EMERGING TECHNOLOGY TO EVALUATE RECONSTRUCTED POST-ANTIREFLUX VALVES WITHOUT CONVENTIONAL ENDOSCOPY

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Background

Upper gastrointestinal endoscopy (UGE) is essential in the diagnosis and follow-up of digestive diseases suchlike gastroesophageal reflux disease (GERD) and peptic ulcer disease (PUD). However, it carries procedural and sedation risks, especially for elderly patients. UGE costs include laboratory work, endoscopy fees, and work-absenteeism. This cost multiplies when there is a need to repeat EGD for monitoring of PUD or erosive esophagitis, etc. Retroflexion enables assessment of the Esophagogastric junction (EGJ) while stented open by the gastroscope. Current technology provides no means to visualize the collapsed/unstented de novo EGJ or post-antireflux surgery.

Materials and Methods

Magnetically Controlled Capsule Endoscopy (MCCE) is a system that includes: capsule (27 x 11.8mm) containing four lights, camera collecting images at 2 frames/second, magnet, a data recorder with sensors, and mechanical robot via a C-arm generating a magnetic field up to 200 mT (Figure 1). Using the robotic magnetic control system, the capsule rotates in five degrees of freedom, two-rotational and three-translational, and controlled migration from the cardia to the pylorus. Two applications are available for capsule control: manual manipulation and software directed.

The MCCE was performed at the surgeon's medical center without anesthesia or a companion driver. Patients completed the MCCE pre-test protocol by withholding food post 8 P.M. the day before the procedure. On procedural day, the MCCE preparation included: 70 mg of Simethicone diluted in 100 ml of water; following a 10-minute latency period, two additional water volumes were ingested 100 ml and ≥ 500 ml before MCCE administration. Total water consumption was 1200 ml of water. The data recorder vest was positioned to cover their chest region and abdominal cavity. The MCCE capsule was ingested in the left lateral decubitus position with a small volume of water, 20 ml. Images were transmitted wirelessly through the sensors in the data recorder vest. The surgeon traversed each region by magnetically controlling the capsule orientation and location. During the MCCE, the patient was in three positions: left and right lateral decubitus and supine. Following esophagus and stomach evaluation, the MCCE system offers opportunities to evaluate the small intestine.

Results

This patient is a 68 y/o female with recurrent antral gastritis. She presented for MCCE to guide further management. She underwent laparoscopic hiatal hernia repair and concomitant transoral incisionless fundoplication (cTIF) in 2019.

She required no preoperative laboratory testing, maintained medications, and no companion driver. She tolerated swallowing the capsule and followed the above protocol. There was improvement of antral gastritis, which did not completely resolve. As we guided the MCCE to evaluate the cardia, we observed the first visualization of a collapsed postoperative TIF valve (Figure 2). She had no adverse events and was discharged 30 minutes post-procedure.

Conclusion

The Magnetically Controlled Capsule Endoscopy system provides opportunities to evaluate and monitor upper digestive diseases without taking the risks and costs of repeated endoscopy. MCCE has the potential to offer new insights regarding de novo and post-antireflux gastroesophageal valves. As this technology advances, it can be performed by nurses/APP/technicians, facilitating patient access to care.

Figure 1: Magnetically Controlled Capsule Endoscopy (MCCE) System.

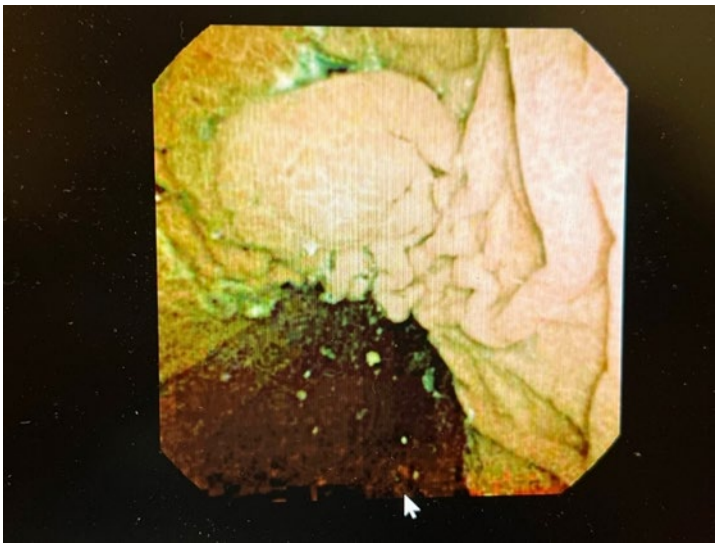

Figure 2: Magnetically Controlled Capsule Endoscopy (MCCE): Collapsed Post-Operative Transoral Incisionless Fundoplication (cTIF) Valve.