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Technology

Robots learn surgical moves

For operations, a steady arm can be better than the human touch

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Would you trust a robot with a scalpel? Last month, history was made at a Calgary hospital when a robot successfully removed a brain tumour from a 21-year old woman. The robot was working under the command of neurosurgeon Garnette Sutherland, who faced the daunting task of removing an egg-shaped growth from chef Paige Nickason's brain.

So why didn't the surgeon just pick up the scalpel and do it himself?

It turns out that the hand of even the best-trained surgeon wavers 1 to 2 millimetres on either side of the desired position. The robot, called NeuroArm, can move in increments of only 50 micrometres (50 millionths of a metre) from the desired position, which, it turns out, drastically decreased the damage to Nickason's healthy tissue.

NeuroArm works through magnetic resonance imaging (MRI), a technique that allows doctors to differentiate tumours from healthy -tissue by their densities. This particular model was designed and built in collaboration with MacDonald, Dett-wiler and Associates Ltd., the company that created the giant robotic Canadarm used on the International Space Station – and that almost got sold to a U.S. defence contractor this spring.

There are other such robot surgeons, like Cyberknife, sold by Accu-ray, based in Sunnyvale, California. It can direct X-rays at a nasty tumour to an accuracy of 0.5 mm. The Cyberknife system also has an application that allows surgeons to zap lesions on things that are moving, like lungs and hearts.

The workhorse of the robotic sur-gery industry, though, is the da Vinci Surgical System. In 2007 it carried out 48,000 surgeries across North America. Intuitive Surgical, which owns da Vinci, has spent over 10 years developing robots designed for minimally invasive surgery (MIS). Human surgeons need to put their large, cumbersome hands inside their patients during operations, where-as the da Vinci System's robots can slip their tools through tiny incisions barely visible after an operation.

Another benefit is that these robots can be manipulated by a surgeon who's not even in the room. The first successful remote surgery was a gall bladder operation conducted in 2001 by a surgeon in New York operating on a patient in Strasbourg, France, over 6,000 kilometres away.

Mehran Anvari, working out of St. Joseph's Hospital in Hamilton, is one of the world leaders of this kind of remote surgery, regularly performing operations on patients in an operating theatre in North Bay. At the Advanced Surgical Technology Centre at Mt. Sinai here in Toronto, the surgeon's voice commands can control everything from the lighting to the position of robotic equipment in a remote operating room thousands of kilometres away.

Such surgeries don't have to be life-saving. Remote Restorations, in Mount Valle, California, is dedicated to robotic surgery for hair transplants. One-millimetre-wide hollow needles dance over a patient's skull implanting hair follicles at high speed. There is less scarring using this technique than in regular procedures, because the robot compensates rapidly if the patient moves during surgery.

As Internet speeds increase and imaging techniques improve, robotic surgeries will become more common. This means highly skilled surgeons can share their skills with people in remote locations or countries who couldn't otherwise access them.

The future of the field is wide open.

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