ROBOTICS

The Next Step in Robotic Neurosurgery

Millions of dollars of EU research money have yielded a robot that will one day be able to perform procedures that have never been done before.

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The idea of using a robot for neurosurgery seems like a (pardon the pun) no-brainer. At European Robotics Week, currently being held in Brussels, the EU-funded Robocast demonstrated that it's closer than ever to making robotic neurosurgery a reality.

No matter how steady a surgeon's hands are, they're still about 10 times shakier than Robocast's machine, which was designed by a group of scientists from Israel, the U.K., Germany and Italy. That makes it perfect for delicate "keyhole surgery," or surgery done through a tiny hole drilled through a patient's skull called a "burr hole."

Needles and catheters inserted through the skull can then be moved by a probe operated by a surgeon, who can feel the resistance of the brain thanks to an advanced haptic device which gives tactile feedback to the operator of the machine. In the future, the probe will be used to perform surgical procedures not possible today, such as allowing surgeons to take a curved path from an entry point in the skull to a targeted lesion.

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Ultimately, according to Robocast, the goal is to make "treatment quicker, less invasive, and more effective," especially when it comes to treating tumors, hydrocephalus, Parkinson's disease, Tourette syndrome and many other neurological diseases.

Of course, surgical robots are nothing new. They've been popular for treating prostate cancer for years now (although not everyone agrees on their effectiveness). What's so special about Robocast is the machine's level of autonomy.

Basically, the robot factors in the surgeon's inputs along with other factors such as diagnostic information from the patient as well as data gathered from optical, electromagnetic and ultrasound sensors in the robot. The machine then proposes the most efficient, risk-free path for the procedure, which is then accepted or rejected by the surgeon.

Robocast also has a higher standard for accuracy than most surgical robots, which, considering the margin for error in brain surgery, makes sense. That would explain why, according to a European Commission press release, it's capable of performing 13 different types of movement at the operating table, nine more than humans can do.

Right now, procedures have only been performed on dummies in a hospital operating room in Verona, Italy and it's perfectly understandable why it might be a while longer before we see this technology used on human beings.

The real problem, however, isn't the safety or efficacy of robots like the one developed by Robocast; it's the cost. Most surgical robots cost anywhere between $1-$2 million and require 150-200 procedures to master, according to the New England Journal of Medicine. That doesn't even count other expenses such as maintenance and replacing single-use

appliances.

For relatively simple procedures, many wonder if surgical robots are worth the cost, especially when you factor in the worry that robotically assisted surgery isn't any more safe in the long-term than normal laparoscopic surgery. While some of that is offset by the savings associated with shorter hospital stays, hospitals still need to know that they're going to use a robot enough to justify its cost.

So, will Robocast's robot be worth it in the eyes of hospital administrators? It's hard to say, but it certainly seems to take a big step in the field of surgical robotics with its haptic feedback and (eventual) curving probe. When you start talking about a robot performing procedures that no human has ever done before, as opposed to simply assisting a human with a procedure, then the game arguably changes. That's when robotics' relationship to medicine is altered forever.

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