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First-ever autonomously controlled 'capsule robot' explores colon

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New research shows that an 18-mm magnetized capsule colonoscope, which can be paired with standard medical instruments, successfully performed intricate maneuvers inside the colon while guided by an external magnet attached to a robotic arm. Researchers believe this technology will reduce the potential discomfort of colonoscopies and lead to more people undergoing the life-saving screening test. This new study was presented at Digestive Disease Week (DDW) 2017 , the largest international gathering of physicians, researchers and academics in the fields of gastroenterology, hepatology, endoscopy and gastrointestinal surgery.

Researchers hope the capsule robot, which is inserted rectally, could be used safely and effectively in the future on humans to identify and remove pre-cancerous lesions and tumors detected during colonoscopy.

"There's no doubt in the value of colonoscopies to keep people healthy through preventive screening for colon cancer, but many individuals still avoid this procedure, because of fear of the test itself, perceived discomfort or the risk of sedation," said Keith Obstein, MD, MPH, FASGE, the study's corresponding author and associate professor of medicine at Vanderbilt University Medical Center, Nashville, TN. "We developed this capsule robot to make traversing the GI tract much easier, for both the clinician and patient."

Dr. Obstein and his team tested the capsule robot, which has a tether that is smaller in diameter than conventional endoscopes, 30 times in the

colon of a pig. They reported that it successfully completed the maneuver of retroflexion, in which it bends backward to give the endoscopist a "reverse-view" of the colon wall, on its own (i.e. autonomously/autopilot) at the press of a button.

"Not only is the capsule robot able to actively maneuver through the GI tract to perform diagnostics, it is also able to perform therapeutic maneuvers, such as biopsies of tissue or polyp removal, due to the tether—something that other capsule devices are unable to do," added Dr. Obstein. "Since the external magnet pulls the capsule robot with the tether segment from the front or head of the capsule, instead of a physician pushing the colonoscope from behind as in traditional endoscopy, we're able to avoid much of the physical pressure that is placed on the patient's colon—possibly reducing the need for sedation or pain medication."

The team found that the autonomously-controlled capsule robot was successful in completing all 30 retroflexions. The capsule robot completed retroflexion in an average of 12 seconds, which was within the researchers' expectations.

Following the success of these tests in a pig, Dr. Obstein indicated that the team will be pursuing human trials, expected to begin at the end of 2018. In the meantime, his team will continue to optimize the algorithms that control the robotic arm to improve their performance in maneuvering the capsule-based robotic system.

More information: Dr. Keith Obstein and Mr. Piotr Slawinski will present data from the study, "The first autonomously controlled capsule robot for colon exploration," abstract Mo1962, on Monday, May 8, at 9:30 a.m. CT, in South Hall of McCormick Place.

Provided by Digestive Disease Week