Individual perspectives improve laparoscopy

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Could giving surgeons individual control over their view of a laparoscopic procedure improve their performance? A small new study indicates so based on in vitro experiments. In this picture, the surgical images have been added. Credit: Dr. Francois Luks

What makes laparoscopic surgery "minimally invasive" — instruments enter the patient through narrow tubes — also makes it visually constraining. As they work on different tasks, surgeons all see the same view. What if each surgeon could control a separate view best suited to the specific task? In a new paper, pediatric surgeon Dr. Francois Luks and his team of co-authors at Brown University and Hasbro Children's Hospital report that in a small in vitro trial, surgeons with their own views performed faster and more accurately.

"When we perform regular surgery, there is more than one point of view," said Luks, professor of surgery in the Warren Alpert Medical

School of Brown University. "If I'm operating with somebody on an open case, I can focus on one aspect of the wound while my assistant can focus on something else. I can cut a suture while he starts the next. We can never do that with laparoscopy, because it is only a single image."

For Luks and his colleagues the idea of giving each surgeon control of his or her own point of view during laparoscopic surgery has emerged as a key step toward making laparoscopic surgery feel more like open surgery.

Does it do any good?

A natural question, however, is whether doing so would produce the assumed performance improvement. The small "proof-of-concept" experiments in the new paper, published online June 25 in the *Journal of Laparoendoscopic and Advanced Surgical Techniques*, were meant to begin answering that. First author Dr. Rajan Thakkar, a surgical resident at Brown University and Rhode Island Hospital, presented the results earlier this year at the IPEG 2012 conference.

To conduct the study, Luks' team gathered 20 surgeons of different experience levels to take on two standardized training tasks. The volunteers were paired in teams of similar experience (e.g., two novices or two experts). Gazing at wall-mounted monitors, each pair would perform each task once using a shared view from one camera and once using individual laparoscopes and therefore their own individually controlled images. The order in which each pair performed the tasks was determined randomly.

The research team meanwhile measured the speed and accuracy of each pair's performance as they worked.

For the first task, one surgeon had to pluck each of 10 beads, one by

one, out of a small dish and pass it in mid-air to the partner who had to then place it atop a peg. The novice pairs did not show any improvement in speed using individual views versus a shared view, taking about 600 seconds to accomplish the task in each case. Experts, however, sped up considerably, reducing the task time to 245 seconds on average using individual views, compared to 409 seconds with the shared view.

The second task involved threading a suture around a rubber band and around some pegs. The band would topple if one surgeon didn't control the tension on the suture that the other created while pulling it around the pegs. On this task, both novice and expert pairs improved markedly with individual views. Novice pairs with individual views did the task in 53.5 seconds on average compared to 90.5 seconds when they had to share a view. Experts did the job in 49 seconds with individual views but 71.7 seconds with the shared view. Individualized viewing also reduced the number of times a rubber band was knocked down.

One camera, individual views

In practice, a surgical team uses only one laparoscope, not two, and so there would be only one image to work from. In previous research the team has shown how software can isolate individually useful views from within a single image.

In 2009 in the same journal, Luks and a team including current co-author Dr. Jeremy Aidlen, described an electronic goggle system called i-LID that offered wearers a unique view from within one image that they could control simply by moving their head to look around or zoom in and out. Given a large, high-resolution image from the laparoscopic camera, software simply carved out the portions that each surgeon indicated interest in based on head movement. The team worked with engineers including Harvey Silverman, professor of engineering at Brown, to develop the system.

The idea had some drawbacks, however. For one thing, goggles isolate surgeons from each other, Luks said. Also wireless transmission of the high-definition image to each pair of goggles could create latency, and while versions with wires had faster data speeds, they had the potential to be physically imposing in the close quarters of surgery.

But now Luks and Aidlen are encouraged both by the new results indicating that individual views could help surgical teams perform better, and by Aidlen's grant from the Rhode Island Foundation to develop an automated system that delivers individual control of views from within the same image, but does so without isolating goggle control.

That next innovation, and more testing, will move them closer to bringing individually controllable views and their apparent benefits into the operating room.

Provided by Brown University