate and less invasive procedures.

For more information visit www.nasa.gov [1].

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